

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

WESTERN ZONE BENCH, PUNE

MEMORANDUM OF APPLICATION

(UNDER SECTION 14 AND SECTION 18(1) READ WITH
SECTION 20 OF THE NATIONAL GREEN TRIBUNAL ACT, 2010)

ORIGINAL APPLICATION NO. OF 2022

IN THE MATTER OF:

Vanashakti & Anr.

.....Applicants

Versus

Union of India & Ors.

.....Respondents

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This index is filed on Day of October, 2022 at Pune

Through


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A

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

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SYNOPSIS

S. NO.	DATE	EVENT
1.	1981	Coastal States issued an advisory by the Prime Minister to keep coasts clear of all activities at least upto 500 meters from the water at the maximum high tide.
2.	1983	Environmental Guidelines for Development of Beaches introduced.
3.	1991	Coastal Regulation Zone Notification promulgated to protect the vulnerable coastal stretches of India.
4.	2009	Final Frontier Report prepared by the Swaminathan Committee.
5.	2011	Coastal Regulation Zone Notification 2011 issued on the basis of the Final Frontier report.
6.	2014	Shailesh Nayak Committee formed to look into the issues raised by coastal states of Maharashtra, Kerala and Karnataka.

B

7.	2015	Shailesh Nayak Committee submitted its report.
8.	18.04.2018	Draft Coastal Regulation Zone Notification 2018 issued by the Respondent for comments and objections.
9.	18.01.2019	Coastal Regulation Zone Notification 2019 issued by the Respondent. Regulation 6(9) clarifies that CRZ 2019 will come into effect only when CZMP are updated and approved. Until then, CRZ 2011 shall continue to apply.
10.	25.03.2021	PIL No. 28 of 2021 filed by the Applicants before the Bombay High Court challenging CRZ Notification, 2019.
11.	29.09.2021	Updated CZMP only for Mumbai City and Mumbai Suburban Districts published. CRZ 2019 comes into effect only for Mumbai City and Mumbai Suburban Districts.
12.	08.10.2021	Bombay High Court dismisses the PIL and directs the Applicants to approach the NGT while holding that the delay is unreasonable.
13.	10.12.2021	Applicants file SLP No. 20495 of 2021 against the judgment of the Bombay High Court.
14.	30.09.2022	Supreme Court passes an order directing the Applicants to approach the NGT and holds that the proceedings be considered by the NGT in accordance with law and on its own merits without raising the issue with respect to limitation.
		Hence, the application.

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
WESTERN ZONE BENCH, PUNE
MEMORANDUM OF APPLICATION

(UNDER SECTION 14 AND SECTION 18(1) READ WITH
SECTION 20 OF THE NATIONAL GREEN TRIBUNAL ACT, 2010)
ORIGINAL APPLICATION NO. OF 2022

IN THE MATTER OF:

1. Vanashakti, a Public Trust registered under
The Bombay Public Trusts Act, 1950

Nandakumar Pawar House

Opp. Shri Jagannath Darshan Building

M.D. Kini Marg, Bhandup Village (East)

Mumbai - 400042

Email ID: stalin.vanashakti@gmail.com

Contact No.: 9820232302

2. Stalin Dayanand, aged 54 years

Indian Inhabitant, Director of Vanashakti

Nandakumar Pawar House

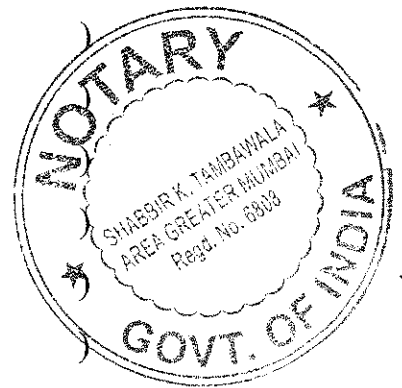
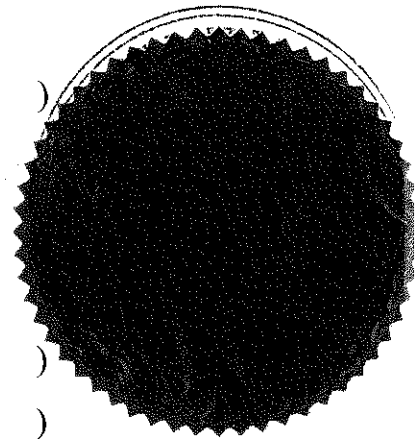
Opp. Shri Jagannath Darshan Building

M.D. Kini Marg, Bhandup Village (East)

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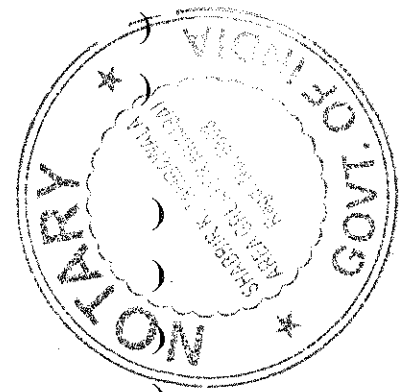


...Applicants

Versus

2

1. Union of India, through the)
Secretary, Ministry of Environment, Forests and Climate)
Change,)
Paryavaran Bhavan, Jorbagh Road,)
New Delhi, 110003)
Email ID: secy-moef@nic.in)
Contact No.: 011-24695262)
2. State of Maharashtra, through the Secretary,)
Department of Environment, Room No. 217 (Annexe),)
Mantralaya, Mumbai, 400032)
Email ID: psec.env@maharashtra.gov.in)
Contact No.: 022-22873845)
3. Maharashtra Coastal Zone Management Authority,)
Through its Chairperson, Environment)
Department, Room No. 217 (Annexe), Mantralaya,)
Mumbai, 400032)
Email ID: dir1.mev-mh@nic.in)
Contact No.: 022-22029388)
4. National Coastal Zone Management Authority,)
Through its Chairperson, Indira Paryavaran)
Bhavan, Aliganj, New Delhi – 110003)
Email ID: sujit.baju@gov.in)
Contact No.: 011-24695407)

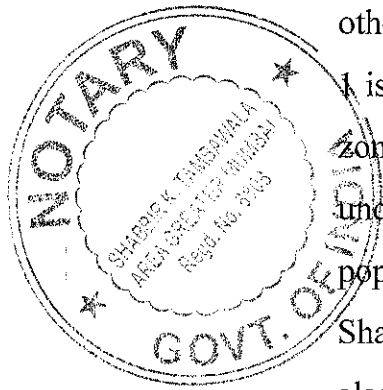


... Respondents

**MEMORANDUM OF APPLICATION UNDER SECTION 14 AND
18(1) READ WITH SECTION 20 OF THE NATIONAL GREEN
TRIBUNAL ACT, 2010**

MOST RESPECTFULLY SHEWETH:

1. The Addresses of the Applicants are as given above for the service of notice of this Application.
2. The addresses of the Respondents are as given above for the service of notices of this Application.
3. Applicant No.1 is a Public Trust registered under the Bombay Public Trusts Act, 1950. Applicant No.1's office is at the address set out above. Applicant No. 1 has been actively pursuing various environmental and other social causes in public interest in and around Mumbai. Applicant No. 1 is actively involved in sustained efforts towards conservation of coastal zones, forests, coastal and inland wetlands and wildlife and have also undertaken programs to ensure sustainable livelihood options for the tribal population of the country. Applicant No. 1 also has a sub-unit called Sagar Shakti which undertakes marine conservation work. Applicant No. 1 has also been instrumental in seeking release of much delayed CZMP Maps under the CRZ Notification, 2011. Applicant No. 2 is a citizen of India, and is the Projects Director of Vanashakti, the Applicant No. 1.
4. Applicants have been working consistently for more than a decade for the protection of forests, rivers, wetlands, mangroves, creeks, floodplains, beaches, National Parks and Wildlife Sanctuaries in Mumbai and Maharashtra. Applicant has not only undertaken various socio-



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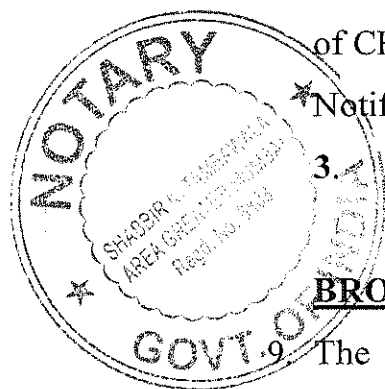
environmental outreach programmes aimed at developing a sense of environmental awareness amongst the younger population of Mumbai by ensuring their active participation in afforestation and cleaning activities but it has also taken an active role in using law as a tool to bring systemic change in protecting the environment. Applicant has been instrumental in securing protective orders from various constitutional courts and this Hon'ble Tribunal such as complete ban on reclamation and destruction of all coastal and inland wetlands in Maharashtra by the High Court of Bombay, fine of Rs. 100 Cr. as restoration costs imposed by the Supreme Court & Hon'ble NGT on various industrial bodies and government organisations for restoration of Ulhas River, complete ban on felling of trees in Sawantwadi-Dodamarg Corridor by High Court, complete ban on felling of trees in Aarey Forest by Hon'ble NGT & HC, direction to IIT Bombay to prepare a comprehensive report on cleaning of Mithi river by Supreme Court, a fine of more than Rs. 30 Cr. on Municipal Corporation of Greater Mumbai (MCGM) by Hon'ble NGT for cleaning up sewage pollution in creeks of Mumbai, ban on any construction activity on flood plains in Maharashtra by High Court and initiating much-delayed declaration of "Critical Wildlife Habitats" in all Protected Areas of Maharashtra. Further, Applicant has *inter alia* challenged vires of various delegated legislations such as challenge to Wetlands Rules, 2017 before the Supreme Court wherein notice has been issued, challenge to withdrawal of river regulation zone before the High Court of Bombay, which is pending final hearing. Further, Applicant had placed its objections and suggestions to the Draft CRZ Notification, 2018 when it was published for public consultation.

5. Respondent No. 1 is the Ministry of Environment, Forests and Climate Change and is the authority responsible for the protection and preservation

of the environment and prevention and abatement of environmental degradation in the country. In the present case, Respondent No. 1 is the authority responsible for issuing and notifying the impugned Notification. Respondent No. 2 is the Environment Department of Maharashtra, and is responsible for the protection of the environment in the state. Respondent No. 3 is the Maharashtra Coastal Zone Management Authority (MCZMA), charged with the responsibility of protecting the coast of the State and regulating related activities thereof. Respondent No. 4 is the National Coastal Zone Management Authority (NCZMA) charged with the responsibility of protecting the coast of the country and regulating related activities.

SUMMARY:

6. This Application challenges various provisions of the Coastal Regulation Zone Notification 2019 (“CRZ 2019”). A copy of CRZ 2019 is annexed hereto as ANNEXURE A-1. CRZ 2019 has superseded CRZ 2011. A copy of CRZ 2011 is attached hereto as ANNEXURE A-2. A copy of the Draft Notification, 2018 dated 18.04.2018 is attached hereto as ANNEXURE A-



BROAD OVERVIEW:

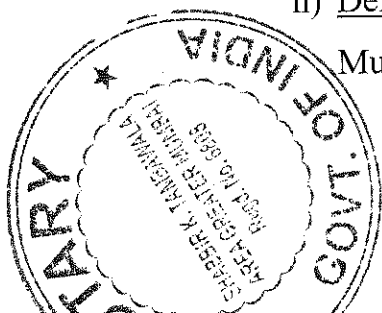
The provisions of the Notification under challenge are harmful to the environment and represent a severe regression both from the protections incorporated in (and/or principles and/or rationale thereof) under earlier CRZ Notifications. The topic areas and consequent provisions of the CRZ 2019 under challenge in the present Petition are as under:

- a) Bifurcation Of CRZ-III Into CRZ-IIIA AND IIIB, And Reduction of 200 Meter NDZ To 50 Meters In CRZ-IIIA [Regulation 2.3.1 and 2.3.2]

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- b) Reduction In The CRZ For Tidal Influenced Water Bodies From 100M TO 50M [Regulation 1.0 (ii)]
- c) Change Of FSI Norms In CRZ-II From Those Existing In 1991 To Those Presently Existing [Regulation 5.2 (iii) and 5.2 (iv)]
- d) Procedure For Clearance Of Projects Including Dispensing With EIA, Risk Assessment Report, And Disaster Management Plans in certain cases [Regulation 8 (i) (b) and 8 (i) (c)]
- e) Dilution of essential components in preparation Of CZMP (Annexure – IV)
- f) Dilution of essential components in Application Form for CRZ Clearance (Annexure – V)
- g) Dilution Of Protection For Mangroves And Mangrove Buffer [Regulation 5.1.1.(i), Regulation 5.1.1.(ii)]
- h) Changes In The Regulation Of Permissible Activities (Hotels, Port Development, Airport) In the CRZ [Regulation 5.1.2(i)(a), Regulation 5.2 (v), Regulation 5.4(ii)(a); Regulation 5.3 (g), Regulation 5.3 (v);
- i) Deleting Items From The List Of Prohibited Activities In The CRZ (Waste Disposal, Land Reclamation, Fish Processing units, and dressing of Sand Dunes) [Regulation 4 (i) and (ix)]
- j) Increase In The Number Of Petroleum And Chemical Products Permitted To Store In CRZ Areas Except For CRZ-I(A) [Annexure II Regulations (xvi) to (xxiii)]
- k) Dilution Of CRZ – I By Removing The Term ‘Associated Biodiversity’ In Respect Of Protection Of Coral Reefs [Regulation 2.1.1 (a) (ii)]
- l) Reduction In CRZ From 50 Meters To 20 Meters On Islands [Regulation 10.2 (ii)]
- m) Construction Of Statues / Monuments [Regulation 5.4 (xv)]
- n) Deletion of Special Provisions For Koliwadass And Gaothans In Greater

Mumbai



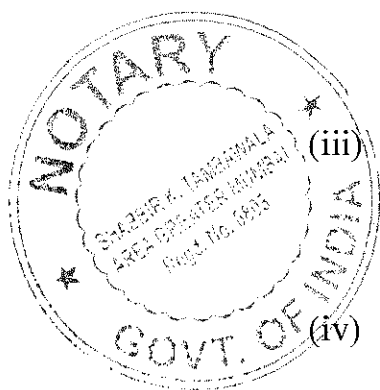
o) Deletion of Special Provisions for Mumbai

10. The Applicant shall deal with each of the areas of challenge independently.

The Applicant's submissions with respect to the provisions of CRZ 2019 are set out in detail below.

11. CRZ 2019 has brought about a radical change in the erstwhile regulatory framework and prevailing safeguards. As is clear from the summary in the foregoing paragraphs, CRZ 2019 takes away or dilutes almost all important measures, in force, to protect the environment. Apart from the irreparable environmental damage that will be caused, CRZ 2019 is also legally flawed. It suffers from various infirmities and legal defects. These may be summarised below:

- (i) Many of the new provisions violate the right to live in a healthy environment and consequently the right to life of citizens of India under Article 21 of the Constitution of India. They are also manifestly arbitrary as they are based on no reasoning whatsoever, and therefore violate Article 14 of the Constitution of India.
- (ii) The reasons cited for enacting many of the proposed changes have no nexus with the object sought to be achieved by them. The same are therefore arbitrary and unconstitutional and violate Article 14 of the Constitution of India;
- (iii) Many of the new provisions re-enact provisions that have been struck down as unconstitutional by Supreme Court or have been read down by the Supreme Court in earlier judgments;
- (iv) Many of the new provisions are contrary to the recommendations of various Committees set up by the Govt. of India to review the CRZ regime;



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- (v) Many of the new provisions were not included in the Draft CRZ Notification. They have therefore been passed in violation of Section 5(3) of the Environment Protection Act, 1986. They are not provisions introduced in an emergency, as the 2019 Notification has been under consideration for a number of years;
- (vi) The nature of the changes made clearly reflect that CRZ 2019 is less a provision to protect the environment from damage and more a provision to protect unregulated construction by diluting well considered and well thought through existing protections and safeguards.

Background facts leading to CRZ 2019

12. CRZ 2019 supersedes CRZ 2011. It would therefore be gainful to advert to the material (Reports and/or observations) which records, discusses and documents matters of environmental concern. This is important because in the exercise leading to CRZ 2019 being notified, this material was noticed, which it, for most of the material, is evident from CRZ 2019 itself. Copies of various Reports which were considered in the process leading to CRZ 2019 and/or on which it is based are attached hereto as under:

- (i) A copy of the Nayak Committee Report is attached hereto as **ANNEXURE A-4.**
- (ii) A Copy of the Swaminathan Committee Report is attached hereto as **ANNEXURE A-5.**
- (iii) A copy of the Final Frontier Report is attached hereto as **ANNEXURE A-6.**
- (iv) A copy of the file notings of the MoEF on CRZ 2019 is attached hereto as **ANNEXURE A-7.**



**A. BIFURCATION OF CRZ-III INTO CRZ-IIIA AND IIIB, AND
REDUCTION OF 200 METER NDZ TO 50 METERS IN CRZ-IIIA**

13. In CRZ 2019, the erstwhile CRZ-III has been bifurcated into CRZ-IIIA and CRZ-IIIB. The No Development Zone ("NDZ") in a part of this bifurcated area i.e. CRZ-IIIA has been reduced to 50 meters.

14. CRZ-III was defined in the 2011 notification as under:

"areas that are relatively undisturbed and those that do not belong to either CRZ-I or II, which includes coastal zone in rural areas (develop and undeveloped) and also areas within municipal limits or in other legally designated urban areas which are not substantially built-up"¹.

15. Regulation 2.3 dealing with CRZ-III in the 2019 notification reads as under:

2.3 CRZ-III:

Land areas that are relatively undisturbed (viz. rural areas, etc.) and those which do not fall under CRZ-II, shall constitute CRZ-III, and CRZ-III shall be further classified into following categories: -

2.3.1 CRZ-III A:

Such densely populated CRZ-III areas, where the population density is more than 2161 per square kilometre as per 2011 census base, shall be designated as CRZ-III A and in CRZ-III A, area up to 50 meters from the HTL on the landward side shall be earmarked as the 'No Development Zone (NDZ)', provided the CZMP as per this notification, framed with due consultative process, have been approved, failing which, a NDZ of 200 meters shall continue to apply.

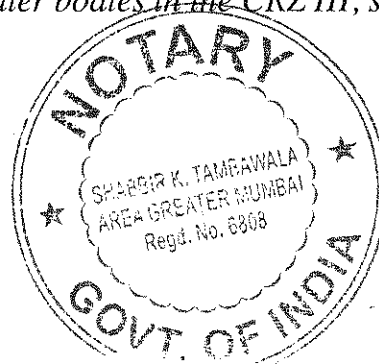
2.3.2 CRZ-III B:

All other CRZ-III areas with population density of less than 2161 per square kilometre, as per 2011 census base, shall be designated as CRZ-III B and in CRZ-III B, the area up to 200 meters from the HTL on the landward side shall be earmarked as the 'No Development Zone (NDZ)'.

2.3.3:

Land area up to 50 meters from the HTL, or width of the creek whichever is less, along the tidal influenced water bodies in the CRZ III, shall also be earmarked as the NDZ in CRZ III.

¹ CRZ 2011, Regulation 7(iii)



Note: The NDZ shall not be applicable in the areas falling within notified Port limits.

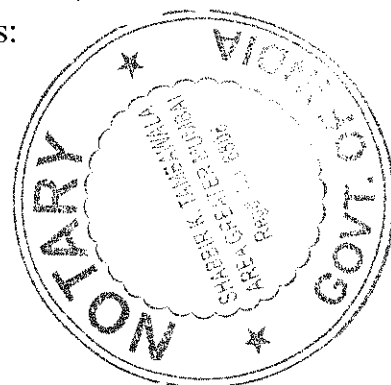
16. In CRZ 2019, it can therefore be seen that CRZ-III has been bifurcated into CRZ-IIIA and CRZ-IIIB the former of which is an area where the population is more than 2161 person per square kilometre as per 2011 census base, and the latter where the population density is less than 2161. The NDZ for CRZ-IIIA has been relaxed to 50 meters. Therefore in more densely populated areas, where the toll/strain on the environment is in greater need of environmental protection, the opposite has been done.

Challenge:

17. The challenge to this provision is based on the following grounds:

- (i) The basis for the said reduction has no rational nexus with the object of the said reduction. The same is therefore arbitrary and violates Article 14 of the Constitution. The Nayak Committee that examined changes to the CRZ has recommended this bifurcation and consequent relaxation of the No Development Zone (NDZ) in CRZ-IIIA. This recommendation appears to have been made on the representations made by State Governments that some rural areas in Kerala, Karnataka and other places are thickly populated with more than 2000 people per square km. The local communities who possess land in such NDZ were according to these representations, deprived of opportunities to construct or expand their houses. The population density standard of 2161 people per sq.km appears to be taken from standard set up in class III towns of 2001 census of India². This reasoning is arbitrary for a number of reasons:

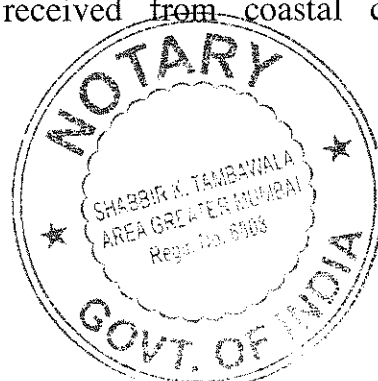
² Nayak Committee report section 3.2.1 at page 70 and 71 of 112.



a) Firstly, under CRZ 2011 (and indeed under CRZ 2019), there was a specific provision for construction/ reconstruction of dwelling units of traditional coastal communities permitted between 100 and 200 meters from HTL³ (which was within the NDZ of 200 meter under CRZ, 2011). Similarly, there was a provision for construction of facilities that were required for local inhabitants on a case to case basis⁴. In Regulation 5.3(ii)(a),(c) and (d), similar provision has been made for coastal communities in CRZ 2019. Therefore, a blanket relaxation cannot be said to have any nexus with the objective enunciated by the Nayak Committee for protecting “coastal communities”. The rights of coastal communities were adequately addressed under CRZ 2011. Even if that needed a revisit, they were addressed by Regulation 53 (ii) (a) (c) and (d) of CRZ 2019. Making essential relaxation for addressing legitimate concerns of a few (coastal communities) can by no stretch of logic or reason be the basis to grant a bonanza (at the cost of huge environmental damage) to the ‘many’ who had no legitimate concerns. Clearly, the manner in which a general relaxation has been done, indicates that the needs of ‘coastal communities’ was nothing but an excuse. The dilution of the NDZ and CRZ-IIIA therefore has no nexus with its purported object and must therefore be struck down. Indeed, if the comments to the draft CRZ notification are perused, it is clear that a large number comments received from coastal communities

³ CRZ 2011, Regulation 8 III A (ii)

⁴ CRZ 2011, Regulation 8 III A (iii)(j)

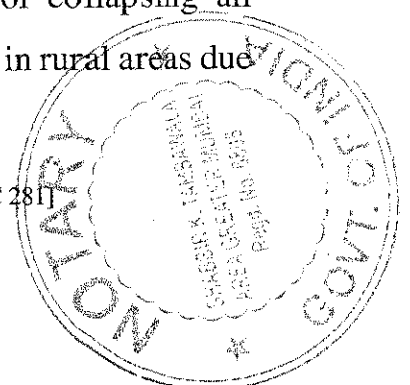


opposed the impugned notification. That apart, there is no consideration as to whether or how the provisions of CRZ 2011 were adequate/inadequate to deal with the needs of traditional coastal communities.

- b) Secondly, there has been absolutely no consideration of the environmental impact of the said relaxation by either the Nayak Committee or the MoEF. A need to relax is but one facet. The environmental consequences of such relaxation are equally important. There is however no consideration whatsoever in the consequences. At the very least, a balancing exercise was called for and a well-considered solution which was mindful of the 'effects' of relaxation, devised. This was one of the reasons that the Supreme Court struck down a Notification reducing the CRZ area from 100m to 50 meters for rivers, creeks, and backwaters in the *Indian Council for Environment-Legal Actions*⁵. The stated basis for the same is merely the population density without having regard to ecological and geomorphological features of an area. The only avowed basis has been the rights of local communities to construct or expand their houses, which in any event had specific provision made for the same in CRZ 2011.

- c) What has been completely ignored is that the above relaxation will heavily increase the risk of collapsing all coastal infrastructure and coastal farmlands in rural areas due

⁵ *Indian Council for Environment-Legal Actions vs Union of India & Ors* [(1996) 5 SCC 281]



to coastal flooding attributed to sea level rise and will also cause intrusion of excess saltwater into inland farmlands, thereby adversely affecting paddy farms and seriously threatening food security of various coastal regions of coastal states.⁶ A copy of a scientific research paper in support of the said data is attached hereto as ANNEXURE A-8.

18. In respect of the above the Applicant makes prayers (a), and (b).

B. REDUCTION IN THE CRZ FOR TIDAL INFLUENCED WATER BODIES FROM 100m TO 50m:

19. Tidal-influenced waterbodies include creeks, lagoons, estuaries, ponds (that are influenced by tide), and backwaters. CRZ 2019 has reduced the CRZ for tidal-influenced waterbodies from 100m⁷ to 50 meters⁸. Regulation 1.0(ii) of CRZ 2019 states as under:

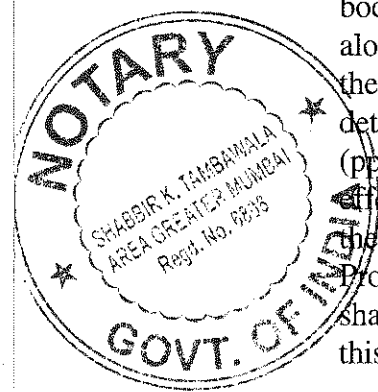
(ii) CRZ shall apply to the land area between HTL to 50 meters or width of the creek, whichever is less on the landward side along the tidal influenced water bodies that are connected to the sea and the distance upto which development along such tidal influenced water bodies is to be regulated shall be governed by the distance upto which the tidal effects are experienced which shall be determined based on salinity concentration of five parts per thousand (ppt) measured during the driest period of the year and distance up to which tidal effects are experienced shall be clearly identified and demarcated accordingly in the Coastal Zone Management Plan (hereinafter referred to as the CZMP):

Provided that the CRZ limit of 50 meters or width of the creek whichever is less, shall be subject to revision and final approval of the respective CZMPs as per this notification, framed with due consultative process, public hearing etc. and

⁶ Paras 1.2 and 2.2, "Paradigms of climate change impacts on some major food sources of the world: A review on current knowledge and future prospects, January 2016" by Ashutosh Tripathi, Durgesh Kumar Tripathi, D.K. Chauhan, Niraj Kumar & G.S. Singh published in the Journal "Agriculture, Ecosystems and Environment" at Pgs. 358 and 363.

⁷ In the 2011 CRZ notification [Regulation 1.0 (ii)] defined the CRZ in tidal-influenced waterbodies as an area between the high tide line to 100 meters or the width of creek whichever is less on the landward side along the tidal-influenced waterbodies.

⁸ In 2019 notification [Regulation 1.0 (ii)], the area of CRZ for tidal-influenced waterbody is 50 meter or the width of the creek, whichever is less on the landward side along the tidal-influenced waterbody.



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environmental safeguards enlisted therein, and till such time the CZMP to this notification is approved, the limit of 100 meters or width of the creek whichever is less, shall continue to apply.

Explanation.- For the purposes of this sub-paragraph the expression "tidal influenced water bodies" means the water bodies influenced by tidal effects from sea in the bays, estuaries, rivers, creeks, backwaters, lagoons, ponds that are connected to the sea

Challenge:

20. The Challenge to this reduction in the area of CRZ to 50 mts is on three grounds:

- (i) The Supreme Court struck down a similar amendment reducing the CRZ from 100m to 50m in the case of *Indian Council for Environment-Legal Actions vs Union of India & Ors* [(1996) 5 SCC 281]. The area that comprised the CRZ in CRZ Notification 1991 was 100 meters. This was sought to be reduced to 50 meters by a Notification dated 18th August 1994. This amendment was challenged and the Hon'ble Supreme Court held that there was no basis given for the reduction in the said area. It noted that even the Vohra Committee which had been set up to look into the demand into the tourism industry did not make any such recommendation either from an environmental point of view or otherwise and therefore, the proposal did not appear to have been made for any valid environmental reasons and was therefore arbitrary. Furthermore, the court noted that in some areas like Goa, there are mangrove areas that need protection which stretch to more than 100 meters from the river bank and this contention had not been denied. Therefore, the court in the absence of any justification for this reduction, concluded that the relaxation was done for some extraneous reasons. The reduction in the distance of CRZ from 100 to 50 meters was therefore held to be contrary to the object of the Environment (Protection) Act, 1986 and was held to be illegal and was



struck down⁹. This decision squarely applies, on all fours, to the present case.

(ii) The only reasoning for this change appears in the file noting of Ministry of Environment that “*These tidal-influenced waterbodies do not generally get flooded*¹⁰”. This has no co-relation to the objects of the Environment (Protection) Act, 1986 and is therefore arbitrary and illegal. Indeed, in the draft notification recommended by the Nayak Committee the CRZ for tidally influenced waterbodies is shown as 100 meters¹¹. Therefore, the Nayak Committee has in fact recommended 100 meters as the correct area which ought to come within the purview of CRZ in the case of tidally influenced waterbodies. Both Reports of the Swaminathan Committee of February 2005 and 16th July 2009 (titled “*Final Frontier*”), note that the Hon'ble Supreme Court in the judgement in the case of ***Indian Council for Environment-Legal Actions vs Union of India & Ors***¹² struck down the proposed reduction in area of CRZ from 100 to 50 meters. The said reports did not make any recommendation to reduce the area from 100 to 50 meters¹³. None of the Committee Reports recommended reduction in the said CRZ area. The file noting in the MoEF also shows that none of these aspects have been considered.

(iii) Therefore, the decision, as taken, is without any basis whatsoever. Worse, it ignores the Supreme Court decision (noted above) which underscores the necessity for there being a “justification”. The absence of any justification for permitting any relaxation has now in fact been

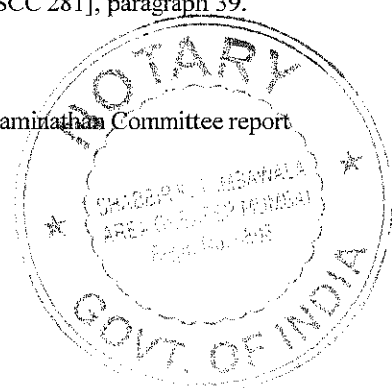
⁹ *Indian Council for Environment Legal Actions vs Union of India & Ors* [(1996) 5 SCC 281], paragraph 39.

¹⁰ File noting of MOEF, para 4(iv) at Internal page 28

¹¹ Nayak Committee report, draft notification Regulation 3(ii) at page 93 of 112.

¹² 1996 (5) SCC 281 decided on 18.04.1996

¹³ Final Frontier report dated 16th July 2009 at paragraph 13(iii), internal page 40; Swaminathan Committee report dated 9th February, 2005 at paragraph 3.1.2 at page 74.



replaced with material which militates against relaxation. “No material to justify relaxation” has now become “abundant material to justify non-relaxation”. Despite this, for no stated reason or basis, relaxations have been permitted.

(iv) The said changes would also adversely impact coastal populations. The reduction in CRZ would affect erosion in tidal influenced water bodies which are crucial to protection of coastal communities from rising sea levels. Tidal influenced water bodies form a conducive environment for mangroves to grow in the mudflats, which act as major natural barriers against drastic natural coastal disasters including a buffer against rising sea levels. The Hon'ble Supreme Court in *Indian Council for Environment-Legal Actions* had already noted that one of the consequences of lowering the CRZ is that it would adversely affect mangroves that would grow beyond 50 meters from the intertidal bodies in various States such as Goa. The Final Frontier Report of July 2009, which formed the basis for the 2011 CRZ Notification emphasized on the fact that the Indian Coast is vulnerable to climate change at two levers – firstly, from growing intensity of cyclonic storms to sea surges and secondly eventual sea level rise.¹⁴ A copy of the judgment is annexed and marked herewith as **ANNEXURE – A-9**.

(v) According to a recently published scientific article, the global Mean Sea Level is likely to rise 20–30 cm by 2050 and high enough to threaten land currently home to a total of 150 (140–170) million people to a future permanently below the High Tide Line by 2050. 70% of the total number of people worldwide currently living on land that will be affected by this

¹⁴ Final Frontier Report, 2011, Para 13(ii), Internal Pg. 40



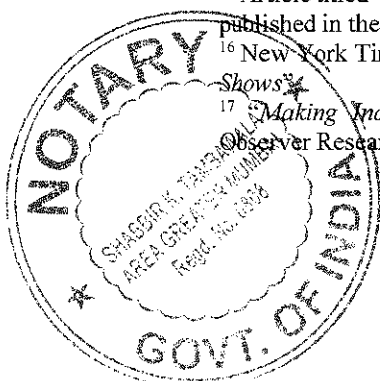
rise in sea levels are in eight Asian countries which includes India.¹⁵ A copy of the said Article is attached hereto as **ANNEXURE A-10**. The IPCC (Intergovernmental Panel on Climate Change – a UN body) Reports of 2018 and 2019 have also concluded the same. The practical consequence of this study was addressed in an article published in New York Times whereby it is predicted that as far as Mumbai is concerned, at least 50% of South Mumbai and entire Central Suburban Mumbai will be underwater by 2050, if stricter measures to protect the coastline is not undertaken.¹⁶ A copy of the New York Times article is attached hereto as **ANNEXURE A-11**. If a reduction of CRZ area from 100 to 50 meters in today's alarming situation is proceeded with, the entire city of Mumbai will face extreme adverse challenges from keeping itself protected from the coastal flooding since many mangrove areas located on Mumbai coasts (both Western and Eastern Coasts) extend beyond 50 meters. Further, allowing intense development closer to the sea by reducing the CRZ limit to 50 meters would exacerbate the risk for the coastal infrastructure and vulnerability of coastal populations.¹⁷ A copy from an article from the Observer Research Foundation is attached hereto as **ANNEXURE A-12**.

(vi) The said changes would also cause other damage to the environment, Tidal influenced water bodies are rich in bio diversity and need extra protection. Many sites form sites for migratory birds such as Flamingos at certain times of the year. They are also the breeding grounds for fishes and crustaceans like crabs etc. that live close to the coast. Various ecologically important areas may exist on creeks beyond 50 meters such as salt marshes,

¹⁵ Article titled "New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding" published in the journal "Nature Communications" in October, 2009

¹⁶ New York Times Article dated 29.10.2019 titled "Rising Seas Will Erase More Cities by 2020, New Research Shows"

¹⁷ "Making India's coastal infrastructure climate-resilient: Challenges and Opportunities," published by Observer Research Foundation in August, 2019



coastal waterbodies, inter-tidal lakes & inter-tidal grasslands wherein habitats of crustacean species and Gastropods & other shell species are found. Reducing the CRZ in such circumstances would have a drastic impact on the food chain in such a fragile ecosystem. Mangroves are one of the many ecological indicators of inter tidal activity. The presence of intertidal fauna and flora has to be recognised and protected.

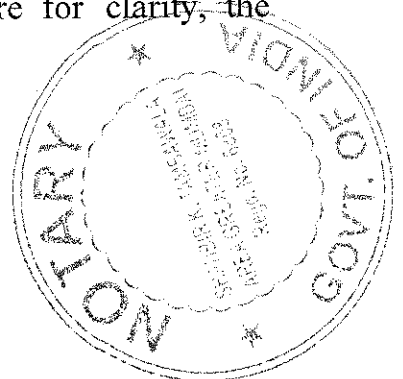
21. In respect of the above, the Applicant makes prayers (c), (d) and (e).

C. CHANGE OF FSI NORMS IN CRZ-II FROM THOSE EXISTING IN 1991 TO THOSE EXISTING AS ON 18TH JANUARY 2019

22. Regulations 5.2 (iii) and (iv) of CRZ 2019, provides that FSI (floor space index)/FAR (floor area ratio) shall be as per relevant town and country planning norms as on the date of CRZ 2019 i.e. 18th January 2019. This removes the freeze on town planning norms in the earlier CRZ which were frozen on the date of coming into force of CRZ 1991 in the judgment of the Supreme Court in *Suresh Estates vs Municipal Corporation of Greater Mumbai & Ors.* [(2007) 14 SCC 439]. A copy of the judgment is attached hereto as ANNEXURE A-13.

23. CRZ 2011 contained a provision stating that the FSI, FAR, and other local town and country planning norms would be as "existing". This was the exact same wording as in CRZ 1991¹⁸. The Hon'ble Supreme Court in *Suresh Estates* interpreted this provision in CRZ 1991 to mean that the town and country planning norms as of the date of coming into force of CRZ 1991 would apply. It may be pointed out here for clarity, the

¹⁸ CRZ 1991, Annexure 1, CRZ-II (i)



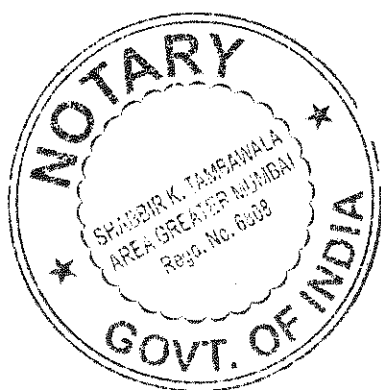
provisions of CRZ 2011 were modified to clarify that the applicable local town planning norms including FSI, FAR would be as of 19th February 1991.

24. Therefore, CRZ 2019 has changed the applicable town planning norms from those that were applicable on coming into force of CRZ 1991 to those in force on coming into force of CRZ 2019 i.e. 18th January 2019. The disastrous implications thereof are only too evident, since development in ecologically and environmentally vulnerable areas will now catastrophically mushroom exponentially.

Challenge:

25. The challenge to the said provision is based on the following grounds:

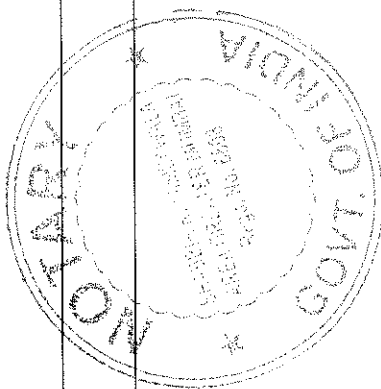
- (i) The enormity of what this change involves is to be seen to be believed. This change will, by itself, destroy the coastal environment. This change will also have devastating consequences even on the standard of life of persons living in these areas. A Table setting out the permissible FSI structure for Mumbai under DCR 1991 and DCR 2034, graphically brings this home.



Sr. No.	DEVELOPMENT ACTIVITY IN CRZ AREAS (As per CRZ, 2019)	FSI under DCR 1967 (as applicable to CRZ areas under CRZ 1991 & 2011)	FSI under DCPR 2034 (as applicable to proposed CRZ 2019)
1.	New construction of residential buildings in CRZ-II on the landward side	(i) Coast along Tardeo, Haji Ali, Worli, Mahalaxmi – 1.66 (ii) Coast along Napean Sea Road, Carnac Road, Mahim Causeway to Bombay-Agra Road (upto Mulund) - - 1.66	Total Permissible FSI is linked to road width <i>(width) – (FSI)</i> I. Island City Upto 9m – 1.8 9m – 12m – 2.7

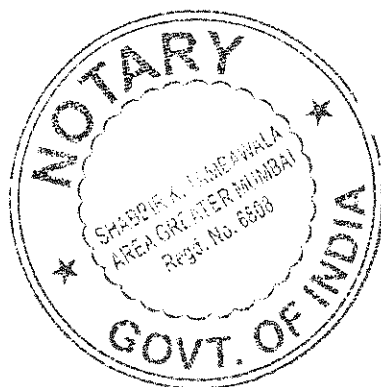
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		(iii) Suburbs and Extended Suburbs (Western) – 1.00 (iv) Reclamation area of MHADA in Mahim Creek (Bandra West) – 2.00 (v) Areas close to shore/creek in 'M' ward – 0.75 or 0.5 (vi) Backbay Reclamation Schemes I & II – 2.45 (vii) Backbay Reclamation Schemes III to VI – 3.5	12m-18m – 3.24 18m-27m – 3.65 above 27m – 4.05 II. Suburbs Upto 9m – 1.35 9m – 12m – 2.7 12m-18m – 2.97 18m-27m – 3.24 above 27m – 3.375
2.	New construction of office space development in CRZ-II	Same as above.	Total Permissible FSI is linked to road width (<i>Greater than 12 m road width only</i>) FOR ENTIRE CITY 12m – 18m – 4.05 18m – 27m – 5.40 Above 27m – 6.75
4.	Reconstruction of authorized buildings in CRZ-II		Redevelopment of construction of staff quarters of govt/MCGM/statutory bodies on govt lands – 4.0 <i>[DCR 33(3A)]</i> Redevelopment of construction of staff quarters of govt/MCGM/statutory bodies on private lands – 3.0 for min. 12m road width & 4.0 for min. 18m road width. <i>[DCR 33(3B)]</i> Redevelopment of MHADA Hsg schemes – 4.0 plus upto 70% incentives <i>[DCR 33(5)]</i> Reconstruction of cessed buildings undertaken by Co-operative Hsg. Society – 3.0



			plus upto 50% more incentive FSI <i>[DCR 33(7)]</i> Reconstruction/Redevelopment of cluster buildings by MHADA/MCGM – 4.00 plus upto 100% incentives <i>[DCR 33(9)]</i> Redevelopment under SRA Scheme – 4.0 plus incentives <i>[DCR 33(10)]</i>
5.	Construction of Hotels in CRZ-II areas	N/A	<i>Road width – FSI</i> Min. 12m – 3.0 Min. 18 m – 4.0 Min. 27m – 5.0 Plus upto 50% additional incentives <i>[DCR 33(4)]</i>
6.	Construction of Hotels in CRZ-III areas	N/A	DCR not applicable as CRZ, 2019 itself states that maximum FSI shall be 1.33

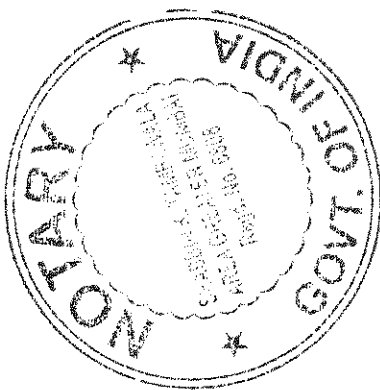
DCR 2034 was the result of a planning exercise which came into force on 1st September, 2018 (& certain additional provisions were notified on 13th November, 2018), this exercise factored in the load based on DCR 1991 in coastal areas. The exponential increase that CRZ 2019 would bring forth was not in contemplation. Therefore, quality of life, air, water, open spaces, noise, population etc. will all catastrophically deteriorate/diminish. Indeed, in places like Mumbai, a drastic increase in FSI in coastal areas will have a disproportionate impact on the population that has not at all been considered when planning for DCR 2034 was done. Coastal areas constitute 53.58 sq.km which is approximately 10% of the area of Mumbai and



26% of the total area of Greater Mumbai is affected by CRZ. If there were a drastic revision of FSI norms (as contemplated in CRZ 2019), it would constitute a “modification of a substantial nature” under Sections 22A (a) and (c) of the Maharashtra Regional and Town Planning Act. Such a revision would normally require an elaborate procedure to be followed, and study to be conducted before being permitted. Nothing of the sort has been done before modifying CRZ 2019, and its consequential impact on DCR 2034.

- (ii) The proposed changes have no rational nexus with any environmental reasons. The environmental impact of the same has not been considered in any of the recommendations. The Nayak Committee does not provide any scientific/environmental analysis and merely states the following at Para 3.1.2:

“The Committee also examined the Office Order of September, 1998 issued by MoEF&CC which freezes the FSI as on 19.2.1991 including the Orders of Hon'ble High Court of Bombay which has upheld the above Orders of MoEF&CC. The Orders of Hon'ble High Court of Bombay in freezing the FSI as on 1991 have also been examined. The Orders of the Hon'ble High Court in this matter does not prevent the Government to amend the law. Hence, the Committee is of the opinion that in view of the serious environmental and social issues arising due to proliferation of slums the matter should be left to the State Governments to implement the slum rehabilitation schemes as per the concerned State Government norms issued from time to time.”¹⁹

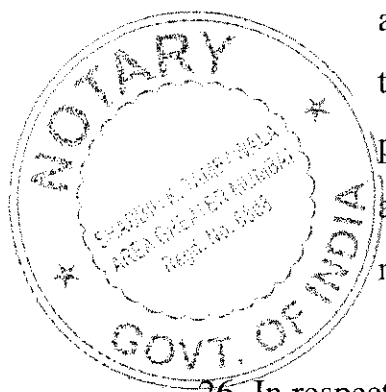


This reasoning has no rational nexus with the implementation of Slum Rehabilitation Schemes and redevelopment of dilapidated buildings. In CRZ 2011, an extensive regimen was set up especially considering Slum Rehabilitation Scheme; and

¹⁹ Nayak committee report, para 3.1.1 and 3.1.2 and 3.1.3 at Pgs. 66 to 68 of 112

dilapidated, cessed and unsafe buildings. Therefore, the said recommendation cannot be said to furnish any valid reasoning at all. If the aim was to ensure redevelopment of slum areas as well as dilapidated, cessed and unsafe buildings, there was no need to make a general relaxation in the date on which relevant town and country planning norms shall apply.

In the various other committee recommendations and comments of MOEF, no specific reason has been provided for why there should be a general relaxation of the date on which the FSI/ FAR are frozen and the extension of the same from 19th February 1991 to 18th January 2019. Indeed, as pointed out earlier, these provisions in respect of the areas sought to be protected were already provided for in CRZ 2011. The said provision is therefore manifestly arbitrary.



26. In respect of the above the Applicant makes prayers (f), and (g).

D. PROCEDURE FOR CLEARANCE OF PROJECTS INCLUDING DISPENSING WITH EIA, RISK ASSESSMENT REPORT, AND DISASTER MANAGEMENT PLANS IN CERTAIN CASES

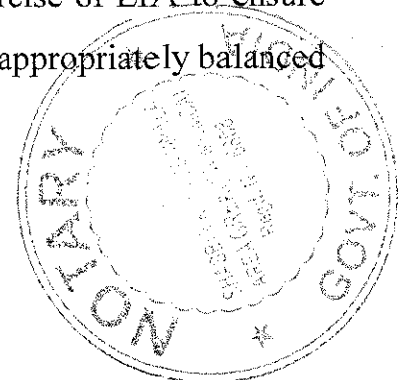
27. Regulations 8.(i) (c) and (d) of CRZ 2019 grants an exemption to building construction projects and housing schemes which are less than the threshold limit mentioned in the EIA Notification of 2006, from submitting a comprehensive EIA study, Risk Assessment Report and Disaster Management Plan. No such exemption was provided in the 2011 Notification. The threshold Unit prescribed for building construction projects and housing schemes, under the EIA Notification, is 20,000

sq/mtr. Therefore every proposal involving an area of less than 2,00,000 sq.ft. can now be sanctioned with no need to do an EIA Study, Risk Assessment, etc.

Challenge:

- (i) The said provision may seem innocuous at first blush but is far from so. The provision places no cap on the number of such projects and the aggregate area covered thereby. It is therefore possible to put up unlimited construction in a CRZ area by merely submitting (and getting approval) separate proposals for individual buildings each below 2 Lac Sq.Ft., which in the first instance is a significant area.
- (ii) The said provision was not in the 2018 Draft Notification which required all project proponents to submit a comprehensive EIA report with cumulative studies, risk assessment report and a disaster management plan for CRZ Clearance.²⁰ This was advisedly so.
- (iii) This contravenes Rule 5(3) of the Environment (Protection) Rules, 1986 ("EPR") which requires that the relevant change has to be published and objections from the public be invited thereon and considered. It is clear that this was not an emergency measure by its very nature. The process of a review of CRZ 2011 has been underway for a long time period.
- (iv) Dispensing with EIA for housing and building projects that have a large footprint is grossly arbitrary and illegal as the exercise of EIA to ensure that environmental and developmental concerns are appropriately balanced

²⁰ Regulation 8 of the Draft CRZ Notification, 2018, pg 15.



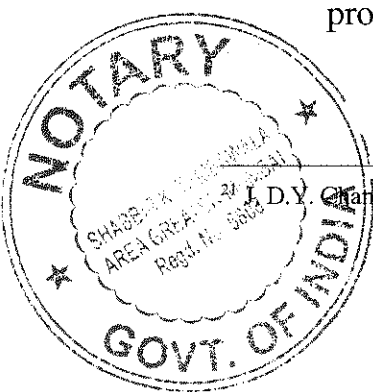
on the basis of the most accurate information available²¹, more so for coastal areas. To meet its objective to ensure protection of coastal stretches and to sustainably develop the coast without losing its sanctity, CRZ 2011 sought preparation of an EIA Report even for all those projects which were outside the ambit of EIA Notification, 2006 but were falling within CRZ areas. CRZ 2019 seeks to remove requirement of preparing an EIA Report and thereby, making the fragile coastline more vulnerable to concretization and thereby, defeating the purpose of CRZ Notifications.

28. In respect of the above the Applicant makes prayers (k), and (l).

E. DILUTION OF ESSENTIAL COMPONENTS IN PREPARATION OF CZMP's

29. In CRZ 2019, there have been drastic changes in the manner in which CZMP's have to be prepared. These have tremendous consequences on the environment at a practical level, and influence/inform on each and every aspect of the CRZ Notification. This primarily flows from the changes to Annexure IV of the Notification. The manner and mode of preparation of the CZMP is fundamental as deficiencies in the same could lead to all the protections/provisions of CRZ 2019 a dead letter. These lacunae are as under:

- (i) Firstly, CRZ 2019 leaves scope for arbitrary demarcation and seeks no second layer of verification for ground-truthing, which involves the process of physically visiting areas, taking note of the GPS Coordinates



and accordingly marking the same on the Map in hand. This is a crucial exercise to verify satellite imagery/data with actual ground conditions.

- (ii) Under CRZ 2011, pollution levels in the water area were required to be demarcated, as per water quality standards set by Central Pollution Control Board.²² CRZ 2019 does away with this requirement. It is essential to demarcate pollution levels to understand which coastal areas are critically polluted and require urgent attention and urgent protection/conservation. This will have an essential role to play in determining CRZ in areas such as in Tidal influenced water bodies, in conducting EIA studies etc.
- (iii) CRZ 2011 considered important geomorphological features such as landward (monsoonal) berm crest in the case of sandy beaches, rocks, headlands, cliffs, seawalls or revetments or embankments while demarcating in HTL or LTL.²³ CRZ 2019 has excluded the entire Regulation relating to this. It is necessary to demarcate all features on the coastline to ensure that the coastline with all its natural features is safeguarded so that these can be assessed against project proposal for granting of clearances/permissions.
- (iv) The 2011 Notification protected the dwelling units of local communities including that of the fishers against relocation if the units are located on the seaward side of the hazard line and mandated the State Government to provide necessary safeguards from natural disasters to such dwelling units.²⁴ This has been excluded from the present notification. This

²² Cause II (11) of Annexure I of CRZ 2011 Notification, pg. 18.

²³ Regulation I B (8) Annexure 1 of CRZ 2011 Notification, pg 17.

²⁴ Regulation II (8) of Annexure I of CRZ 2011 Notification, pg 18.



adversely impacts the life and livelihoods traditional communities existing on the seaward side of the hazard line. This is also a telltale indicator of the real intent behind the extensive and far-reaching changes which have been introduced.

Challenge:

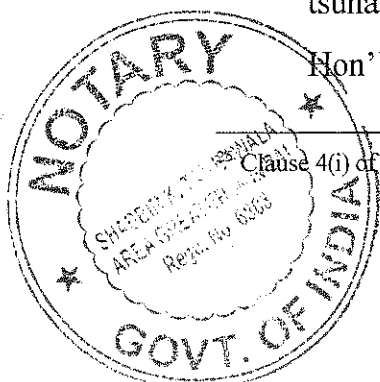
- (i) The Shailesh Nayak report includes no reason whatsoever with respect to the above mentioned differences in preparation of CZMP's between the CRZ 2011 and CRZ 2019. In the file notings of MoEF on Shailesh Nayak Report, it is stated/commented that ground verification and rectification has been assigned to NCSCM to rest ambiguities resulting from multi-organisational demarcation, and that it shall be prepared based on methodology approved by the MoEF&CC (including ground verification).²⁵ However, there has been no mention of such methodology as well. The absence of such criteria in the CZMP's would render CRZ 2019 a dead letter at a practical level.

30. In respect of the above the Applicant makes prayers (m), and (n).

F. DILUTION OF PROTECTION FOR MANGROVES AND MANGROVE BUFFER

31. There has been a reduction/dilution of protection of mangroves in CRZ 2019. This topic can be divided into three parts: Before doing so, it is extremely important to highlight the immense importance of mangroves to the environment and also the critical role they play in protecting persons and property in coastal areas from natural disasters such as cyclones; tsunamis etc. In this behalf, the following observations made by the Hon'ble High Court of Bombay in *Bombay Environmental Action Group*

Clause 4(i) of the file notings of MoEF on Shailesh Nayak Report, pg 27.



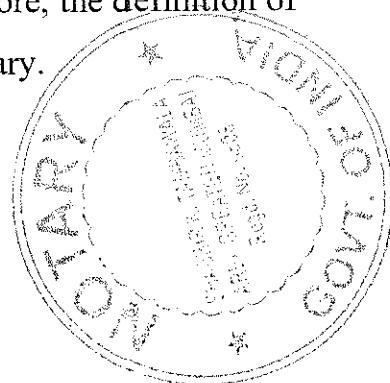
& Anr. v/s State of Maharashtra & Ors. (PIL No. 87 of 2006), while relying upon *Krishnadevi Malchand Kamathia and Ors. v/s Bombay Environmental Action Group & Ors.* (2011) 3 SCC 363 may be noted:-

“55. Mangroves ecosystems play a vital role in human life. In the subsequent part of this judgment, we have quoted a decision of the Apex Court which notes that the mangroves forests are of great ecological importance and are also ecologically sensitive. Considering the vital role played by the mangroves which can be seen from what is set out above, if a citizen is to lead a meaningful life as contemplated by Article 21 of the Constitution of India, the mangroves will have to be preserved and protected. Considering the drastic effects of destruction of mangroves on the environment, the destruction of mangroves and the failure of the State to take steps for its restoration will amount to violation of fundamental rights guaranteed by Article 21 of the Constitution.”

Challenge:

- (i) **Increasing the types of permissible activity:** The 2019 Notification adds “etc.” to the definition of eco-tourism activities permitted in mangrove areas which includes mangrove walks among other things. This insertion makes the definition of eco-tourism activities non-exhaustive. This sub-Regulation wasn’t included in the earlier Notification.²⁶ There are no reasons given for adding the word “etc.” to the definition of eco-tourism activities. It is designed to expand and expands the term and to top it off, is extremely vague. The Notification uses the word “etc” and not “or the like” which would have clearly brought in the *ejusdem generis* principle, – therefore, the definition of permissible activities is vague and therefore arbitrary.

²⁶ Regulation 5.1.1.(i) of the 2019 Notification, pg 33.



- (ii) **Change in Buffer Zone:** There has been a complete change in the permissible activities in the buffer zone. CRZ 2019 adds another Regulation which permits laying of pipelines, transmission lines, conveyance systems/mechanisms and construction of road on stilts etc. that are required for public utilities in the mangrove buffer area.²⁷ This is without any reasoning or consideration. It is also contrary to the recommendations of the Swaminathan report.

The Swaminathan report mentioned the benefit of the buffer area of 50m which was to be around the mangrove stretch.

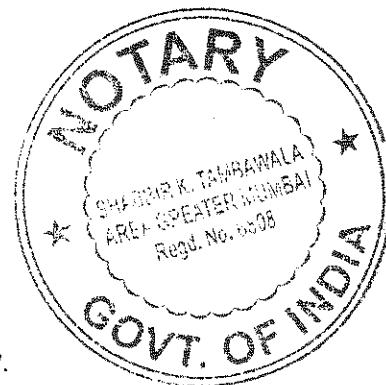
"In addition to the diversity of the habitat, the mangroves play an important role in a sediment repository, stabilises shoreline, a buffer against storm surges (that would otherwise have a more damaging effect on the coast. Its positive impact was noticed in the Bangladesh cyclone of 1991. In the recent Gujarat and Orissa cyclones the devastation was reported to have been lesser where sufficient mangrove buffers were present".²⁸

In its 87th meeting in January 2014, the Maharashtra CZMA decided that there should be a policy to manage the 50 m buffer zone around the mangrove area of 1,000 m or more. it resolved that a green belt has to be developed by project proponents in the proximity of the mangrove areas in the 50 m buffer zone for the protection of existing mangroves."²⁹

²⁷ Regulation 5.1.1.(ii) of the 2019 Notification, pg 33.

²⁸ Para 2.4.1. of Swaminathan Committee Report, 2005, Pg 39.

²⁹ Q. 11 of the Report "CZMAs and Coastal Environments", 2015 internal pg 127.



However, the Shailesh Nayak Report drastically changed the purpose of the buffer land area. It recommended that:

“This buffer zone of 50 m shall be utilized for constructing walkways, interpretation centers, promenades public facilities for developing parks, research facilities related to mangrove biodiversity, facilities for conservation and the like. Further, in the mangrove area and in the buffer, all activities are prohibited except for laying of pipelines, transmission lines, conveyor belts, construction of road on stilts and other conveying mechanisms that are required for public use. Défense establishments such as watch tower could be taken up in the mangrove area”³⁰

However, this is not the case in the notification. The MoEF file notings only mention that development project could be undertaken only if no other option exists,³¹ but does not seem to give any reasons for relaxing the requirements in the buffer area. The importance of the buffer area was noted by the Hon’ble Bombay High Court in PIL No. 87 of 2006 (*Bombay Environmental Action Group & Anr. v/s the State of Maharashtra & Ors*). The final provision therefore goes against the very nature of a buffer area and changes the entire purpose of the buffer area.

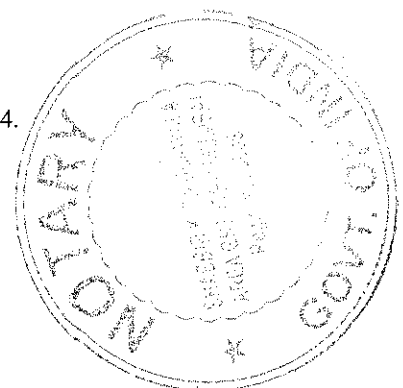
- (iii) **Compensatory Afforestation:** In a mangrove area, if the construction of any road or sewage treatment plant is inevitable, a minimum of three times the mangrove area affected or destroyed or cut during the construction process shall be taken up for compensatory plantation of mangroves as per the 2019 Notification³² as opposed to five times that the CRZ 2011 Notification directs.³³ The Shailesh Nayak Report itself states that the Government (State/Union) shall undertake 10 (ten) times mangrove afforestation in lieu of the mangrove land area reclaimed for

³⁰ Annexure A – Clause (I)(A)(a) of the Shailesh Nayak Report, internal pg 107 of 112.

³¹ Clause 3.2 of the file notings of MoEF for the Shailesh Nayak Committee Report, pg 24.

³² Regulation 5.1.1.(iii) of CRZ 2019, pg 33.

³³ Clause 8(V.)(1.)(A.)(ii) of CRZ 2011, pg 12



the purpose.³⁴ Therefore the requirement of compulsory afforestation of only 3 times the affected area is contrary to all the reports. There is no reasoning for dilution of the requirement under CRZ 2011. This dilution is therefore illegal, unlawful, and arbitrary.

32. In respect of the above the Applicant makes prayers (h), (i) and (j).

G. CHANGES IN THE REGULATION OF PERMISSIBLE ACTIVITIES (HOTELS, PORT DEVELOPMENT, AIRPORT) IN THE CRZ

33. The change in permissible activities can be bifurcated into the following sub-categories: (i) Hotels; (ii) Airports; and (iii) Port Development

(i) HOTELS-

34. There are 2 major issues in the new CRZ 2019 regime in respect of Hotels:

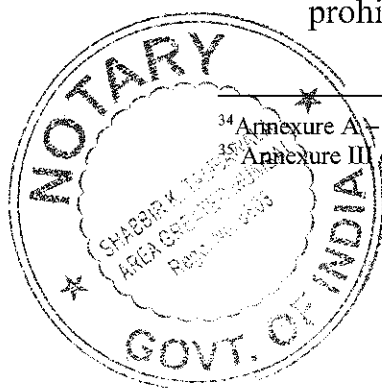
- (i) Expanding scope of Beach Resorts/hotels and (ii) Relaxation of regulations in CRZ-III.

Challenge:

35. **Expanding scope of Beach Resorts/hotels:** Firstly, Regulation 5.2 (v) & 5.4(iii)(a) read with, Annexure III of CRZ 2019 has expanded the scope of tourism development in CRZ areas by adding the words “tourism development projects”³⁵ Therefore, while the draft 2018 Notification only permitted development of beach resorts and hotels in CRZ areas, the 2019 Notification permits construction of tourism development projects in addition to beach resorts or hotels. It may be pointed out that the CRZ 2011 prohibited reclamation for commercial purposes such as shopping and

³⁴ Annexure A - Clause (I)(A)(c) of the Shailesh Nayak Report, internal pg 107 of 112.

³⁵ Annexure III of CRZ 2019 and also at Regulation 5.2 (v) at Pg. 36 & 5.4(iii)(a) at Pg. 37 of CRZ, 2019

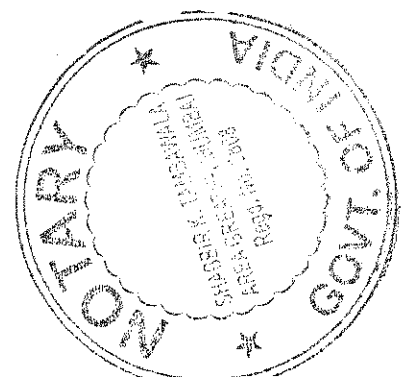


36. That apart, the expression “Tourism Development Project” is not defined. Tourism is of many types as are tourists. There can be any number of possibilities of projects which develop or promote tourism. E.g. Casinos promote tourism; Hospitals promote medical tourism. Museums, Art Galleries, Opera Houses; Theatres also promote tourism. High End Shopping Malls/High Streets promote shopping tourism. Sporting facilities promote tourism. A “Tourism Development Project” will therefore sound the death knell for the coastal ecology, This is therefore totally arbitrary, irrational and a source of unregulated and un-canalised power and therefore bad in law.

37. In respect of the above the Applicant makes prayer (o).

38. Relaxation of regulations in CRZ-III: Secondly, Annexure-III of CRZ 2019 removes various restrictions on construction of “tourism development projects” such as

³⁶ Regulation 3 (ix) of CRZ 2011, pg 4.



(i) the restriction on construction for the distance of 200 mts from the shore for the construction of hotels in CRZ II and CRZ III.³⁷

(ii) One example is the criteria relating to FSI (which shall not exceed 0.33) is now restricted only to CRZ III, which was earlier applicable to both zones.

(iii) Similarly, most of the other safeguards of the 2011 notification have been applied to CRZ III but not for CRZ II.³⁸

39. The Shailesh Nayak Report did not comment on differentiation on the applicability of FSI upto 0.33 between CRZ-II and CRZ-III but it has merely recorded the objection of Government of Kerala that such a differentiation is required for "promotion of tourism".³⁹ There has been no consideration of ecological factors. The BB Vohra committee formed in 1994 in effect recommended reducing the NDZ from 200 m to 50 m for similar reasons i.e. to permit tourism activities. This was struck down by the Supreme Court in 1996 in *Indian Council for Environment-Legal Action* and the reasoning was found to be insufficient.⁴⁰

40. In respect of the above the Applicant makes prayer (p).

(ii) AIRPORTS-

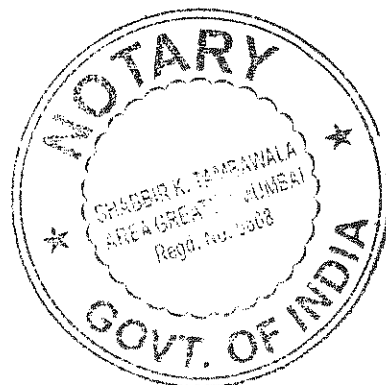
41. The 2011 Notification which specifically permitted only a green field airport at Navi Mumbai. Regulation 5.3 (v) of CRZ 2019 notification makes a departure from this to allow the development of airports in

³⁷ CRZ 2011, Annexure III – Regulation I.(a), pg.21

³⁸ CRZ 2011, Annexure III – Regulations I.(h),(i),(j),(k),(l),(m),(p), pg. 21, 22

³⁹ Para 2.3.3 (f) at Internal Pg. 40 of 112 of Shailesh Nayak Committee Report, 2015

⁴⁰ (1996) 5 SCC 281 – *Indian Council for Environment - legal Action v. Union of India*.



wastelands and non-arable lands in CRZ-III areas with adequate environmental safeguards.

Challenge:

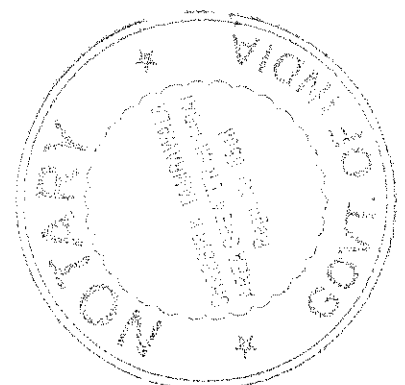
- (i) The draft Notification 2018 did not include a provision permitting development of airports in CRZ – III except for the Navi Mumbai airport whereas the 2019 Notification⁴¹ permits development of airports in wastelands and non-arable lands in CRZ-III areas with adequate safeguards. This contravenes Rule 5(3) of the Environment (Protection) Rules, 1986 (“EPR”) which requires that the relevant change has to be published and objections from the public be invited thereon and considered.
- (ii) There is no reasoning for any of the changes suggested above, the same are arbitrary and unreasonable. Also ‘waste land and non-arable land’ can more often than not have enormous benefits. The inclusion of the term in fact manifests the thought process involved which is really to avoid agrarian strife and not protect the environment, To put it simply, if farmers cannot complain and the land has no commercial value, the environment be damned. The Shailesh Nayak report vaguely states ‘*Though in several countries offshore airports are operating, this issue needs to be examined from both economic and environmental angles.*’⁴² It however provides no adequate reasoning or positive recommendation on the same.

42. In respect of the above the Applicant makes prayers (q), and (r).

(iii) PORT DEVELOPMENT-

⁴¹ Regulation 5.3(iii) (v) of the CRZ 2019 Notification, pg 37.

⁴² Shailesh Nayak Report, Para 3.12.2, internal pg. 82 of 112



43. The 2019 notification now permits construction of ports in CRZ I B⁴³ (Regulation 5.1.2(i)(a)) and in CRZ IV⁴⁴ (Regulation 5.4(ii)(a)) which was not permitted in the earlier notification.

Challenge:

(i) No reasons have been mentioned in any of the reports or the file notings of the MoEFCC regarding the development of ports. Shailesh Nayak report recommends reclamation of sea bed in CRZ-IV areas for construction of ports and harbour without any discussion on the adverse impact on marine biodiversity and marine ecosystem.⁴⁵ No consideration has been given to fishing communities which will be adversely impacted due to development of ports. The major consequence of permitting reclamation of seabed will be the change in hydrology of coastal regions nearby which will lead to more coastal flooding and ingress of seawater, especially in the present scenario of rising sea levels due to global warming. The reclamation shall cause coastal erosion and accretion in adjacent areas and further reduce fishing resources for the traditional fisherfolk which will ultimately affect the fish stocks and fish productivity of the country.

44. In respect of the above the Applicant makes prayers (s), and (t).

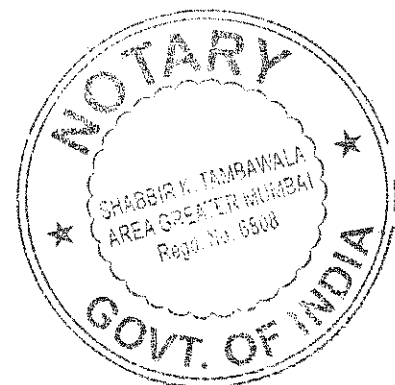
H. DELETING ITEMS FROM THE LIST OF PROHIBITED ACTIVITIES IN THE CRZ

45. This section is split into three parts. The following prohibited activities have now been permitted in CRZ areas under the 2019 Notification:

⁴³ CRZ, 2019, Regulation 5.1.2(i)(a), pg 34.

⁴⁴ CRZ, 2019, Regulation 5.4(ii)(a), pg 37.

⁴⁵ Shailesh Nayak Committee Report, Para D(v.), Internal Pg. 104 of 112



(i) Units for waste disposal now permitted

46. The 2019 Notification does not prohibit the setting up and expansion of units or mechanism for disposal of wastes and effluents, which was prohibited in the 2011 Notification.⁴⁶ The 2011 Notification includes a statement which emphasises the need for phasing out of the discharge of untreated waste and effluents from industries, cities or towns and other human settlements within a period of 2 years by the concerned authorities, which has been deleted in the Draft Notification of 2018 and the 2019 Notification⁴⁷. Such units, by their very nature, impose a colossal environmental burden, including in terms of direct pollution. The removal of the prohibition, is therefore almost an inducement to pollute at nature's doorstep.

Challenge

(i) This provision is contrary to the spirit of the recommendations of the various committees. The Shailesh Nayak Committee Report time and again mentions the importance of zero discharge for buildings, industrial units, etc. and that efforts should be made to do the same. CRZ 2019 completely ignores this and does not include such a provision. Deletion of the provision that seeks phasing out of discharge of untreated waste and effluents from industries, cities or towns and other human settlements in CRZ areas within a period of 2 years from CRZ 2019 will substantially worsen the overall quality of a healthy coastal ecosystem in regions where discharge still continues and where phasing out of such activities are not yet undertaken. Deletion of such a provision in CRZ 2019 regularises and condones the violation of continuing such activities in CRZ areas by

⁴⁶ Comparing Regulation 3(v) of CRZ 2011, pg 3 to Regulation 4 of CRZ 2019, pg 33.

⁴⁷ Comparing Regulation 3(vi) of CRZ 2011, pg 3 to Regulation 4 of CRZ 2019, pg 33.



perpetrators and therefore, such a dilution gravely violates Doctrine of Non-Regression.

(ii) In respect of the above the Applicant makes prayers (u), and (v)

(ii) Setting up and expansion of fish processing units

47. CRZ 2011⁴⁸ prohibited setting up and expansion of fish processing units including warehousing except for hatchery and natural fish drying in permitted areas whereas Regulation 4 (iii) of CRZ 2019⁴⁹ only prohibits setting up of fish processing units while permitting “expansion”. Further, it does not include “warehousing” under the definition of fish processing units.

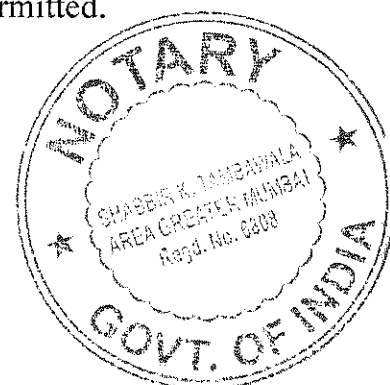
Challenge:

48. This provision is contrary to the recommendations of the various committees. Usage of the words “expansion” and “warehousing” of fish processing units effectively means that existing fish processing units can be expanded and that any kind of warehouses of any built up area can be set up. The file notings of the Shailesh Nayak Committee Report mention that for fish processing units, modernization should be allowed on landward side to any extent and utilize the dynamic FSI of local body,⁵⁰ but it does not ascertain or discuss environmental consequences of an expansion in the nature of an unlimited built-up area on the coastal environment. Therefore, indiscriminate modifications for expansion of fishing units and warehousing have now been permitted.

⁴⁸ Regulation 3 (iii) of the 2011 Notification, pg 4.

⁴⁹ Regulation 4 (iii) of the 2019 Notification, pg 33.

⁵⁰ Para 41.(vii) of the Shailesh Nayak Committee Report, internal pg 20.



49. In respect of the above, the Applicant makes prayer (w).

(iii) *dressing or altering the sand dunes, hills, natural features*

50. CRZ 2011⁵¹ prohibits “*dressing or altering the sand dunes, hills, natural features including landscape changes for beautification, recreation and other such purposes*” whereas Regulation 4 (ix) CRZ 2019 only prohibits “*dressing or altering of active sand dunes*”⁵² leaving out hills and other natural coastal areas outside of areas prohibited for construction activities.

Challenge:

- (i) According to a Ministry of Earth Sciences Report of 2018 titled “*National Assessment of Shoreline Changes along Indian Coast*” (“MoES Report”), every landform, like a rocky coast, offers certain degree of resistance to erosion. That natural features such as rocky cliffs and headlands play an important role in controlling the morphology of the beach adjacent to them. A copy of the said report is attached hereto as ANNEXURE A-14. That the extent of relaxation in 2019 Notification to alter hills and natural features including landscape changes for beautification, recreation, and other such purposes will create an ecological havoc as any sensitive coast that has hills and similar natural features can now be destroyed for “recreational purposes” and thereby, make the 2019 Notification more regressive and against the positive principles of conservation and protection.

51. In respect of the above the Applicant makes prayers (x), and (y).

⁵¹ CRZ, 2011, Regulation 3(xiii), pg 4.

⁵² CRZ, 2019, Regulation 4(ix), pg. 33



Challenge:

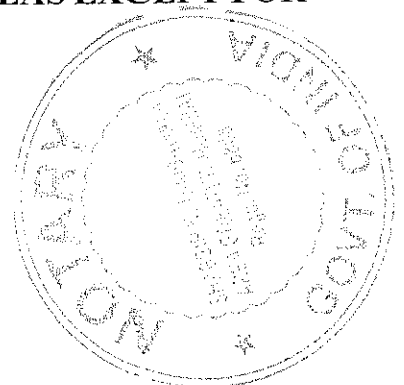
- (i) The above-mentioned change has not been made for environmental reasons. The two reasons for the change in the Shailesh Nayak Report are on the unfounded assumption that the above information sought at Annexure-IV of CRZ, 2011 *may* not be available with the agencies proposing to undertake project activities and that detailed information *may* also not be required for small projects and therefore, with a view to simplifying the procedure for obtaining clearance, it recommended that it is best to leave the formulation of criteria for seeking clearance with respective State governments.⁵³ This amendment has been made only from the point of view of “ease of business and speedy clearance” and without considering any environmental reasons/factors. It also violates the principles of sustainable development and the precautionary principle as the information that has been excluded has a direct correlation with safety planning, disaster management, and associated risk mitigation/risk avoidance. The Swaminathan Report considered this aspect and recommended in no unclear terms that alongwith a comprehensive EIA, safety/disaster planning analysis that takes climate change implications and extreme events into account is *sine qua non* for allowing any permissible activity in CRZ areas.⁵⁴

53. In respect of the above, the Applicant makes prayer (jj).

J. INCREASE IN THE NUMBER OF PETROLEUM AND CHEMICAL PRODUCTS PERMITTED TO STORE IN CRZ AREAS EXCEPT FOR CRZ-I(A)

⁵³ Para 3.9.2 of Shailesh Nayak Report at Pg. 120

⁵⁴ Para 4.1.3(xii) of Swaminathan Committee Report at Pg. 101



54. In Annexure-II read with Regulation 5.1.2(v) CRZ 2019, eight new chemicals are permitted for storage in Annexure-II to the CRZ Notification. These chemicals are Acetic Acid, Mono Ethylene Glycol, Paraxylene, Ethane, Butadine, Methanol, Caustic, Bitumen⁵⁵. These substances were not included in CRZ 2011⁵⁶.

Challenge:

(i) The existing framework did a balancing exercise, by restricting the categories of products into two broad categories; namely (i) petroleum/fuel; and (ii) fertilizer. These were critical to the economy and imported in large quantities. The new list of products do not answer this description at all. These changes/additions (except for Acetic Acid and Mono Ethylene Glycol) were not even included in the Draft Notification, 2018⁵⁷. Therefore, the inclusion of Items (xviii) to (xxiii) in Annexure II to CRZ, 2019 contravenes Rule 5(3) of the Environment (Protection) Rules, 1986 ("EPR") which requires that the relevant change has to be published and objections from the public be invited thereon and considered. Therefore, the inclusion of the above entry is *ultra vires* the EPR and in particular, Rule 5(3) thereof.

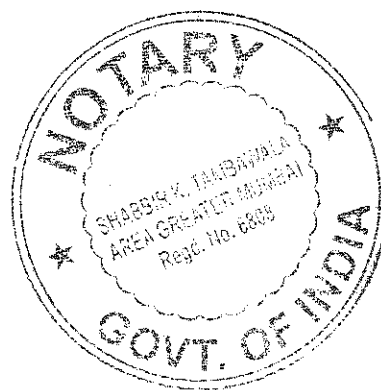
(ii) There has also been absolutely no consideration of why the storage of the said additional chemicals ought to be permitted. In Shailesh Nayak Committee report, there is no consideration of the said issue. File notings of the MoEF state that use of petroleum products ought to be permitted.⁵⁸ However, it appears that apart from Acetic Acid & Butadine, none of the chemicals are reflected in the said Notifications. The Swaminathan Report

⁵⁵ CRZ 2019, Annexure II (xvi) to (xxiii) at Pg. 47

⁵⁶ CRZ 2011, Annexure II at Pg. 20

⁵⁷ Draft CRZ Notification, 2018, Annexure II at Pg. 22

⁵⁸ File notings of the MoEF, paragraph 41(xvi) at Pg. 21



of 2005 recommended prohibition of hazardous chemicals, except petroleum products in port areas.⁵⁹ Lastly, the Final Frontier Report of 2009 does not speak of Petroleum Products but merely recommends that storage of Fertilizers be permitted.⁶⁰ The inclusion of these additional chemicals is therefore arbitrary being based on no reasons whatsoever.

(iii) Furthermore, the above-mentioned chemicals are highly toxic and the nature and extent of harm that such toxic chemicals can cause are as under:

(a) Acetic Acid is a corrosive substance, where inhalation of concentrated vapour may cause serious damage to the linings of these organs and later, breathing difficulties may result. Even skin contact can lead to second degree burns. Environmental effects depend on the concentration and duration of exposure to acetic acid. In high concentrations it can be harmful to plants, animals and aquatic life. Inhalation of acetic acid causes irritation to the nose, throat and lungs.⁶¹

(b) Ethylene Glycol is also a dangerous chemical to store as it is highly combustible and if mixed with water and leaked into fields, a short term exposure of it can cause renal failure and brain injury.⁶²

(c) Xylene is used as a solvent in the printing, rubber, paint and leather industries. It is found in small amounts in airplane fuel, gasoline and

⁵⁹ Regulation 3.1.9 at Pg. 74

⁶⁰ Entry 58, Annexure II at Pg. 29.

⁶¹ National Pollutant Inventory, Department of Agriculture, Government of Australia at <http://www.npi.gov.au/resource/acetic-acid-ethanoic-acid>

⁶² World Health Organisation (WHO), Concise International Chemical Assessment Document at <https://www.who.int/ipcs/publications/cicad/en/cicad22.pdf>

cigarette smoke. It is found in small amounts in airplane fuel, gasoline and cigarette smoke. The main effect of inhaling xylene vapor is depression of the central nervous system, with symptoms such as headache, dizziness, nausea and vomiting. At very high levels of exposure, xylene can injure the liver and kidneys, but this is extremely unlikely to happen without noticeable effects on the nervous system.⁶³

(d) The ill-effects of storing methanol, Butadine, Ethanol and Bitumen arise from consequences that will entail after spillage of these chemicals. Specifically, Bitumen can disrupt the activities of soil microorganisms and affect the growth of plants and crops.⁶⁴ Bitumen can also lead to absolute erosion of soil fertility. Similarly, Caustic, a fertilizer, also causes damage to the soil fertility.

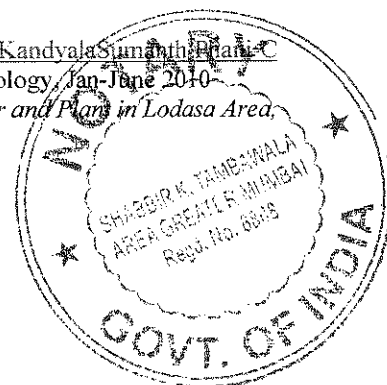
55. The additional chemical products, as stated above, have been permitted for storage without carrying out any scientific study on the impact of storing such products in coastal areas.

56. In respect of the above the Applicant makes prayers (z) and (aa).

K. DILUTION OF CRZ – I BY REMOVING THE TERM ‘ASSOCIATED BIODIVERSITY’ IN RESPECT OF PROTECTION OF CORAL REEFS

⁶³ “Xylene: An overview of its health hazards and preventive measures” by Reena Kandya Sundharam, Raghavendra and Saraswathi T Rajasekharan, Journal of Oral and Maxillofacial Pathology, Jan-June 2010.

⁶⁴ Journal of Science & Technology, “Environmental Impact of Bitumen on Soil, Water and Plant in Lodasa Area, Ode-Irele, Ondo State, Nigeria”



57. The words ‘associated biodiversity’ along with Coral Reefs⁶⁵ in the definition of CRZ-I has been deleted.

Challenge:

(i) This deletion is contrary to the recommendations of the various committees. Swaminathan Committee Report lays down details regarding the importance of reefs and how different countries have realised started taking steps for conserving the same.⁶⁶ Shailesh Nayak Committee Report also mentions the importance of the protection of coral reefs along with their associated biodiversity and lays that their destruction is prohibited.⁶⁷ In the file notings of the MoEFCC, it is stated that coral biodiversity is extremely important for the very existence of corals as they live in symbiotic relation, hence coral biodiversity should be addressed completely.⁶⁸ It was only the Joint Secretary (as per the file notings) who recommended the deletion of the words “associated biodiversity” because it has no definite meaning for identification.⁶⁹ This was not clearly an issue for the Shailesh Nayak Committee.

(ii) The terms “associated biodiversity” are crucial to protecting reefs ecosystems. All coral reefs systems in India are very rich in biodiversity. There is an accumulation of various types of biotic factors in each ecosystem of coral reefs. The composition of coral reefs in India is unique and it includes near about 180 species of biotic algae, 20 species of sea weeds, 20 species sea grasses, 115 species of Poriferans, 5 species of Crustaceans, 110 species of Echinoderms, and 600 species of bony fishes. Besides, it should be noted that different species of crabs, gastropods,

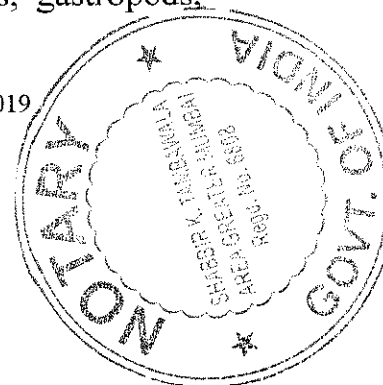
⁶⁵ Comparison of Regulation 7(i)(A)(b) of CRZ 2011 with Regulation 2.1.1(a)(ii.) of CRZ 2019

⁶⁶ Swaminathan Report, 2005, Clause 2.4.2. pg 40

⁶⁷ Shailesh Nayak Committee Report, Annexure A – Clause II, internal pg. 108 of 112

⁶⁸ File notings of the MoEF (SS) on Shailesh Nayak Committee Report, Internal pg 28

⁶⁹ Recommendation (ix) of the File Notings of MoEF (JS), internal pg 20



bivalves, cephalopods are also found in Indian coral reefs. Both stony and soft corals are found in the sub-tidal regions of reefs in India.⁷⁰ Coral reef ecosystem has one of the highest biodiversity of any ecosystem in the world – more than a tropical rainforest. These live in a symbiotic manner with the coral reefs though they do not form part of the coral reefs themselves. Protecting the biodiversity in the coral reef area is as important as protecting coral reefs themselves. One cannot survive without the other.

(iii) In respect of the above the Applicant makes prayer (bb).

L. REDUCTION IN CRZ FROM 50 METERS TO 20 METERS ON ISLANDS

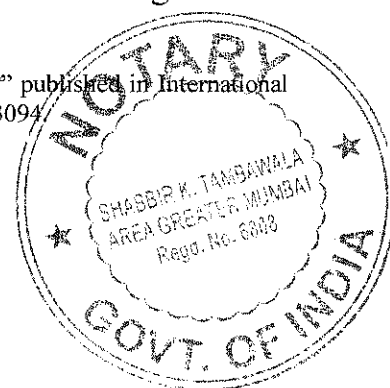
58. In view of the unique coastal systems of backwater islands and islands along the mainland coast, along with space limitations in such coastal stretches, CRZ has been reduced from 50 meters in CRZ 2011⁷¹ Notification to 20 meters in CRZ 2019⁷² (Regulation 10.2(ii)) from the HTL on the landward side. Andaman & Nicobar islands and Lakshadweep Islands are excluded since they are governed by a separate notification, viz. Island Protection Zone Notification, 2019.

Challenge:

59. There is no distinction made between large and small islands. The reduced CRZ may be required/essential in smaller islands, but the same cannot be applied to all Islands. Islands in India range from the size of Mumbai to smaller islands in backwaters. The purported reason for change in the

⁷⁰ "Review of Coral Reefs of India: Distribution, status, research and management" published in International Journal of Science, Environment and Technology, Vol. 5, No. 5, 2016 at Pgs. 3093-3094

⁷¹ "Review of Coral Reefs of India: Distribution, status, research and management" published in International Journal of Science, Environment and Technology, Vol. 5, No. 5, 2016 at Pgs. 3093-3094



Shailesh Nayak Report is the hardships of local communities and the potential loss of tourism.⁷³ File notings of the MoEF accepted the regulation for reducing the NDZ to 10 meters on backwater islands in CRZ II for “promoting tourism”.⁷⁴ It has been judicially settled, by a number of decisions, that Environmental Law must, where development is needed, be founded on ‘sustainable development. Tourism cannot therefore be the be all and end all. This was done without dealing with taking account any of the environmental factors and environmental consequences of such reduction on the islands. It is submitted that the “loss of tourism” cannot be a ground for diluting environmental protections. No scientific rationale has been provided to show the basis of reducing the CRZ limits to a mere 20 meters is environmentally benign or made on rational scientific study, especially when sea level rise due to climate change is now certain in the near future. No expert study for such a reduction has been undertaken.

60. In respect of the above the Applicant makes prayers (cc), (dd), and (ee).

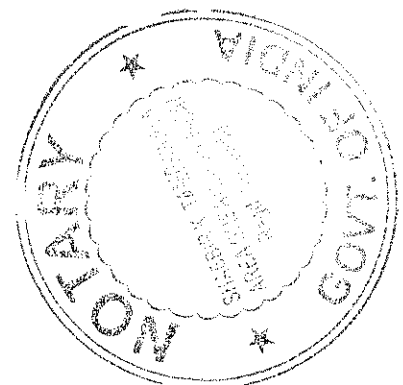
M. CONSTRUCTION OF STATUES / MONUMENTS / MEMORIALS

61. CRZ 2019 permits construction of monuments and memorials and allied facilities by the concerned State Governments in exceptional cases.⁷⁵

62. Additionally, CRZ 2019 lays down that if the Central Government considers it necessary so to do, it can dispense with the requirement of public hearing for constructions of monuments and memorials if it is

shed in International Journal of Science, Environment and Technology, Vol. 5, No. 5, 2016 at Pgs. 3093-3094.
oEF, internal pg 26.

⁷⁵ Regulation 5.4(xv) of CRZ, 2019, internal pg. 38



satisfied that the project will not involve rehabilitation and resettlement of the public or the project site is located away from human habitation.⁷⁶

Reasons for change

- i) The Shailesh Nayak Report states that *“With regard to monuments/memorials proposed by the State/UT Government recommended by the local CZMA to be approved by MoEF&CC on a case-to-case basis taking into account the erosion control and other disaster mitigation measures. Wherever reclamation, if any, for the above projects are permitted, the original HTL as demarcated in the approved CZMP shall prevail.”*⁷⁷
- ii) This Regulation is arbitrary and irrational as it does not consider large-scale environmental consequences of reclamation of sea bed, especially with zero limits placed on the built-up area permissible for construction of monuments and therefore, such large-scale unregulated projects do not fulfil the objective of the CRZ Notification.

63. In light of the above the Applicant makes prayers (ff) and (gg).

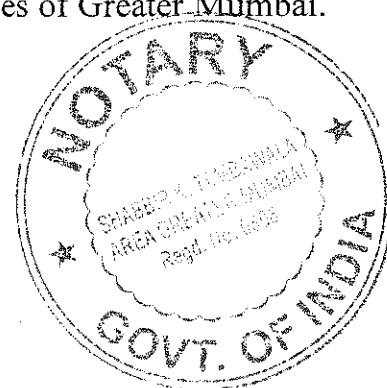
N. DELETION OF SPECIAL PROVISIONS FOR KOLIWADAS AND GAUTHANS IN GREATER MUMBAI

64. In CRZ 2019, there is no special regime/provision for Koliwadadas and Gauthans in Greater Mumbai.

65. In CRZ 2011, Koliwadadas were declared as CRZ – III so as to ensure optimal protection of traditional coastal communities of Greater Mumbai.

⁷⁶ Regulation 5.4(xv)(d) of CRZ, 2019, internal pg. 38

⁷⁷ Para D(v) of Shailesh Nayak Report, at internal pg. 104 of 112



Their development, including repair, construction or reconstruction norms in these areas, can be carried out as per the Town and Country Planning Regulations. Koliwadass were given a special protection under special consideration given to Greater Mumbai under CRZ 2011.⁷⁸

66. In fact, Final Frontier report of 2009 perused, considered and recorded the objections of the local fishing communities (Kolis) that in the name of slum rehabilitation or reconstruction of dilapidated structures, the houses of local communities were given the least priority. The prime land, especially the sea-facing properties, belonging to these communities were sold at exorbitant costs by the developers, while the redeveloped area earmarked for fisherfolk was small and on marginal lands. They requested the Committee to debar all projects of slum redevelopment in these lands, arguing that only projects which secured their ownership should be permitted. It is based on these arguments that the Final Frontier Report recommended the government to strongly consider making a special case for fishing villages (Koliwadass) in Mumbai and frame specific provisions to cater to the needs and demands of Kolis and suggested to restrict SRA styled re-development of koliwadass in Mumbai.⁷⁹ It is because of this recommendation that the CRZ 2011 brought special protectionist provisions for Koliwadass.

67. However, the 2019 Notification deletes the special consideration of koliwadass and merely includes fisher folk areas in CRZ - III and

⁷⁸ CRZ, 2011, Regulations 8(V.)(g) and (h), internal pg. 15

⁷⁹ Para 7.3, Internal Pg. 19-20 of Final Frontier Report of 2009



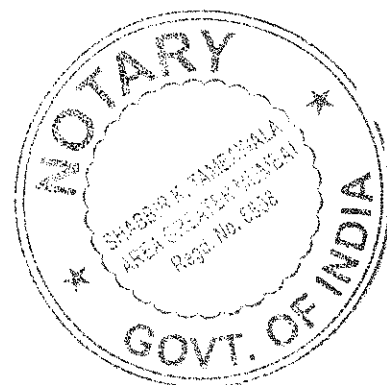
completely disregards the reasons as to why such special distinction was made for fisher communities of Mumbai.⁸⁰

Challenge:

- (i) The first challenge is the lack of consultation with the local communities. There also does not appear to be any good reasoning as to why public consultation was not undertaken while taking away such protectionist provisions. The Shailesh Nayak Committee, without consulting the communities residing in Koliwadās, concludes that CRZ 2011 restricted the development of Koliwadās and sought to declare the Koliwada areas as CRZ-II to bring in development on par with other parts of Mumbai and meet the economic aspirations of the society.⁸¹ The Shailesh Nayak Committee Report completely disregards the fact that it was only because the traditional communities of Mumbai demanded for Koliwadās to be protected under CRZ-III and be treated differently from slum areas of Mumbai did the relevant protectionist provision was drafted in CRZ, 2011.
- (ii) Secondly, the cultural heritage of traditionally occupied villages of Koliwada will be wiped out and the fishermen from Koli community (who are the original inhabitants of Mumbai) will be displaced from their villages. Kolis are Mumbai's most ancient artisanal fishers and form an intrinsic part of the cultural heritage of the city. Koli community will get further marginalised, who has faced the brunt of developmental pressures from time immemorial and has sacrificed much of the lands for the development of the city as it stands today. The role of fishing communities

⁸⁰ CRZ 2019, Regulation 5.3(ii)(a), pg 36.

⁸¹ Shailesh Nayak Committee Report, Para 2.1.4, internal pg. 69 78



in ecological sustenance and ecosystem maintenance has not been taken very seriously.⁸²

68. In respect of the above the Applicant makes prayer (hh).

O. DILUTION OF SPECIAL PROTECTIONS GRANTED TO GREATER MUMBAI IN CRZ 2011

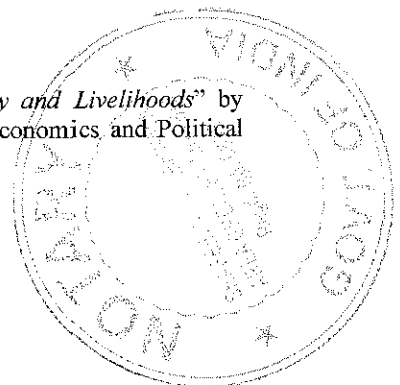
69. The entire special regime for Mumbai has been severely diluted in CRZ 2011. This had been introduced to deal with the peculiar problems of the environmental issues relating to degradation of mangroves, pollution of creeks and coastal waters, discharge of untreated effluents and disposal of solid waste, provision of decent housing to the poor section of society and lack of suitable alternatives in the inter connected islands of Greater Mumbai, the municipal limits of Greater Mumbai were thereby given a special consideration in the 2011 Notification.⁸³

70. CRZ 2011 laid special emphasis on Greater Mumbai on subject matters ranging from Construction of Roads, Solid Waste disposal Sites, Slum Rehabilitation Schemes, Redevelopment of Dilapidated, Cessed and Unsafe Buildings to open spaces and parks, and Koliwadass in Greater Mumbai.⁸⁴ The reason for such special provision was that Mumbai, being an island city, is the most populated city in India by density and therefore, while lacking enough space to cater to the demands and needs of its overtly populated citizens, general provisions that apply to coastal areas regarding development could not have been implemented *in toto* in Mumbai. Such

⁸² "Coastal Ecology and Fishing Community in Mumbai CRZ Policy, Sustainability and Livelihoods" by Hemantkumar A Chouhan, D Parthasarathy, Sarmistha Pattanaik dated 24.09.2016, Economics and Political Weekly, Volume LI No. 39.

⁸³ Clause 8.V.1.(i) of CRZ 2011 Notification, pg 12.

⁸⁴ Clause 8.(v).1 from A to (h) of CRZ 2011, pg 12.

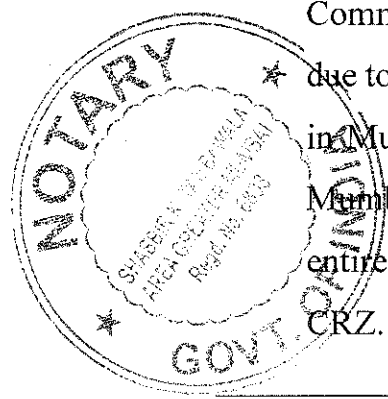


special protections were made keeping in the mind the fact that environmental concerns relating to protection of mangroves, creeks, mudflats, coasts, Arabian Sea, Western Ghats, National Park, etc. has remained at the forefront of government policies.

71. However, this entire section was deleted in the Draft Notification of 2018 and the CRZ 2019 except for two Regulations, namely the Regulation for the protection of open spaces, parks, gardens and playgrounds in CRZ areas and for the construction of Sewage Treatment plants in CRZ-I area.⁸⁵

Challenge:

- (i) Dilution of specific governing provisions for Greater Mumbai on subject matters ranging from Construction of Roads, Solid Waste disposal Sites, Slum Rehabilitation Schemes, Redevelopment of Dilapidated, Cessed and Unsafe Buildings to opens spaces and parks, and Koliwadass in Greater Mumbai is arbitrary. Mumbai, was unique in the sense of its size; shape; population; population density; location; urbanization. Therefore, cognizant of this, special provisions were advisedly made. There has been no change in this on account of intervening developments. In fact, the need for special provisions has increased. The earlier protections were made keeping in mind the developmental pressure on the sensitive coastal ecology of the Mumbai and that no circumstances are reflected in the Committee Reports that suggest otherwise. This change was recommended due to the disparity between 1967 DCR which was applicable to CRZ areas in Mumbai and the current DCR which was applicable in other areas of Mumbai. Shailesh Nayak Committee Report suggested a uniform DCR for entire Mumbai without having special consideration for sensitive areas like CRZ. The committee termed this practice of following the 1967 regulation



⁸⁵ CRZ 2019, Clause 10.3, pg 43.

as one that would 'inhibit development in the city' and "unrealistic and anachronistic".⁸⁶ It also notes that the Government of Maharashtra has requested to provide uniform FSI/FAR for the city of Mumbai as per the prevailing Town and Country Planning Regulations for undertaking development of slum redevelopment schemes, redevelopment of dilapidated buildings, cessed and unsafe buildings in CRZ Areas. The BMC has also suggested that integrated planning should take place of the city with CRZ I and CRZ III areas.⁸⁷ The Shailesh Nayak Committee, therefore proposed that redevelopment which was stopped in CRZ as per CRZ 2011, should not be stopped altogether and thereby sought to do away with the special dispensation given to Greater Mumbai.⁸⁸

- (ii) It has been pointed out earlier that in the special provisions for Mumbai allowances were made for slum rehabilitation and dilapidated buildings. These issues could therefore not be a reason to make a blanket change in the regime for Mumbai even in the cases of areas not covered by Slums or dilapidated buildings. The said deletion is therefore manifestly arbitrary. Moreover, this is aggravated, when the effect of other changes is also considered.

72. In respect of the above the Applicant makes prayer (ii).

GROUND S

73. Under the circumstances as enunciated above, the Applicants are constrained to approach this Hon'ble Tribunal on the following, amongst

⁸⁶ Shailesh Nayak Committee Report, Clause 2.4.12 (a), pg 53 of 112,

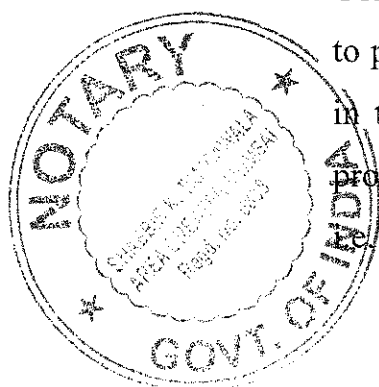
⁸⁷ Shailesh Nayak Committee Report, Clause 2.4.12 (a), pg 53 of 112,

⁸⁸ Shailesh Nayak Committee Report, Clause 2.1.3, pg 31, internal pg 77

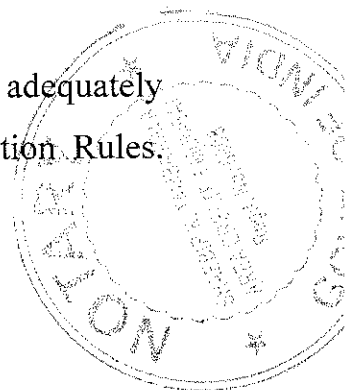


other grounds which are independent of and without prejudice to one another:

- A. The Regulations on a true and correct interpretation do not seek to further dilute the environmental protections under the earlier CRZ Notifications. Correctly interpreted, the same do not constitute violations of either Articles 14, 21 or become *ultra-vires* the Environment (Protection) Act, 1986. The said regulations must therefore be properly interpreted and implemented by the Respondents in their true spirit.
- B. The Regulations in items A to O above are detrimental to the environment and are based on no reasoning whatsoever. They violate the principle of non-regression in environmental regulation. They therefore are manifestly arbitrary and violate the provisions of Article 14 of the Constitution of India. They also violate the rights of citizens to live in a healthy environment. As held in numerous judgments of the Supreme Court, this constitutes a violation of the right to life under Article 21 of the Constitution.
- C. The Regulations in items A to O have no rational nexus with the object sought to be achieved. There is no consideration of environmental factors in passing the said Regulations. The said regulations are therefore arbitrary, unreasonable and violate Article 14 of the Constitution of India. Furthermore, the said regulations do not attempt to protect the environment and constitute a dilution of the principles in the earlier CRZ Regulations. They are therefore *ultra-vires* the provisions of the parent legislation under which they have been passed the Environment (Protection) Act, 1986.

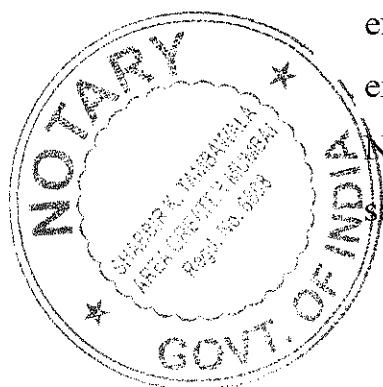


- D. The Regulations in items A, B and C are contrary to principles of law laid down by the Supreme Court and various High Courts. Many of the proposed changes have been held to be arbitrary and have been struck down. The said principles cannot be dismissed and ignored by merely re-enacting the same provisions in a new CRZ Notification. The said provisions suffer from the same constitutional infirmities and therefore, are in direct contravention of the judgments in *Indian Council for Environment-Legal Actions vs Union of India & Ors* and *Suresh Estates vs Municipal Corporation of Greater Mumbai & Ors*.
- E. The Regulations in items E, G, I were not included in the Draft CRZ notification and have been directly introduced in CRZ 2019 without inviting objections and suggestions. This contravenes Rule 5(3) of the Environment (Protection) Rules, 1986 ("EPR") which requires that the relevant change has to be published and objections from the public be invited thereon and considered. It is clear that this was not an emergency measure by its very nature. The process of a review of CRZ 2011 has been underway for a long time period and there is therefore no reason why the same ought not to have been published and suggestions and objections invited in accordance with statute.
- F. The Regulations in items A to O are contrary to the principle of non-regression, and in effect measures that damage the environment and are therefore ultra-vires the Environment Protection Act;
- G. The impugned notification has been promulgated without adequately following the procedure under the Environment Protection Rules.



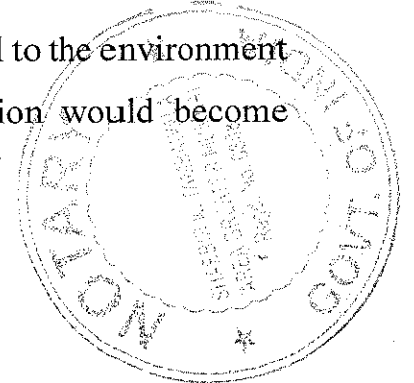
There has been no publication of the notification in regional languages and comments in regional languages appear not to have been considered. Significantly, several of the objections received from fishing associations raised the issue that the draft notification was not published in regional languages and therefore, it was not possible for them to offer any meaningful comments/ suggestions. The compilation of comments prepared by the MoEF referred to above notes, at several places, that some of the comments/ suggestions were 'received in regional languages', suggesting that these comments were not considered at all. It is therefore clear that the notification was prepared without any effective public engagement or consultation as required under the Environment Protection Rules. Furthermore, Respondent No.1 has not given due consideration to the comments/ suggestions received in response to the draft CRZ Notification dated 18th April 2018. Most of the comments/ suggestions raised serious objections to the proposed policy. Out of the 1965 responses, 1338 responses objected to the finalization of the draft CRZ Notification 2018. Over half of the responses to the draft Notification were received from citizens residing in coastal areas who will be directly impacted by the CRZ Policy. Of these 54% demanded that the notification be scrapped. the draft. Applicants crave leave to produce the comments received on Draft CRZ Notification, 2018 & prepared by MoEF.

H. The unconstitutionality of the provisions referred to above is extensive, wide-ranging, comprehensive and far reaching. Further, it encompasses almost all material facets and terms of the Impugned Notification, let alone its pith and substance. The promulgation of the said notification cannot be said to be a valid exercise of under sub-



section (1) and clause (v) of sub-section (2) of section 3 of the Environmental Protection Act. Rather than protecting and improving the quality of the environment or preventing, controlling and abating environmental pollution; the impugned notification removes various environmental protections under CRZ 2011. Parts of the Notification have not followed the procedure laid down under section 5 (3) of the Environment Protection Rules. This renders the Impugned Notification as a whole ultra-vires, *non-est*, null and void, and unconstitutional. Consequently CRZ 2011, having not been validly superseded, continues to remain in force.

- I. The present case is a fit case for the grant of interim and/or ad-interim reliefs; and a fit case in which the finalisation of the Coastal Zone Management Plans for all districts must be stayed. The Coastal Zone Management Plans are null and void and ought to be stayed for a number reasons: firstly, they prepared on the basis of a faulty CRZ, which will necessarily have ramifications on the substantive content of the CZMP's. Secondly, as pointed out above, the procedure for preparation of the CZMP's are inherently illegal, arbitrary and ultra-vires. *Vide* Letter dated 29.09.2021 issued by Respondent No. 1 to Respondent No. 3, new CZMP as per CRZ 2019 for Mumbai City and Mumbai Suburban Districts was finalised and approved, which further clarified that in light of such an approval, provisions of CRZ 2019 shall be made applicable to Mumbai City and Mumbai Suburban Districts. Annexed and marked hereto as **ANNEXURE A-15** is a copy of the said letter dated 29.09.2021. That if the new CZMPs are finalised for remaining districts, activities harmful to the environment that are directly under challenge in this Petition would become



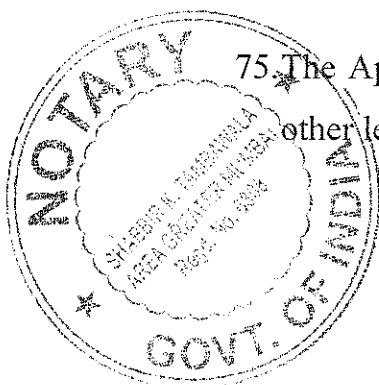
permissible, possibly causing large-scale irretrievable environmental damage as well as well as damage to coastal communities.

74. It is submitted that the Applicants herein had earlier filed the present challenge before the Hon'ble High Court of Bombay in PIL No. 28 of 2021, which came to be dismissed *vide* final order dated 08.10.2021 with a direction to pursue the remedy before this Hon'ble Tribunal. However, the order dated 08.10.2021 had returned a finding on limitation wherein the Hon'ble High Court had also held that that there is an unreasonable delay in filing the petition and therefore, declined interference. Annexed and marked hereto as ANNEXURE A-16 is a copy of the order dated 08.10.2021 passed by the Hon'ble Bombay High Court in PIL No. 28 of 2021. Aggrieved by the findings of the High Court in the aforesaid order, the Applicants preferred SLP No. 20495 of 2021 (*Vanashakti & Anr. v/s Union of India & Ors.*). By an order dated 30.09.2022, the Hon'ble Apex Court was pleased to pass an order that it would be appropriate for the Applicants to approach this Hon'ble Tribunal and held as under:

"However, it is observed that if the petitioners approach the NGT within a period of four weeks from today, the proceedings be considering in accordance with law and on its own merits without raising the issue with respect to limitation."

Annexed and marked hereto as ANNEXURE A-17 is a copy of the order dated 30.09.2022 passed by the Hon'ble Supreme Court in SLP No. 20495 of 2021 (*Vanashakti & Anr. v/s Union of India & Ors.*)

75. The Applicants submit that subsequent to the above, it has not filed any other legal proceedings on the present subject matter.



76. It is submitted that the Applicants have no other equally efficacious remedy available to them save and except moving this Hon'ble Tribunal by filing this instant Application.

LIMITATION

77. That there is no delay in filing the present Application in light of the express order dated 30.09.2022 passed by the Hon'ble Supreme Court in SLP No. 20495 of 2021 (*Vanashakti & Anr. v/s Union of India & Ors.*). That the present Application is filed within a period of 4 weeks from 30.09.2022. That on 29.09.2021, the CRZ Notification, 2019 has been brought into effect only for Mumbai City and Mumbai suburban Districts in the State of Maharashtra and the notification is yet to come into effect *qua* other coastal districts. Applicant states that the present application has been filed under Section 14 of the NGT Act, 2010 as substantial questions relating to the environment are involved and such questions arise out of the enactments specified in Schedule-I.

PRAYERS

78. In view of the facts and circumstances as enunciated above, it is therefore humbly prayed as follows:

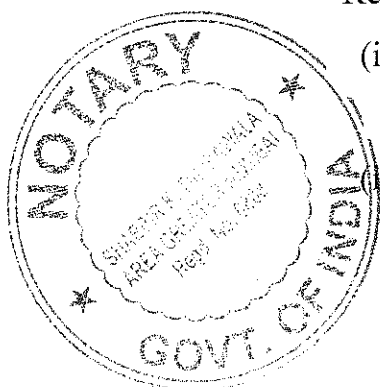
- A. That this Hon'ble Tribunal be pleased to pass a direction that the impugned notification is illegal, ultra-vires, and violates Articles 14 and 21 of the Constitution of India; and declare that the Coastal Regulation Zone Notification dated 6th January 2011 (and as amended from time to time) continues to be valid and binding;



- B. That this Hon'ble Tribunal be pleased to pass a direction restraining the Respondents, its officers or any person claiming through or under them from acting on the impugned notification; and direct the said Respondents to act in accordance with the Coastal Regulation Zone Notification dated 6th January 2011 (and as amended from time to time);
- C. In the alternative to the above,

Bifurcation of CRZ-III into CRZ-IIIA and IIIB, and relaxation of 200 meter NDZ to 50 meters in CRZ-IIIA

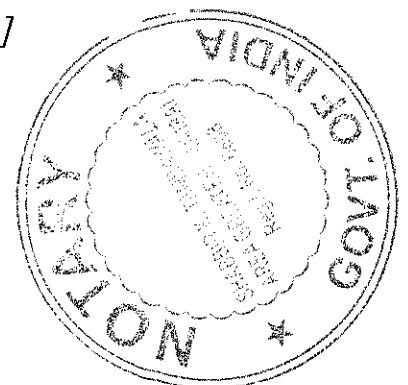
- a) That this Hon'ble Tribunal direct that the following provisions are arbitrary, illegal, and *ultra-vires*:
- (i) The words "and CRZ-III shall be further classified into following categories" in Regulation 2.3
 - (ii) Regulation 2.3.1
 - (iii) The words "-B" occurring in CRZ-III-B in the entire notification
 - (iv) The words "All CRZ-III areas with population density of less than 2161 per square kilometre, as per 2011 census base, shall be designated as CRZ-III B and" in Regulation 2.3.2
 - (v) the words "with population density" to "and in CRZ III-B" in Regulation 2.3.2.
- b) that this Hon'ble Tribunal pass a direction restraining the Respondents from acting upon the following:
- (i) The words "*and CRZ-III shall be further classified into following categories*" in Regulation 2.3
 - (ii) Regulation 2.3.1



- (iii) The words “-B” occurring in CRZ-III-B in the entire notification
- (iv) The words “*All CRZ-III areas with population density of less than 2161 per square kilometre, as per 2011 census base, shall be designated as CRZ-III B and*” in Regulation 2.3.2
- (v) the words “*with population density*” to “*and in CRZ III-B*” in Regulation 2.3.2.

Reduction in the CRZ for tidal influenced water bodies from 100m to 50m:

- c) that this Hon’ble Tribunal direct that:
 - (i) the terms “*to the land area between HTL to 50 meters or width of the creek*” in Regulation 1.0 (ii) and “*Provided that the CRZ limit of 50 meters or width of the creek whichever is less, shall be subject to revision and final approval of the respective CZMPs as per this notification, framed with due consultative process, public hearing etc. and environmental safeguards enlisted therein, and till such time the CZMP to this notification is approved, the limit of 100 meters or width of the creek whichever is less, shall continue to apply*” in Proviso to Regulation 1.0 (ii) are arbitrary, illegal, and void;
 - (ii) an area upto 100 meter from HTL or width of the creek be continued to be declared as a CRZ area in line with the judgment in *Indian Council for Environment-Legal Action & ors. v/s Union of India & Ors. [(1996) 5 SCC 281]*



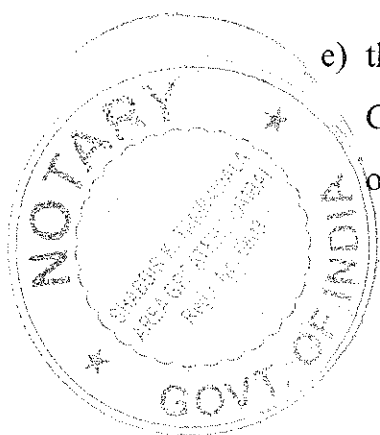
(iii) without prejudice to c) (i) and (ii) above, that 50mt. width of the creek is a minimum area of CRZ and not an outer limit that has to be fixed in the CZMP. The actual area of CRZ has to be determined on a case to case basis in the CZMP based on various factors which may require that the CRZ in the case of a tidal influenced water body may extend beyond 50m;

d) that this Hon'ble Tribunal pass directions:

(i) restraining the Respondents from Acting upon the terms "*to the land area between HTL to 50 meters or width of the creek*" in Regulation 1.0 (ii) and "*Provided that the CRZ limit of 50 meters or width of the creek whichever is less, shall be subject to revision and final approval of the respective CZMPs as per this notification, framed with due consultative process, public hearing etc. and environmental safeguards enlisted therein, and till such time the CZMP to this notification is approved, the limit of 100 meters or width of the creek whichever is less, shall continue to apply*" in Proviso to Regulation 1.0 (ii)

(ii) In the alternative to d (i), above, directing the Respondents to treat the CRZ limit of that 50m/width of the creek is a minimum area of CRZ that has to be fixed in the CZMP. The actual area of CRZ has to be determined on a case to case basis in the CZMP based on various factors which may require that the CRZ in the case of a tidal influenced water body may extend beyond 50m;;

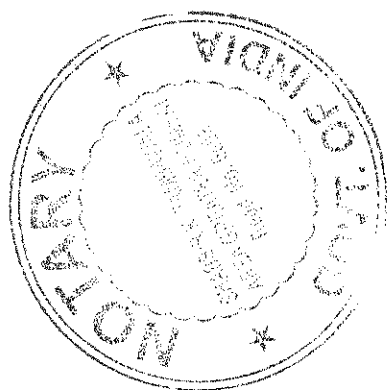
e) that this Hon'ble Tribunal formulate guidelines for preparation of CZMP that the criteria in paragraph 20(vi) shall govern the extension of CRZ beyond 50 meters.



Change of FSI norms in CRZ-II from this existing in 1991 to those presently existing

f) that this Hon'ble Tribunal direct that the following provisions are arbitrary, illegal, and ultra-vires; and restrain the Respondents from acting upon the following:

(i) the words "as on the date of this Notification , and in the event that there is a need for amendment of the FSI after the date of publication of this notification in the official Gazette, the Urban Local Body or State Government or Union territory Administration shall approach the Ministry of Environment, Forest and Climate Change through the concerned State Coastal Zone Management Authority (SCZMA) or Union Territory Coastal Zone Management Authority, as the case may be and the SCZMA shall forward the proposal to the National Coastal Zone Management Authority (NCZMA) with its views in the matter, and the NCZMA shall thereafter examine various aspects like availability of public amenities, environmental protection measures, etc., and take a suitable decision on the proposal and it shall be the responsibility of the concerned Town Planning Authority to ensure that the Solid Wastes are handled as per respective Solid Waste Management Rules and no untreated sewage is discharged on to the coast or coastal waters." after the term "prevailing" in Regulation 5.2 (iii)



(ii) the words "as on the date of this Notification notification in the official Gazette and in the event that there is a need for amendment of the FSI after the said date of this notification,

the Urban Local Body or State Government or Union territory Administration shall approach the Ministry of Environment, Forest and Climate Change through the concerned State Coastal Zone Management Authority (SCZMA) or Union Territory Coastal Zone Management Authority, as the case may be and the CZMA shall forward the proposal to the National Coastal Zone Management Authority (NCZMA) with its views in the matter, and the NCZMA shall thereafter examine various aspects like availability of public amenities, environmental protection measures etc., and take a suitable decision on the proposal and it shall be the responsibility of the concerned Town Planning Authority to ensure that the Solid Wastes are handled as per respective Solid Waste Management Rules and no untreated sewage is discharged on to the coast or coastal waters.” after the term “prevailing” in Regulation 5.2 (iv)

- g) that this Hon'ble Tribunal direct that the term “prevailing” would mean FSI prevailing at the time of coming into force of CRZ 1991 in line with the judgment in *Suresh Estates vs Municipal Corporation of Greater Mumbai & Ors.* [(2007) 14 SCC 439].

Dilution of protection for mangroves and mangrove buffer

- h) that this Hon'ble Tribunal direct that the following provisions are arbitrary, illegal, and ultra-vires:
- (i) the term “etc.” in Regulation 5.1.1.(i).
 - (ii) Regulation 5.1.1.(ii)



i) that this Hon'ble Tribunal pass directions restraining the Respondents from acting upon the following:

- (i) the term "etc." in Regulation 5.1.1.(i).
- (ii) Regulation 5.1.1.(ii)

j) That this Hon'ble Tribunal direct that afforestation must be of an equivalent "area on which mangroves grow" and not merely of the number of mangroves affected or destroyed or cut during the construction process and further direct the Respondents to conduct compensatory afforestation of three times the "area on which mangroves grow" and not merely the number of mangroves cut;

Procedure for clearance of projects including dispensing with EIA, risk assessment report, and disaster management plans

k) that this Hon'ble Tribunal direct that the following provisions are arbitrary, illegal, and ultra-vires:

(i) the words "(except for building construction projects or housing schemes with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification, 2006 number S.O 1533(E), dated 14th September, 2006) if located in low and medium eroding stretches" ^[1]_{SEP} in Regulation 8 (1) (c);

(ii) the words "except for building construction projects or housing schemes" in Regulation 8 (1) (b);

(iii) the words "*except for building construction projects or housing schemes with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA*



Notification, 2006 number S.O 1533(E), dated 14th September, 2006" in Regulation 8 (1) (d).

l) that this Hon'ble Tribunal pass directions restraining the Respondents from acting upon the following:

(i) the words "*(except for building construction projects or housing schemes with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification, 2006 number S.O 1533(E), dated 14th September, 2006) if located in low and medium eroding stretches*" in in Regulation 8 (1) (c);

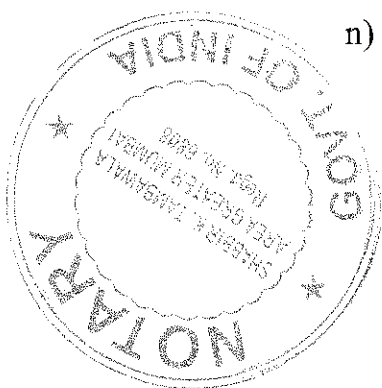
(ii) the words "*except for building construction projects or housing schemes*" in Regulation 8 (1) (b);

(iii) the words "*except for building construction projects or housing schemes with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification, 2006 number S.O 1533(E), dated 14th September, 2006*" in Regulation 8 (1) (d)

Preparation of CZMP's

m) that this Hon'ble Tribunal direct the Respondents to conduct the process of "ground verification" in preparation of CZMP's, and the same will not be based only on satellite images;

n) that this Hon'ble Tribunal direct the Respondents to include important geomorphological features such as landward (monsoonal) berm crest in the case of sandy beaches, rocks, headlands, cliffs,



seawalls or revetments or embankments while demarcating in HTL or LTL in the CZMP;

Changes in the regulation of permissible activities (hotels, port development, airport) in the CRZ

Hotels:

o) that this Hon'ble Tribunal direct that the following provisions are arbitrary, illegal, and ultra-vires:

- (i) the words "or tourism development activities" in Regulation 5.2 (v);
- (ii) Regulation 5.3 (g)
- (iii) In the alternative to o (ii), formulate directions on the criteria to be adopted in determining the distance permitted in the CZMP
- (iv) The words "*and Tourism Development Projects*" in Annexure-III;

p) that this Hon'ble Tribunal pass directions restraining the Respondents from acting upon the following:

- (i) the words "or tourism development activities" in Regulation 5.2 (v);
- (ii) Regulation 5.3 (g)

Direct that no hotels with FSI above 1.33 can be constructed within 200m from the HTL in CRZ-II and CRZ-III

Airports:

q) that this Hon'ble Tribunal direct that Regulation 5.3 is arbitrary, illegal, and ultra-vires;



- r) that this Hon'ble Tribunal pass directions restraining the Respondents from acting upon Regulation 5.3;

Port Development:

- s) that this Hon'ble Tribunal direct that Regulation 5.1.2(1)(a); and Regulation 5.4(ii)(a) are arbitrary, illegal, and ultra-vires
- t) that this Hon'ble Tribunal pass directions restraining the Respondents from acting upon Regulation 5.1.2(1)(a); and Regulation 5.4(ii)(a);

Deleting items from the list of prohibited activities in the CRZ

Waste disposal units

- u) that this Hon'ble Tribunal direct that the "*setting up and expansion of units or mechanism for disposal of wastes and effluents*" are prohibited under Regulation (i) of Regulation 4;
- v) that this Hon'ble Tribunal pass directions restraining the Respondents from acting upon the terms "*setting up and expansion of units or mechanism for disposal of wastes and effluents*" in Regulation (i) of Regulation 4;

Fish processing units

- w) that this Hon'ble Tribunal direct that:
- (i) the "*reclamation for commercial purposes such as shopping and housing complexes, hotels and entertainment activities*" are prohibited under Regulation (i) of Regulation 4



(ii) only “modernisation” of fish processing units is permitted.

Sand-dunes

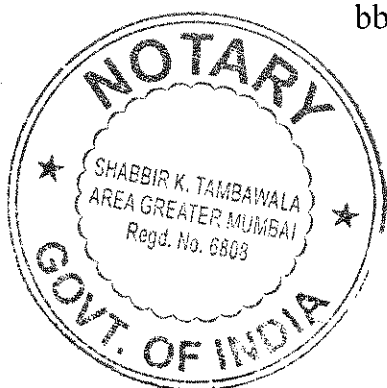
- x) that this Hon’ble Tribunal direct that the term “*active*” before sand dunes in Regulation (ix) of Regulation 4 is arbitrary, illegal, and ultra-vires;
- y) that this Hon’ble Tribunal pass directions restraining the Respondents from acting upon the term “*active*” before sand dunes in Regulation (ix) of Regulation 4;

Increase in the number of petroleum and chemical products permitted to store in crz areas except for crz-i(a)

- z) that this Hon’ble Tribunal direct that Regulations (xvi) to (xxiii) of Annexure II (i.e. Acetic Acid, Mono Ethylene Glycol, Paraxylene, Ethane, Butadine, Methanol, Caustic, and Bitumen) are arbitrary, illegal, and ultra-vires;
- aa) that this Hon’ble Tribunal pass directions restraining the Respondents from acting upon the Regulations (xvi) to (xxiii) of Annexure II (i.e. Acetic Acid, Mono Ethylene Glycol, Paraxylene, Ethane, Butadine, Methanol, Caustic, and Bitumen);

Dilution of CRZ-I by removing the term ‘associated biodiversity’ in respect of protection of coral reefs

- bb) that this Hon’ble Tribunal direct that the term “Coral Reefs” in Regulation 2.2.1 (a) (ii) includes not only the Corals themselves but the highly diverse and tightly “associated biodiversity” of the entire



reef ecosystems including sponges, sea-grasses, sea-weeds, reef fish, coral invertebrates, sea anemones, feeders and molluscs such as clams, oysters, snails, octopuses.

Reduction in CRZ from 50 meters to 20 meters on islands

cc)that this Hon'ble Tribunal direct that the terms "of 20 meters from the HTL on the landward side shall uniformly to such islands and" in Regulation 10.2 (ii), provisions are arbitrary, illegal, and ultra-vires;

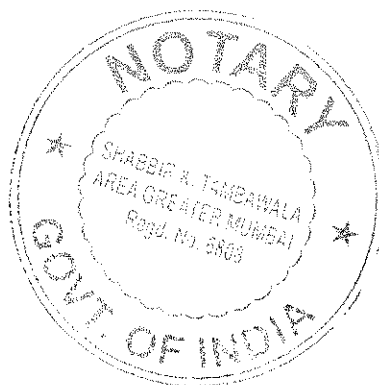
dd)that this Hon'ble Tribunal pass directions restraining the Respondents from acting upon the following the terms "*of 20 meters from the HTL on the landward side shall uniformly to such islands and*" ^[1]_{SEP}in Regulation 10.2 (ii),

ee)that this Hon'ble Tribunal direct Respondent No.1 to determine the size of Islands that deserve special criteria for a reduced the CRZ

Construction of statues / monuments

ff) that this Hon'ble Tribunal direct that Regulation 5.4 (xv) is arbitrary, illegal, and ultra-vires;

gg)that this Hon'ble Tribunal pass directions restraining the Respondents from acting upon Regulation 5.4 (xv);



Deletion of special provisions for Koliwadass and Gauthans in greater Mumbai

hh) that this Hon'ble Tribunal direct Respondent No.1 to frame special regulations for Koliwadass and Gauthans in Greater Mumbai;

Dilution of special protections granted to Greater Mumbai

ii) that this Hon'ble Tribunal direct Respondent No.1 to frame special regulations for Greater Mumbai given its unique circumstances;

Dilution of essential components in Application Form for CRZ Clearance

jj) that this Hon'ble Tribunal pass directions permanently restraining Respondent No. 1 from acting upon Annexure-V to CRZ, 2019 and consequently, direct Respondent No. 1 to frame a fresh Form for CRZ Clearance;

Interim Relief

kk) that pending hearing and final disposal of the present Petition this Hon'ble Tribunal be pleased to:

- (i) restrain the Respondents from acting upon the CRZ 2019 and granting any permissions on the basis thereof;
- (ii) restrain the Respondents from finalizing the Coastal Zone Management Plans on the basis of the impugned Notification for all remaining districts of State of Maharashtra;
- (iii) pass an order staying the implementation of the impugned notification *qua* Mumbai City and Mumbai Suburban Districts and direct revival of provisions of CRZ Notification, 2011 *in*



toto qua Mumbai City and Mumbai Suburban Districts
Districts;

II) ad-interim relief in terms of prayers (kk) (i) and (ii);

D. For the costs of the present Application;

E. For such further and other reliefs as this Hon'ble Tribunal may deem
fit and proper in the interest of justice, equity and good conscience.

Petition drawn up by:

Mr. Akash Rebello & Mr. Zaman Ali

And settled by:

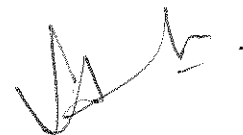
Mr. Venkatesh Dhond, Sr. Adv.

Petition filed by:



Zaman Ali,

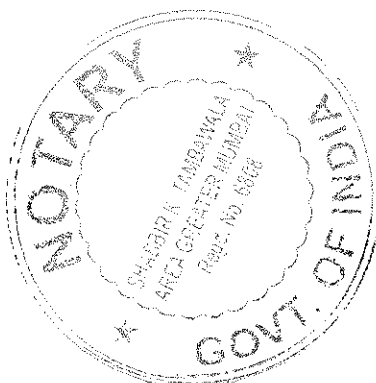
Advocate for Applicants



Applicant No. 1



Applicant No. 2



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VERIFICATION

I, Stalin Dayanand, aged 56 years, Indian inhabitant, authorized representative of Applicant No. 1 having his office at Nandakumar Pawar House, Opp. Shri Jagannath Darshan Building, M.D. Kini Marg, Bhandup Village (East), Mumbai - 400 042 and the Applicant No. 2 herein, do hereby state and solemnly declare that what is stated in para No. 1 to 72 is true to my own knowledge and what is stated in remaining paras from Para 73 to 78 is stated on information and belief and I believe the same to be true.

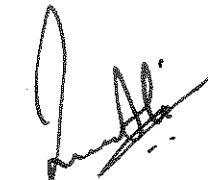
Solemnly Declared at Mumbai

On this 27th Day of October, 2022

Applicant No. 1.

(Stalin Dayanand, Authorised Signatory of Vanashakti)

Identified By Me

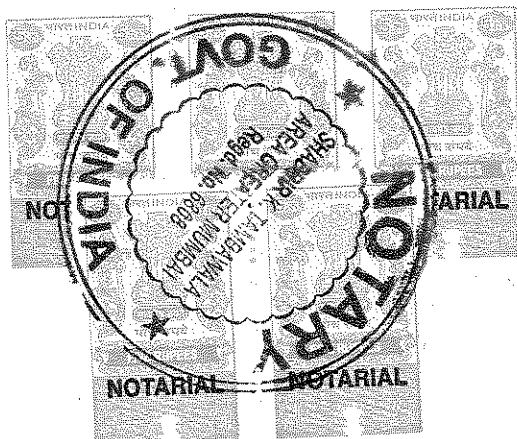


Zaman Ali,

Advocate for Applicants



Before Me



BEFORE ME

S. K. TAMBAWALLA
 ADVOCATE, HIGH COURT
 B-23, Taheri Manzil
 Nesbit Road, Mazgaon
 Mumbai - 400 010
 27/10/22
 NOTARY & REGISTERED
 10043 27/10/22
 Sr. No. dt.

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL**WESTERN ZONE BENCH, PUNE****MEMORANDUM OF APPLICATION**

(UNDER SECTION 14 AND SECTION 18(1) READ WITH
SECTION 20 OF THE NATIONAL GREEN TRIBUNAL ACT, 2010)

ORIGINAL APPLICATION NO. OF 2022

IN THE MATTER OF:

1. Vanashakti, a Public Trust registered under)
The Bombay Public Trusts Act, 1950)

Nandakumar Pawar House)
Opp. Shri Jagannath Darshan Building)
M.D. Kini Marg, Bhandup Village (East))
Mumbai - 400042)
Email ID: stalin.vanashakti@gmail.com)
Contact No.: 9820232302)

2. Stalin Dayanand, aged 54 years)
Indian Inhabitant, Director of Vanashakti)
Nandakumar Pawar House)
Opp. Shri Jagannath Darshan Building)
M.D. Kini Marg, Bhandup Village (East))
Mumbai - 400042)
Email ID: stalin.vanashakti@gmail.com)
Contact No.: 9820232302)

...Applicants:

Versus



1. Union of India, through the)
Secretary, Ministry of Environment, Forests and Climate)
Change,)
Paryavaran Bhavan, Jorbagh Road,)
New Delhi, 110003)
Email ID: secy-moef@nic.in)
Contact No.: 011-24695262)

2. State of Maharashtra, through the Secretary,)
Department of Environment, Room No. 217 (Annexe),)
Mantralaya, Mumbai, 400032)
Email ID: psec.env@maharashtra.gov.in)
Contact No.: 022-22873845)

3. Maharashtra Coastal Zone Management Authority,)
Through its Chairperson, Environment)
Department, Room No. 217 (Annexe), Mantralaya,)
Mumbai, 400032)
Email ID: dir1.mev-mh@nic.in)
Contact No.: 022-22029388)

4. National Coastal Zone Management Authority,)
Through its Chairperson, Indira Paryavaran)
Bhavan, Aliganj, New Delhi – 110003)
Email ID: sujit.baju@gov.in)
Contact No.: 011-24695407)



... Respondents

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To,
The Hon'ble Registrar,
National Green Tribunal, Western Zone Bench,
Pune – 411 001

VAKALATNAMA

KNOW ALL to whom these presents shall come that WE, the Applicants abovenamed, do hereby appoint: **ZAMAN ALI, Advocate, High Court of Bombay**, to be my Advocate in the above noted case & authorise him:-

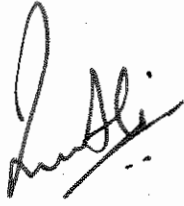
- (i) To act. appear and plead in the above-noted case in this Court or in any other Court in which the same may be tried or heard including High Courts and the Supreme Court.
- (ii) To sign, file, verify and present pleadings, appeals, cross-objections or petitions for execution review, revision, withdraw compromise or other petitions or affidavits or other documents as may be deemed necessary or proper for the execution of the said case in all its stages subject to payment of fees for each stage.
- (iii) To file and take back document, to admit &/or deny the documents of opposite party.

And I/we undersigned do hereby agree not to hold the advocate or his substitute responsible for the result of the said case.

IN WITNESS WHEREOF I do hereunto set our hand and presents the contents of which have been understood by us on this ____ day of October, 2022.



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Zaman Ali

Advocate for the Applicants,

8, 2nd Floor, Darya Building,

Opp. Flora Fountain,

Hutatma Chowk, Fort,

Mumbai – 400 001

+91-9167628833

zamanali1602@gmail.com



Applicant No. 1



Applicant No. 2



BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

WESTERN ZONE BENCH, PUNE

MEMORANDUM OF APPLICATION

(UNDER SECTION 14 AND SECTION 18(1) READ WITH
SECTION 20 OF THE NATIONAL GREEN TRIBUNAL ACT, 2010)

ORIGINAL APPLICATION NO. OF 2022

IN THE MATTER OF:

Vanashakti & Anr.

.....Applicants

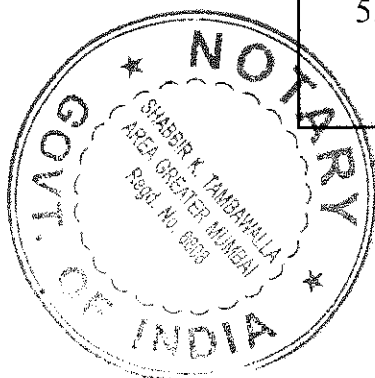
Versus

Union of India & Ors.

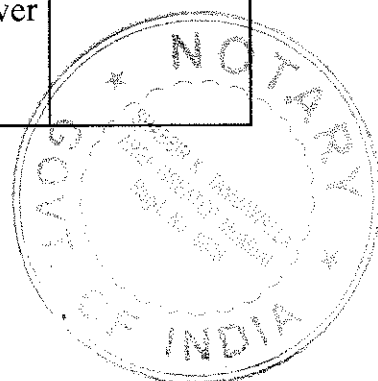
.....Respondents

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This index is filed on Day of October, 2022 at Pune

Through



ZAMAN ALI

Advocate for the Applicant



8, 2nd Floor, Darya Building,
Opp. Flora Fountain, D.N. Road,
Fort, Mumbai – 400 001
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ANNEXURE A-1 77

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 18th January, 2019

G.S.R. 37(E).—Whereas by notification of the Government of India in the erstwhile Ministry of Environment and Forests number S.O.19 (E), dated the 6th January, 2011 (hereinafter referred to as the Coastal Regulation Zone Notification, 2011), the Central Government declared certain coastal stretches as Coastal Regulation Zone (hereinafter referred to as the CRZ) under section 3 of Environment (Protection) Act, 1986 (29 of 1986);

And Whereas, the Ministry of Environment, Forest and Climate Change has received representations from various coastal States and Union territories, besides other stakeholders, regarding certain provisions in the Coastal Regulation Zone Notification, 2011 related to management and conservation of marine and coastal ecosystems, development in coastal areas, eco-tourism, livelihood options and sustainable development of coastal communities etc.;

And Whereas, various State Governments and Union territory administrations and stakeholders have requested the Ministry of Environment, Forest and Climate Change to address the concerns related to coastal environment and sustainable development with respect to the Coastal Regulation Zone Notification, 2011;

And Whereas, the Ministry of Environment, Forest and Climate Change had constituted a Committee under the Chairmanship of Dr. Shailesh Nayak to examine various issues and concerns of coastal States and Union territories and various stakeholders, relating to the Coastal Regulation Zone Notification 2011 and to recommend appropriate changes in the said Notification;

And Whereas, the report submitted by Dr. Shailesh Nayak Committee has been examined in the Ministry and consultations have been held with various stakeholders in this regard;

And Whereas, a draft Coastal Regulation Zone Notification, 2018 was issued and hosted in the website of the Ministry of Environment, Forest and Climate Change on the 18th April, 2018 seeking comments and suggestions from all concerned;

And Whereas, objections and suggestions received in response to the above mentioned draft Coastal Regulation Zone Notification, 2018 have been duly considered by the Central Government;

Now, therefore in exercise of the powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) and in supersession of the Coastal Regulation Zone Notification 2011, number S.O. 19(E), dated the 6th January, 2011, except as respects things done or omitted to be done before such supersession, the Central Government, with a view to conserve and protect the unique environment of coastal stretches and marine areas, besides livelihood security to the fisher communities and other local communities in the coastal areas and to promote sustainable development based on scientific principles taking into account the dangers of natural hazards, sea level rise due to global warming, do hereby, declares the coastal stretches of the country and the water area up to its territorial water limit, excluding the islands of Andaman and Nicobar and Lakshadweep and the marine areas surrounding these islands, as Coastal Regulation Zone as under:-

- (i) The land area from High Tide Line (hereinafter referred to as the HTL) to 500 meters on the landward side along the sea front.

Explanation. - For the purposes of this notification, the HTL means the line on the land upto which the highest water line reaches during the spring tide, as demarcated by the National Centre for Sustainable Coastal Management (NCSCM) in accordance with the laid down procedures and made available to various coastal States and Union territories.

- (ii) CRZ shall apply to the land area between HTL to 50 meters or width of the creek, whichever is less on the landward side along the tidal influenced water bodies that are connected to the sea and the distance upto which development along such tidal influenced water bodies is to be regulated shall be governed by the distance upto which the tidal effects are experienced which shall be determined based on salinity concentration of five parts per thousand (ppt)

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measured during the driest period of the year and distance up to which tidal effects are experienced shall be clearly identified and demarcated accordingly in the Coastal Zone Management Plan (hereinafter referred to as the CZMP):

Provided that the CRZ limit of 50 meters or width of the creek whichever is less, shall be subject to revision and final approval of the respective CZMPs as per this notification, framed with due consultative process, public hearing etc. and environmental safeguards enlisted therein, and till such time the CZMP to this notification is approved, the limit of 100 meters or width of the creek whichever is less, shall continue to apply.

Explanation.- For the purposes of this sub-paragraph the expression "tidal influenced water bodies" means the water bodies influenced by tidal effects from sea in the bays, estuaries, rivers, creeks, backwaters, lagoons, ponds that are connected to the sea.

(iii) The "intertidal zone" means land area between the HTL and the Low Tide Line (hereinafter referred to as the LTL).

(iv) The water and the bed area between the LTL to the territorial water limit (12 Nm) in case of sea and the water and the bed area between LTL at the bank to the LTL on the opposite side of the bank, of tidal influenced water bodies.

2.0 Classification of CRZ. - For the purpose of conserving and protecting the coastal areas and marine waters, the CRZ area shall be classified as follows, namely: -

2.1 CRZ-I areas are environmentally most critical and are further classified as under:

2.1.1 CRZ-I A:

(a) CRZ-I A shall constitute the following ecologically sensitive areas (ESAs) and the geomorphological features which play a role in maintaining the integrity of the coast viz.:

(i) Mangroves (in case mangrove area is more than 1000 square meters, a buffer of 50 meters along the mangroves shall be provided and such area shall also constitute CRZ-I A);

(ii) Corals and coral reefs;

(iii) Sand dunes;

(iv) Biologically active mudflats;

(v) National parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas under the provisions of Wild Life (Protection) Act, 1972 (53 of 1972), Forest (Conservation) Act, 1980 (69 of 1980) or Environment (Protection) Act, 1986 (29 of 1986), including Biosphere Reserves;

(vi) Salt marshes;

(vii) Turtle nesting grounds;

(viii) Horse shoe crabs' habitats;

(ix) Sea grass beds;

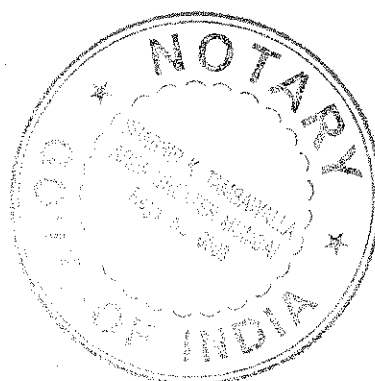
(x) Nesting grounds of birds;

(xi) Areas or structures of archaeological importance and heritage sites.

(b) A detailed environment management plan shall be formulated by the states and Union territories for such ecologically sensitive areas in respective territories, as mapped out by the National Centre for Sustainable Coastal Management (NCSCM), Chennai based on guidelines as contained in Annexure-I to this notification and integrated with the CZMP.

2.1.2 CRZ-I B:

The intertidal zone i.e. the area between Low Tide Line and High Tide Line shall constitute the CRZ-I B.



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2.2 CRZ-II:

CRZ-II shall constitute the developed land areas up to or close to the shoreline, within the existing municipal limits or in other existing legally designated urban areas, which are substantially built-up with a ratio of built-up plots to that of total plots being more than 50 per cent and have been provided with drainage and approach roads and other infrastructural facilities, such as water supply, sewerage mains, etc.

2.3 CRZ-III:

Land areas that are relatively undisturbed (viz. rural areas, etc.) and those which do not fall under CRZ-II, shall constitute CRZ-III, and CRZ-III shall be further classified into following categories: -

2.3.1 CRZ-III A:

Such densely populated CRZ-III areas, where the population density is more than 2161 per square kilometre as per 2011 census base, shall be designated as CRZ-III A and in CRZ-III A, area up to 50 meters from the HTL on the landward side shall be earmarked as the 'No Development Zone (NDZ)', provided the CZMP as per this notification, framed with due consultative process, have been approved, failing which, a NDZ of 200 meters shall continue to apply.

2.3.2 CRZ-III B:

All other CRZ-III areas with population density of less than 2161 per square kilometre, as per 2011 census base, shall be designated as CRZ-III B and in CRZ-III B, the area up to 200 meters from the HTL on the landward side shall be earmarked as the 'No Development Zone (NDZ)'.

2.3.3:

Land area up to 50 meters from the HTL, or width of the creek whichever is less, along the tidal influenced water bodies in the CRZ III, shall also be earmarked as the NDZ in CRZ III.

Note: The NDZ shall not be applicable in the areas falling within notified Port limits.

2.4 CRZ- IV:

The CRZ- IV shall constitute the water area and shall be further classified as under:-

2.4.1 CRZ- IVA:

The water area and the sea bed area between the Low Tide Line up to twelve nautical miles on the seaward side shall constitute CRZ-IV A.

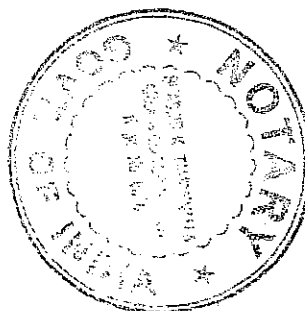
2.4.2 CRZ- IVB:

CRZ-IV B areas shall include the water area and the bed area between LTL at the bank of the tidal influenced water body to the LTL on the opposite side of the bank, extending from the mouth of the water body at the sea up to the influence of tide, i.e., salinity of five parts per thousand (ppt) during the driest season of the year.

3.0 Areas requiring special consideration in the CRZ.- Following coastal areas shall be accorded special consideration for the purpose of protecting the critical coastal environment and difficulties faced by local communities: -

3.1 Critically Vulnerable Coastal Areas (CVCA):

Sundarban region of West Bengal and other ecologically sensitive areas identified as under Environment (Protection) Act, 1986 such as Gulf of Khambat and Gulf of Kutchh in Gujarat, Malvan, Achra-Ratnagiri in Maharashtra, Karwar and Coondapur in Karnataka, Vembanad in Kerala, Gulf of Mannar in Tamil Nadu, Bhitarkanika in Odisha, Coringa, East Godavari and Krishna in Andhra Pradesh shall be treated as Critical Vulnerable Coastal Areas (CVCA) and managed with the involvement of coastal communities including fisher folk who depend on coastal resources for their sustainable livelihood.

3.2 CRZ for inland Backwater islands and islands along the mainland coast.**3.3 CRZ falling within municipal limits of Greater Mumbai.**

4. Prohibited activities within CRZ.- The following activities shall be prohibited, in general, within the entire CRZ and exceptions to these and other permissible and regulated activities in specific CRZ categories viz. CRZ-I, II, III and IV, shall be governed by the provisions of paragraph 5:-

- (i) Setting up of new industries and expansion of existing industries, operations or processes.
- (ii) Manufacture or handling of oil, storage or disposal of hazardous substances as specified in the notification of the Ministry of Environment, Forest and Climate Change number G.S.R.395 (E), dated the 4th April, 2016.
- (iii) Setting up of new fish processing units.
- (iv) Land reclamation, bunding or disturbing the natural course of seawater except for the activities permissible under this notification and executed with prior permission from the competent authority.
- (v) Discharge of untreated waste and effluents from industries, cities or towns and other human settlements.
- (vi) Dumping of city or town wastes including construction debris, industrial solid wastes, fly ash for the purpose of land filling.
- (vii) Port and harbour projects in high eroding stretches of the coast.
- (viii) Mining of sand, rocks and other sub-strata materials.
- (ix) Dressing or altering of active sand dunes.
- (x) In order to safeguard the aquatic system and marine life, disposal of plastic into the coastal waters shall be prohibited and adequate measures for management and disposal of plastic materials shall be undertaken in the CRZ.
- (xi) Drawal of ground water.

5. Regulation of permissible activities in CRZ:

5.1 CRZ-I:

5.1.1. CRZ-IA:

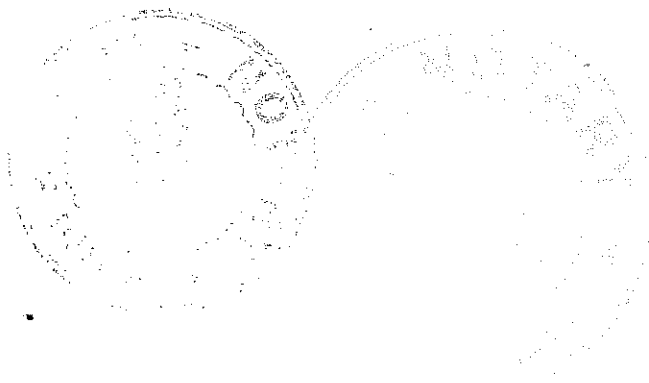
These areas are ecologically most sensitive and generally no activities shall be permitted to be carried out in the CRZ-I A area, with following exceptions:-

- (i) Eco-tourism activities such as mangrove walks, tree huts, nature trails, etc., in identified stretches areas subject to such eco-tourism plan featuring in the approved CZMP as per this notification, framed with due consultative process, public hearing, etc. and further subject to environmental safeguards and precautions related to the Ecologically Sensitive Areas, as enlisted in the CZMP.
- (ii) In the mangrove buffer, only such activities shall be permitted like laying of pipelines, transmission lines, conveyance systems or mechanisms and construction of road on stilts, etc. that are required for public utilities.
- (iii) Construction of roads and roads on stilts, by way of reclamation in CRZ-I areas, shall be permitted only in exceptional cases for defence, strategic purposes and public utilities, subject to a detailed marine or terrestrial or both environment impact assessment, to be recommended by the Coastal Zone Management Authority and approved by the Ministry of Environment, Forest and Climate Change; and in case construction of such roads passes through mangrove areas or is likely to damage the mangroves, a minimum three times the mangrove area affected or destroyed or cut during the construction process shall be taken up for compensatory plantation of mangroves.

5.1.2 CRZ-I B - The inter tidal areas:

Activities shall be regulated or permissible in the CRZ-I B areas as under:-

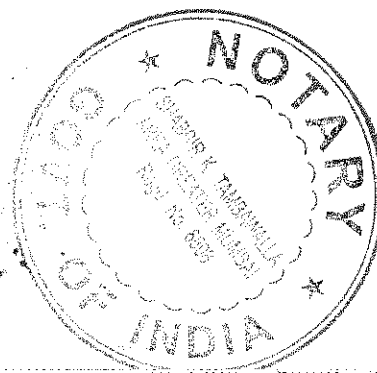
- (i) Land reclamation, bunding, etc. shall be permitted only for activities such as,-



- (a) foreshore facilities like ports, harbours, Jetties, wharves, quays, slipway, bridges, hover ports for coast guard, sea links, etc;
- (b) projects for defence, strategic and security purposes;
- (c) road on stilts, provided that such roads shall not be authorised for permitting development on the landward side of such roads, till the existing High Tide Line:

Provided that the use of reclaimed land may be permitted only for public utilities such as mass rapid or multimodal transit system, construction and installation of all necessary associated public utilities and infrastructure to operate such transit or transport system including those for electrical or electronic signaling system, transit stopover of permitted designs; except for any industrial operation, repair or maintenance;

- (d) measures for control of erosion;
 - (e) maintenance and clearing of waterways, channels, ports and hover ports for coast guard;
 - (f) measures to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structure for prevention of salinity ingress and freshwater recharge.
- (ii) Activities related to waterfront or directly needing foreshore facilities such as ports and harbours, jetties, quays, wharves, erosion control measures, breakwaters, pipelines, lighthouses, navigational safety facilities, coastal police stations, Indian coast guard stations and the like.
 - (iii) Power by non-conventional energy sources and associated facilities.
 - (iv) Transfer of hazardous substances from ships to Ports, terminals and refineries and vice versa.
 - (v) Facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II to this notification, subject to implementation of safety regulations including guidelines issued by the Oil Industry Safety Directorate in the Ministry of Petroleum and Natural Gas and guidelines issued by the Ministry of Environment, Forest and Climate Change, provided that such facilities are for receipt and storage of fertilizers and raw materials required for fertilizers, like ammonia, phosphoric acid, sulphur, sulphuric acid, nitric acid, etc.
 - (vi) Storage of non-hazardous cargo i.e. edible oil, fertilizers and food grains in notified Ports.
 - (vii) Hatchery and natural fish drying.
 - (viii) Existing fish processing units may utilise 25% additional plinth area for modernisation purposes (only for additional equipment and pollution control measures) subject to the following:-
 - (a) Floor Space Index of such reconstruction not exceeding the permissible Floor Space Index as per prevalent town and country planning regulations;
 - (b) additional plinth area is constructed only to the landward side.
 - (c) approval of the concerned State Pollution Control Board or Pollution Control Committee.
 - (ix) Treatment facilities for waste and effluents and conveyance of treated effluents.
 - (x) Storm water drains.
 - (xi) Projects classified as strategic, defence related projects and projects of the Department of Atomic Energy, Government of India.
 - (xii) Manual mining of atomic mineral(s) notified under Part-B of the First Schedule to the Mining and Minerals (Development and Regulation) Act, 1957 (67 of 1957) occurring as such or in association with one or other minerals in the intertidal zone by such agencies as authorised by the Department of Atomic Energy, Government of India as per mining plan approved by the Atomic Mineral Directorate for Exploration and Research:



Provided that the manual mining operations shall be carried out only by deploying persons using baskets and hand spades for collection of ore or mineral within the intertidal zone and as per approved mining plan, without deploying or using drilling and blasting or Heavy Earth Moving Machinery in the intertidal zone.

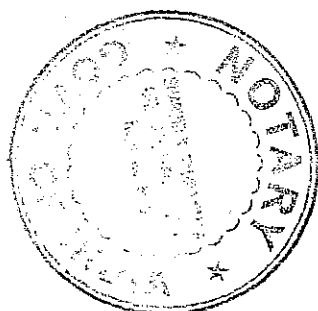
- (xiii) Exploration and extraction of oil and natural gas and all associated activities and facilities thereto;
- (xiv) Foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water, intake water for desalination plants, etc, and outfall for discharge of treated wastewater or cooling water from thermal power plants in conformity with the environmental standards notified by Ministry of Environment, Forest and Climate Change and relevant directions of Central Pollution Control Board (CPCB) or State Pollution Control Board (SPCB) or Pollution Control Committee (PCC), as the case may be.
- (xv) Pipelines, conveying systems including transmission lines.
- (xvi) Weather radar for monitoring of cyclones prediction, ocean observation platforms, movement and associated activities.
- (xvii) Salt harvesting and associated facilities.
- (xviii) Desalination plants and associated facilities.

5.2 CRZ-II:

- (i) Activities as permitted in CRZ-I B, shall also be permissible in CRZ-II, in so far as applicable.
- (ii) Construction of buildings for residential purposes, schools, hospitals, institutions, offices, public places, etc. shall be permitted only on the landward side of the existing road, or on the landward side of existing authorised fixed structures:

Provided that no permission for construction of buildings shall be given on landward side of any new roads which are constructed on the seaward side of an existing road.

- (iii) Buildings permitted as in (ii) above, shall be subject to the local town and country planning regulations as applicable from time to time, and the norms for the Floor Space Index (FSI) or Floor Area Ratio (FAR) prevailing as on the date of this Notification, and in the event that there is a need for amendment of the FSI after the date of publication of this notification in the official Gazette, the Urban Local Body or State Government or Union territory Administration shall approach the Ministry of Environment, Forest and Climate Change through the concerned State Coastal Zone Management Authority (SCZMA) or Union Territory Coastal Zone Management Authority, as the case may be and the SCZMA shall forward the proposal to the National Coastal Zone Management Authority (NCZMA) with its views in the matter, and the NCZMA shall thereafter examine various aspects like availability of public amenities, environmental protection measures, etc., and take a suitable decision on the proposal and it shall be the responsibility of the concerned Town Planning Authority to ensure that the Solid Wastes are handled as per respective Solid Waste Management Rules and no untreated sewage is discharged on to the coast or coastal waters.
- (iv) Reconstruction of authorised buildings shall be permitted, without change in present land use, subject to the local town and country planning regulations as applicable from time to time, and the norms for the Floor Space Index or Floor Area Ratio, prevailing as on the date of publication of this notification in the official Gazette and in the event that there is a need for amendment of the FSI after the said date of this notification, the Urban Local Body or State Government or Union territory Administration shall approach the Ministry of Environment, Forest and Climate Change through the concerned State Coastal Zone Management Authority (SCZMA) or Union Territory Coastal Zone Management Authority, as the case may be and the CZMA shall forward the proposal to the National Coastal Zone Management Authority (NCZMA) with its views in the matter, and the NCZMA shall thereafter examine various aspects like availability of public amenities, environmental protection measures etc., and take a suitable decision on the proposal and it shall be the responsibility of the concerned Town Planning Authority to ensure that the Solid Wastes are



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handled as per respective Solid Waste Management Rules and no untreated sewage is discharged on to the coast or coastal waters.

- (v) Development of vacant plots in designated areas for construction of beach resorts or hotels or tourism development projects subject to the conditions or guidelines at **Annexure-III** to this notification.
- (vi) Temporary tourism facilities shall be permissible in the beaches which shall only include shacks, toilets or washrooms, change rooms, shower panels; walk ways constructed using interlocking paver blocks, etc, drinking water facilities, seating arrangements, etc. and such facilities shall however be permitted only subject to the tourism plan featuring in the approved CZMP as per this notification, framed with due consultative process or public hearing, etc. and further subject to environmental safeguards enlisted in the CZMP, however, a minimum distance of 10 meter from HTL shall be maintained for setting up of such facilities.

5.3 CRZ-III:

- (i) Activities as permitted in CRZ-I B, shall also be permissible in CRZ-III, in so far as applicable.

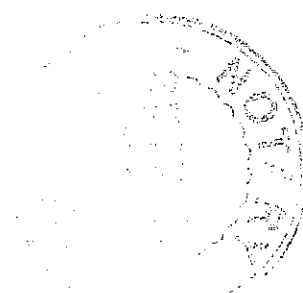
(ii) Regulation of activities in NDZ:

Following shall be permissible and regulated in the NDZ:-

- (a) No construction shall be permitted within NDZ in CRZ III, except for repairs or reconstruction of existing authorised structure not exceeding existing Floor Space Index, existing plinth area and existing density and for permissible activities under this notification including facilities essential for activities and construction or reconstruction of dwelling units of traditional coastal communities including fisher folk, incorporating necessary disaster management provisions and proper sanitation arrangements.
- (b) Agriculture, horticulture, gardens, pastures, parks, playfields and forestry.
- (c) Construction of dispensaries, schools, public rain shelter, community toilets, bridges, roads, provision of facilities for water supply, drainage, sewerage, crematoria, cemeteries and electric sub-station which are required for the local inhabitants may be permitted on a case to case basis by Coastal Zone Management Authority (CZMA).
- (d) Construction of units or auxiliary thereto for domestic sewage, treatment and disposal with the prior approval of the concerned Pollution Control Board or Committee.
- (e) Facilities required for local fishing communities such as fish drying yards, auction halls, net mending yards, traditional boat building yards, ice plant, ice crushing units, fish curing facilities and the like.
- (f) Wherever there is a national or State highway passing through the NDZ of CRZ-III areas, temporary tourism facilities such as toilets, change rooms, drinking water facility and temporary shacks can be taken up on the seaward side of the road.

On landward side of such roads in the NDZ, resorts or hotels and associated tourism facilities shall be permitted and such facilities shall, however, be permitted only subject to the incorporation of tourism plan in the approved CZMP as per this notification and the conditions or guidelines at Annexure-III, to this notification as applicable.

- (g) Temporary tourism facilities shall be permissible in the NDZ and beaches in the CRZ-III areas and such temporary facilities shall only include shacks, toilets or washrooms, change rooms, shower panels, walk ways constructed using interlocking paver blocks, etc, drinking water facilities, seating arrangements etc., and such facilities shall, however, be permitted only subject to the tourism plan featuring in the approved CZMP as per this notification subject to maintaining a minimum distance of 10 meters from HTL for setting up of such facilities.
- (h) Mining of atomic minerals notified under Part-B of the First Schedule to Mining and



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Minerals (Development and Regulation) Act, 1957 (67 of 1957) occurring as such or in association with one or other minerals by such agencies as authorised by the Department of Atomic Energy, Government of India, as per mining plan by the Atomic Mineral Directorate for Exploration and Research.

(iii) **Regulation of activities for CRZ-III areas beyond NDZ:**

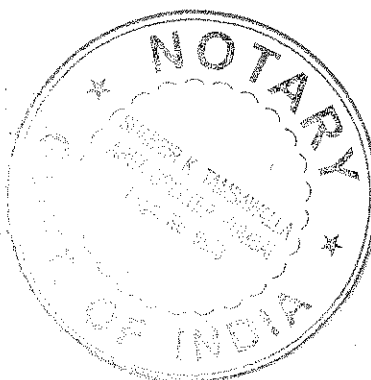
- (a) Development of vacant plots in designated areas for construction of beach resorts or hotels or tourism development projects subject to the conditions or guidelines at Annexure-III to this notification.
- (b) Construction or reconstruction of dwelling units, so long it is within the ambit of traditional rights and customary uses such as existing fishing villages, etc. and building permission for such construction or reconstruction will be subject to local town and country planning rules, with an overall height of construction not exceeding 9 meters and with only two floors (ground + one floor).
- (c) The local communities including fishermen may be permitted to facilitate tourism through 'home stay' without changing the plinth area or design or facade of the existing houses.
- (d) Construction of public rain shelters, community toilets, water supply drainage, sewerage, roads, bridges, etc.
- (e) Limestone mining:
Selective mining of limestone minerals may be permitted in specific identified areas under the mining plans, which are adequately above the height of HTL, based on the recommendations of reputed National Institutes in the mining field such as Council of Scientific and Industrial Research (CSIR), Central Mining Research Institute etc., provided that the extraction of minerals shall be carried out not below a height of 1 meter above the HTL and an adequate barrier shall be created so as to safeguard against saline water incursion and subject to appropriate safeguards related to pollution of coastal waters and prevention of coastal erosion.
- (f) Mining of atomic minerals notified under Part-B of the First Schedule of Mining and Minerals (Development and Regulation) Act, 1957 (67 of 1957) occurring as such or in association with one or other minerals by such agencies as authorised by Department of Atomic Energy, Government of India, as per mining plan by the Atomic Mineral Directorate for Exploration and Research.

- (iv) Drawing of groundwater and construction related thereto shall be prohibited within 200 meters of HTL except for the use of local communities in areas inhabited by them and in the areas between 200 to 500 meters of the HTL, groundwater withdrawal may be permitted only through manual means from ordinary wells for drinking, horticulture, agriculture and fisheries, etc. where no other source of water is available and restrictions for such drawal may be imposed by the designated Authority by State Government or Union territory Administration in the areas affected by sea water intrusion, however, for horticulture and agriculture purpose, micro irrigation promoted by Government welfare schemes shall be permitted.
- (v) Development of airports in wastelands and non-arable lands in CRZ-III areas with adequate environmental safeguards.

5.4 CRZ-IV:

Activities shall be permitted and regulated in the CRZ IV areas as under:-

- (i) Traditional fishing and allied activities undertaken by local communities.
- (ii) Land reclamation, bunding, etc to be permitted only for activities such as.-
 - (a) foreshore facilities like ports, harbours, Jetties, wharves, quays, slipway, bridges, sea links and hover ports for coast guard, etc;
 - (b) projects for defence, strategic and security purpose including coast guard;



- (c) measures for control of erosion;
- (d) maintenance and clearing of waterways, channels and ports;
- (e) measures to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structure for prevention of salinity ingress and freshwater recharge.
- (iii) Activities related to waterfront or directly needing foreshore facilities, such as ports and harbours, jetties, quays, wharves, erosion control measures, breakwaters, pipelines, navigational safety facilities and the like.
- (iv) Power by non-conventional energy sources and associated facilities such as offshore wind, wave energy, ocean thermal energy conversion, etc.
- (v) Transfer of hazardous substances from ships to Ports.
- (vi) Storage of non-hazardous cargo like edible oil, fertilizers and food grains in notified Ports.
- (vii) Facilities for discharging treated effluents into the water course.
- (viii) Projects classified as strategic and defence related projects including coast guard coastal security network.
- (ix) Projects of department of Atomic Energy.
- (x) Exploration and extraction of oil and natural gas and all associated activities and facilities thereto.
- (xi) Exploration and mining of atomic minerals notified under Part-B of the First Schedule of the Mining and Minerals (Development and Regulation) Act, 1957 (67 of 1957), occurring as such or in association with other mineral(s) and of such associated mineral(s).
- (xii) Foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water and outfall for discharge of treated wastewater or cooling water from thermal power plants, and foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water and outfall for discharge of treated wastewater or cooling water from thermal power plants, in conformity with the environmental standards notified by Ministry of Environment, Forest and Climate Change and relevant directions of the Central Pollution Control Board or State Pollution Control Board or Pollution Control Committee.
- (xiii) Pipelines, conveying systems including transmission lines.
- (xiv) Weather radar for monitoring of cyclone prediction, ocean observation platforms, movement and associated activities.
- (xv) Construction of memorials or monuments and allied facilities by the concerned State Government in CRZ-IV (A) areas, in exceptional cases, with adequate environmental safeguards, subject to the following, namely: -
 - (a) the concerned State Government shall submit justification for locating the project in CRZ-IVA area along with details of alternate sites considered and weightage matrix on various parameters including environmental parameters, to State Coastal Zone Management Authority who will examine the project and make recommendation to the Central Government (Ministry of Environment, Forest and Climate Change) for grant of Terms of Reference (ToRs) for preparation of an environmental impact assessment report by the State Government;
 - (b) On grant of ToRs by the Central Government, the concerned State Government shall submit the draft Environmental Impact Assessment report (EIA) with Environmental Management Plan (EMP), draft Risk Assessment Report with Disaster Management Plan (DMP) including on-site and off-site emergency plan and evacuation plan during emergency, to the State Pollution Control Board for conduct of public hearing for the proposed project in accordance with the procedure laid down under the Environment Impact Assessment (EIA) notification number S.O. 1533(E), dated the 14th September, 2006;

- (c) The concerned State Government shall, after addressing the relevant issues raised by the public during the public hearing referred to in sub-item (b), submit the final EIA, EMP, Risk Assessment and DMP, to the State CZMA for their examination and recommendation to MoEF&CC;
- (d) The Central Government may, if it considers necessary so to do, dispense with the requirement of public hearing referred to in sub-clause (b), if it is satisfied that the project will not involve rehabilitation and resettlement of the public or the project site is located away from human habitation.

5.5 Requirement for Clearance from Department of Atomic Energy installations:

Prior to undertaking any developmental activity including construction of new structures, falling in the boundary limits specified by Atomic Energy Regulatory Board (AERB) guidelines, prior clearance shall be obtained from Department of Atomic Energy installations.

6. Coastal Zone Management Plan (CZMP)

- (i) All coastal States and Union territory administrations shall revise or update their respective coastal zone management plan (CZMP) framed under CRZ Notification, 2011 number S.O. 19(E), dated 6th January, 2011, as per provisions of this notification and submit to the Ministry of Environment, Forest and Climate Change for approval at the earliest and all the project activities attracting the provisions of this notification shall be required to be appraised as per the updated CZMP under this notification and until and unless the CZMPs is so revised or updated, provisions of this notification shall not apply and the CZMP as per provisions of CRZ Notification, 2011 shall continue to be followed for appraisal and CRZ clearance to such projects.
- (ii) The CZMP may be prepared or updated by the coastal State Government or Union territory by engaging reputed and experienced scientific institution(s) or the agencies including the National Centre for Sustainable Coastal Management (hereinafter referred to as the NCSCM) of Ministry of Environment, Forest and Climate Change and in consultation with the concerned stakeholders.
- (iii) The coastal States and Union territories shall prepare draft CZMP in 1:25,000 scale map identifying and classifying the CRZ areas within the respective territories in accordance with the guidelines given in Annexure-IV to this notification, which involve public consultation.
All developmental activities listed in this notification shall be regulated by the State Government, Union territory administration, the local authority or the concerned Coastal Zone Management Authority within the framework of such approved CZMP, as the case may be, in accordance with provisions of this notification.
- (iv) The draft CZMP shall be submitted by the State Government or Union territory to the concerned Coastal Zone Management Authority for appraisal, including appropriate consultations, and recommendations in accordance with the procedure(s) laid down in the Environment (Protection) Act, 1986 (29 of 1986).
- (v) The Ministry of Environment, Forest and Climate Change shall thereafter consider and approve the respective CZMP of concerned State Governments or Union territory administrations.
- (vi) The CZMP shall not normally be revised before a period of five years after which, the concerned State Government or the Union territory may consider undertaking a revision.

7. CRZ clearance for permissible and regulated activities- Delegation:

- (i) All permitted or regulated project activities attracting the provisions of this notification shall be required to obtain CRZ clearance prior to their commencement.
- (ii) All development activities or projects in CRZ-I and CRZ-IV areas, which are regulated or permissible as per this notification, shall be dealt with by Ministry of Environment, Forest and Climate Change for CRZ clearance, based on the recommendation of the concerned Coastal Zone Management Authority.

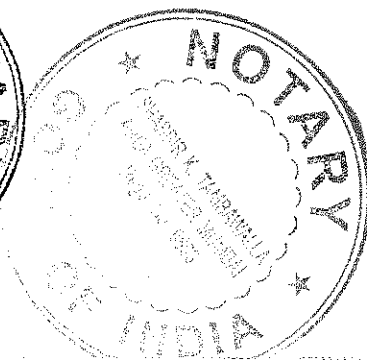
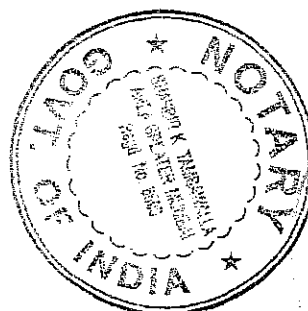


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- (iii) For all other permissible and regulated activities as per this notification, which fall purely in CRZ-II and CRZ-III areas, the CRZ clearance shall be considered by the concerned Coastal Zone Management Authority and such projects in CRZ -II and III, which also happen to be traversing through CRZ-I or CRZ-IV areas or both, CRZ clearance shall, however be considered only by the Ministry of Environment, Forest and Climate Change, based on recommendations of the concerned Coastal Zone Management Authority.
- (iv) Projects or activities which attract the provisions of this notification as also the provisions of EIA notification, 2006 number S.O. 1533(E), dated the 14th September, 2006, shall be dealt with for a composite Environmental and CRZ clearance under EIA Notification, 2006 by the concerned approving Authority, based on recommendations of the concerned Coastal Zone Management Authority, as per delegations i.e., State Environmental Impact Assessment Authority (hereinafter referred to as the SEIAA) or the Ministry of Environment, Forest and Climate Change for category 'B' and category 'A' projects respectively.
- (v) In case of building or construction projects with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification, 2006 these shall be approved by the concerned local State or Union territory Planning Authorities in accordance with this notification, after obtaining recommendations of the concerned Coastal Zone Management Authority.
- (vi) Only for self-dwelling units up to a total built up area of 300 square meters, approval shall be accorded by the concerned local Authority, without the requirement of recommendations of concerned Coastal Zone Management Authority and such authorities shall, however, examine the proposal from the perspective of the Coastal Regulation Zone notification before according approval.

8. Procedure for CRZ clearance for permissible and regulated activities:

- (i) The project proponents shall apply with the following documents to the concerned State or the Union territory Coastal Zone Management Authority for seeking prior clearance under this notification:-
 - (a) Project summary details as per Annexure-V to this notification.
 - (b) Rapid Environment Impact Assessment (EIA) Report including marine and terrestrial component, as applicable, except for building construction projects or housing schemes.
 - (c) Comprehensive EIA with cumulative studies for projects, (except for building construction projects or housing schemes with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification, 2006 number S.O 1533(E), dated 14th September, 2006) if located in low and medium eroding stretches, as per the CZMP to this notification.
 - (d) Risk Assessment Report and Disaster Management Plan, except for building construction projects or housing schemes with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification, 2006 number S.O 1533(E), dated 14th September, 2006).
 - (e) CRZ map in 1:4000 scale, drawn up by any of the agencies identified by the Ministry of Environment, Forest and Climate Change vide its Office Order number J-17011/8/92-IA-III, dated the 14th March, 2014 using the demarcation of the HTL or LTL, as carried out by NCSCM.
 - (f) Project layout superimposed on the CRZ map duly indicating the project boundaries and the CRZ category of the project location as per the approved Coastal Zone Management Plan under this notification.
 - (g) The CRZ map normally covering 7 kilometre radius around the project site also indicating the CRZ-I, II, III and IV areas including other notified ecologically sensitive areas.
 - (h) "Consent to establish" or No Objection Certificate from the concerned State Pollution Control Board or Union territory Pollution Control Committee for the projects involving treated discharge of industrial effluents and sewage, and in case prior consent of

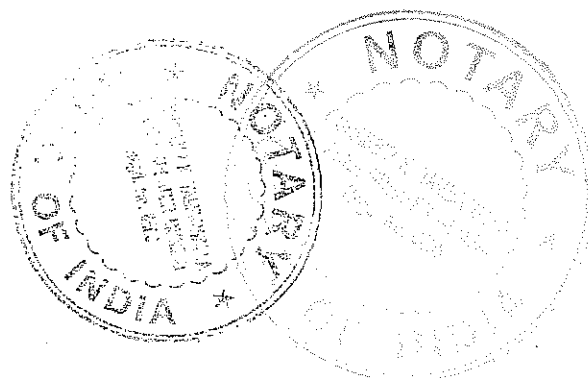


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Pollution Control Board or Pollution Control Committee is not obtained, the same shall be ensured by the proponent before the start of the construction activity of the project, following the clearance under this notification.

- (ii) The concerned Coastal Zone Management Authority shall examine the documents in clause (i) above, in accordance with the approved Coastal Zone Management Plan and in compliance with this notification and make recommendations within a period of sixty days from date of receipt of complete application as under: -
 - (a) For the projects or activities also attracting the EIA Notification, 2006 number S.O. 1533(E), dated 14th September, 2006, the Coastal Zone Management Authority shall forward its recommendations to Ministry of Environment, Forest and Climate Change or SEIAA for category 'A' and category 'B' projects respectively, to enable a composite clearance under the EIA Notification, 2006 number S.O. 1533(E), dated 14th September, 2006, however, even for such Category 'B' projects located in CRZ-I or CRZ-IV areas, final recommendation for CRZ clearance shall be made only by the Ministry of Environment, Forest and Climate Change to the concerned SEIAA to enable it to accord a composite Environmental Clearance and CRZ clearance to the proposal.
 - (b) Coastal Zone Management Authority shall forward its recommendations to the Ministry of Environment, Forest and Climate Change for the projects or activities not covered in the EIA notification, 2006, but attracting this notification and located in CRZ-I or CRZ-IV areas.
 - (c) Projects or activities not covered in the aforesaid EIA Notification, 2006, but attracting this notification and located in CRZ-II or CRZ-III areas shall be considered for clearance by the concerned Coastal Zone Management Authority within sixty days of the receipt of the complete proposal from the proponent.
 - (d) In case of construction projects attracting this notification but with built-up area less than the threshold limit stipulated for attracting the provisions of the aforesaid EIA Notification 2006, Coastal Zone Management Authority shall forward their recommendations to the concerned State or Union territory planning authorities, to facilitate granting approval by such authorities.
- (iii) The Ministry of Environment, Forest and Climate Change shall consider complete project proposals for clearance under this notification, based on the recommendations of the Coastal Zone Management Authority, within a period of sixty days.
- (iv) In case the Coastal Zone Management Authorities are not in operation due to their reconstitution or any other reasons, then it shall be responsibility of the Department of Environment in the State Government or Union territory Administration, who are the custodian of the CZMP of respective States or Union territories, to provide comments and recommend the proposals in terms of the provisions of the said notification.
- (v) The clearance accorded to the projects under this notification shall be valid for a period of seven years, provided that the construction activities are completed and the operations commence within seven years from the date of issue of such clearance.

The validity may be further extended for a maximum period of three years, provided an application is made to the concerned authority by the applicant within the validity period, along with recommendation for extension of validity of the clearance by the concerned State or Union territory Coastal Zone Management Authority.
- (vi) Post clearance monitoring:
 - (a) It shall be mandatory for the project proponent to submit half-yearly compliance reports in respect of the stipulated terms and conditions of the environmental clearance in hard and soft copies to the regulatory authority(s) concerned, on the 1st June and 31st December of each calendar year and all such compliance reports submitted by the project proponent shall be published in public domain and its copies shall be given to any person on application to the concerned Coastal Zone Management Authority.



- (b) The compliance report shall also be displayed on the website of the concerned regulatory authority.
- (vii) To maintain transparency in the working of the Coastal Zone Management Authority, it shall be the responsibility of the Coastal Zone Management Authority to create a dedicated website and post the agenda, minutes, decisions taken, clearance letters, violations, action taken on the violations and court matters including the Orders of the Hon'ble Court as also the approved CZMP of the respective State Government or Union territory.

9. Enforcement of this notification:

- (i) For the purposes of implementation and enforcement of the provisions of this notification and compliance with conditions stipulated thereunder, the powers either original or delegated are available under Environment (Protection) Act, 1986 (29 of 1986) with the Ministry of Environment, Forest and Climate Change, State Government or the Union territory Administration, National Coastal Zone Management Authority and the State or Union territory Coastal Zone Management Authority;
- (ii) The composition, tenure and mandate of National Coastal Zone Management Authority and State Government or the Union territory Coastal Zone Management Authority have already been notified by the Ministry of Environment, Forest and Climate Change in terms of Orders of Hon'ble Supreme Court in Writ Petition 664 of 1993;
- (iii) The State Government or the Union territory Coastal Zone Management Authority shall primarily be responsible for enforcing and monitoring of this notification and to assist in this task, the State Government and the Union territory shall constitute district level Committees under the Chairmanship of the District Magistrate concerned comprising at least three representatives of local traditional coastal communities including from fishermen, and the State Government may consider the enforcement of this notification to the level of respective District Magistrates.
- (iv) The dwelling units of the traditional coastal communities including fishermen, tribals as were permissible under the provisions of the Coastal Regulation Zone notification, 2011 number S.O. 19(E), dated the 6th January, 2011, but which have not obtained formal approval from concerned authorities under the said Notification shall be considered by the respective Coastal Zone Management Authority and the dwelling units shall be regularised subject to the following condition, namely: -
- (a) these are not used for any commercial activity;
- (b) these are not sold or transferred to non-traditional coastal community.

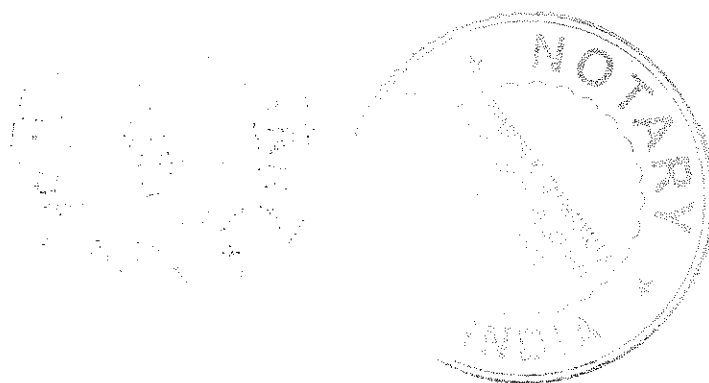
10. Areas requiring special consideration:

10.1 Critically Vulnerable Coastal Areas (CVCAs):

- (i) For all the CVCAs mentioned in sub-paragraph 3.1, Integrated Management Plans (IMPs) shall be prepared, which shall, inter alia, keep in view the conservation and management of mangroves, needs of local communities, such as dispensaries, schools, public rain shelter, community toilets, bridges, roads, jetties, water supply, drainage, sewerage and the impact of sea level rise and other natural disasters and the IMPs will be prepared in line with the guidelines for preparation of Coastal Zone Management Plan.
- (ii) Till such time the IMPs are approved and notified, construction of dispensaries, schools, public rain/cyclone shelters, community toilets, bridges, roads, jetties, water supply, drainage, sewerage which are required for traditional inhabitants shall be permitted on a case to case basis, by the Coastal Zone Management Authority with due regards to the views of coastal communities including fisher folk.

10.2 CRZ for inland backwater islands and islands along mainland coast:

- (i) All the inland islands in the coastal backwaters and islands along the mainland coast shall also be covered under this notification.



- (ii) In view of the unique coastal systems of backwater islands and islands along the mainland coast, along with space limitations in such coastal stretches, CRZ of 20 meters from the HTL on the landward side shall uniformly apply to such islands and activities shall be regulated as under:-
- (a) existing dwelling units of local communities may be repaired or reconstructed within 20 meters from the HTL of these islands, however, no new construction shall be permitted in this zone.
- (b) foreshore facilities, such as fishing jetty, fish drying yards, net mending yard, fishing processing by traditional methods, boat building yards, ice plant, boat repairs and the like, may be taken up in CRZ limits subject to due environmental safeguards.
- (iii) Integrated Island Management Plans (IIMPs), as applicable to smaller islands in Lakshadweep and Andaman & Nicobar, as per Island Protection Zone Notification, 2011 number S.O. 20(E), dated the 6th January, 2011, shall be formulated by respective States or Union territory for all such islands and submitted to Ministry of Environment, Forest and Climate Change and till the IIMPs are framed, provisions of this notification shall not apply and the CZMP as per provisions of CRZ Notification 2011 number S.O. 19(E), dated the 6th January, 2011, shall continue to apply.

10.3 CRZ areas falling within municipal limits of Greater Mumbai:

- (i) In order to protect and preserve the 'green lung' of the Greater Mumbai area, all open spaces, parks, gardens, playgrounds indicated in development plans within CRZ-II shall be categorised as No Development Zone and a Floor Space Index up to 15% shall be allowed only for construction of civic amenities, stadium and gymnasium meant for recreational or sports related activities and the residential or commercial use of such open spaces shall not be permissible.
- (ii) Construction of sewage treatment plants in CRZ-I area for the purpose of treating the sewage from the municipal area shall be taken only by the municipal authorities in exceptional circumstances, where no alternate site is available to set up such facilities, subject to recommendations of the Coastal Zone Management Authority and approval by the Central Government and in case the construction of such plant is inevitable in a mangrove area, a minimum three times the mangrove area affected or destroyed or cut during the construction process shall be taken up for compensatory plantation of mangroves.

[F. No. 19-112/2013-IA-III]

RITESH KUMAR SINGH, Jt. Secy.

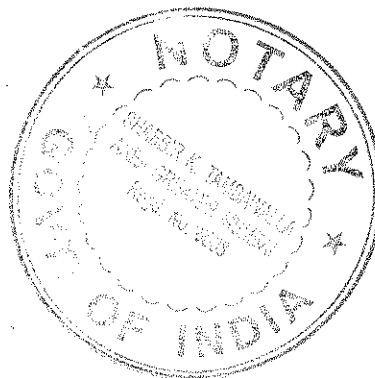
Annexure-I

CONSERVATION, PROTECTION AND MANAGEMENT FRAMEWORK FOR ECOLOGICALLY SENSITIVE AREAS

The coastal and marine Ecologically Sensitive Areas (ESAs) and the geo-morphological features play a vital role in maintaining the functions of the coast. Mangroves, beaches, coral reefs, etc., aid in controlling coastal erosion, shoreline change, saltwater intrusion and also serve as natural defence against coastal hazards such as storm surges, cyclones and tsunamis. The ESAs maintain the biological integrity of the coast by providing direct and indirect ecosystem services to the coastal livelihood. In addition, several invaluable archaeological and heritage sites are also located along the coast. Hence conservation and protection of the above areas, features and sites become necessary.

1. General measures

- (i) All ESAs shall be identified and boundary delineated by NCSCM using satellite data.
- (ii) The State Governments or Union territory Administrations through the authorised agencies shall prepare CZMP as per the guidelines contained in this notification highlighting the conservation and protection of the ESAs.
- (iii) Those activities permissible under this notification shall be included in the CZMP.



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Specific conditions shall be adopted for the conservation, protection and management of each of the ESAs as under: -

1.1 Mangroves:

- (i) Mangroves declared as forest under the Forest (Conservation) Act, 1980 (69 of 1980).

Notwithstanding anything contained in this notification, such mangroves declared by the concerned State Governments or Union territory Administrations or Central Government as forest land under the Forest (Conservation) Act, 1980 (69 of 1980) shall attract the provisions of the said Act.

- (ii) Mangroves not declared under Forest (Conservation) Act, 1980:

(a) Mangroves in Government land shall be protected based on a detailed plan to be prepared by the concerned State Governments or Union territory administrations, and in case the mangrove area is more than 1000 square meters, a buffer of 50 metre along the periphery of mangrove area shall be provided. This buffer zone of 50 metre may be utilised for public facilities for developing parks, research facilities related to mangrove biodiversity, facilities for conservation and the like.

(b) Mangroves in private land will not require a buffer zone.

1.2 Corals and coral reefs and associated biodiversity:

- (i) Destruction of coral and coral reefs and the surroundings is a prohibited activity.
- (ii) All coral and coral reefs shall be protected except for those small quantities required for research purposes.
- (iii) Coral and coral reefs transplantation activities shall be through recognised research institutions wherever required for regeneration after obtaining necessary approvals under Wildlife (Protection) Act 1972 (53 of 1972).
- (iv) The dead or destroyed or both coral areas shall be taken up for rejuvenation and rehabilitation. The conservation and protection of corals and coral reefs shall be taken up as follows:-
- (a) active and live coral and coral reefs identified and delineated shall be declared and notified as ESA under Environment (Protection) Act 1986 (29 of 1986);
- (b) it shall be ensured that no activities that are detrimental to the health of corals, coral reefs and its associated biodiversity, such as mining, effluent and sewage discharge, dredging, ballast water discharge, ship washings, fishing other than traditional non-destructive fisheries, construction activities and the like are taken up in and around the coral areas.

1.3 The National Parks, marine parks, Sanctuaries, reserve forests, wildlife habitats and other protected areas declared under the provisions of Wild Life (Protection) Act, 1972 (53 of 1972), the Forest (Conservation) Act 1980 (69 of 1980) or Environment (Protection) Act 1986 (29 of 1986); including Biosphere Reserves shall be conserved and protected as follows:-

- (i) Conservation and protection of the above mentioned areas shall be as per the provisions of the respective Acts, notifications or guidelines as the case may be.
- (ii) Efforts shall be made to increase the forest area in the coastal region in order to prevent loss of life and property from increased storms, tides and floods.
- (iii) The concerned State Governments or Union territory administrations shall provide for adequate funds for such measures to undertake shelter belt plantation or bio-shields with planting material suitable to the location.

1.4. Salt marshes:

The conservation and protection of salt marshes shall be as follows:-



- (i) The salt marsh areas shall be conserved and protected and efforts shall be made to promote the endemic biodiversity in the salt marshes.
- (ii) Only those activities required for overhead conveying or transmission of cables and underground laying of transmission line cables and so on, shall be permissible.
- (iii) Traditional fishing shall be permissible in salt marshes.
- (iv) Temporary tourism facilities around the salt marsh areas may be considered subject to adhering to norms laid down in the guidelines.
- (v) Certain salt marshes which have less biodiversity, identified by NCSCM and demarcated in Coastal Zone Management Plan can be considered for salt pan activities.

1.5 Turtle nesting grounds shall be protected and conserved as follows:-

- (i) Turtle nesting grounds identified by the concerned State Governments or Union territory administrations shall be protected as per Wildlife (Protection) Act of 1972.
- (ii) No activities shall be permitted in and around the turtle nesting ground including those causing light and sound pollution except for those required for conservation and protection of these sites.
- (iii) Strict management plans for protecting the turtle nesting grounds shall be undertaken and implemented by the concerned State or Union territory Authorities.

1.6 Horse shoe crabs habitats shall be protected and conserved as follows:-

- (i) The habitat identified shall be taken up for conservation and protection.
- (ii) No activities shall be taken up in and around these habitats which affect the horse shoe crab ecosystem.

1.7 Sea grass beds shall be protected and conserved as follows:-

- (i) Identified sea grass beds shall be conserved and protected.
- (ii) No developmental activities that have adverse effect on the sea grass bed shall be undertaken.
- (iii) Efforts shall be made to propagate sea grass beds along the coastal waters where ever possible by States or Union territories as it acts as a carbon sink.

1.8 Nesting grounds of birds shall be protected and conserved as follows:-

- (i) The nesting ground of birds including their local migratory route shall be protected. No developmental activities which have adverse impact on the nesting grounds and the migratory routes shall be undertaken including construction of wind mills, transmission lines and the like in the locality.
- (ii) Efforts shall be made to increase the forest cover and mangrove cover including enriching the biodiversity of salt marsh and other coastal water bodies so as to provide for suitable habitat for the avifauna.

1.9 Geo-morphologically Important Zones shall be protected and managed as follows:

- (i) **Sand dunes** identified shall be conserved and protected as follows:
 - (a) sand dunes identified shall be notified under Environment (Protection) Act 1986;
 - (b) no developmental activities shall be permissible except for providing eco-friendly temporary tourism facilities on stilts such as walkways, tents and the like;
 - (c) mining of sand from sand dunes shall be prohibited activity except for the removal of atomic minerals with proper replenishment using the tailings or other suitable sand;
 - (d) no activities on the sand dunes shall be taken up that would lead to erosion/destruction of sand dunes;
 - (e) afforestation, if any, on the sand dunes shall be done only with native flora;



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- (f) the States or Union territory shall prepare management plans for the demarcated sand dunes.
- (iii) **Sandy beaches:**
 - (a) Mining of beach sand is prohibited except for manual mining of atomic minerals with proper replenishment using the tailings or other suitable sand.
 - (b) When the permissible developmental activities are taken up on the beaches if loss of beach in the neighbourhood is predicted, necessary beach nourishment to compensate for the losses shall be undertaken by the project authorities and its long term maintenance shall be ensured by them.
 - (c) The States or Union Territory shall prepare management plans for the demarcated beaches.
- (iv) **Biologically active mudflats:**
 - (a) Biologically active mudflats shall be identified by NCSCM in association with State Governments or Union territory administrations.
 - (b) The States or Union territories shall prepare management plans for such demarcated biologically active mudflats.
- 1.10 Areas or structures of archaeological importance and heritage value sites:**
 - (i) State Archaeological agencies shall be responsible for conservation and protection of all archaeological structures and heritage sites identified by the Archaeological Survey of India, as per the provisions of the respective Acts, notifications or guidelines.
 - (ii) No activities that are detrimental to the identified areas or structures of archaeological and heritage value shall be permitted.
 - (iii) It shall be ensured that these structures or areas are preserved and activities undertaken without changing the façade/plinth of such structures. Such structures could be considered for use in accordance with the relevant norms after undertaking careful designing of the interiors without changing the exterior architectural design of the structure.

Annexure-II

LIST OF PETROLEUM AND CHEMICAL PRODUCTS PERMITTED FOR STORAGE IN CRZ, EXCEPT CRZ-I A

- (i) Crude oil;
- (ii) Liquefied Petroleum Gas;
- (iii) Motor spirit;
- (iv) Kerosene;
- (v) Aviation fuel;
- (vi) High speed diesel;
- (vii) Lubricating oil;
- (viii) Butane;
- (ix) Propane;
- (x) Compressed Natural Gas;
- (xi) Naphtha;
- (xii) Furnace oil;
- (xiii) Low Sulphur Heavy Stock;



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- (xiv) Liquefied Natural Gas;
- (xv) Fertilizers and raw materials for manufacture of fertilizers;
- (xvi) Acetic acid;
- (xvii) Mono ethylene glycol;
- (xviii) Paraxylene;
- (xix) Ethane;
- (xx) Butadine;
- (xxi) Methanol;
- (xxii) Caustic;
- (xxiii) Bitumen.

Annexure-III

GUIDELINES FOR DEVELOPMENT OF BEACH RESORTS, HOTELS AND TOURISM DEVELOPMENT PROJECTS IN THE DESIGNATED CRZ AREAS

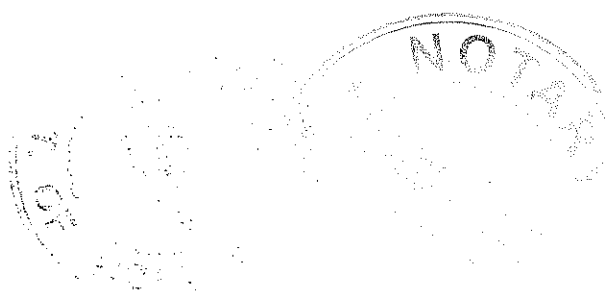
1. CRZ-II

Construction of beach resorts or hotels in designated areas of CRZ-II for occupation of tourist or visitors shall be subject to the following conditions, namely: -

- (i) construction shall be permitted only to the landward side of an existing road or existing authorized fixed structures;
- (ii) live fencing and barbed wire fencing with vegetative cover may be allowed around private properties subject to the condition that such fencing shall in no way hamper public access to the beach;
- (iii) no flattening of sand dunes shall be carried out;
- (iv) no permanent structures for sports facilities shall be permitted except construction of goal posts, net posts and lamp posts;
- (v) construction of basement may be allowed subject to the condition that no objection certification is obtained from the State Ground Water Authority to the effect that such construction will not adversely affect the flow of groundwater in that area;
- (vi) the State Ground Water Authority shall take into consideration the guidelines issued by the Central Government before granting such no objection certificate;
- (vii) the quality of treated effluents, solid wastes, emissions and noise levels and the like, from the project area must conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986 (29 of 1986);
- (viii) necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that the untreated effluents and solid wastes are not discharged into the water or on the beach; and no effluent or solid waste shall be discharged on the beach;
- (ix) if the project involves diversion of forest land for non-forest purposes, clearance as required under the Forest (Conservation) Act, 1980 (69 of 1980) shall be obtained and the requirements of other Central and State laws as applicable to the project shall be met with and approval of the State or Union territory Tourism Department shall be obtained.

2. CRZ-III

Construction of beach resorts and hotels in designated areas of CRZ- III for occupation of tourists or visitors shall be subject to the following conditions, namely: -



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- (i) live fencing and barbed wire fencing with vegetative cover may be allowed around private properties subject to the condition that such fencing shall in no way hamper public access to the beach;
- (ii) no flattening of sand dunes shall be carried out;
- (iii) no permanent structures for sports facilities shall be permitted except construction of goal posts, net posts and lamp posts;
- (iv) construction of basement may be allowed subject to the condition that no objection certification is obtained from the State Ground Water Authority to the effect that such construction will not adversely affect the flow of groundwater in that area;
- (v) the State Ground Water Authority shall take into consideration the guidelines issued by the Central Government before granting such no objection certificate;
- (vi) though no construction is allowed in the no development zone for the purposes of calculation of Floor Space Index, the area of entire plot including the portion which falls within the no development zone shall be taken into account;
- (vii) the total covered area on all floors shall not exceed 33 per cent of the plot size i.e., the Floor Space Index shall not exceed 0.33 and the open area shall be suitably landscaped with appropriate vegetal cover;
- (viii) the construction shall be consistent with the surrounding landscape and local architectural style;
- (ix) the overall height of construction up to the highest ridge of the roof, shall not exceed 9 metres and the construction shall not be more than two floors (ground floor plus one upper floor);
- (x) groundwater shall not be tapped within 200 metre of the High Tide Line; and within the 200 to 500 metre zone it can be tapped only with the concurrence of the Central or State Ground Water Board;
- (xi) extraction of sand, leveling or digging of sandy stretches, except for structural foundation of building or swimming pool, shall not be permitted within 500 metres of the High Tide Line;
- (xii) the quality of treated effluents, solid wastes, emissions and noise levels and the like, from the project area must conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986 (29 of 1986);
- (xiii) necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that the untreated effluents and solid wastes are not discharged into the water or on the beach; and no effluent or solid waste shall be discharged on the beach;
- (xiv) to allow public access to the beach, at least a gap of 20 metres width shall be provided between any two hotels or beach resorts; and in no case shall gaps be less than 500 metres apart; and
- (xv) If the project involves diversion of forestland for non-forest purposes, clearance as required under the Forest (Conservation) Act, 1980 (69 of 1980) shall be obtained and the requirements of other Central and State laws as applicable to the project shall be met with; and approval of the State or Union territory Tourism Department shall be obtained.

Note: Construction of beach resorts or hotels shall not be permitted in Ecologically sensitive areas (such as marine parks, mangroves, coral reefs, breeding and spawning grounds of fish, wildlife habitats and such other area as may be notified by the Central Government or State Government or Union territory administrations).



ANNEXURE -IV**GUIDELINES FOR PREPARATION OF COASTAL ZONE MANAGEMENT PLANS****1. Demarcation of High Tide Line and Low Tide Line:**

Demarcation of High Tide Line (HTL) and Low Tide Line (LTL) as carried out by NCSCM for the entire coastline of the country, has been made available to the Coastal States or Union territories and only such demarcation of HTL and LTL shall be applicable for all purposes of this notification.

2. Hazard Line:

A 'Hazard line' has been demarcated by the Survey of India (SOI) taking into account the extent of the flooding on the land area due to water level fluctuations, sea level rise and shoreline changes (erosion or accretion) occurring over a period of time. The hazard line mapped by SOI has been shared with the coastal States or Union territories through NCSCM. The hazard line shall be used as a tool for disaster management plan for the coastal environment, including planning of adaptive and mitigation measures. With a view to reduce the vulnerability of the coastal communities and ensuring sustainable livelihood, while drawing the CZMP, the land use planning for the area between the Hazard line and HTL shall take into account such impacts of climate change and shoreline changes.

3. Preparation of CZM Maps:

- (i) Base Maps of 1:25,000 scale shall be acquired from the Survey of India (SOI) and wherever 1:25,000 maps are not available, 1:50,000 maps shall be enlarged to 1:25,000 for the purpose of base map preparation and these maps will be of the standard specification given below:-

Unit : 7.5 minutes X 7.5 minutes

Numbering : Survey of India Sheet Numbering System

Horizontal Datum : Everest or WGS 84

Vertical Datum : Mean Sea Level (MSL)

Topography : Topography in the SOI maps will be updated using latest satellite imageries or aerial photographs

- (ii) Coastal Zone Management (CZM) Maps of scale 1:25,000 shall be got prepared by any of the agencies identified by the Ministry of Environment, Forest and Climate Change vide its Office Order number J-17011/8/92-IA-III dated the 14th March, 2014 using the demarcation of the High Tide Line or LTL, as carried out by NCSCM.
- (iii) Various regulatory lines viz. at a distance of 20 metres, 50 metres, 200 metres and 500 metres from HTL respectively, as applicable in various CRZ categories, and the Hazard line shall be demarcated and transferred to the CZM maps.
- (iv) HTL, LTL and CRZ boundaries, as applicable, shall also be demarcated in the CZM maps along the banks of tidal influenced inland water bodies.
- (v) Classification of different coastal zones shall be done as per the CRZ notification and Standard national or international colour codes shall be used.

4. Local level CZM Maps:

- (i) Local level CZM Maps are for the use of local bodies and other agencies to facilitate implementation of the Coastal Zone Management Plans.
- (ii) Cadastral (village) maps in 1:3960 or the nearest scale, as available with revenue authorities shall be used as the base maps.
- (iii) HTL, LTL, other CRZ regulatory lines and the Hazard line shall be demarcated in the cadastral maps and classifications shall be transferred into local level CZM maps.



5. Classification of CRZ areas:

- (i) The CZM Maps shall clearly demarcate the land use plan of the area and map out the Ecologically Sensitive Areas (ESAs) or the CRZ-IA areas as per mapping made available by NCSCM to coastal State or Union territories. All such ESAs shall be appropriately demarcated with colour codes.
- (ii) Buffer zone along mangrove areas of more than 1000 square metres shall be stipulated with a different colour distinguishing from the mangrove area. The buffer zone shall also be classified as CRZ-I area.
- (iii) In the CRZ areas, the fishing villages, common properties of the fishermen communities, fishing jetties, ice plants, fish drying platforms or areas infrastructure facilities of fishing and local communities such as dispensaries, roads, schools, and the like, shall be indicated on the cadastral scale maps. States and Union territories shall prepare detailed plans for long term housing needs of coastal fisher communities in view of expansion and other needs, provisions of basic services including sanitation, safety, and disaster preparedness.
- (iv) The water areas of CRZ-IV shall be demarcated and clearly demarcated if the water body is sea, lagoon, backwater, creek, bay, and estuary and for such classification of the water bodies the terminology used by Naval Hydrographic Office shall be relied upon.
- (v) The fishing Zones in the water bodies and the fish breeding areas shall be clearly marked.
- (vi) In CVCAs, the land use maps shall be superimposed on the Coastal Zone Management Plan clearly demarcating the CRZ-I, II, III, IV.
- (vii) The existing authorised developments on the seaward side shall be clearly demarcated.
- (viii) The features like cyclone shelters, rain shelters, helipads and other infrastructure including road network may be clearly indicated on the CZM Maps for the purpose of rescue and relief operations during cyclones, storms, tsunami and the like.
- (ix) Construction of buildings or other activities shall be permitted under the CZMP provided adequate arrangements are made for proper management and disposal of solid and liquid wastes in accordance with the environmental standards, rules and statutes, and under no circumstances, untreated effluents shall be disposed off in the coastal waters.

6. Public consultations on CZMP:

- (i) The draft CZMP prepared shall be given wide publicity and suggestions and objections received in accordance with the Environment (Protection) Act, 1986. Public hearing on the draft CZMP shall be held at district level by the concerned CZMA.
- (ii) Based on the suggestions and objections received the CZMPs shall be revised and approval of Ministry of Environment, Forest and Climate Change shall be obtained.
- (iii) The approved CZMP shall be put up on the website of Ministry of Environment, Forest and Climate Change, concerned website of the State or Union Territory Coastal Zone Management Authority and hard copy made available in the Panchayat Office and District Collector Office.

7. Revision of Coastal Zone Management Plans:

- (i) Whenever there is a doubt, the concerned State or Union territory Coastal Zone Management Authority shall refer the matter to the National Centre for Sustainable Coastal Management who shall verify the CZMP based on latest satellite imagery and ground truthing.
- (ii) If required, the rectified map shall be submitted to Ministry of Environment, Forest and Climate Change for consideration.



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ANNEXURE-V

PROJECT INFORMATION DETAILS

1. PROJECT DETAILS

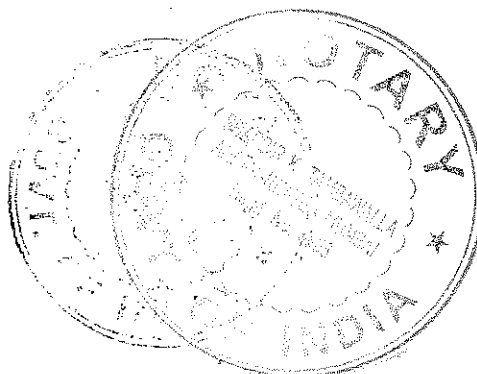
- A. Project Name
- B. Survey No./ Village/ Co-ordinates
- C. District
- D. State
- E. Whether the proposal is for (Select relevant field)
 - (i) Fresh Clearance under CRZ
 - (ii) Amendment to an already issued CRZ clearance
 - (iii) Extension of validity of an already issued CRZ clearance
- F. Name of the Applicant
- G. Address of the Applicant
- H. Contact details (Telephone nos. and e-mail address)
- I. Cost of the project (Rs in crores)

2. BENEFITS OF THE PROJECT

- A. Details of Project Benefits
- B. Employment Likely to be Generated (Yes/No)
 - If Yes
 - (i) Total Manpower Requirement
 - (ii) Permanent Employment (Numbers)
 - (iii) Temporary Employment (Numbers)
 - (iv) Temporary Employment- During Construction (Numbers)
 - (v) Temporary Employment- During Operation (Numbers)

3. DESCRIPTION OF THE PROJECT UNDER CONSIDERATION (Select the Category of the project):

- A. Resort / Buildings / civic amenities
 - (i) Total area/Built-up area (in sqm.)
 - (ii) Height of structure
 - (iii) FSI ratio
 - (iv) Name of concerned town planning authority/ Panchayat etc.
 - (v) Details of provision of car parking area
- B. Coastal Roads / Roads on Stilt
 - (i) Area of land reclamation
 - (ii) Estimated quantity of muck/earth for reclamation
 - (iii) Traffic carrying capacity
 - (iv) Dimensions of road
- C. Pipelines from thermal power blow down
 - (i) Length of pipeline
 - (ii) Length traversing CRZ area



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- (iii) Depth of excavation
- (iv) Width of excavation
- (v) Length of pipeline from seashore to deep sea
- (vi) Depth of outfall point from surface of sea water
- (vii) Temperature of effluent above ambient at disposal point

D. Marine Disposal of Treated Effluent through pipelines

- (i) Location of intake/ outfall
- (ii) Depth of outfall point
- (iii) Length of pipeline
- (iv) Length traversing CRZ area
- (v) Depth of excavation
- (vi) Width of excavation
- (vii) Length of pipeline from shore to deep sea/creek
- (viii) Depth of outfall point from surface of water
- (ix) Depth of water at disposal point
- (x) BOD, COD, TSS, oil and grease, heavy metals in the effluent

E. Facility for storage of goods/chemicals

- (i) Name of chemical
- (ii) End use of the chemical
- (iii) No. of tanks for storage
- (iv) Capacity of tanks

F. Offshore structures

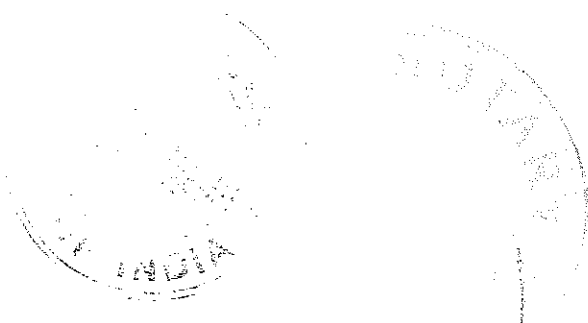
- (i) Exploration or development
- (ii) Depth of sea bed
- (iii) No. of rigs
- (iv) No. of platform
- (v) Details of group gathering stations

G. Desalination Plant

- (i) Capacity of desalination
- (ii) Total brine generation
- (iii) Temperature of effluent above ambient at disposal point
- (iv) Ambient salinity
- (v) Disposal point

H. Mining of atomic minerals

- (i) Capacity of mining
- (ii) Type of mineral to be extracted
- (iii) End use of the mineral
- (iv) Government order for mining lease/exploration and approved mining plan details
- (v) Extent of mining lease area



I. Sewage Treatment Plants

- (i) Capacity
- (ii) Total area of construction
- (iii) Compliance of effluent parameters as laid down by cpcb/spcb/other authorised agency
- (iv) Whether discharge is in sea water/creek?
 - If yes
 - Distance of marine outfall point from shore/from the tidal river bank
 - Depth of outfall point from sea water/river water surface
 - Depth of seabed/riverbed at outfall point

J. Lighthouse

- (i) Total ground area of foundation/platform
- (ii) Height of the structure

K. Wind Mills

- (i) Capacity (MW)
- (ii) Height of the windmill
- (iii) Diameter of the windmill
- (iv) Length of blade
- (v) Speed of rotation
- (vi) Transmission lines (overhead or underground)

L. Others

- (i) Please specify with salient features
- (ii) Upload relevant Documents (upload PDF only)

4. PROJECT LOCATION AS PER CRZ CLASSIFICATION (If project site falls in different/multiple CRZ categories the same may also be elaborated)**5. CLAUSE OF CRZ NOTIFICATION UNDER WHICH PROJECT IS A PERMISSIBLE /REGULATED ACTIVITY****6. MANDATORY FIELDS FOR PROJECT ASSESSMENT****A. CRZ map in 1:4000 scale indicating HTL, LTL demarcation and distance of the nearest project boundary (in meters) from HTL to be stated**

- (i) Upload Map (kml file)

B. Project layout superimposed on CRZ Map 1:4000 scale with classification of project location including other notified ESAs prepared

- (i) Upload Map (kml file)

C. CRZ map 1:25000 scale covering 7 km radius around Project site

- (i) Upload Map (kml file)

7. PROJECT LOCATED IN (Select Type)

- (i) Non eroding Coast
- (ii) Low and Medium eroding coast
- (iii) High eroding Coast



8. DETAILS OF FOREST/ MANGROVES LAND INVOLVED (YES/NO)**IF YES**

- (i) Detail of area diverted
- (ii) Forest clearance to be submitted (Upload document)
- (iii) No. of trees to be cut under the project
- (iv) Compensatory afforestation plan to be submitted (Upload document)

9. DISTANCE OF PROPOSED PROJECT FROM ESA/MARINE PARK/ WILD LIFE SANCTUARY

- (i) Within 10 kilometre radius from the project site (Yes/No)

If YES

- Permission from NBWL to be submitted (Upload document)

10. NOC OR CONSENT TO ESTABLISH FROM STATE/UT POLLUTION CONTROL BOARDS OBTAINED (YES/NO)**If YES**

- (i) Copy of NOC to be provided (Upload document)
- (ii) Conditions imposed to be stated (Upload document)

11. Environment Impact Assessment (EIA) studies (relevant fields to be filled)**A. Terrestrial studies:**

- (i) Summary details of EIA (Terrestrial) Studies
- (ii) Upload Recommendation made in EIAs (Upload document)
- (iii) State period of Study

B. Marine Studies

- (i) Summary details of EIA (Marine) Studies
- (ii) Upload Recommendation made in EIAs (Upload document)
- (iii) State period of Study

12. DISASTER MANAGEMENT PLAN / NATIONAL OIL SPILL DISASTER CONTINGENCY PLAN (if applicable)**13. PROJECT INVOLVING DISCHARGE OF LIQUID EFFLUENTS:**

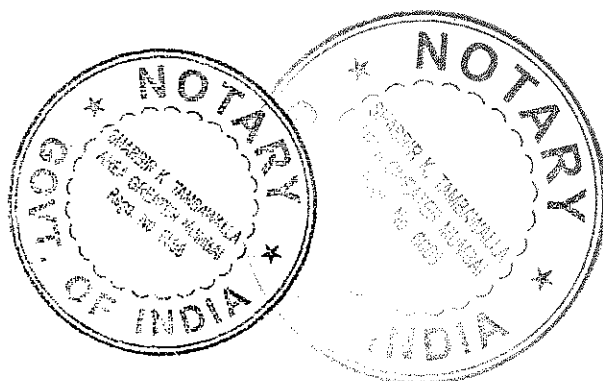
- (i) Capacity of Sewage Treatment Plant
- (ii) Quantity of effluent generated
- (iii) Quantity of effluent treated
- (iv) Method of treatment and disposal

14. PROJECT INVOLVING DISCHARGE OF SOLID WASTE:

- (i) Type of solid waste
- (ii) Quantity of solid waste generated
- (iii) Method of disposal
- (iv) Mode of transport

15. WATER REQUIREMENT in kilo litres per day (KLD)

- (i) Quantity of water required
- (ii) Source of water



- (iii) If Ground water (Upload a copy of approval from Central Ground Water Authority or other authorised body)
- (iv) If other Source (Upload a copy of permission from competent authority)
- (v) Mode of transport
- (vi) Commitment of water supply (Upload document)

16. DETAILS OF WATER TREATMENT AND RECYCLING (If any) (Multiple Entries Allowed)

Type/ Source	Quantity of Waste Water Generated (Kilos Litre per Day)	Treatment Capacity (Kilos Litre per Day)	Treatment Method	Mode of Disposal	Quantity of Discharged Water (Kilos Litre per Day)	Quantity of Treatment Water used in Recycling/Reuse (Kilo Litre per Day)

17. DETAILS OF RAINWATER HARVESTING

- (i) No. of Storage tanks
- (ii) Total capacity of tanks
- (iii) No. of Recharge Pits
- (iv) Capacity of pits

18. ENERGY REQUIREMENT AND SOURCES

- (i) Total Power Requirements (kwh)
- (ii) Source
- (iii) Upload Copy of Agreement (upload pdf only)
- (iv) Stand by Arrangement (Details)

19. ENERGY EFFICIENCY/SAVING MEASURES

- (i) Source/Mode
- (ii) Details of savings

20. RECOMMENDATION OF STATE COASTAL ZONE MANAGEMENT AUTHORITY

- (i) Upload Copy of CZMA recommendations (Upload pdf only)
- (ii) Compliance status of the Conditions Imposed

21. WHETHER PROPOSAL ATTRACTS EIA NOTIFICATION, 2006. (Yes/No)

If YES,

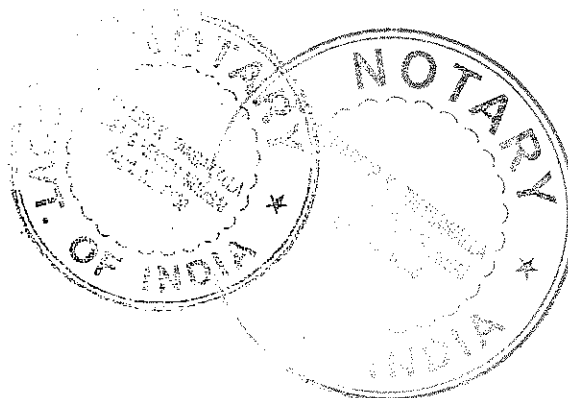
- (i) the category thereof
- (ii) Status of proposal for EC (as applicable)

22. SOCIAL AND ENVIRONMENTAL ISSUES AND MITIGATIONS MEASURES SUGGESTED INCLUDING BUT NOT LIMITED TO R&R, WATER, AIR, HAZARDOUS WASTES, ECOLOGICAL ASPECTS, ETC. (Brief Details to be Provided)

23. DETAILS OF COURT CASES Whether there is any Court Cases pending against the project and/or land in which the project is proposed to be set up? (Yes/No)

If Yes, Pending or Disposed (Select relevant)

- (i) Name of the Court (Supreme Court, High Court, National Green Tribunal)
- (ii) Case No.



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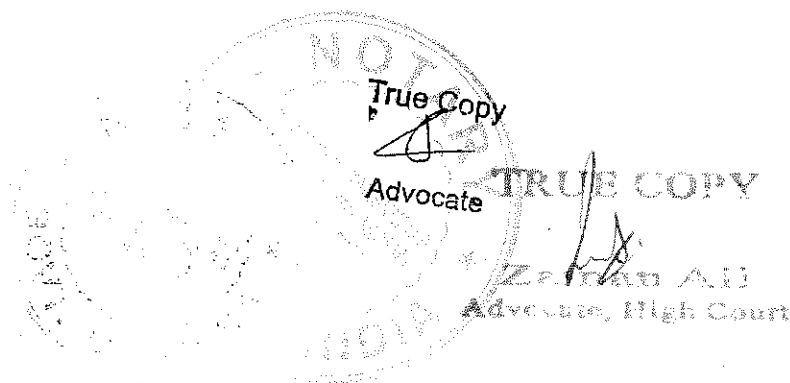
- (iii) Case Details
- (iv) Orders/Directions of the court, if any and its relevance with the proposed project
(Upload document)

24. ADDITIONAL INFORMATION, If any

UNDERTAKING: It is certified that the information given above are true to the best of my knowledge and belief and nothing contravening the provisions of CRZ Notification, 2011 has been concealed therefore.

Name and Signature of the applicant:

Date:



104 ANNEXURE A-2

(To be published in the Gazette of India, Extraordinary, Part-II, Section 3, Sub-section (ii) of dated the 6th January, 2011)

COASTAL REGULATION ZONE NOTIFICATION MINISTRY OF ENVIRONMENT AND FORESTS (Department of Environment, Forests and Wildlife)

S.O.19(E).- WHEREAS a draft notification under sub-section (1) of section and clause (V) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 was issued inviting objections and suggestions for the declaration of coastal stretches as Coastal Regulation Zone and imposing restrictions on industries, operations and processes in the CRZ was published vide S.O.No.2291 (E), dated 15th September, 2010.;

AND WHEREAS, copies of the said Gazette were made available to the public on 15th September, 2010.;

AND WHEREAS, the suggestions and objections received from the public have been considered by the Central Government.;

Now, therefore, in exercise of the powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government, with a view to ensure livelihood security to the fisher communities and other local communities, living in the coastal areas, to conserve and protect coastal stretches, its unique environment and its marine area and to promote development through sustainable manner based on scientific principles taking into account the dangers of natural hazards in the coastal areas, sea level rise due to global warming, does hereby, declare the coastal stretches of the country and the water area upto its territorial water limit, excluding the islands of Andaman and Nicobar and Lakshadweep and the marine areas surrounding these islands upto its territorial limit, as Coastal Regulation Zone (hereinafter referred to as the CRZ) and restricts the setting up and expansion of any industry, operations or processes and manufacture or handling or storage or disposal of hazardous substances as specified in the Hazardous Substances (Handling, Management and Transboundary Movement) Rules, 2009 in the aforesaid CRZ.; and

In exercise of powers also conferred by clause (d) and sub rule (3) of rule 5 of Environment (Protection) Act, 1986 and in supersession of the notification of the Government of India in the Ministry of Environment and Forests, number S.O.114(E), dated the 19th February, 1991 except as respects things done or omitted to be done before such supercession, the Central Government hereby declares the following areas as CRZ and imposes with effect from the date of the notification the following restrictions on the setting up and expansion of industries, operations or processes and the like in the CRZ,-

- (i) the land area from High Tide Line (hereinafter referred to as the HTL) to 500mts on the landward side along the sea front.
- (ii) CRZ shall apply to the land area between HTL to 100 mts or width of the creek whichever is less on the landward side along the tidal influenced water bodies that are connected to the sea and the distance upto which development along such tidal influenced water bodies is to be regulated shall be governed by the distance upto which the tidal effects are experienced which shall be determined based on salinity concentration of 5 parts per thousand (ppt) measured during the driest period of the year and distance upto which tidal effects are experienced shall be clearly identified and demarcated accordingly in the Coastal Zone Management Plans (hereinafter referred to as the CZMPs).

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Explanation.- For the purposes of this sub-paragraph the expression tidal influenced water bodies means the water bodies influenced by tidal effects from sea, in the bays, estuaries, rivers, creeks, backwaters, lagoons, ponds connected to the sea or creeks and the like.

(iii) the land area falling between the hazard line and 500mts from HTL on the landward side, in case of seafront and between the hazard line and 100mts line in case of tidal influenced water body the word 'hazard line' denotes the line demarcated by Ministry of Environment and Forests (hereinafter referred to as the MoEF) through the Survey of India (hereinafter referred to as the SoI) taking into account tides, waves, sea level rise and shoreline changes.

(iv) land area between HTL and Low Tide Line (hereinafter referred to as the LTL) which will be termed as the intertidal zone.

(v) the water and the bed area between the LTL to the territorial water limit (12 Nm) in case of sea and the water and the bed area between LTL at the bank to the LTL on the opposite side of the bank, of tidal influenced water bodies.

2. For the purposes of this notification, the HTL means the line on the land upto which the highest water line reaches during the spring tide and shall be demarcated uniformly in all parts of the country by the demarcating authority(s) so authorized by the MoEF in accordance with the general guidelines issued at Annexure-I. HTL shall be demarcated within one year from the date of issue of this notification.

3. Prohibited activities within CRZ,- The following are declared as prohibited activities within the CRZ,-

(i) Setting up of new industries and expansion of existing industries except,-

(a) those directly related to waterfront or directly needing foreshore facilities;

Explanation: The expression "foreshore facilities" means those activities permissible under this notification and they require waterfront for their operations such as ports and harbours, jetties, quays, wharves, erosion control measures, breakwaters, pipelines, lighthouses, navigational safety facilities, coastal police stations and the like.;

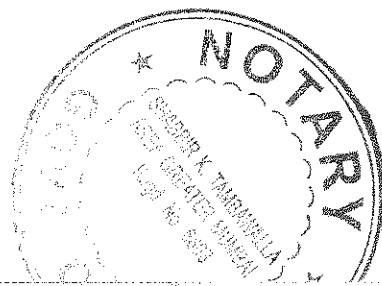
(b) projects of Department of Atomic Energy;

(c) facilities for generating power by non-conventional energy sources and setting up of desalination plants in the areas not classified as CRZ-I(i) based on an impact assessment study including social impacts.;

(d) development of green field Airport already permitted only at Navi Mumbai;

(e) reconstruction, repair works of dwelling units of local communities including fishers in accordance with local town and country planning regulations.

(ii) manufacture or handling oil storage or disposal of hazardous substance as specified in the notification of Ministry of Environment and Forests, No. S.O.594 (E), dated the 28th July 1989, S.O.No.966(E), dated the 27th November, 1989 and GSR 1037 (E), dated the 5th



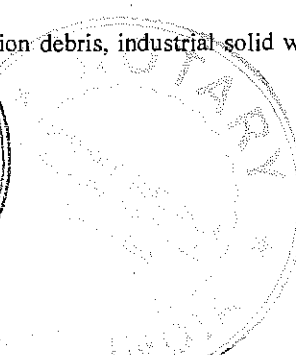
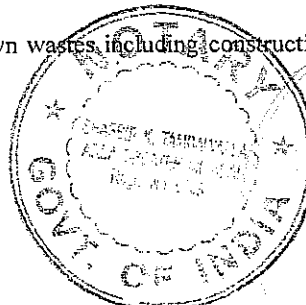
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December, 1989 except,-

- (a) transfer of hazardous substances from ships to ports, terminals and refineries and vice versa;
- (b) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II appended to this notification and facilities for regasification of Liquefied Natural Gas (hereinafter referred to as the LNG) in the areas not classified as CRZ- I(i) subject to implementation of safety regulations including guidelines issued by the Oil Industry Safety Directorate in the Ministry of Petroleum and Natural Gas and guidelines issued by MoEF and subject to further terms and conditions for implementation of ameliorative and restorative measures in relation to environment as may be stipulated by MoEF.

Provided that facilities for receipt and storage of fertilizers and raw materials required for manufacture of fertilizers like ammonia, phosphoric acid, sulphur, sulphuric acid, nitric acid and the like, shall be permitted within the said zone in the areas not classified as CRZ-I(i).

- (iii) Setting up and expansion of fish processing units including warehousing except hatchery and natural fish drying in permitted areas:
- (iv) Land reclamation, bunding or disturbing the natural course of seawater except those,-
 - (a) required for setting up, construction or modernisation or expansion of foreshore facilities like ports, harbours, jetties, wharves, quays, slipways, bridges, sealink, road on stilts, and such as meant for defence and security purpose and for other facilities that are essential for activities permissible under the notification;
 - (b) measures for control of erosion, based on scientific including Environmental Impact Assessment (hereinafter referred to as the EIA) studies
 - (c) maintenance or clearing of waterways, channels and ports, based on EIA studies;
 - (d) measures to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structures for prevention of salinity ingress and freshwater recharge based on carried out by any agency to be specified by MoEF.
- (v) Setting up and expansion of units or mechanism for disposal of wastes and effluents except facilities required for,-
 - (a) discharging treated effluents into the water course with approval under the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974);
 - (b) storm water drains and ancillary structures for pumping;
 - (c) treatment of waste and effluents arising from hotels, beach resorts and human settlements located in CRZ areas other than CRZ-I and disposal of treated wastes and effluents;
- (vi) Discharge of untreated waste and effluents from industries, cities or towns and other human settlements. The concerned authorities shall implement schemes for phasing out existing discharge of this nature, if any, within a time period not exceeding two years from the date of issue of this notification.
- (vii) Dumping of city or town wastes, including construction debris, industrial solid wastes, fly



ash for the purpose of land filling and the like and the concerned authority shall implement schemes for phasing out any existing practice, if any, shall be phased out within a period of one year from date of commencement of this notification.

Note:-The MoEF will issue a separate instruction to the State Governments and Union territory Administration in respect of preparation of Action Plans and their implementation as also monitoring including the time schedule thereof, in respect of paras (v), (vi) and (vii).

(viii) Port and harbour projects in high eroding stretches of the coast, except those projects classified as strategic and defence related in terms of EIA notification, 2006 identified by MoEF based on scientific studies and in consultation with the State Government or the Union territory Administration.

(ix) Reclamation for commercial purposes such as shopping and housing complexes, hotels and entertainment activities.

(x) Mining of sand, rocks and other sub-strata materials except,-

- (a) those rare minerals not available outside the CRZ area,
- (b) exploration and exploitation of Oil and Natural Gas.

(xi) Drawl of groundwater and construction related thereto, within 200mts of HTL; except the following:-

- (a) in the areas which are inhabited by the local communities and only for their use.
- (b) In the area between 200mts-500mts zone the drawl of groundwater shall be permitted only when done manually through ordinary wells for drinking, horticulture, agriculture and fisheries and where no other source of water is available.

Note:-Restrictions for such drawl may be imposed by the Authority designated by the State Government and Union territory Administration in the areas affected by sea water intrusion.

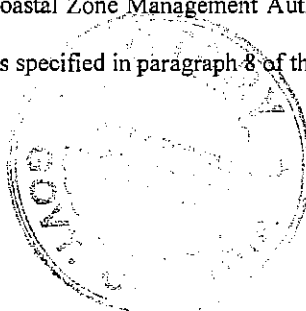
(xi) Construction activities in CRZ-I except those specified in para 8 of this notification.

(xiii) Dressing or altering the sand dunes, hills, natural features including landscape changes for beautification, recreation and other such purpose.

(xiv) Facilities required for patrolling and vigilance activities of marine/coastal police stations.

4. Regulation of permissible activities in CRZ area.- The following activities shall be regulated except those prohibited in para 3 above,-

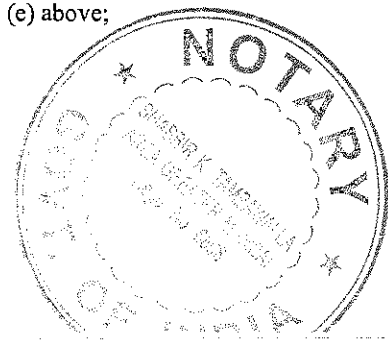
- (i)(a) clearance shall be given for any activity within the CRZ only if it requires waterfront and foreshore facilities;
- (b) for those projects which are listed under this notification and also attract EIA notification, 2006 (S.O.1533 (E), dated the 14th September, 2006), for such projects clearance under EIA notification only shall be required subject to being recommended by the concerned State or Union territory Coastal Zone Management Authority (hereinafter referred to as the CZMA).
- (c) Housing schemes in CRZ as specified in paragraph 8 of this notification;



- (d) Construction involving more than 20,000sq mts built-up area in CRZ-II shall be considered in accordance with EIA notification, 2006 and in case of projects less than 20,000sq mts built-up area shall be approved by the concerned State or Union territory Planning authorities in accordance with this notification after obtaining recommendations from the concerned CZMA and prior recommendations of the concern CZMA shall be essential for considering the grant of environmental clearance under EIA notification, 2006 or grant of approval by the relevant planning authority.
 - (e) MoEF may under a specific or general order specify projects which require prior public hearing of project affected people.
 - (f) construction and operation for ports and harbours, jetties, wharves, quays, slipways, ship construction yards, breakwaters, groynes, erosion control measures;
- (ii) the following activities shall require clearance from MoEF, namely:-
- (a) those activities not listed in the EIA notification, 2006.
 - (b) construction activities relating to projects of Department of Atomic Energy or Defence requirements for which foreshore facilities are essential such as, slipways, jetties, wharves, quays; except for classified operational component of defence projects. Residential buildings, office buildings, hospital complexes, workshops of strategic and defence projects in terms of EIA notification, 2006.;
 - (c) construction, operation of lighthouses;
 - (d) laying of pipelines, conveying systems, transmission line;
 - (e) exploration and extraction of oil and natural gas and all associated activities and facilities thereto;
 - (f) Foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water and outfall for discharge of treated wastewater or cooling water from thermal power plants. MoEF may specify for category of projects such as at (f), (g) and (h) of para 4;
 - (g) Mining of rare minerals as listed by the Department of Atomic Energy;
 - (h) Facilities for generating power by non-conventional energy resources, desalination plants and weather radars;
 - (i) Demolition and reconstruction of (a) buildings of archaeological and historical importance, (ii) heritage buildings; and buildings under public use which means buildings such as for the purposes of worship, education, medical care and cultural activities;

4.2 Procedure for clearance of permissible activities.- All projects attracting this notification shall be considered for CRZ clearance as per the following procedure, namely:-

- (i) The project proponents shall apply with the following documents seeking prior clearance under CRZ notification to the concerned State or the Union territory Coastal Zone Management Authority,-
 - (a) Form-1 (Annexure-IV of the notification);
 - (b) Rapid EIA Report including marine and terrestrial component except for construction projects listed under 4(c) and (d)
 - (c) Comprehensive EIA with cumulative studies for projects in the stretches classified as low and medium eroding by MoEF based on scientific studies and in consultation with the State Governments and Union territory Administration;
 - (d) Disaster Management Report, Risk Assessment Report and Management Plan;
 - (e) CRZ map indicating HTL and LTL demarcated by one of the authorized agency (as indicated in para 2) in 1:4000 scale;
 - (f) Project layout superimposed on the above map indicated at (e) above;



- (g) The CRZ map normally covering 7km radius around the project site.
- (h) The CRZ map indicating the CRZ-I, II, III and IV areas including other notified ecologically sensitive areas;
- (i) No Objection Certificate from the concerned State Pollution Control Boards or Union territory Pollution Control Committees for the projects involving discharge of effluents, solid wastes, sewage and the like.;
- (ii) The concerned CZMA shall examine the above documents in accordance with the approved CZMP and in compliance with CRZ notification and make recommendations within a period of sixty days from date of receipt of complete application,-
 - (a) MoEF or State Environmental Impact Assessment Authority (hereinafter referred to as the SEIAA) as the case may be for the project attracting EIA notification, 2006;
 - (b) MoEF for the projects not covered in the EIA notification, 2006 but attracting para 4(ii) of the CRZ notification;
- (iii) MoEF or SEIAA shall consider such projects for clearance based on the recommendations of the concerned CZMA within a period of sixty days.
- (vi) The clearance accorded to the projects under the CRZ notification shall be valid for the period of five years from the date of issue of the clearance for commencement of construction and operation.
- (v) For Post clearance monitoring – (a) it shall be mandatory for the project proponent to submit half-yearly compliance reports in respect of the stipulated terms and conditions of the environmental clearance in hard and soft copies to the regulatory authority(s) concerned, on 1st June and 31st December of each calendar year and all such compliance reports submitted by the project proponent shall be published in public domain and its copies shall be given to any person on application to the concerned CZMA.
- (b) the compliance report shall also be displayed on the website of the concerned regulatory authority.
- (vi) To maintain transparency in the working of the CZMAs it shall be the responsibility of the CZMA to create a dedicated website and post the agenda, minutes, decisions taken, clearance letters, violations, action taken on the violations and court matters including the Orders of the Hon'ble Court as also the approved CZMPs of the respective State Government or Union territory.

5. Preparation of Coastal Zone Management Plans.

- (i) The MoEF may obtain the CZMPs prepared through the respective State Government or Union territory;
- (ii) The CZMPs may be prepared by the coastal State Government or Union territory by engaging reputed and experienced scientific institution(s) or the agencies including the National Centre for Sustainable Coastal Management (hereinafter referred to as the NCSCM) of MoEF and in consultation with the concerned stakeholders;
- (iii) The hazard line shall be mapped by MoEF through SoI all along the coastline of the country and the hazard line shall be demarcated taking into account, tide, waves, sea level

rise and shoreline changes;

- (iv) For the purpose of depicting the flooding due to tides, waves and sea level rise in the next fifty and hundred years, the contour mapping of the coastline shall be carried out at 0.5m interval normally upto 7km from HTL on the landward side, and the shoreline changes shall be demarcated based on historical data by comparing the previous satellite imageries with the recent satellite imageries;
- (v) Mapping of the hazard line shall be carried out in 1:25,000 scale for macro level planning and 1:10,000 scale or cadastral scale for micro level mapping and the hazard line shall be taken into consideration while preparing the land use plan of the coastal areas;
- (vi) The coastal States and Union Territory will prepare within a period of twenty four months from the date of issue this notification, draft CZMPs in 1:25,000 scale map identifying and classifying the CRZ areas within the respective territories in accordance with the guidelines given in Annexure-I of the notification, which involve public consultation;
- (vii) The draft CZMPs shall be submitted by the State Government or Union territory to the concerned CZMA for appraisal, including appropriate consultations, and recommendations in accordance with the procedure(s) laid down in the Environment (Protection) Act, 1986;
- (viii) The State Government or Union territory CZMA shall submit the draft CZMPs to MoEF alongwith its recommendations on the CZMP within a period of six months after incorporating the suggestions and objections received from the stakeholders;
- (ix) MoEF shall thereafter consider and approve the CZMPs within a period of four months from the date of receipt of the CZMPs complete in all respects;
- (x) All developmental activities listed in this notification shall be regulated by the State Government, Union Territory Administration, the local authority or the concerned CZMA within the framework of such approved CZMPs as the case may be in accordance with provisions of this notification;
- (xi) The CZMPs shall not normally be revised before a period of five years after which, the concerned State Government or the Union territory may consider undertaking revision of the maps following the above procedures;
- (xii) The CZMPs already approved under CRZ notification, 1991 shall be valid for a period of twenty four months unless the aforesaid period is extended by MoEF by a specific notification subject to such terms and conditions as may be specified therein.

6. Enforcement of the CRZ, notification, 2011-

- (a) For the purpose of implementation and enforcement of the provisions this notification and compliance with conditions stipulated thereunder, the powers either original or delegated are available under Environment (Protection) Act, 1986 with the MoEF, State Government or the Union territory Administration NCZMA and SCZMA's;
- (b) The composition, tenure and mandate of NCZMA and State Government or the Union territory CZMA's have already been notified by MoEF in terms of Orders of Hon'ble

Supreme Court in Writ Petition 664 of 1993;

- (c) the State Government or the Union territory CZMAs shall primarily be responsible for enforcing and monitoring of this notification and to assist in this task, the State Government and the Union territory shall constitute district level Committees under the Chairmanship of the District Magistrate concerned containing atleast three representatives of local traditional coastal communities including from fisherfolk;
- (d) The dwelling units of the traditional coastal communities including fisherfolk, tribals as were permissible under the provisions of the CRZ notification, 1991, but which have not obtained formal approval from concerned authorities under the aforesaid notification shall be considered by the respective Union territory CZMAs and the dwelling units shall be regularized subject to the following condition, namely-
 - (i) these are not used for any commercial activity
 - (ii) these are not sold or transferred to non-traditional coastal community.

7. Classification of the CRZ – For the purpose of conserving and protecting the coastal areas and marine waters, the CRZ area shall be classified as follows, namely:-

(i) CRZ-I,-

A. The areas that are ecologically sensitive and the geomorphological features which play a role in the maintaining the integrity of the coast,-

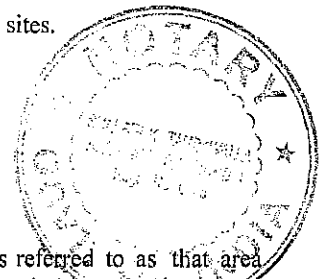
- (a) Mangroves, in case mangrove area is more than 1000 sq mts, a buffer of 50meters along the mangroves shall be provided;
- (b) Corals and coral reefs and associated biodiversity;
- (c) Sand Dunes;
- (d) Mudflats which are biologically active;
- (e) National parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas under the provisions of Wild Life (Protection) Act, 1972 (53 of 1972), the Forest (Conservation) Act, 1980 (69 of 1980) or Environment (Protection) Act, 1986 (29 of 1986); including Biosphere Reserves;
- (f) Salt Marshes;
- (g) Turtle nesting grounds;
- (h) Horse shoe crabs habitats;
- (i) Sea grass beds;
- (j) Nesting grounds of birds;
- (k) Areas or structures of archaeological importance and heritage sites.

B. The area between Low Tide Line and High Tide Line;

(ii) CRZ-II,-

The areas that have been developed upto or close to the shoreline.

Explanation.- For the purposes of the expression “developed area” is referred to as that area within the existing municipal limits or in other existing legally designated urban areas which are substantially built-up and has been provided with drainage and approach roads and other infrastructural facilities, such as water supply and sewerage mains;



(iii) CRZ-III,-

Areas that are relatively undisturbed and those do not belong to either CRZ-I or II which include coastal zone in the rural areas (developed and undeveloped) and also areas within municipal limits or in other legally designated urban areas, which are not substantially built up.

(iv.) CRZ-IV,-

- A. the water area from the Low Tide Line to twelve nautical miles on the seaward side;
- B. shall include the water area of the tidal influenced water body from the mouth of the water body at the sea upto the influence of tide which is measured as five parts per thousand during the driest season of the year.

(v) Areas requiring special consideration for the purpose of protecting the critical coastal environment and difficulties faced by local communities,-

- A. (i) CRZ area falling within municipal limits of Greater Mumbai;
(ii) the CRZ areas of Kerala including the backwaters and backwater islands;
(iii) CRZ areas of Goa.
- B. Critically Vulnerable Coastal Areas (CVCA) such as Sunderbans region of West Bengal and other ecologically sensitive areas identified as under Environment (Protection) Act, 1986 and managed with the involvement of coastal communities including fisherfolk.

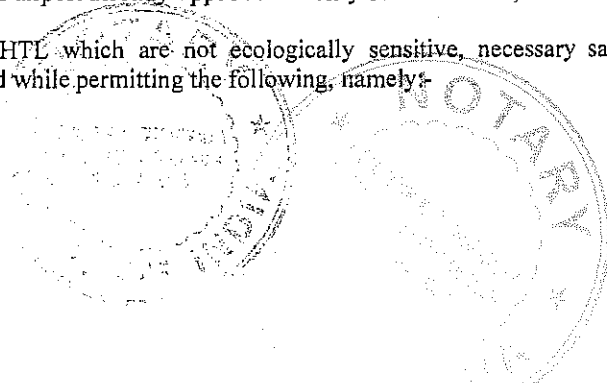
8. Norms for regulation of activities permissible under this notification,-

- (i) The development or construction activities in different categories of CRZ shall be regulated by the concerned CZMA in accordance with the following norms, namely:-

Note:- The word existing use hereinafter in relation to existence of various features or existence of regularisation or norms shall mean existence of these features or regularisation or norms as on 19.2.1991 wherein CRZ notification, was notified.

1. CRZ-I,-

- (i) no new construction shall be permitted in CRZ-I except,-
 - (a) projects relating to Department of Atomic Energy;
 - (b) pipelines, conveying systems including transmission lines;
 - (c) facilities that are essential for activities permissible under CRZ-I;
 - (d) installation of weather radar for monitoring of cyclones movement and prediction by Indian Meteorological Department;
 - (e) construction of trans harbour sea link and without affecting the tidal flow of water, between LTL and HTL.
 - (f) development of green field airport already approved at only Navi Mumbai;
- (ii) Areas between LTL and HTL which are not ecologically sensitive, necessary safety measures will be incorporated while permitting the following, namely:-



- (a) exploration and extraction of natural gas;
- (b) construction of dispensaries, schools, public rainshelter, community toilets, bridges, roads, jetties, water supply, drainage, sewerage which are required for traditional inhabitants living within the biosphere reserves after obtaining approval from concerned CZMA.
- (c) necessary safety measure shall be incorporated while permitting such developmental activities in the area falling in the hazard zone;
- (d) salt harvesting by solar evaporation of seawater;
- (e) desalination plants;
- (f) storage of non-hazardous cargo such as edible oil, fertilizers and food grain within notified ports;
- (g) construction of trans harbour sea links, roads on stilts or pillars without affecting the tidal flow of water.

II. CRZ-II,-

- (i) buildings shall be permitted only on the landward side of the existing road, or on the landward side of existing authorized structures;
- (ii) buildings permitted on the landward side of the existing and proposed roads or existing authorized structures shall be subject to the existing local town and country planning regulations including the 'existing' norms of Floor Space Index or Floor Area Ratio:
Provided that no permission for construction of buildings shall be given on landward side of any new roads which are constructed on the seaward side of an existing road;
- (iii) reconstruction of authorized building to be permitted subject with the existing Floor Space Index or Floor Area Ratio Norms and without change in present use;
- (iv) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II appended to this notification and facilities for regasification of Liquefied Natural Gas subject to the conditions as mentioned in sub-paragraph (ii) of paragraph 3;
- (v) desalination plants and associated facilities;
- (vi) storage of non-hazardous cargo, such as edible oil, fertilizers and food grain in notified ports;
- (vii) facilities for generating power by non-conventional power sources and associated facilities;

III. CRZ-III,-

A. Area upto 200mts from HTL on the landward side in case of seafront and 100mts along tidal influenced water bodies or width of the creek whichever is less is to be earmarked as "No Development Zone (NDZ)",-

- (i) the NDZ shall not be applicable in such area falling within any notified port limits;
- (ii) No construction shall be permitted within NDZ except for repairs or reconstruction of existing authorized structure not exceeding existing Floor Space Index, existing plinth area and existing density and for permissible activities under the notification including facilities essential for activities; Construction/reconstruction of dwelling units of traditional coastal communities including fisherfolk may be permitted between 100 and 200 metres from the HTL along the seafront in accordance with a comprehensive plan prepared by the State Government or the Union territory in consultation with the traditional coastal



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communities including fisherfolk and incorporating the necessary disaster management provision, sanitation and recommended by the concerned State or the Union territory CZMA to NCZMA for approval by MoEF;

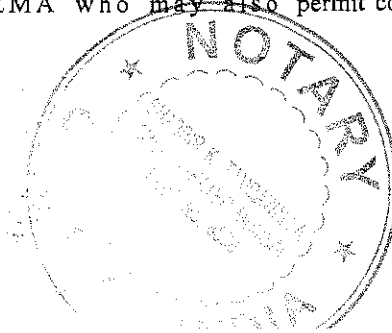
(iii) however, the following activities may be permitted in NDZ -

- (a) agriculture, horticulture, gardens, pasture, parks, play field, and forestry;
- (b) projects relating to Department of Atomic Energy;
- (c) mining of rare minerals;
- (d) salt manufacture from seawater;
- (e) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II;
- (f) facilities for regasification of liquefied natural gas subject to conditions as mentioned in subparagraph (ii) of paragraph 3;
- (g) facilities for generating power by non conventional energy sources;
- (h) Foreshore facilities for desalination plants and associated facilities;
- (i) weather radars;
- (j) construction of dispensaries, schools, public rain shelter, community toilets, bridges, roads, provision of facilities for water supply, drainage, sewerage, crematoria, cemeteries and electric sub-station which are required for the local inhabitants may be permitted on a case to case basis by CZMA;
- (k) construction of units or auxiliary thereto for domestic sewage, treatment and disposal with the prior approval of the concerned Pollution Control Board or Committee;
- (l) facilities required for local fishing communities such as fish drying yards, auction halls, net mending yards, traditional boat building yards, ice plant, ice crushing units, fish curing facilities and the like;
- (m) development of green field airport already permitted only at Navi Mumbai.

B. Area between 200mts to 500mts,-

The following activities shall be permissible in the above areas;

- (i) development of vacant plot in designated areas for construction of hotels or beach resorts for tourists or visitors subject to the conditions as specified in the guidelines at Annexure-III;
- (ii) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II;
- (iii) facilities for regasification of liquefied natural gas subject to conditions as mentioned in sub-paragraph (ii) of paragraph 3;
- (iv) storage of non-hazardous cargo such as, edible oil, fertilizers, food grain in notified ports;
- (v) foreshore facilities for desalination plants and associated facilities;
- (vi) facilities for generating power by non-conventional energy sources;
- (vii) construction or reconstruction of dwelling units so long it is within the ambit of traditional rights and customary uses such as existing fishing villages and goathans. Building permission for such construction or reconstruction will be subject to local town and country planning rules with overall height of construction not exceeding 9mts with two floors (ground + one floor);
- (viii) Construction of public rain shelters, community toilets, water supply drainage, sewerage, roads and bridges by CZMA who may also permit construction of



- schools and dispensaries for local inhabitants of the area for those panchayats, the major part of which falls within CRZ if no other area is available for construction of such facilities;
- (ix) reconstruction or alteration of existing authorised building subject to sub-paragraph (vii), (viii);
 - (x) development of green field airport already permitted only at Navi Mumbai.

(IV) In CRZ-IV areas,-

The activities impugning on the sea and tidal influenced water bodies will be regulated except for traditional fishing and related activities undertaken by local communities as follows:-

- (a) No untreated sewage, effluents, ballast water, ship washes, fly ash or solid waste from all activities including from aquaculture operations shall be let off or dumped. A comprehensive plan for treatment of sewage generating from the coastal towns and cities shall be formulated within a period of one year in consultation with stakeholders including traditional coastal communities, traditional fisherfolk and implemented;
- (b) Pollution from oil and gas exploration and drilling, mining, boat house and shipping;
- (c) There shall be no restriction on the traditional fishing and allied activities undertaken by local communities.

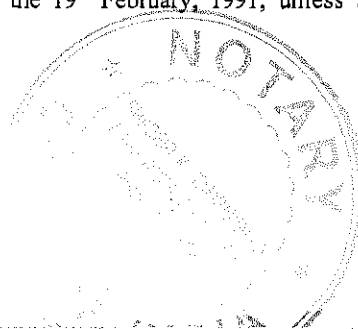
V. Areas requiring special consideration,-

1. CRZ areas falling within municipal limits of the Greater Mumbai.

- (i) Developmental activities in the CRZ area of the Greater Mumbai because of the environmental issues, relating to degradation of mangroves, pollution of creeks and coastal waters, due to discharge of untreated effluents and disposal of solid waste, the need to provide decent housing to the poor section of society and lack of suitable alternatives in the inter connected islands of Greater Mumbai shall be regulated as follows, namely:-
 - A. Construction of roads - In CRZ-I areas indicated at sub-paragraph (i) of paragraph 7 of the notification the following activities only can be taken up:-
 - (a) Construction of roads, approach roads and missing link roads approved in the Developmental Plan of Greater Mumbai on stilts ensuring that the free flow of tidal water is not affected, without any benefit of CRZ-II accruing on the landward side of such constructed roads or approach roads subject to the following conditions:-
 - (i) All mangrove areas shall be mapped and notified as protected forest and necessary protection and conservation measures for the identified mangrove areas shall be initiated.
 - (ii) Five times the number of mangroves destroyed/cut during the construction process shall be replanted.
 - B. Solid waste disposal sites shall be identified outside the CRZ area and thereafter within two years the existing conventional solid waste sites shall be relocated outside the CRZ area.

(iii) In CRZ-II areas-

- (a) The development or redevelopment shall continue to be undertaken in accordance with the norms laid down in the Town and Country Planning Regulations as they existed on the date of issue of the notification dated the 19th February, 1991, unless specified



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otherwise in this notification.

(b) SLUM REHABILITATION SCHEMES,-

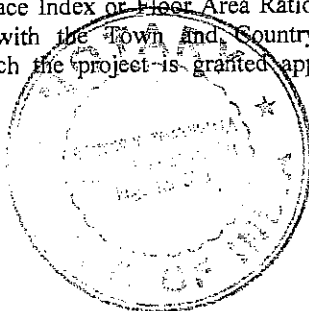
1. In the Greater Mumbai area there are large slum clusters with lakhs of families residing therein and the living conditions in these slums are deplorable and the civic agencies are not able to provide basic infrastructure such as drinking water, electricity, roads, drainage and the like because the slums come up in an unplanned and congested manner and the slums in the coastal area are at great risk in the event of cyclones, storm surges or tsunamis, in view of the difficulties in providing rescue, relief and evacuation.
2. To provide a safe and decent dwelling to the slum dwellers, the State Government may implement slum redevelopment schemes as identified as on the date of issue of this notification directly or through its parastatal agencies like Maharashtra Housing and Area Development Authority (MHADA), Shivshahi Punarvasan Prakalp Limited (SPPL), Mumbai Metropolitan Region Development Authority (MMRDA) and the like.:

Provided that,-

- (i) such redevelopment schemes shall be undertaken directly or through joint ventures or through public private partnerships or other similar models ensuring that the stake of the State Government or its parastatal entities shall be not less than 51%;
- (ii) the Floor Space Index or Floor Area Ratio for such redevelopment schemes shall be in accordance with the Town and Country Planning Regulations prevailing as on the date on which the project is granted approval by the competent authority;
- (iii) it shall be the duty of the project proponent undertaking the redevelopment through conditions (i) (2) above along with the State Government to ensure that all legally regularized tenants are provided houses in situ or as per norms laid down by the State Government in this regard.

(c) REDEVELOPMENT OF DILAPIDATED, CESSSED AND UNSAFE BUILDINGS:

1. In the Greater Mumbai, there are, also a large number of old and dilapidated, cesssed and unsafe buildings in the CRZ areas and due to their age these structures are extremely vulnerable and disaster prone and therefore there is an urgent need for the redevelopment or reconstruction of these identified buildings.
2. These projects shall be taken up subject to the following conditions and safeguards:
 - (i) such redevelopment or reconstruction projects as identified on the date of issue of this notification shall be allowed to be taken up involving the owners of these buildings either above or with private developers in accordance with the prevailing Regulation, directly or through joint ventures or through other similar models.
 - (ii) the Floor Space Index or Floor Area Ratio for such redevelopment schemes shall be in accordance with the Town and Country Planning Regulations prevailing as on the date on which the project is granted approval by the competent authority

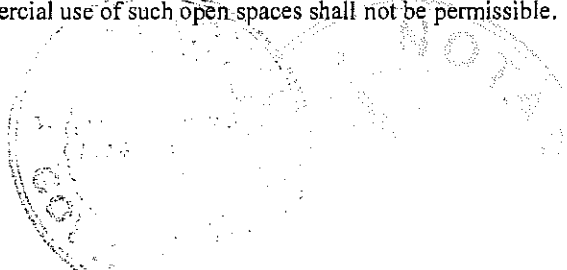


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(iii) suitable accommodation to the original tenants of the specified buildings shall be ensured during the course of redevelopment or reconstruction of the buildings by the project proponents, undertaking the redevelopment through condition 2(i) above.

(d) Notwithstanding anything contained in this notification, the developmental activities for slums and for dilapidated, cessed and unsafe buildings as specified at paras (b) and (c) above shall be carried out in an accountable and transparent manner by the project proponents mentioned therein which shall include the following pre-condition measures, wherever applicable:-

1. (i) applicability of the Right to Information Act, 2005 to all redevelopment or reconstruction projects granted clearance by the Competent Authorities;
 - (ii) MoEF shall issue an order constituting the CPIO and the first Appellate Authority of appropriate ranks in consultation with Government of Maharashtra;
 - (iii) details of the Slum Rehabilitation Scheme, including the complete proposal and the names of the eligible slum dwellers will be declared suo-moto as a requirement of Section 4 of compliance of the Right to Information Act, 2005 by the appropriate authority in the Government of Maharashtra in one month before approving it;
 - (iv) the implementing or executing agency at the State Government with regard to projects indicated at sub-item (b) and (c) of item (iii) of sub-paragraph V shall display on a large notice boards at the site and at the office of the implementing or executing agency the names of the eligible builders, total number of tenements being made, names of eligible slum dwellers who are to be provided the dwelling units and the extra area available for free sale.
 - (v) Projects being developed under sub-items (b) and (c) of item (iii) of sub-paragraph V shall be given permission only if the project proponent agree to be covered under the Right to Information Act, 2005.
2. MoEF may appoint statutory auditors, who are empanelled by the Comptroller and auditor General (hereinafter referred to as the C&AG) to undertake performance and fiscal audit in respect of the projects relating to redevelopment of dilapidated, cessed and unsafe buildings and the projects relating to Slum Rehabilitation Scheme shall be audited by C&AG.
 3. A High Level Oversight Committee may be set up by the Government of Maharashtra for periodic review of implementation of V(iii)(b) and (c) which shall include eminent representatives of various Stakeholders, like Architects, Urban Planner, Engineers, and Civil Society, besides the local urban bodies, the State Government and the Central Government.
 4. The individual projects under V(iii)(b) and (c) shall be undertaken only after public consultation in which views of only the legally entitled slum dweller or the legally entitled tenant of the dilapidated or cessed buildings shall be obtained in accordance with the procedures laid down in EIA notification, 2006.
- (e) In order to protect and preserve the 'green lung' of the Greater Mumbai area, all open spaces, parks, gardens, playgrounds indicated in development plans within CRZ-II shall be categorized as CRZ-III, that is, 'no development zone'.
- (f) the Floor Space Index upto 15% shall be allowed only for construction of civic amenities, stadium and gymnasium meant for recreational or sports related activities and the residential or commercial use of such open spaces shall not be permissible.



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- (g) Koliwada namely, fishing settlement areas as identified in the Development Plan of 1981 or relevant records of the Government of Maharashtra, shall be mapped and declared as CRZ-III so that any development, including construction and reconstruction of dwelling units within these settlements shall be undertaken in accordance with applicable as per local Town and Country Planning Regulations.
- (h) Reconstruction and repair works of the dwelling units, belonging to fisher communities and other local communities identified by the State Government, shall be considered and granted permission by the Competent Authorities on a priority basis, in accordance with the applicable Town and Country Planning Regulations.

2. CRZ for Kerala

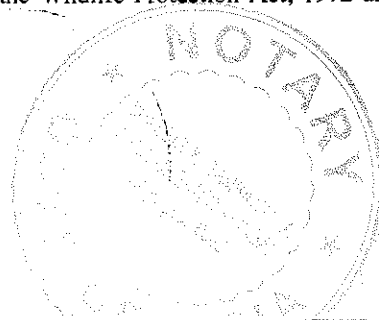
In view of the unique coastal systems of backwater and backwater islands alongwith space limitation present in the coastal stretches of the State of Kerala, the following activities in CRZ shall be regulated as follows, namely:-

- (i) all the islands in the backwaters of Kerala shall be covered under the CRZ notification;
- (ii) the islands within the backwaters shall have 50mts width from the High Tide Line on the landward side as the CRZ area;
- (iii) within 50mts from the HTL of these backwater islands existing dwelling units of local communities may be repaired or reconstructed however no new construction shall be permitted;
- (iv) beyond 50mts from the HTL on the landward side of backwater islands, dwelling units of local communities may be constructed with the prior permission of the Gram panchayat;
- (v) foreshore facilities such as fishing jetty, fish drying yards, net mending yard, fishing processing by traditional methods, boat building yards, ice plant, boat repairs and the like, may be taken up within 50mts width from HTL of these backwater islands.

3. CRZ of Goa.-

In view of the peculiar circumstances of the State Goa including past history and other developments, the specific activities shall be regulated and various measures shall be undertaken as follows:-

- (i) the Government of Goa shall notify the fishing villages wherein all foreshore facilities required for fishing and fishery allied activities such as traditional fish processing yards, boat building or repair yards, net mending yards, ice plants, ice storage, auction hall, jetties may be permitted by Grama Panchayat in the CRZ area;
- (ii) reconstruction, repair works of the structures of local communities including fishermen community shall be permissible in CRZ;
- (iii) purely temporary and seasonal structures customarily put up between the months of September to May;
- (iv) the eco sensitive low lying areas which are influenced by tidal action known as khazan lands shall be mapped;
- (v) the mangroves along such as khazan land shall be protected and a management plan for the khazan land prepared and no developmental activities shall be permitted in the khazan land;
- (vi) sand dunes, beach stretches along the bays and creeks shall be surveyed and mapped. No activity shall be permitted on such sand dune areas;
- (vii) the beaches such as Mandrem, Morjim, Galgiba and Agonda has been designated as turtle nesting sites and protected under the Wildlife Protection Act, 1972 and these areas



shall be surveyed and management plan prepared for protection of these turtle nesting sites;

(viii) no developmental activities shall be permitted in the turtle breeding areas referred to in sub-paragraph (vii).

4. (a) Critical Vulnerable Coastal Areas (CVCA) which includes Sunderbans and other identified ecological sensitive areas which shall be managed with the involvement of the local coastal communities including the fisher folk;-
- (b) the entire Sunderbans mangrove area and other identified ecologically important areas such as Gulf of Khambat and Gulf of Kutchhh in Gujarat, Malvan, Achra-Ratnagiri in Maharashtra, Karwar and Coondapur in Karnataka, Vembanad in Kerala, Gulf of Mannar in Tamil Nadu, Bhaitarkanika in Orissa, Coringa, East Godavari and Krishna in Andhra Pradesh shall be declared as Critical Vulnerable Coastal Areas (CVCA) through a process of consultation with local fisher and other communities inhabiting the area and depend on its resources for their livelihood with the objective of promoting conservation and sustainable use of coastal resources and habitats;
- (c) the process of identifying planning, notifying and implementing CVCA shall be detailed in the guideline which will be developed and notified by MoEF in consultations with the stakeholders like the State Government, local coastal communities and fisherfolk and the like inhabiting the area;
- (d) the Integrated Management Plans (IMPs) prepared for such CVCA shall interalia keep in view the conservation and management of mangroves, needs of local communities such as, dispensaries, schools, public rain shelter, community toilets, bridges, roads, jetties, water supply, drainage, sewerage and the impact of sea level rise and other natural disasters and the IMPs will be prepared in line with the para 5 above for preparation of Coastal Zone Management Plans;
- (e) till such time the IMPs are approved and notified, construction of dispensaries, schools, public rain shelters, community toilets, bridges, roads, jetties, water supply, drainage, sewerage which are required for traditional inhabitants shall be permitted on a case to case basis, by the CZMA with due regards to the views of coastal communities including fisherfolk.

[F.No.11-83/2005-IA-III]
J. M. MAUSKAR, Addl. Secy.

ANNEXURE I**GUIDELINES FOR PREPARATION OF COASTAL ZONE MANAGEMENT PLANS****I. A. Demarcation of High Tide Line**

1. Demarcation of High Tide Line (HTL) and Low Tide Line (LTL) shall be carried out by one of the agencies authorised by MoEF based on the recommendations of the National Centre for Sustainable Coastal Management (NCSCM).
2. Demarcation of the High Tide Line or LTL shall be made on the Coastal Zone Management (CZM) Maps of scale 1:25,000 prepared by the agencies identified by the MoEF.
3. Local level CZM Maps shall be prepared for use of officials of local bodies for determination of the CRZ.
4. The local level CZM Maps shall be prepared on a Cadastral scale in accordance with the CZM Maps approved by the Central Government.

B. Preparation of CZM Maps

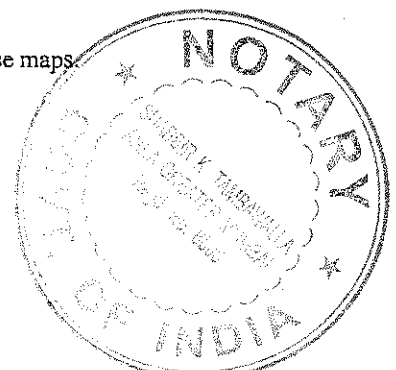
5. Base Maps of 1:25,000 scale shall be acquired from the Survey of India (SOI) and wherever 1:25,000 maps are not available, 1:50,000 maps shall be enlarged to 1:25,000 for the purpose of base map preparation and these maps will be of the standard specification given below:

Unit	:	7.5 minutes X 7.5 minutes
Numbering	:	Survey of India Sheet Numbering System
Horizontal Datum	:	Everest or WGS 84
Vertical Datum	:	Mean Sea Level (MSL)
Topography	:	Topography in the SOI maps will be updated using latest satellite imageries or aerial photographs
6. The High Water Level (HWL) and Low Water Level (LWL) marked on the Base maps will be transferred to the CZM maps.
7. Coastal geomorphological signatures in the field or satellite imageries or aerial photographs will be used for appropriate adjustment, in the HWL or LWL for demarcating HTL or LTL in accordance with the CRZ notification.
8. The following geomorphological features shall be considered while demarcating in HTL or LTL:
 - Landward (monsoonal) berm crest in the case of sandy beaches
 - Rocks, Headlands, Cliffs
 - Seawalls or revetments or embankments
9. 500 meter and 200 metre lines will be demarcated with respect of HTL.
10. HTL (as defined in the CRZ notification) and LTL shall also be demarcated in the CZM maps along the banks of tidal influenced inland water bodies with the help of the geomorphological signatures or features.
11. Classification of different coastal zones shall be done as per the CRZ notification
12. Standard national or international colour codes shall be used to highlight sub-classification of data.

C. Local level CZM Maps

Local level CZM Maps are for the use of local bodies and other agencies to facilitate implementation of the Coastal Zone Management Plans

13. Cadastral (village) maps in 1:3960 or the nearest scale, shall be used as the base maps.

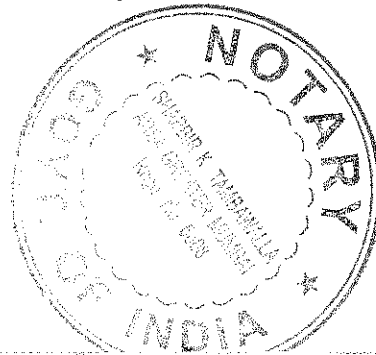


14. These maps are available with revenue Authorities and are prepared as per standard norms.
15. HTL (as defined in the CRZ notification) and LTL will be demarcated in the cadastral map based on detailed physical verification using coastal geomorphological signatures or features in accordance with the CZM Maps approved by the Central Government.
16. 500metre and 200metre lines shall be demarcated with respect to the HTL thus marked.
17. HTL (as defined in the CRZ notification, 1991) and LTL will also be demarcated along the banks of tidal influenced inland water bodies with the help of geomorphological signatures or features.
18. Classifications shall be transferred into local level CZM maps from the CZM Plans.
19. Symbols will be adopted from CZM Maps.
20. Colour codes as given in CZM Maps shall be used.
21. Demarcation of cadastral maps will be done by local agencies approved by the Central Government. The local agencies shall work under the guidance of the concerned State Government or Union Territory Coastal Zone Management Authorities.

D. Hazard mapping:-

II. Classification of CRZ areas

1. The CZM Maps shall be prepared in accordance with para 5 of the CRZ notification demarcating CRZ I, II, III, IV and V.
2. The CZM Maps shall clearly demarcate the land use plan of the area and lists out the CRZ-I areas. All the CRZ-I areas listed under para 7(I)A and B shall be clearly demarcated and colour codes given so that each of the CRZ-I areas can be clearly identified.
3. Buffer zone along mangrove areas of more than 1000sq mts shall be stipulated with a different colour distinguishing from the mangrove area.
4. The buffer zone shall also be classified as CRZ-I area.
5. The hazard line to be drawn up by MoEF shall be superimposed on the CZM maps in 1:25,000 scale and also on the cadastral scale maps.
6. The CRZ-II areas shall be those areas which have been substantially built-up with a ratio of built-up plots to that of total plots is more than 50%.
7. In the CRZ areas, the fishing villages, common properties of the fishermen communities, fishing jetties, ice plants, fish drying platforms or areas infrastructure facilities of fishing and local communities such as dispensaries, roads, schools, and the like, shall be indicated on the cadastral scale maps. States shall prepare detailed plans for long term housing needs of coastal fisher communities in view of expansion and other needs, provisions of basic services including sanitation, safety, and disaster preparedness.
8. No developmental activities other than those listed above shall be permitted in the areas between the hazard line and 500mts or 100mts or width of the creek on the landward side. The dwelling unit of the local communities including that of the fishers will not be relocated if the dwelling units are located on the seaward side of the hazard line. The State Government will provide necessary safeguards from natural disaster to such dwelling units of local communities.
9. The water areas of CRZ IV shall be demarcated and clearly demarcated if the water body is sea, lagoon, backwater, creek, bay, estuary and for such classification of the water bodies the terminology used by Naval Hydrographic Office shall be relied upon.
10. The fishing Zones in the water bodies and the fish breeding areas shall be clearly marked.
11. The water area shall be demarcated indicating the pollution levels as per Central Pollution Control Board standards on water quality.
12. In the CRZ V areas the land use maps shall be superimposed on the Coastal Zone Management Plan and clearly demarcating the CRZ I, II, III, IV.
13. The existing authorized developments on the sea ward side shall be clearly demarcated.



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14. The features like cyclone shelters, rain shelters, helipads and other infrastructure including road network may be clearly indicated on the CZM Maps for the purpose of rescue and relief operations during cyclones, storms, tsunami and the like.

III. CZMPs approved by MoEF in accordance with CRZ notification, 1991

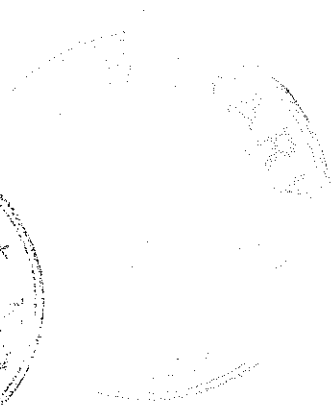
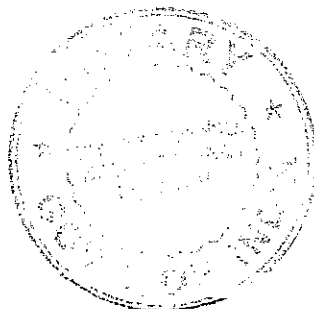
1. While preparing the CZMPs under CRZ notification, 2011, the CZMPs that have been approved under the CRZ Notification, 1991 shall be compared. A justification shall be provided by the concerned CZMA in case the CZMPs prepared under CRZ notification, 2011 varies with respect to the approved CZMP prepared under CRZ notification, 1991.

IV. Public Views on the CZMP.

- a) The draft CZMPs prepared shall be given wide publicity and suggestions and objections received in accordance with the Environment (Protection) Act, 1986. Public hearing on the draft CZMPs shall be held at district level by the concerned CZMAs.
- b) Based on the suggestions and objections received the CZMPs shall be revised and approval of MoEF shall be obtained.
- c) The approved CZMP shall be put up on the website of MoEF, concerned website of the State, Union Territory CZMA and hard copy made available in the panchayat office, District collector office and the like.

V. Revision of Coastal Zone Management Plans

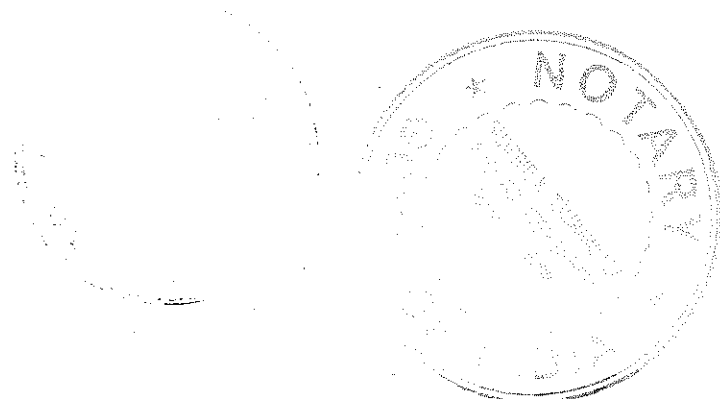
1. Whenever there is a doubt the concerned State or Union territory Coastal Zone Management Authority shall refer the matter to the National Centre for Sustainable Coastal Management who shall verify the CZMP based on latest satellite imagery and ground truthing.
2. The rectified map would be submitted to MoEF for its record.



Annexure-II

List of petroleum and chemical products permitted for storage in [CRZ except CRZ-I(A)]

- (i) Crude oil;
- (ii) Liquefied Petroleum Gas;
- (iii) Motor spirit;
- (iv) Kerosene;
- (v) Aviation fuel;
- (vi) High speed diesel;
- (vii) Lubricating oil;
- (viii) Butane;
- (ix) Propane;
- (x) Compressed Natural Gas;
- (xi) Naphtha;
- (xii) Furnace oil;
- (xiii) Low Sulphur Heavy Stock;
- (xiv) Liquefied Natural Gas;
- (xv) Fertilizers and raw materials for manufacture of fertilizers.

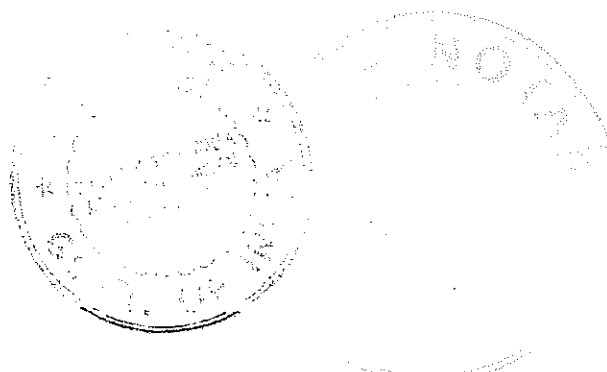


Guidelines for development of beach resorts or hotels in the designated areas of CRZ-III and CRZ-II for occupation of tourist or visitors with prior approval of the Ministry of Environment and Forests

- (a) The project proponent shall not undertake any construction within 200 metres in the landward side of High Tide Line and within the area between Low Tide Line and High Tide Line;
- (b) The proposed constructions shall be beyond the hazard line or 200mts from the High Tide Line whichever is more;
- (c) live fencing and barbed wire fencing with vegetative cover may be allowed around private properties subject to the condition that such fencing shall in no way hamper public access to the beach;
- (d) no flattening of sand dunes shall be carried out;
- (e) no permanent structures for sports facilities shall be permitted except construction of goal posts, net posts and lamp posts;
- (f) Construction of basement may be allowed subject to the condition that no objection certification is obtained from the State Ground Water Authority to the effect that such construction will not adversely affect the flow of groundwater in that area;
- (g) the State Ground Water Authority shall take into consideration the guidelines issued by Central Government before granting such no objection certificate;
- (h) though no construction is allowed in the no development zone for the purposes of calculation of Floor Space Index, the area of entire plot including the portion which falls within the no development zone shall be taken into account;
- (i) the total plot size shall not be less than 0.4 hectares and the total covered area on all floors shall not exceed 33 percent of the plot size i.e., the Floor Space Index shall not exceed 0.33 and the open area shall be suitably landscaped with appropriate vegetal cover;
- (j) the construction shall be consistent with the surrounding landscape and local architectural style;
- (k) the overall height of construction upto the highest ridge of the roof, shall not exceed 9metres and the construction shall not be more than two floors (ground floor plus one upper floor);
- (l) groundwater shall not be tapped within 200metre of the High Tide Line; within the 200metre 500metre zone it can be tapped only with the concurrence of the Central or State Ground Water Board;
- (m) extraction of sand, leveling or digging of sandy stretches except for structural foundation of building, swimming pool shall not be permitted within 500metres of the High Tide Line;



- (n) the quality of treated effluents, solid wastes, emissions and noise levels and the like, from the project area must conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986;
 - (o) necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that the untreated effluents and solid wastes are not discharged into the water or on the beach; and no effluent or solid waste shall be discharged on the beach;
 - (p) to allow public access to the beach, atleast a gap of 20metres width shall be provided between any two hotels or beach resorts; and in no case shall gaps be less than 500metres apart; and
 - (q) if the project involves diversion of forestland for non-forest purposes, clearance as required under the Forest (Conservation) Act, 1980 shall be obtained and the requirements of other Central and State laws as applicable to the project shall be met with; and
 - (r) approval of the State or Union territory Tourism Department shall be obtained.
- II. In ecologically sensitive areas (such as marine parks, mangroves, coral reefs, breeding and spawning grounds of fish, wildlife habitats and such other area as may be notified by the Central or State Government Union territories) construction of beach resorts or hotels shall not be permitted



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Annexure-IVForm-I for seeking clearance for project attracting CRZ notification

Basic information:

Name of the Project:-

Location or site alternatives under consideration:-

Size of the project (in terms of total area) :-

CRZ classification of the area :-

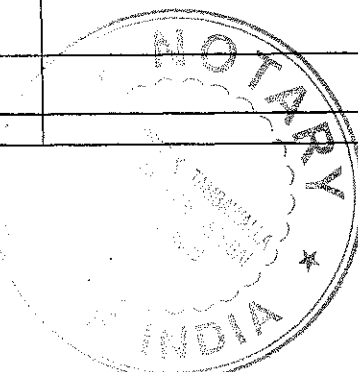
Expected cost of the project:-

Contact Information:-

(II) Activity

1. Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, and the like)

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)		
1.2	Details of CRZ classification as per the approved Coastal Zone Management Plan?		
1.3	Whether located in CRZ-I area?		
1.4	The distance from the CRZ-I areas.		
1.5	Whether located within the hazard zone as mapped by Ministry of Environment and Forests/National Disaster Management Authority?		
1.6	Whether the area is prone to cyclone, tsunami, tidal surge, subduction, earthquake etc.?		
1.7	Whether the area is prone for saltwater ingress?		
1.8	Clearance of existing land, vegetation and buildings?		
1.9	Creation of new land uses?		
1.10	Pre-construction investigations e.g. bore hole, soil testing?		
1.11	Construction works?		



1.12	Demolition works?		
1.13	Temporary sites used for construction works or housing of construction workers?		
1.14	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations		
1.15	Underground works including mining or tunneling?		
1.16	Reclamation works?		
1.17	Dredging/reclamation/land filling/disposal of dredged material etc.?		
1.18	Offshore structures?		
1.19	Production and manufacturing processes?		
1.20	Facilities for storage of goods or materials?		
1.21	Facilities for treatment or disposal of solid waste or liquid effluents?		
1.22	Facilities for long term housing of operational workers?		
1.23	New road, rail or sea traffic during construction or operation?		
1.24	New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?		
1.25	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?		
1.26	New or diverted transmission lines or pipelines?		
1.27	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?		
1.28	Stream and river crossings?		
1.29	Abstraction or transfers of water from ground or surface waters?		
1.30	Changes in water bodies or the land surface affecting drainage or run-off?		
1.31	Transport of personnel or materials for construction, operation or decommissioning?		
1.32	Long-term dismantling or decommissioning or restoration works?		
1.33	Ongoing activity during decommissioning which could have an impact on the environment?		
1.34	Influx of people to an area in either temporarily or permanently?		
1.35	Introduction of alien species?		
1.36	Loss of native species or genetic diversity?		
1.37	Any other actions?		

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2. Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):

S. No.	Information/checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)		
2.2	Water (expected source & competing users) unit: KLD		
2.3	Minerals (MT)		
2.4	Construction material – stone, aggregates, sand/soil (expected source – MT)		
2.5	Forests and timber (source – MT)		
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)		
2.7	Any other natural resources (use appropriate standard units)		

3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)		
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)		
3.3	Affect the welfare of people e.g. by changing living conditions?		
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,		
3.5	Any other causes, that would affect local communities, fisherfolk, their livelihood, dwelling units of traditional local communities etc		

4. Production of solid wastes during construction or operation or decommissioning (MT/month)

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data

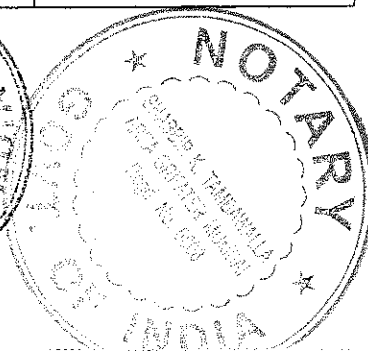
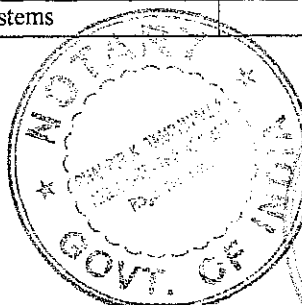
4.1	Spoil, overburden or mine wastes		
4.2	Municipal waste (domestic and or commercial wastes)		
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)		
4.4	Other industrial process wastes		
4.5	Surplus product		
4.6	Sewage sludge or other sludge from effluent treatment		
4.7	Construction or demolition wastes		
4.8	Redundant machinery or equipment		
4.9	Contaminated soils or other materials		
4.10	Agricultural wastes		
4.11	Other solid wastes		

5. Release of pollutants or any hazardous, toxic or noxious substances to air (Kg/hr)

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources		
5.2	Emissions from production processes		
5.3	Emissions from materials handling including storage or transport		
5.4	Emissions from construction activities including plant and equipment		
5.5	Dust or odours from handling of materials including construction materials, sewage and waste		
5.6	Emissions from incineration of waste		
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)		
5.8	Emissions from any other sources		

6. Generation of Noise and Vibration, and Emissions of Light and Heat:

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers		
6.2	From industrial or similar processes		
6.3	From construction or demolition		
6.4	From blasting or piling		
6.5	From construction or operational traffic		
6.6	From lighting or cooling systems		



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6.7	From any other sources		

7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

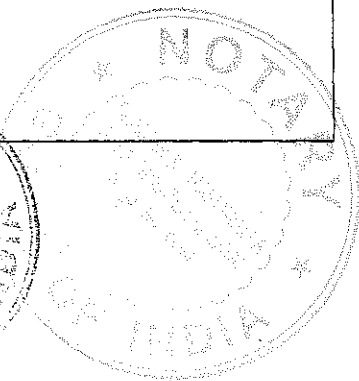
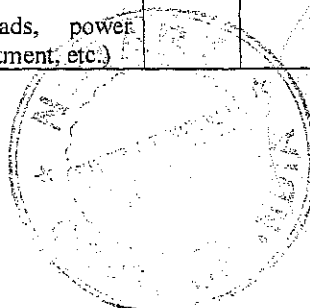
S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials		
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)		
7.3	By deposition of pollutants emitted to air into the land or into water		
7.4	From any other sources		
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?		

8. Risk of accidents during construction or operation of the Project, which could affect human health or the environment

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances		
8.2	From any other causes		
8.3	Could the project be affected by natural disasters causing environmental damage (e.g., floods, earthquakes, landslides, cloudburst etc)?		

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality

S. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting, utilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.: Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.)		



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	housing development extractive industries supply industries other		
9.2	Lead to after-use of the site, which could have an impact on the environment		
9.3	Set a precedent for later developments		
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects		

III. Environmental Sensitivity

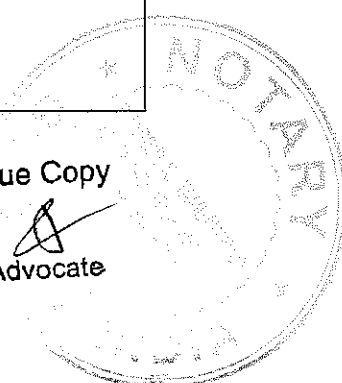
S. No.	Areas	Name/ Identity	Aerial distance (within 15 km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value		
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests		
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration		
4	Inland, coastal, marine or underground waters		
5	State, National boundaries		
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas		
7	Defence installations		
8	Densely populated or built-up area		
9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)		
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)		
11	Areas already subjected to pollution or environmental damage. (those where existing legal environmental standards are exceeded)		
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)		

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Zaman Ali
Advocate, High Court

True Copy

Advocate



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• ANNEXURE A-3

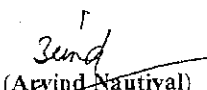
F.No. 19-112/2013-IA-III
Government of India
Ministry of Environment, Forest and Climate Change
(IA-III Division)

Telefax: 011-24695340
e-mail: arvind.nautiyal@gov.in
J-615, Jal Block, Indira Paryavaran Bhawan,
Jor Bagh Road, New Delhi – 110003
Dated: 18.04.2018

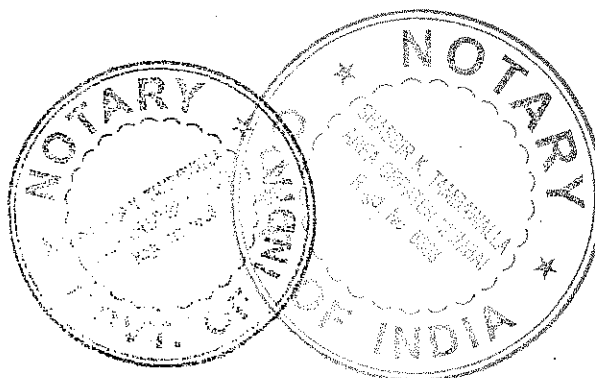
PUBLIC NOTICE

Sub: Draft Coastal Regulation Zone Notification, 2018 – reg.

Based on the representations received from various Coastal States and Union Territories and other stake holders including recommendations made by the Committee under the Chairmanship of Dr. Shailesh Nayak, the Ministry of Environment, Forest and Climate Change hereby issues the Draft Coastal Regulation Zone Notification, 2018 for seeking comments / suggestions from all concerned. The aforesaid draft notification is available in this Ministry's website in public domain. Comments/suggestions (if any) may be sent either by e-mail or at the address of the undersigned given above within 60 (sixty) days.


(Arvind Nautiyal)
Director

To,
All Stakeholders



DRAFT CRZ NOTIFICATION 2018

[TO BE PUBLISHED IN THE GAZETTE OF INDIA, EXTRAORDINARY, PART II, SECTION 3,
SUB-SECTION (i)]

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, dated....., 2018

G.S.R.....(E).-Whereas by notification of the Government of India in the Ministry of Environment and Forests number S.O.19 (E), dated the 6th January, 2011 (hereinafter referred to as the Coastal Regulation Zone Notification, 2011), the Central Government declared certain coastal stretches as Coastal Regulation Zone (hereinafter referred to as the CRZ); under Section 3 of Environment (Protection) Act, 1986;

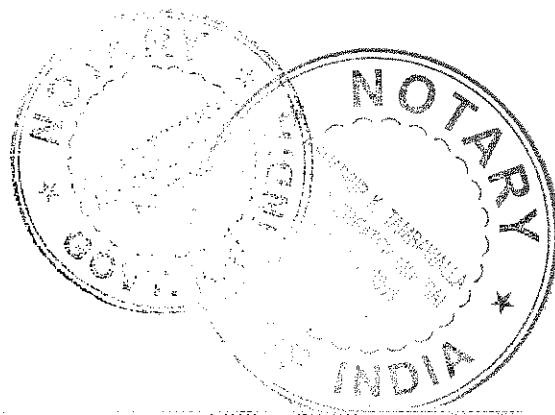
And whereas, the Ministry of Environment, Forest and Climate Change (MoEF&CC) has received representations from various coastal States and Union Territories (UTs), besides other stakeholders, regarding certain provisions in the CRZ Notification, 2011 related to management and conservation of marine and coastal ecosystems, development in coastal areas, eco-tourism, livelihood options and sustainable development of coastal communities etc;

And whereas, various State Governments/UTs and stakeholders have requested the MoEF&CC to address the concerns related to Coastal Environment and sustainable development w.r.t. the CRZ Notification, 2011;

Whereas MoEF&CC had constituted a committee under the chairmanship of Dr Shailesh Nayak to examine various issues & concerns of coastal states / Union Territories and various stakeholders, relating to the CRZ Notification 2011 and to recommend appropriate changes in the said Notification;

Whereas the report submitted by Dr Shailesh Nayak Committee has been examined in the Ministry and consultations have been held with various stakeholders in this regard;

Now, therefore in exercise of the powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 and in supersession of Coastal Regulation Zone Notification 2011, the Central Government, with a view to conserve and protect the unique environment of coastal stretches and marine areas, besides livelihood security to the fisher communities and other local communities in the coastal areas and to promote sustainable development based on scientific principles taking into account the dangers of natural hazards, sea level rise due to global warming, does hereby, declare the coastal stretches of the country and the water area up to its territorial water limit, excluding the islands of Andaman and Nicobar and Lakshadweep and the marine areas surrounding these islands, as Coastal Regulation Zone as under:



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- (i) The land area from High Tide Line (hereinafter referred to as the HTL) to 500 mts on the landward side along the sea front.

For the purposes of this Notification, the HTL means the line on the land upto which the highest water line reaches during the spring tide, as demarcated by the National Centre for Sustainable Coastal Management (NCSCM) in accordance with the laid down procedures and made available to various coastal States /UTs.

- (ii) CRZ shall apply to the land area between HTL to 50 mts or width of the creek whichever is less on the landward side along the tidal influenced water bodies that are connected to the sea and the distance upto which development along such tidal influenced water bodies is to be regulated shall be governed by the distance upto which the tidal effects are experienced which shall be determined based on salinity concentration of 5 parts per thousand (ppt) measured during the driest period of the year and distance up to which tidal effects are experienced shall be clearly identified and demarcated accordingly in the Coastal Zone Management Plans (hereinafter referred to as the CZMPs).

This CRZ limit of 50 mts or width of the creek whichever is less, shall however be subject to revision and final approval of the respective CZMPs as per this Notification, framed with due consultative process/ public hearing etc. and environmental safeguards enlisted therein. Till such time the CZMP to this notification is approved, the limit of 100 mts or width of the creek whichever is less, shall continue to apply.

Explanation: - For the purposes of this sub-paragraph the expression tidal influenced water bodies means the water bodies influenced by tidal effects from sea in the bays, estuaries, rivers, creeks, backwaters, lagoons and ponds etc. that are connected to the sea.

- (iii) The intertidal zone i.e. land area between the HTL and the Low Tide Line (hereinafter referred to as the LTL).
- (iv) The water and the bed area between the LTL to the territorial water limit (12 Nm) in case of sea and the water and the bed area between LTL at the bank to the LTL on the opposite side of the bank, of tidal influenced water bodies.
2. **Classification of the CRZ** – For the purpose of conserving and protecting the coastal areas and marine waters, the CRZ area shall be classified as follows, namely:-
- 2.1 **CRZ-I** areas are environmentally most critical and shall be further classified as under:
- 2.1.1 **CRZ-I A:**
- (a) CRZ-I A shall constitute the following ecologically sensitive areas and the geomorphological features which play a role in the maintaining the integrity of the coast viz.:

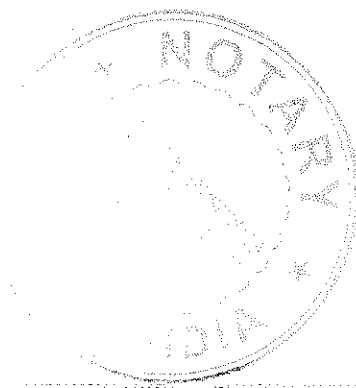
- (i) Mangroves. In case mangrove area is more than 1000 sq. mts, a buffer of 50 meters along the mangroves shall be provided and such area shall also constitute CRZ -I A.
 - (ii) Corals and coral reefs;
 - (iii) Sand Dunes;
 - (iv) Biologically active Mudflats;
 - (v) National parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas under the provisions of Wild Life (Protection) Act, the Forest (Conservation) Act or Environment (Protection) Act; including Biosphere Reserves;
 - (vi) Salt Marshes;
 - (vii) Turtle nesting grounds;
 - (viii) Horse shoe crabs habitats;
 - (ix) Sea grass beds;
 - (x) Nesting grounds of birds;
 - (xi) Areas or structures of archaeological importance and heritage sites.
- (b) A detailed environment management plan shall be formulated by the States/UTs for such ESAs in respective territories, as mapped out by NCSCM, based on guidelines as contained in Annexure-I and integrated in the CZMPs.

2.1.2 CRZ-I B:

The intertidal zone i.e. the area between Low Tide Line and High Tide Line shall constitute the CRZ-I B.

2.2 CRZ-II

CRZ-II shall constitute the developed land areas up to or close to the shoreline, within the existing municipal limits or in other existing legally designated urban areas, which are substantially built-up with a ratio of built up plots to that of total plots being more than 50% and have been provided with drainage and approach roads and other infrastructural facilities, such as water supply and sewerage mains etc.



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2.3 CRZ-III

Land areas that are relatively undisturbed (viz rural areas etc) and those do not fall under CRZ-II, shall constitute CRZ -III. CRZ-III shall be further classified into following categories:

2.3.1 CRZ-III A

Such densely populated CRZ-III areas, where the population density is more than 2161 per sq km as per 2011 census base, shall be designated as CRZ -III A. In CRZ-III A, area up to 50 mts from the HTL on the landward side shall be earmarked as the No Development Zone (NDZ), provided the CZMPs as per this Notification, framed with due consultative process, have been approved, failing which, a NDZ of 200 mts shall continue to apply.

2.3.2 CRZ-III B

All other CRZ-III areas with population density of less than 2161 per sq km, as per 2011 census base, shall be designated as CRZ-III B. In CRZ-III B, the area up to 200 mts. from the HTL on the landward side shall be earmarked as the No Development Zone (NDZ).

2.3.3

Land area up to 50 mts. from the HTL, or width of the creek whichever is less, along the tidal influenced water bodies, shall also be earmarked as the NDZ in CRZ III areas.

Note: The NDZ shall not be applicable in such areas falling within notified Port limits.

2.4 CRZ- IV:

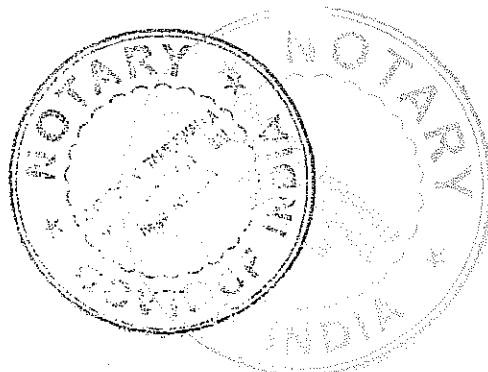
The CRZ - IV shall constitute the water area and shall be further classified as under:

2.4.1 CRZ- IV A

The water area and the sea bed area between the Low Tide Line up to twelve (12) nautical miles on the seaward side shall constitute CRZ-IV A.

2.4.2 CRZ- IV B

CRZ-IV B areas shall include the water area and the bed area between LTL at the bank of the tidal influenced water body to the LTL on the opposite side of the bank, extending from the mouth of the water body at the sea up to the influence of tide, i.e., salinity of five parts per thousand (ppt) during the driest season of the year.



3. Areas requiring special consideration in the CRZ

Following coastal areas shall be accorded special consideration for the purpose of protecting the critical coastal environment and difficulties faced by local communities:-

3.1 Critically Vulnerable Coastal Areas (CVCA)

Sunderban region of West Bengal and other ecologically sensitive areas identified as under Environment (Protection) Act, 1986 such as Gulf of Khambat and Gulf of Kutchchh in Gujarat, Malvan, Achra-Ratnagiri in Maharashtra, Karwar and Coondapur in Karnataka, Vembanad in Kerala, Gulf of Mannar in Tamil Nadu, Bhaitarkanika in Odisha, Coringa, East Godavari and Krishna in Andhra Pradesh shall be treated as Critical Vulnerable Coastal Areas (CVCA) and managed with the involvement of coastal communities including fisher folk who depend on coastal resources for their sustainable livelihood.

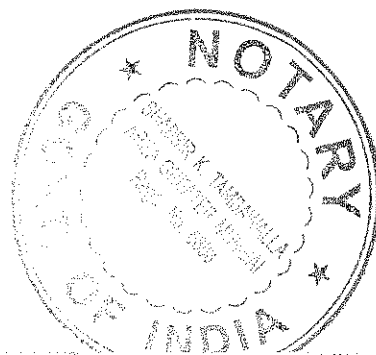
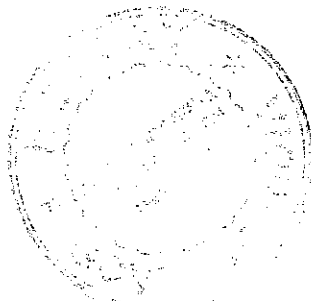
3.2 CRZ for inland Backwater islands and islands along the mainland coast.

3.3 CRZ falling within municipal limits of Greater Mumbai.

4. Prohibited activities within CRZ

The following activities shall be prohibited, in general, within the entire CRZ. Exceptions to these and other permissible/ regulated activities in specific CRZ categories viz. CRZ-I, II, III & IV, shall however be governed by the provisions under para 5 of this Notification.

- (i) Setting up of new industries and expansion of existing industries, operations or processes.
- (ii) Manufacture or handling of oil, storage or disposal of hazardous substances as specified in the notification of Ministry of Environment, Forest & Climate Change.
- (iii) Setting up of new fish processing units.
- (iv) Land reclamation, bunding or disturbing the natural course of seawater
- (v) Discharge of untreated waste and effluents from industries, cities or towns and other human settlements.
- (vi) Dumping of city or town wastes including construction debris, industrial solid wastes, fly ash for the purpose of land filling.
- (vii) Port and harbour projects in high eroding stretches of the coast.
- (viii) Mining of sand, rocks and other sub-strata materials.
- (ix) Dressing or altering active sand dunes.
- (x) In order to safeguard the aquatic system and marine life, disposal of plastic into the coastal waters shall be prohibited. Adequate measures for management and disposal of plastic materials shall be undertaken in the CRZ.



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5. Regulation of permissible activities in the CRZ

5.1 CRZ-I

5.1.1. CRZ-I A

These areas are ecologically most sensitive and generally no activities shall be permitted to be carried out in the CRZ-I A areas, with following exceptions:

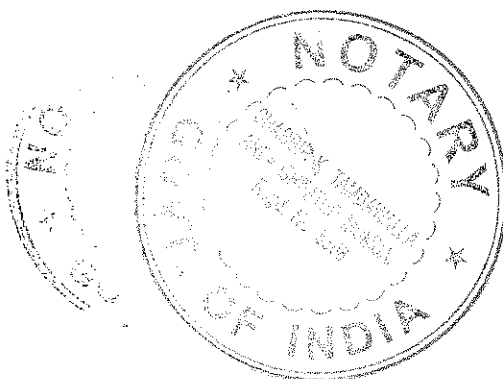
- (i) Eco-tourism activities such as mangrove walks, tree huts, nature trails, etc., in identified stretches areas subject to such eco-tourism plan featuring in the approved CZMPs as per this Notification, framed with due consultative process/ public hearing etc. and further subject to environmental safeguards and precautions related to the Ecologically Sensitive Areas, as enlisted in the CZMPs.
- (ii) In the mangrove buffer, only such activities shall be permitted like laying of pipelines, transmission lines, conveyance systems/mechanisms and construction of road on stilts etc. that are required for public utilities.
- (iii) Construction of roads and roads on stilts, by way of reclamation in CRZ-I areas, shall be permitted only in exceptional cases for defence, strategic purposes and public utilities, subject to a detailed marine/terrestrial environment impact assessment, to be recommended by the Coastal Zone Management Authority and approved by the Ministry of Environment, Forest and Climate Change; and in case construction of such roads passes through mangrove areas or is likely to damage the mangroves, a minimum three times the mangrove area affected/ destroyed /cut during the construction process shall be taken up for compensatory plantation of mangroves.

5.1.2 CRZ-I B - The inter tidal areas

Activities shall be regulated /permissible in the CRZ-I B areas as under:

- (i) Land reclamation and bunding etc. shall be permitted only for activities such as;
 - (a) Foreshore facilities like ports, harbours, Jetties, wharves, quays, slipway, bridges and sea links etc.
 - (b) Projects for defence, strategic and security purpose;
 - (c) Road on stilts, provided that such roads shall not be authorized for permitting development on the landward side of such roads, till the existing High Tide Line.

Provided further that the use of reclaimed land may be permitted only for public utilities such as mass rapid or multimodal transit system, construction and installation of all necessary associated public utilities and infrastructure to operate such transit or transport system including those for electrical or electronic signaling



system, transit stopover of permitted designs; except for any industrial operation, repair and maintenance.

- (d) Measures for control of erosion.
- (e) Maintenance and clearing of waterways, channels and ports.
- (f) Measures to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structure for prevention of salinity ingress and freshwater recharge.
- (ii) Activities related to waterfront or directly needing foreshore facilities such as ports and harbours, jetties, quays, wharves, erosion control measures, breakwaters, pipelines, lighthouses, navigational safety facilities, coastal police stations and the like.
- (iii) Power by non-conventional energy sources and associated facilities.
- (iv) Transfer of hazardous substances from ships to Ports, terminals and refineries and vice versa.
- (v) Facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II, subject to implementation of safety regulations including guidelines issued by the Oil Industry Safety Directorate in the Ministry of Petroleum and Natural Gas and guidelines issued by MoEF&CC, provided that such facilities are for receipt and storage of fertilizers and raw materials required for fertilizers, like ammonia, phosphoric acid, sulphur, sulphuric acid, nitric acid etc.
- (vi) Storage of non-hazardous cargo i.e. edible oil, fertilizers & food grains in notified Ports.
- (vii) Hatchery and natural fish drying.
- (viii) Existing fish processing units may utilize 25% additional plinth area for modernization purposes (only for additional equipments and pollution control measures) subject to the following:
 - (a) FSI of such reconstruction not exceeding the permissible FSI permissible as per prevalent town and country planning regulations.
 - (b) Additional plinth area is constructed only to the landward side.
 - (c) Approval of the concerned SPCB/ PCC.
- (ix) Treatment facilities for waste and effluents and conveyance of treated effluents.
- (x) Storm water drains.
- (xi) Projects classified as Strategic, Defence related projects & Projects of Department of Atomic Energy.
- (xii) Manual mining of atomic mineral(s) notified under Part-B of First Schedule of Mining and Minerals (Development) Act, 1957 occurring as such or in association with one or



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other minerals in the inter-tidal zone by such agencies as authorised by Department of Atomic Energy, as per mining plan approved by the Department of Atomic Energy.

Provided that the manual mining operations are carried out only by deploying persons using baskets and hand spades for collection of ore or mineral within the intertidal zone and as per approved mining plan, without deploying or using drilling and blasting or Heavy Earth Moving Machinery in the intertidal zone.

- (xiii) Exploration and extraction of oil and natural gas and all associated activities and facilities thereto;
- (xiv) Foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water and outfall for discharge of treated wastewater or cooling water from thermal power plants, in conformity with the environmental standards notified by MoEF&CC and relevant directions of Central Pollution Control Board (CPCB)/SPCB/PCC.
- (xv) Pipelines, conveying systems including transmission lines.
- (xvi) Weather radar for monitoring of cyclones movement and prediction and associated facilities.
- (xvii) Salt harvesting and associated facilities.
- (xviii) Desalination plants and associated facilities.

5.2. CRZ-II

- (i) Activities as permitted in CRZ-I B, shall also be permissible in CRZ-II, as applicable.
- (ii) Construction of buildings for residential purposes, schools, hospitals, institutions, offices, public places etc shall be permitted only on the landward side of the existing road, or on the landward side of existing authorized fixed structures; provided that no permission for construction of buildings shall be given on landward side of any new roads which are constructed on the seaward side of an existing road.
- (iii) Buildings permitted as in (ii) above, shall be subject to the local town and country planning regulations as applicable from time to time, and the norms for the Floor Space Index or Floor Area Ratio prevailing as on the date of this Notification. It shall be the responsibility of the concerned Town Planning Authority to ensure that the Solid Wastes are handled as per respective SWM rules and no untreated sewage is discharged on to the coast or coastal waters.

- (iv) Reconstruction of authorized buildings shall be permitted, without change in present land use, subject to the local town and country planning regulations as applicable from time to time, and the norms for the Floor Space Index or Floor Area Ratio, prevailing as on the date of this Notification. It shall be the responsibility of the concerned Town Planning Authority to ensure that the Solid Wastes are handled as per respective SWM rules and no untreated sewage is discharged on to the coast or coastal waters.
- (v) Development of vacant plots in designated areas for construction of beach resorts/hotels subject to the conditions / guidelines at Annexure-III.
- (vi) Temporary tourism facilities shall be permissible in the beaches. Such temporary facilities shall only include shacks, toilets/washrooms, change rooms, shower panels; walk ways constructed using interlocking paver blocks etc., drinking water facilities, seating arrangements etc. Such facilities shall however be permitted only subject to the tourism plan featuring in the approved CZMPs as per this Notification, framed with due consultative process/ public hearing etc. and further subject to environmental safeguards enlisted in the CZMPs.

5.3 CRZ-III

- (i) Activities as permitted in CRZ-I B, shall also be permissible in CRZ-III, as applicable.
- (ii) Regulation of activities in the NDZ:

Following shall be permissible / regulated in the NDZ:

- (a) No construction shall be permitted within NDZ in CRZ III, except for repairs or reconstruction of existing authorized structure not exceeding existing Floor Space Index, existing plinth area and existing density; for permissible activities under the notification including facilities essential for activities and construction/reconstruction of dwelling units of traditional coastal communities including fisher folk, incorporating necessary disaster management provisions and proper sanitation arrangements.
- (b) Agriculture, horticulture, gardens, pastures, parks, playfields and forestry.
- (c) Construction of dispensaries, schools, public rain shelter, community toilets, bridges, roads, provision of facilities for water supply, drainage, sewerage, crematoria, cemeteries and electric sub-station which are required for the local inhabitants may be permitted on a case to case basis by CZMA.
- (d) Construction of units or auxiliary thereto for domestic sewage, treatment and disposal with the prior approval of the concerned Pollution Control Board or Committee.



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- (e) Facilities required for local fishing communities such as fish drying yards, auction halls, net mending yards, traditional boat building yards, ice plant, ice crushing units, fish curing facilities and the like;
- (f) Wherever there is a national or state highway passing through the NDZ of CRZ-III areas, temporary tourism facilities such as toilets, change rooms, drinking water facility and temporary shacks can be taken up on the seaward side of the road.

On landward side of such roads in the NDZ, Resorts / hotels and associated tourism facilities shall be permitted. Such facilities shall, however, be permitted only subject to the incorporation of tourism plan in the approved CZMPs as per this Notification and the conditions / guidelines at Annexure-III, as applicable.

- (g) Temporary tourism facilities shall be permissible in the NDZ of CRZ-III areas. Such temporary facilities shall only include shacks, toilets/washrooms, change rooms, shower panels; walk ways constructed using interlocking paver blocks etc, drinking water facilities, seating arrangements etc. Such facilities shall however be permitted only subject to the tourism plan featuring in the approved CZMPs as per this Notification.
- (iii) For CRZ-III Areas beyond the NDZ, activities shall be permissible/regulated as under:
 - (a) Development of vacant plots in designated areas for construction of beach resorts/hotels subject to the conditions / guidelines at Annexure-III ;
 - (b) Construction or reconstruction of dwelling units so long it is within the ambit of traditional rights and customary uses such as existing fishing villages etc. Building permission for such construction or reconstruction will be subject to local town and country planning rules with overall height of construction not exceeding 9mts. with two floors (ground + one floor);
 - (c) The local communities including fishermen can be permitted to facilitate tourism through 'home stay' without changing the plinth area/ design or facade of the existing houses.
 - (d) Construction of public rain shelters, community toilets, water supply drainage, sewerage, roads and bridges etc.
 - (e) Limestone Mining:

Selective mining of limestone minerals may be permitted in specific identified areas under the mining plans, which are adequately above the height of HTL, based on the recommendations of reputed National Institutes in the mining field such as CSIR, Central Mining Research Institute etc. provided that the extraction of minerals is



carried out not below a height of 1 mtr. above HTL and an adequate barrier is created so as to safeguard against saline water incursion and subject to appropriate safeguards related to pollution of coastal waters and prevention of coastal erosion.

- (iv) Drawing of groundwater and construction related thereto shall be prohibited within 200 mts. of HTL except for the use of local communities in areas inhabited by them. In the areas between 200mts.-500 mts. of the HTL, groundwater withdrawal can be permitted only through manual means from ordinary wells for drinking, horticulture, agriculture and fisheries etc. where no other source of water is available. Restrictions for such drawal may be imposed by the designated Authority by State Government/UT Administration in the areas affected by sea water intrusion.

5.4 CRZ-IV

- (i) Traditional fishing and allied activities undertaken by local communities.
- (ii) Land reclamation and bunding etc to be permitted only for activities such as;
 - (a) Foreshore facilities like ports, harbours, Jetties, wharves, quays, slipway, bridges and sea links etc.
 - (b) Projects for defence, strategic and security purpose.
 - (c) Measures for control of erosion.
 - (d) Maintenance and clearing of waterways, channels and ports.
 - (e) Measures to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structure for prevention of salinity ingress and freshwater recharge.
- (iii) Activities related to waterfront or directly needing foreshore facilities such as ports and harbours, jetties, quays, wharves, erosion control measures, breakwaters, pipelines, navigational safety facilities, and the like.
- (iv) Power by non-conventional energy sources and associated facilities.
- (v) Transfer of hazardous substances from ships to Ports.
- (vi) Storage of non-hazardous cargo like edible oil, fertilizers and food grains in notified Ports.
- (vii) Facilities for discharging treated effluents into the water course.
- (viii) Projects classified as Strategic and Defence related projects.
- (ix) Projects of Department of Atomic Energy.

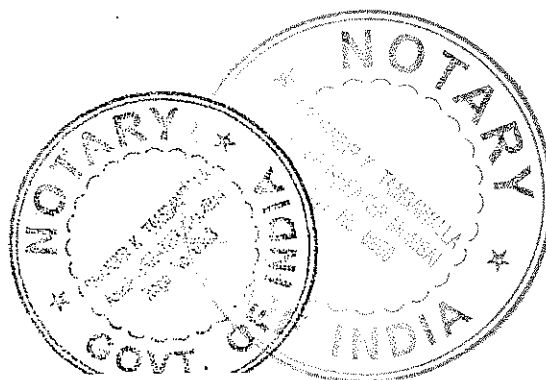
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- (x) Exploration and extraction of oil and natural gas and all associated activities and facilities thereto;
- (xi) Foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water and outfall for discharge of treated wastewater or cooling water from thermal

power plants. Foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water and outfall for discharge of treated wastewater or cooling water from thermal power plants, in conformity with the environmental standards notified by MoEF&CC and relevant directions of CPCB/SPCB/PCC.

- (xii) Pipelines, conveying systems including transmission lines.
- (xiii) Weather radar for monitoring of cyclone prediction, movement and associated facilities.
- (xiv) Construction of memorials/monuments and allied facilities by the concerned State Government in CRZ-IV (A) areas, in exceptional cases, with adequate environmental safeguards, subject to the following, namely:-

- (a) The concerned State Government shall submit justification for locating the project in CRZ-IV A area along with details of alternate sites considered and weightage matrix on various parameters including environmental parameters, to State CZMA who will examine the project and make recommendation to the Central Government (MoEF&CC) for grant of Terms of Reference (ToRs) for preparation of an environmental impact assessment report by the State Government;
- (b) On grant of ToRs by the Central Government, the concerned State Government shall submit the draft Environmental Impact Assessment report (EIA) with Environmental Management Plan (EMP), draft Risk Assessment Report with Disaster Management Plan (DMP) including on-site and off-site emergency plan and evacuation plan during emergency, to the State Pollution Control Board for conduct of public hearing for the proposed project in accordance with the procedure laid down under the Environment Impact Assessment notification;
- (c) The concerned State Government shall, after addressing the relevant issues raised by the public during the public hearing referred to in sub-item (b), submit the final EIA, EMP, Risk Assessment and DMP, to the State CZMA for their examination and recommendation to MoEF&CC;
- (d) The Central Government may, if it considers necessary so to do, dispense with the requirement of public hearing referred to in sub-item (b), if it is satisfied that the



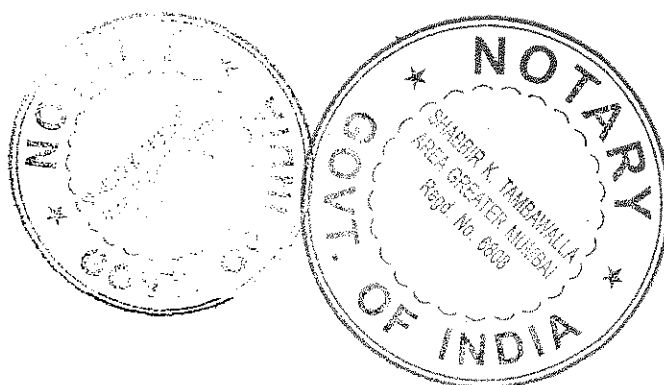
project will not involve rehabilitation and resettlement of the public or the project site is located away from human habitation.

6. Coastal Zone Management Plans (CZMPs)

- (i) All coastal States/UTs shall revise / update their respective coastal zone management plan (CZMP) framed under CRZ Notification, 2011, as per provisions of this Notification and submit to MoEF&CC for approval at the earliest. All the project activities attracting the provisions of this Notification shall be required to be appraised as per the updated CZMPs to this Notification. Until and unless the CZMPs are so revised/updated, provisions of this Notification shall not come in force and the CZMPs as per provisions of CRZ Notification, 2011 shall continue to be followed for appraisal and CRZ clearance to such projects;
- (ii) The CZMPs may be prepared/updated by the coastal State Government or Union territory by engaging reputed and experienced scientific institution(s) or the agencies including the National Centre for Sustainable Coastal Management (hereinafter referred to as the NCSCM) of MoEF&CC and in consultation with the concerned stakeholders;
- (iii) The coastal States and Union Territory shall prepare draft CZMPs in 1:25,000 scale map identifying and classifying the CRZ areas within the respective territories in accordance with the guidelines given in Annexure-IV of the notification, which involve public consultation;

All developmental activities listed in this notification shall be regulated by the State Government, Union Territory Administration, the local authority or the concerned CZMA within the framework of such approved CZMPs as the case may be in accordance with provisions of this notification;

- (iv) The draft CZMPs shall be submitted by the State Government or Union territory to the concerned CZMA for appraisal, including appropriate consultations, and recommendations in accordance with the procedure(s) laid down in the Environment (Protection) Act, 1986;
- (v) MoEF&CC shall thereafter consider and approve the respective CZMPs of concerned State Governments/UTs.

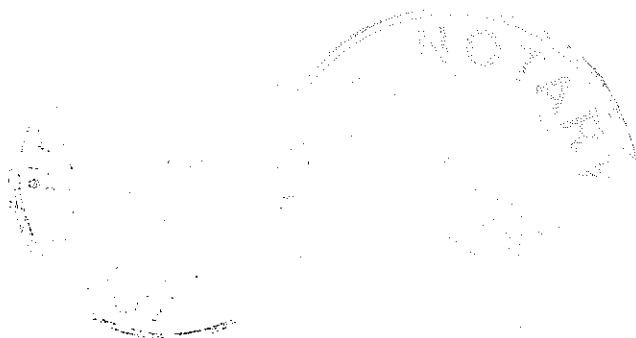


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- (vi) The CZMPs shall not normally be revised before a period of five years after which, the concerned State Government or the Union territory may consider undertaking a revision.

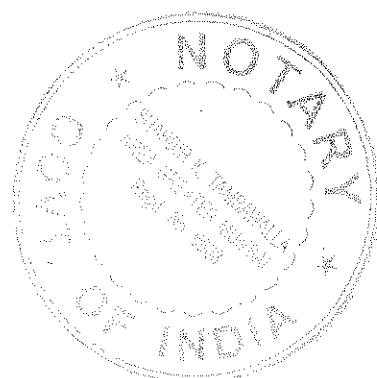
7. CRZ clearance for permissible/ regulated activities- Delegations

- (i) All permitted / regulated project activities attracting the provisions of this notification shall be required to obtain CRZ clearance prior to their commencement.
- (ii) All development activities/projects in CRZ-I and CRZ-IV areas, which are regulated/ permissible as per this notification, shall be dealt with by MOEF&CC for CRZ clearance, based on the recommendation of the concerned CZMA.
- (iii) For all other permissible/regulated activities as per this Notification, which fall purely in CRZ-II / CRZ-III areas, the CRZ clearance shall be considered by the concerned CZMAs. Such projects in CRZ -II and III, which also happen to be traversing through CRZ-I and/or CRZ-IV areas, CRZ clearance shall, however be considered only by MoEF&CC, based on recommendations of the concerned CZMA.
- (iv) Projects / activities which attract the provisions of this Notification as also the provisions of EIA Notification 2006, shall be dealt with for a composite Environmental and CRZ clearance under EIA Notification 2006 by the concerned approving Authority, based on recommendations of concerned CZMA, as per delegations i.e., State Environmental Impact Assessment Authority (hereinafter referred to as the SEIAA) or MoEF&CC for category 'B' and category 'A' projects respectively.
- (v) In case of building/construction projects with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification, these shall be approved by the concerned local State or Union Territory Planning Authorities in accordance with this notification, after obtaining recommendations of concerned CZMA.
- (vi) Only for self dwelling units up to a total built up area of 300 sq mts, approval shall be accorded by the concerned local Authority, without the requirement of recommendations of concerned CZMA. Such authorities shall, however, examine the proposal from the perspective of the CRZ Notification before according approval.



8. Procedure for CRZ clearance for permissible/regulated activities

- (i) The project proponents shall apply with the following documents to the concerned State or the Union territory Coastal Zone Management Authority for seeking prior clearance under CRZ Notification:
- (a) Project summary details as per Annexure-V of the notification.
 - (b) Rapid EIA Report including marine and terrestrial component, as applicable, except for building construction projects / housing schemes.
 - (c) Comprehensive EIA with cumulative studies for projects, if located in low and medium eroding stretches, as per the CZMP to this notification.
 - (d) Risk Assessment Report and Disaster Management Plan.
 - (e) CRZ map in 1:4000 scale, drawn up by any of the agencies identified by the MoEF&CC vide its Office order number J-17011/8/92-IA-III dated 14th March 2014 using the demarcation of the High Tide Line or LTL, as carried out by NCSCM.
 - (f) Project layout superimposed on the above map duly indicating the project boundaries and the CRZ category of the project location.
 - (g) The CRZ map normally covering 7km radius around the project site also indicating the CRZ-I, II, III and IV areas including other notified ecologically sensitive areas.
 - (h) "Consent to establish" or NOC from the concerned State Pollution Control Boards or Union Territory Pollution Control Committees for the projects involving discharge of industrial effluents.
- (ii) The concerned CZMA shall examine the documents as in (i) above, in accordance with the approved CZMP and in compliance with CRZ notification and make recommendations within a period of sixty days from date of receipt of complete application:-
- (a) To MoEF&CC or SEIAA for category 'A' and category 'B' projects respectively, as the case may be, for the projects also attracting EIA Notification, 2006; as per delegations in the EIA Notification 2006. For such Category 'B' projects located in CRZ-I or CRZ-IV areas, final recommendation for CRZ clearance shall however be made only by MoEF&CC to the concerned SEIAA to enable it accord a composite EC and CRZ clearance to the proposal.
 - (b) To MoEF&CC for the projects/activities not covered in the EIA notification, 2006, but attracting CRZ Notification and located in CRZ-I or CRZ-IV areas.
 - (c) To SEIAA for the projects/activities not covered in the EIA notification, 2006, but attracting CRZ Notification and located in CRZ-II or CRZ-III areas.
 - (d) To the concerned State or Union territory planning authorities, in case of construction projects with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification 2006.



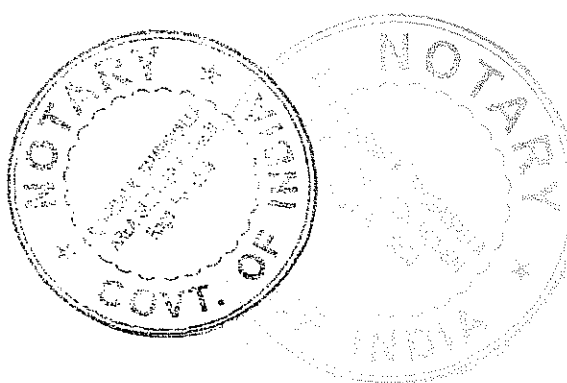
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- (iii) MoEF&CC, SEIAA or the concerned State / Union territory planning authority shall consider such projects for clearance based on the recommendations of the concerned CZMA, within a period of sixty days.
- (v) In case the CZMAs are not in operation due to their reconstitution or any other reasons, then it shall be responsibility of the Department of Environment in the State Government or Union territory Administrations, who are the custodian of the CZMPs of respective States or Union Territories, to provide comments and recommend the proposals in terms of the provisions of the said notification.
- (vi) The clearance accorded to the projects under this notification shall be valid for a period of seven years, provided that the construction activities are completed and the operations commence within seven years from the date of issue of such clearance.

The validity may be further extended for a maximum period of three years, provided an application is made to the concerned authority by the applicant within the validity period, along with recommendation for extension of validity of the clearance by the concerned State/ Union Territory Coastal Zone Management Authority.
- (vii) Post clearance monitoring:-
 - (a) It shall be mandatory for the project proponent to submit half-yearly compliance reports in respect of the stipulated terms and conditions of the environmental clearance in hard and soft copies to the regulatory authority(s) concerned, on 1st June and 31st December of each calendar year and all such compliance reports submitted by the project proponent shall be published in public domain and its copies shall be given to any person on application to the concerned CZMA.
 - (b) The compliance report shall also be displayed on the website of the concerned regulatory authority.
- (viii) To maintain transparency in the working of the CZMAs, it shall be the responsibility of the CZMA to create a dedicated website and post the agenda, minutes, decisions taken, clearance letters, violations, action taken on the violations and court matters including the Orders of the Hon'ble Court as also the approved CZMPs of the respective State Government or Union Territory.

9. Enforcement of the CRZ Notification:

- (i) For the purpose of implementation and enforcement of the provisions this notification and compliance with conditions stipulated there under, the powers either original or delegated are available under Environment (Protection) Act, 1986 with the MoEF&CC, State Government or the Union territory Administration, NCZMA and SCZMAs;



- (ii) The composition, tenure and mandate of NCZMA and State Government or the Union territory CZMAs have already been notified by MoEF&CC in terms of Orders of Hon'ble Supreme Court in Writ Petition 664 of 1993;
- (iii) The State Government or the Union territory CZMAs shall primarily be responsible for enforcing and monitoring of this notification and to assist in this task, the State Government and the Union territory shall constitute district level Committees under the Chairmanship of the District Magistrate concerned comprising at least three representatives of local traditional coastal communities including from fisherfolk. The State Government may consider further delegation of the enforcement of this notification to the level of respective District Magistrates.
- (iv) The dwelling units of the traditional coastal communities including fisher folk, tribals as were permissible under the provisions of the CRZ notification, 2011, but which have not obtained formal approval from concerned authorities under the aforesaid notification shall be considered by the respective Union territory CZMAs and the dwelling units shall be regularized subject to the following condition, namely:-
 - (a) These are not used for any commercial activity.
 - (b) These are not sold or transferred to non-traditional coastal community.

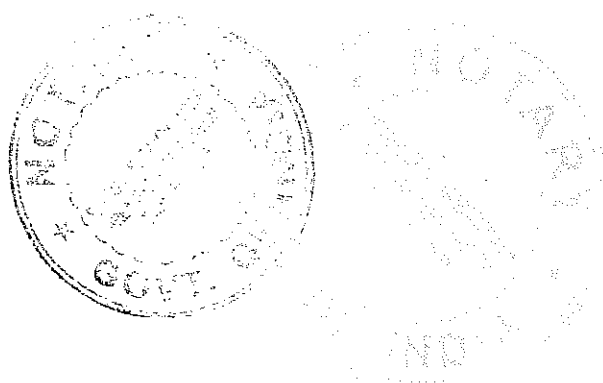
10. Areas requiring special consideration:

10.1 Critically Vulnerable Coastal Areas (CVCAs):

- (i) For all the CVCAs enlisted in para 3.3 of this notification, Integrated Management Plans (IMPs) shall be prepared, which shall, inter alia, keep in view the conservation and management of mangroves, needs of local communities such as, dispensaries, schools, public rain shelter, community toilets, bridges, roads, jetties, water supply, drainage, sewerage and the impact of sea level rise and other natural disasters. The IMPs will be prepared in line with the guidelines for preparation of Coastal Zone Management Plans;
- (ii) Till such time the IMPs are approved and notified, construction of dispensaries, schools, public rain/cyclone shelters, community toilets, bridges, roads, jetties, water supply, drainage, sewerage which are required for traditional inhabitants shall be permitted on a case to case basis, by the CZMA with due regards to the views of coastal communities including fisher folk.

10.2 CRZ for inland Backwater islands and islands along the mainland coast:

- (i) All the inland islands in the coastal backwaters and islands along the mainland coast shall also be covered under this CRZ Notification.

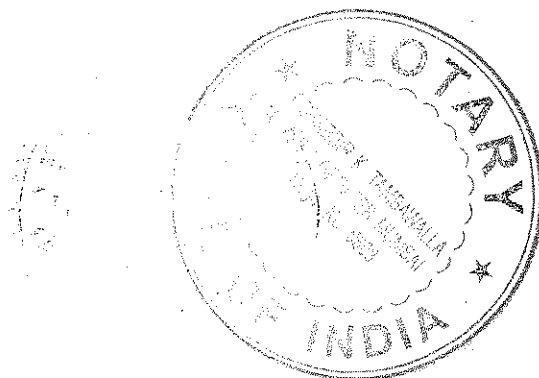


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- (ii) In view of the unique coastal systems of backwater and backwater islands along with space limitations in such coastal stretches, CRZ of 20 mts. from the HTL on the landward side shall uniformly apply to such islands and activities shall be regulated as under:
 - (a) Existing dwelling units of local communities may be repaired or reconstructed within 20 mts from the HTL of these islands. However, no new construction shall be permitted.
 - (b) Foreshore facilities such as fishing jetty, fish drying yards, net mending yard, fishing processing by traditional methods, boat building yards, ice plant, boat repairs and the like, may be taken up in CRZ limits subject to due environmental safeguards.
- (iii) Integrated Island Management Plans (IIMPs), as applicable to smaller islands in Lakshadweep and Andaman & Nicobar, as per Island Protection Zone Notification, shall be formulated by respective States/UTs for all such islands and submitted to MoEF&CC for approval at the earliest. Until and unless the IIMPs are framed, provisions of this Notification shall not come in force and the CZMPs as per provisions of CRZ Notification 2011 shall continue to be followed.

10.3 CRZ areas falling within municipal limits of the Greater Mumbai:

- (i) In order to protect and preserve the 'green lung' of the Greater Mumbai area, all open spaces, parks, gardens, playgrounds indicated in development plans within CRZ-II shall be categorized as No Development Zone. A Floor Space Index up to 15% shall be allowed only for construction of civic amenities, stadium and gymnasium meant for recreational or sports related activities and the residential or commercial use of such open spaces shall not be permissible.
- (ii) Construction of sewage treatment plants in CRZ-I area for the purpose of treating the sewage from the municipal area shall be taken only by the municipal authorities in exceptional circumstances, where no alternate site is available to set up such facilities, subject to recommendations of the CZMA and approval by the Central Government and in case the construction of such plant is inevitable in a mangrove area, a minimum three times the mangrove area affected/destroyed /cut during the construction process shall be taken up for compensatory plantation of mangroves.



CONSERVATION, PROTECTION AND MANAGEMENT FRAMEWORK FOR ESAs

The coastal and marine Ecologically Sensitive Areas (ESAs) and the geo-morphological features play a vital role in maintaining the functions of the coast. Mangroves, beaches, coral reefs etc., aid in controlling coastal erosion, shoreline change, saltwater intrusion and also serve as natural defence against coastal hazards such as storm surges, cyclones and tsunamis. The ESAs maintain the biological integrity of the coast by providing direct and indirect ecosystem services to the coastal livelihood. In addition, several invaluable archaeological and heritage sites are also located along the coast. Hence conservation and protection of the above areas/ features/ sites become necessary.

1. General measures

- (i) All ESAs shall be identified and boundary delineated by NCSCM using satellite data.
- (ii) The State/UT Governments through the authorized agencies shall prepare CZMP as per the guidelines contained in the Notification highlighting the conservation and protection of the ESAs.
- (iii) Those activities permissible under this notification shall be included in the CZMPs

Specific conditions shall be adopted for the conservation, protection and management of each of the ESAs as under:-

1.1 Mangroves:

- (i) Mangroves declared as forest under Forest Conservation Act, 1980:

Notwithstanding anything contained in this notification, such mangroves declared by the concerned State Governments/UT Administrations/Central Government as forest land under the F(C) Act, 1980 shall attract the provisions of the F(C) Act, 1980 only.

- (ii) Mangroves not declared under Forest Conservation Act, 1980.

- (a) Mangroves in Government land shall be protected based on a detailed plan to be prepared by the concerned State/UT Governments. In case the mangrove area is more than 1000 sq mt, a buffer of 50m along the periphery of mangrove area shall be provided. This buffer zone of 50m may be utilized for public facilities for developing parks, research facilities related to mangrove biodiversity, facilities for conservation and the like.

- (b) Mangroves in private land will not require a buffer zone.

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1.2 Corals and coral reefs and associated biodiversity:

- (i) Destruction of coral and coral reefs and the surroundings is a prohibited activity.
- (ii) All coral and coral reefs shall be protected except for those small quantities required for research purposes.
- (iii) Coral and coral reefs transplantation activities shall be through recognized research institutions wherever required for regeneration after obtaining necessary approvals under Wildlife (Protection) Act 1972.
- (iv) The dead and/or destroyed coral areas shall be taken up for rejuvenation and rehabilitation. The conservation and protection of corals and coral reefs shall be taken up as follows:
 - (a) Active and live coral and coral reefs identified and delineated shall be declared and notified as ESA under E (P) Act 1986.
 - (b) It shall be ensured that no activities that are detrimental to the health of corals, coral reefs and its associated biodiversity such as mining, effluent and sewage discharge, dredging, ballast water discharge, ship washings, fishing other than traditional non-destructive fisheries, construction activities and the like are taken up in and around the coral areas.

1.3 The National Parks, marine parks, Sanctuaries, reserve forests, wildlife habitats and other protected areas declared under the provisions of Wild Life (Protection) Act, 1972 (53 of 1972), the F(C)Act 1980 (69 of 1980) or E(P)Act 1986 (29 of 1986); including Biosphere Reserves would be conserved and protected as follows:

- (i) Conservation and protection of the above listed areas shall be as per the provisions of the respective Acts/notifications/guidelines.
- (iii) Efforts shall be made to increase the forest area in the coastal region in order to prevent loss of life and property from increased storms, tides and floods.
- (iv) The concerned State Governments/UTs shall provide for adequate funds for such measures to undertake shelter belt plantation or bio-shields with planting material suitable to the location.

1.4. Salt marshes:

The conservation and protection of salt marshes shall be as follows:

- (i) The salt marsh areas shall be conserved and protected and efforts shall be made to promote the endemic biodiversity in the salt marshes.
- (ii) Only those activities required for overhead conveying/transmission of cables and underground laying of transmission line cables and so on, shall be permissible.
- (iii) Traditional fishing is permissible in salt marshes.
- (iv) Temporary tourism facilities around the salt marsh areas could be considered subject to adhering to strict norms laid down in the guidelines.
- (v) Certain salt marshes which have less biodiversity, identified by NCSCM and demarcated in CZMP can be considered for salt pan activities.



1.5 Turtle nesting grounds shall be protected and conserved as follows:

- (i) Turtle nesting grounds identified by the concerned States/UTs shall be protected as per Wildlife (Protection) Act of 1972.
- (ii) No activities shall be permitted in and around the turtle nesting ground including those causing light and sound pollution except for those required for conservation and protection of these sites.
- (iii) Strict management plans for protecting the turtle nesting grounds shall be undertaken and implemented by the concerned State/UT Authorities.

1.6 Horse shoe crabs habitats shall be protected and conserved as follows:

- (i) The habitat identified shall be taken up for conservation and protection.
- (ii) No activities shall be taken up in and around these habitats which affect the horse shoe crab ecosystem.

1.7 Sea grass beds shall be protected and conserved as follows:

- (i) Identified sea grass beds shall be conserved and protected.
- (ii) No developmental activities that have adverse effect on the sea grass bed shall be undertaken.
- (iii) Efforts shall be made to propagate sea grass beds along the coastal waters where ever possible by States/UTs as it acts as a carbon sink.

1.8 Nesting grounds of birds shall be protected and conserved as follows:

- (i) The nesting ground of birds including their local migratory route shall be protected. No developmental activities which have adverse impact on the nesting grounds and the migratory routes shall be undertaken including construction of wind mills, transmission lines and the like in the locality.
- (ii) Efforts shall be made to increase the forest cover and mangrove cover including enriching the biodiversity of salt marsh and other coastal water bodies so as to provide for suitable habitat for the avifauna.

1.9 Geo-morphologically Important Zones shall be protected and managed as follows:

- (i) **Sand dunes** identified shall be conserved and protected as follows:
 - (a) Sand dunes identified shall be notified under E(P)Act 1986;
 - (b) No developmental activities be permissible except for providing eco-friendly temporary tourism facilities on stilts such as walkways, tents and the like;
 - (c) Mining of sand from sand dunes is a prohibited activity except for the removal of rare earth minerals with proper replenishment using the tailings or other suitable sand.
 - (d) No activities on the sand dunes shall be taken up that would lead to erosion/destruction of sand dunes;



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- (e) Afforestation, if any, on the sand dunes shall be done only with native flora.
- (f) The States/UTs shall prepare management plans for the demarcated sand dunes.

(ii) **Sandy beaches:**

- (a) Mining of beach sand is prohibited except for the removal of rare earth minerals with proper replenishment using the tailings or other suitable sand.
- (b) When the permissible developmental activities are taken up on the beaches if loss of beach in the neighbourhood is predicted, necessary beach nourishment to compensate for the losses shall be undertaken by the project authorities and its long term maintenance shall be ensured by them.
- (c) The States/UTs shall prepare management plans for the demarcated beaches.

(iii) **Biologically active Mudflats:**

- a) Biologically active mudflats will be identified by NCSCM in association with State Govt./UT Administration.
- b) The States/UTs shall prepare management plans for such demarcated biologically active mudflats.

1.10 Areas or structures of archaeological importance and heritage value sites:

- (i) State Archaeological agencies shall be responsible for conservation and protection of all archaeological structures and heritage sites identified by Archaeological Survey of India, as per the provisions of the respective Acts/notifications/guidelines.
- (ii) No activities that are detrimental to the identified areas or structures of archaeological and heritage value shall be permitted.
- (iii) It shall be ensured that these structures or areas are preserved and activities undertaken without changing the façade/plinth of such structures. Such structures could be considered for use in accordance with the relevant norms after undertaking careful designing of the interiors without changing the exterior architectural design of the structure.

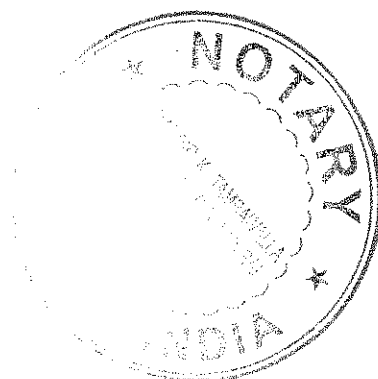


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Annexure-II

List of petroleum and chemical products permitted for storage in CRZ, except CRZ-I A

- (i) Crude oil;
- (ii) Liquefied Petroleum Gas;
- (iii) Motor spirit;
- (iv) Kerosene;
- (v) Aviation fuel;
- (vi) High speed diesel;
- (vii) Lubricating oil;
- (viii) Butane;
- (ix) Propane;
- (x) Compressed Natural Gas;
- (xi) Naphtha;
- (xii) Furnace oil;
- (xiii) Low Sulphur Heavy Stock;
- (xiv) Liquefied Natural Gas;
- (xv) Fertilizers and raw materials for manufacture of fertilizers
- (xvi) Acetic acid
- (xvii) Mono ethylene glycol



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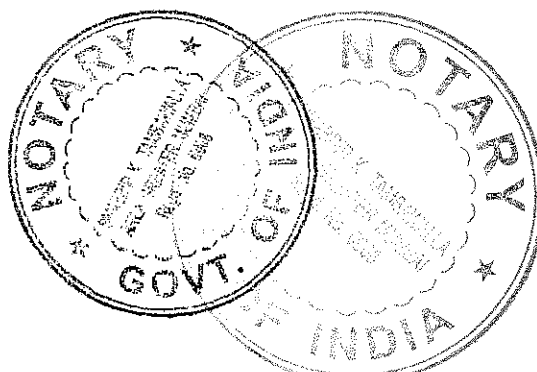
Annexure-III

Guidelines for development of beach resorts/hotels in the designated CRZ Areas

1. CRZ-II

Construction of beach resorts/hotels in designated areas of CRZ-II for occupation of tourist or visitors shall be subject to the following conditions, namely:-

- (i) Construction shall be permitted only to the landward side of an existing road or existing authorized fixed structures.
- (ii) Live fencing and barbed wire fencing with vegetative cover may be allowed around private properties subject to the condition that such fencing shall in no way hamper public access to the beach;
- (iii) No flattening of sand dunes shall be carried out;
- (iv) No permanent structures for sports facilities shall be permitted except construction of goal posts, net posts and lamp posts;
- (v) Construction of basement may be allowed subject to the condition that no objection certification is obtained from the State Ground Water Authority to the effect that such construction will not adversely affect the flow of groundwater in that area;
- (vi) The State Ground Water Authority shall take into consideration the guidelines issued by Central Government before granting such no objection certificate;
- (vii) The quality of treated effluents, solid wastes, emissions and noise levels and the like, from the project area must conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986;
- (viii) Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that the untreated effluents and solid wastes are not discharged into the water or on the beach; and no effluent or solid waste shall be discharged on the beach;
- (ix) If the project involves diversion of forestland for non-forest purposes, clearance as required under the Forest (Conservation) Act, 1980 shall be obtained and the requirements of other Central and State laws as applicable to the project shall be met with; and approval of the State or Union territory Tourism Department shall be obtained.



2. CRZ-III

Construction of beach resorts/hotels in designated areas of CRZ- III for occupation of tourists or visitors shall be subject to the following conditions, namely:-

- (i) Live fencing and barbed wire fencing with vegetative cover may be allowed around private properties subject to the condition that such fencing shall in no way hamper public access to the beach;
- (ii) No flattening of sand dunes shall be carried out;
- (iii) No permanent structures for sports facilities shall be permitted except construction of goal posts, net posts and lamp posts;
- (iv) Construction of basement may be allowed subject to the condition that no objection certification is obtained from the State Ground Water Authority to the effect that such construction will not adversely affect the flow of groundwater in that area;
- (v) The State Ground Water Authority shall take into consideration the guidelines issued by Central Government before granting such no objection certificate;
- (vi) Though no construction is allowed in the no development zone for the purposes of calculation of Floor Space Index, the area of entire plot including the portion which falls within the no development zone shall be taken into account;
- (vii) The total covered area on all floors shall not exceed 33 per cent of the plot size i.e., the Floor Space Index shall not exceed 0.33 and the open area shall be suitably landscaped with appropriate vegetal cover;
- (viii) The construction shall be consistent with the surrounding landscape and local architectural style;
- (ix) The overall height of construction up to the highest ridge of the roof, shall not exceed 9 metres and the construction shall not be more than two floors (ground floor plus one upper floor);
- (x) Groundwater shall not be tapped within 200metre of the High Tide Line; within the 200metre 500metre zone it can be tapped only with the concurrence of the Central or State Ground Water Board;
- (xi) Extraction of sand, leveling or digging of sandy stretches, except for structural foundation of building or swimming pool, shall not be permitted within 500 metres of the High Tide Line;
- (xii) The quality of treated effluents, solid wastes, emissions and noise levels and the like, from the project area must conform to the standards laid down by the



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competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986;

- (xiii) Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that the untreated effluents and solid wastes are not discharged into the water or on the beach; and no effluent or solid waste shall be discharged on the beach;
- (xiv) To allow public access to the beach, at least a gap of 20 metres width shall be provided between any two hotels or beach resorts; and in no case shall gaps be less than 500 metres apart; and
- (xv) If the project involves diversion of forestland for non-forest purposes, clearance as required under the Forest (Conservation) Act, 1980 shall be obtained and the requirements of other Central and State laws as applicable to the project shall be met with; and approval of the State or Union territory Tourism Department shall be obtained.

Note: Construction of beach resorts or hotels shall not be permitted in Ecologically sensitive areas (such as marine parks, mangroves, coral reefs, breeding and spawning grounds of fish, wildlife habitats and such other area as may be notified by the Central or State Government Union territories).

ANNEXURE -IV**GUIDELINES FOR PREPARATION OF COASTAL ZONE MANAGEMENT PLANS****1. Demarcation of High Tide Line and Low Tide Line**

Demarcation of High Tide Line (HTL) and Low Tide Line (LTL) as carried out by NCSCM for the entire coastline of the country, has been made available to the Coastal States / Union Territories and only such demarcation of HTL and LTL shall be applicable for all purposes under this Notification.

2. A 'Hazard line' has been demarcated by the Survey of India (SOI) taking into account the extent of the flooding on the land area due to water level fluctuations, sea level rise and shoreline changes (erosion/accretion) occurring over a period of time. The hazard line mapped by SOI has been shared with the coastal States/UTs through NCSCM. The hazard line shall be used as a tool for disaster management plan for the coastal environment, including planning of adaptive and mitigation measures. With a view to reduce the vulnerability of the coastal communities and ensuring sustainable livelihood, while drawing the CZMPs, the land use planning for the area between the Hazard line and HTL shall take into account such impacts of climate change and shoreline changes.

3. Preparation of CZM Maps

- (i) Base Maps of 1:25,000 scale shall be acquired from the Survey of India (SOI) and wherever 1:25,000 maps are not available, 1:50,000 maps shall be enlarged to 1:25,000 for the purpose of base map preparation and these maps will be of the standard specification given below:

Unit	: 7.5 minutes X 7.5 minutes
Numbering	: Survey of India Sheet Numbering System
Horizontal Datum	: Everest or WGS 84
Vertical Datum	: Mean Sea Level (MSL)
Topography	: Topography in the SOI maps will be updated using latest satellite imageries or aerial photographs

- (ii) Coastal Zone Management (CZM) Maps of scale 1:25,000 shall be got prepared by any of the agencies identified by the MoEF&CC vide its Office order number J-17011/8/92-IA-III dated 14th March 2014 using the demarcation of the High Tide Line or LTL, as carried out by NCSCM.

- (iii) Various regulatory lines viz. at a distance of 20 mtrs., 50 mts., 200 mts. and 500 mts. from HTL respectively, as applicable in various CRZ categories, and the Hazard line shall be demarcated and transferred to the CZM Maps

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- (iv) HTL, LTL and CRZ boundaries, as applicable, shall also be demarcated in the CZM maps along the banks of tidal influenced inland water bodies.
- (v) Classification of different coastal zones shall be done as per the CRZ notification and Standard national or international colour codes shall be used.

3. Local level CZM Maps

- (i) Local level CZM Maps are for the use of local bodies and other agencies to facilitate implementation of the Coastal Zone Management Plans
- (ii) Cadastral (village) maps in 1:3960 or the nearest scale, as available with revenue authorities shall be used as the base maps.
- (iii) HTL, LTL, other CRZ regulatory lines and the Hazard line shall be demarcated in the cadastral maps and classifications shall be transferred into local level CZM maps.

4. Classification of CRZ areas

- (i) The CZM Maps shall clearly demarcate the land use plan of the area and map out the Ecologically Sensitive Areas (ESAs) or the CRZ-IA areas as per mapping made available by NCSCM to coastal State / UTs. All such ESAs shall be appropriately demarcated with colour codes.
- (ii) Buffer zone along mangrove areas of more than 1000sq mts. shall be stipulated with a different colour distinguishing from the mangrove area. The buffer zone shall also be classified as CRZ-I area.
- (iii) In the CRZ areas, the fishing villages, common properties of the fishermen communities, fishing jetties, ice plants, fish drying platforms or areas infrastructure facilities of fishing and local communities such as dispensaries, roads, schools, and the like, shall be indicated on the cadastral scale maps. States shall prepare detailed plans for long term housing needs of coastal fisher communities in view of expansion and other needs, provisions of basic services including sanitation, safety, and disaster preparedness.
- (iv) The water areas of CRZ-IV shall be demarcated and clearly demarcated if the water body is sea, lagoon, backwater, creek, bay, and estuary and for such classification of the water bodies the terminology used by Naval Hydrographic Office shall be relied upon.
- (v) The fishing Zones in the water bodies and the fish breeding areas shall be clearly marked.
- (vi) In CVCAs, the land use maps shall be superimposed on the Coastal Zone Management Plan clearly demarcating the CRZ-I, II, III, IV.

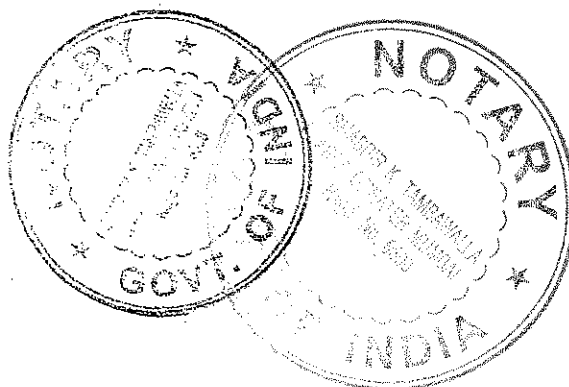
- (vii) The existing authorized developments on the seaward side shall be clearly demarcated.
- (viii) The features like cyclone shelters, rain shelters, helipads and other infrastructure including road network may be clearly indicated on the CZM Maps for the purpose of rescue and relief operations during cyclones, storms, tsunami and the like.
- (ix) Construction of buildings or other activities shall be permitted under the CZMPs provided adequate arrangements are made for proper management and disposal of solid and liquid wastes in accordance with the environmental standards, rules and statutes etc. Under no circumstances, untreated effluents shall be disposed off in the coastal waters.

5. Public consultations on the CZMP.

- (i) The draft CZMPs prepared shall be given wide publicity and suggestions and objections received in accordance with the Environment (Protection) Act, 1986. Public hearing on the draft CZMPs shall be held at district level by the concerned CZMAs.
- (ii) Based on the suggestions and objections received the CZMPs shall be revised and approval of MoEF&CC shall be obtained.
- (iii) The approved CZMP shall be put up on the website of MoEF&CC, concerned website of the State, Union Territory CZMA and hard copy made available in the Panchayat Office, District Collector Office and the like.

6. Revision of Coastal Zone Management Plans

- (i) Whenever there is a doubt the concerned State or Union territory Coastal Zone Management Authority shall refer the matter to the National Centre for Sustainable Coastal Management who shall verify the CZMP based on latest satellite imagery and ground truthing.
- (ii) If required the rectified map would be submitted to MoEF&CC for consideration.



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ANNEXURE-V

PROJECT INFORMATION DETAILS

1. PROJECT DETAILS

- A. Project Name
- B. Survey No./ Village/ Co-ordinates
- C. District
- D. State
- E. Whether the proposal is for (Select relevant field)
 - (i) Fresh Clearance under CRZ
 - (ii) Amendment to an already issued CRZ clearance
 - (iii) Extension of validity of an already issued CRZ clearance
- F. Name of the Applicant
- G. Address of the Applicant
- H. Contact details (Telephone nos. and e-mail address)
- I. Cost of the project (Rs in crores)

2. BENEFITS OF THE PROJECT

- A. Details of Project Benefits
- B. Employment Likely to be Generated (Yes/No)
 - If Yes
 - (i) Total Manpower Requirement
 - (ii) Permanent Employment (Numbers)
 - (iii) Temporary Employment (Numbers)
 - (iv) Temporary Employment- During Construction (Numbers)
 - (v) Temporary Employment- During Operation (Numbers)

3. DESCRIPTION OF THE PROJECT UNDER CONSIDERATION (Select the Category of the project):

- A. Resort / Buildings / civic amenities
 - (i) Total area/Built-up area (in sqm.)
 - (ii) Height of structure
 - (iii) FSI ratio
 - (iv) Name of concerned town planning authority/ Panchayat etc.
 - (v) Details of provision of car parking area
- B. Coastal Roads / Roads on Stilt
 - (i) Area of land reclamation
 - (ii) Estimated quantity of muck/earth for reclamation
 - (iii) Traffic carrying capacity



(iv) Dimensions of road

C. Pipelines from thermal power blow down

- (i) Length of pipeline
- (ii) Length traversing CRZ area
- (iii) Depth of excavation
- (iv) Width of excavation
- (v) Length of pipeline from seashore to deep sea
- (vi) Depth of outfall point from surface of sea water
- (vii) Temperature of effluent above ambient at disposal point

D. Marine Disposal of Treated Effluent through pipelines

- (i) Location of intake/ outfall
- (ii) Depth of outfall point
- (iii) Length of pipeline
- (iv) Length traversing CRZ area
- (v) Depth of excavation
- (vi) Width of excavation
- (vii) Length of pipeline from shore to deep sea/creek
- (viii) Depth of outfall point from surface of water
- (ix) Depth of water at disposal point
- (x) BOD, COD, TSS, oil & grease, heavy metals in the effluent

E. Facility for storage of goods/chemicals

- (i) Name of chemical
- (ii) End use of the chemical
- (iii) No. of tanks for storage
- (iv) Capacity of tanks

F. Offshore structures

- (i) Exploration or development
- (ii) Depth of sea bed
- (iii) No. of rigs
- (iv) No. of platform
- (v) Details of group gathering stations

G. Desalination Plant

- (i) Capacity of desalination
- (ii) Total brine generation
- (iii) Temperature of effluent above ambient at disposal point
- (iv) Ambient salinity
- (v) Disposal point

H. Mining of rare earth/atomic minerals

- (i) Capacity of mining
- (ii) Type of mineral to be extracted
- (iii) End use of the mineral



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I. Sewage Treatment Plants

- (i) Capacity
- (ii) Total area of construction
- (iii) Compliance of effluent parameters as laid down by cpcb/spcb/other authorised agency
- (iv) Whether discharge is in sea water/creek?
 - If yes
 - Distance of marine outfall point from shore/from the tidal river bank
 - Depth of outfall point from sea water/river water surface
 - Depth of seabed/riverbed at outfall point

J. Lighthouse

- (i) Total ground area of foundation/platform
- (ii) Height of the structure

K. Wind Mills

- (i) Capacity (MW)
- (ii) Height of the windmill
- (iii) Diameter of the windmill
- (iv) Length of blade
- (v) Speed of rotation
- (vi) Transmission lines (overhead or underground)

L. Others

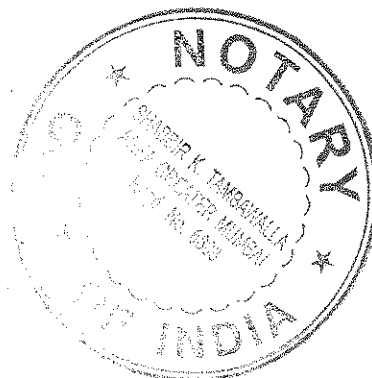
- (i) Please specify with salient features
- (ii) Upload relevant Documents (upload PDF only)

- 4. PROJECT LOCATION AS PER CRZ CLASSIFICATION** (If project site falls in different/multiple CRZ categories the same may also be elaborated)
- 5. CLAUSE OF CRZ NOTIFICATION UNDER WHICH PROJECT IS A PERMISSIBLE /REGULATED ACTIVITY**
- 6. MANDATORY FIELDS FOR PROJECT ASSESSMENT**
- A. CRZ map in 1:4000 scale indicating HTL, LTL demarcation and distance of the nearest project boundary (in meters) from HTL to be stated**
 - (i) Upload Map (kml file)
 - B. Project layout superimposed on CRZ Map 1:4000 scale with classification of project location including other notified ESAs prepared**
 - (i) Upload Map (kml file)
 - C. CRZ map 1:25000 scale covering 7 km radius around Project site**
 - (i) Upload Map (kml file)



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- 7. PROJECT LOCATED IN (Select Type)**
- (i) Non eroding Coast
 - (ii) Low and Medium eroding coast
 - (iii) High eroding Coast
- 8. DETAILS OF FOREST/ MANGROVES LAND INVOLVED (YES/NO)**
- IF YES**
- (i) Detail of area diverted
 - (ii) Forest clearance to be submitted (Upload document)
 - (iii) No. of trees to be cut under the project
 - (iv) Compensatory afforestation plan to be submitted (Upload document)
- 9. DISTANCE OF PROPOSED PROJECT FROM ESA/MARINE PARK/ WILD LIFE SANCTUARY**
- (i) Within 10 km radius from the project site (Yes/No)
- If YES**
- Permission from NBWL to be submitted (Upload document)
- 10. NOC OR CONSENT TO ESTABLISH FROM STATE/UT POLLUTION CONTROL BOARDS OBTAINED (YES/NO)**
- If YES**
- (i) Copy of NOC to be provided (Upload document)
 - (ii) Conditions imposed to be stated (Upload document)
- 11. EIA studies (relevant fields to be filled)**
- A. Terrestrial studies:**
- (i) Summary Details of EIA (Terrestrial) Studies
 - (ii) Upload Recommendation made in EIAs (Upload document)
 - (iii) State period of Study
- B. Marine Studies**
- (i) Summary Details of EIA (Marine) Studies
 - (ii) Upload Recommendation made in EIAs (Upload document)
 - (iii) State period of Study
- 12. DISASTER MANAGEMENT PLAN / NATIONAL OIL SPILL DISASTER CONTINGENCY PLAN (if applicable)**
- 13. PROJECT INVOLVING DISCHARGE OF LIQUID EFFLUENTS:**
- (i) Capacity of STP
 - (ii) Quantity of effluent generated
 - (iii) Quantity of effluent treated
 - (iv) Method of treatment & disposal



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14. PROJECT INVOLVING DISCHARGE OF SOLID WASTE:

- (i) Type of solid waste
- (ii) Quantity of solid waste generated
- (iii) Method of disposal
- (iv) Mode of transport

15. WATER REQUIREMENT (KLD)

- (i) Quantity of water required
- (ii) Source of water
- (iii) If Ground water (Upload a copy of approval from CGWA or authorised body)
- (iv) If other Source (Upload a copy of permission from competent authority)
- (v) Mode of transport
- (vi) Commitment of water supply (Upload document)

16. DETAILS OF WATER TREATMENT AND RECYCLING (If any) (Multiple Entries Allowed)

Type/ Source	Quantity of Waste Water Generated (Kilos Litre per Day)	Treatment Capacity (Kilos Litre per Day)	Treatment Method	Mode of Disposal	Quantity of Discharged Water (Kilos Litre per Day)	Quantity of Treatment Water used in Recycling/Reuse (Kilo Litre per Day)

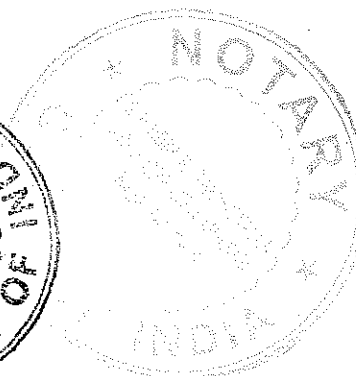
17. DETAILS OF RAINWATER HARVESTING

- (i) No. of Storage tanks
- (ii) Total capacity of tanks
- (iii) No. of Recharge Pits
- (iv) Capacity of pits

18. ENERGY REQUIREMENT AND SOURCES

- (i) Total Power Requirements (kW.h)
- (ii) Source
- (iii) Upload Copy of Agreement (upload pdf only)
- (iv) Stand By Arrangement (Details)

19. ENERGY EFFICIENCY/SAVING MEASURES



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- (i) Source/Mode
- (ii) Details of savings

20. RECOMMENDATION OF STATE COASTAL ZONE MANAGEMENT AUTHORITY

- (i) Upload Copy of CZMA recommendations (Upload pdf only)
- (ii) Compliance status of the Conditions Imposed

21. WHETHER PROPOSAL ATTRACTS EIA NOTIFICATION, 2006. (Yes/No)

If YES,

- (i) the category thereof
- (ii) Status of proposal for EC (as applicable)

22. SOCIAL AND ENVIRONMENTAL ISSUES AND MITIGATIONS MEASURES SUGGESTED INCLUDING BUT NOT LIMITED TO R&R, WATER, AIR, HAZARDOUS WASTES, ECOLOGICAL ASPECTS, ETC.(Brief Details to be Provided)

23. DETAILS OF COURT CASES Whether there is any Court Cases pending against the project and/or land in which the project is proposed to be set up? (Yes/No)

If Yes,

Pending or Disposed (Select relevant)

- (i) Name of the Court (Supreme Court, High Court, NGT)
- (ii) Case No.
- (iii) Case Details
- (iv) Orders/Directions of the court, if any and its relevance with the proposed project (Upload document)

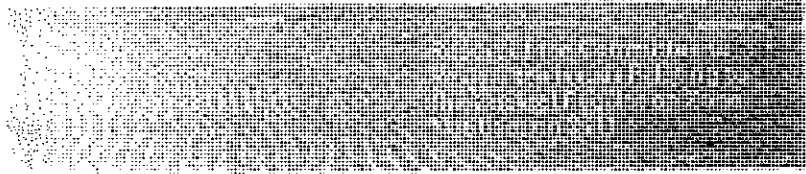
24. ADDITIONAL INFORMATION, If any

UNDERTAKING: It is certified that the information given above are true to the best of my knowledge and belief and nothing contravening the provisions of CRZ Notification, 2011 has been concealed therefore.



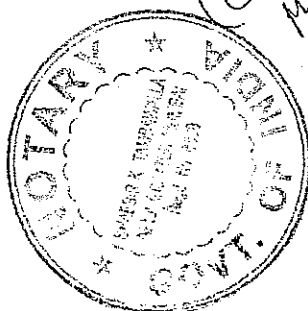
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ANNEXURE A-4 169



Report of the Committee to Review the Issues Relating to the Coastal Regulation Zone Notification, 2011

Information under Cr. Act, 2015
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(CPGO-CRZ)
MOEF



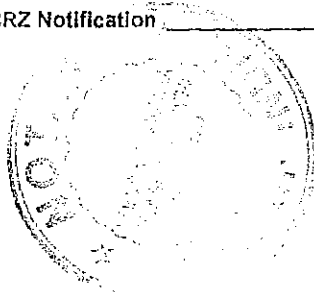
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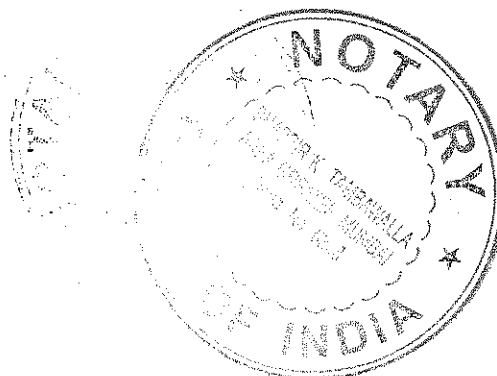
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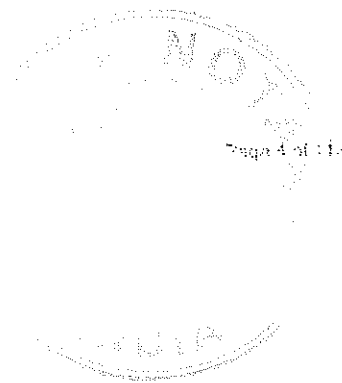


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List of key abbreviations

CESS	Centre for Earth Science Studies (now designated as National Centre for Earth Science Studies)
CIDCO	City Industrial Development Corporation
CPDAC	Coastal Protection and Development Advisory Committee
CRZ	Coastal Regulation Zone
CVCAs	Critical Vulnerable Coastal Areas
CZMA	Coastal Zone Management Authority
CZMP	Coastal Zone Management Plan
DCR	Development Control Rules
DP	Development Plan
E(P)A 1986	Environment (Protection) Act, 1986
ESA	Ecologically Sensitive Area
FSI	Floor Space Index
HTL	High Tide Line
ICZMP	Integrated Coastal Zone Management Plan
IMBL	International Maritime Boundary Line
IMP	Integrated Management Plan
IPZ	Island Protection Zone
LTL	Low Tide Line
MoEF&CC	Ministry of Environment, Forests & Climate Change
MoES	Ministry of Earth Sciences
NCSCM	National Centre for Sustainable Coastal Management
NCZMA	National Coastal Zone Management Authority
NMMC	Navi Mumbai Municipal Corporation
NDZ	No Development Zone
SCZMA	State Coastal Zone Management Authority
SEIAA	State Environmental Impact Assessment Authority
SICOM	Society of Integrated Coastal Management
SLR	Sea Level Rise
Sol	Survey of India
UT	Union Territory

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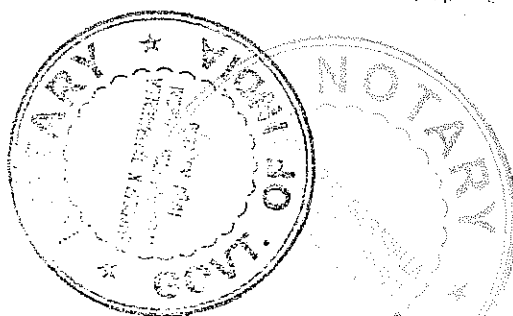
Executive Summary

The MoEF (now designated as MoEF&CC) constituted a six-member Committee on 17 June 2014 under the Chairmanship of Dr. Shailesh Nayak, Secretary, MoES to examine the issues of coastal States/UT Governments relating to CRZ Notification, 2011 and to examine the errors or inconsistencies and procedural simplification in the said Notification. The other members of the Committee were Shri Shashi Shekhar, Additional Secretary, MoEF&CC, Prof. R. Ramesh, Director, NCSCM, Dr. M. Baba, Former Director, CESS, Shri Hardik Shah, Member Secretary, Gujarat CZMA and Dr. A. Senthil Vel, Additional Project Director, SICOM, the Member Secretary of the Committee.

The Committee examined the issues posed by coastal States/UTs with regard to CRZ Notification, 2011. The correspondences, communications and presentations made by the States/UTs are annexed. The Committee had sittings with the Governments of Maharashtra, Karnataka and Kerala in Mumbai, Bangalore and Thiruvananthapuram, respectively. Later, all the States and UTs were invited to Delhi and the Committee heard the representations. A summary of the presentations on the issues and suggestions of the States/UTs and the Committee's analysis of the same are given in detail in this report. The Committee also critically examined the CRZ Notification, 2011 with respect to the errors/inconsistencies and discussed the ways and means for procedural simplification.

After examining all the issues detailed by the State Governments and taking into consideration the implications of CRZ Notification, 2011 the Committee is of the opinion that the coastal zone management policy in the country should focus upon the following six principles:-

- (i) Keeping in view the importance and incomparable values of ESAs, the geomorphological features, archaeological and heritage sites, the CRZ Notification should primarily focus on protection and conservation of such areas/features in the coastal areas. The protection and conservation including



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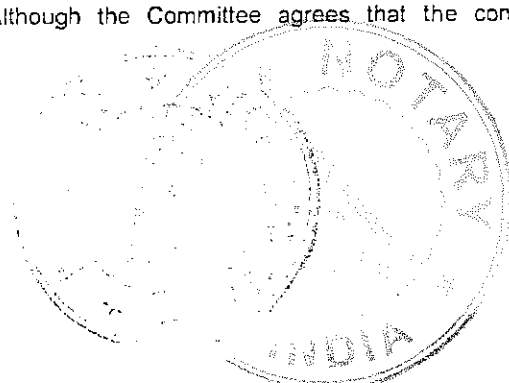
monitoring of the above areas/features have not been addressed adequately in the existing CRZ Notification, 2011.

- (ii) All developmental activities in the coastal areas undertaken to address the economic and growing needs of the society to be taken up keeping in view the sensitivity of the coast and ensuring no or minimum impact to the coastal environment.
- (iii) The coastal environment which is highly vulnerable to natural and manmade hazards needs to be addressed comprehensively taking into account the fragile nature of the coastal ecosystem and the communities who depend on the coastal resources.
- (iv) The restrictions/regulations in construction enforced under the existing CRZ Notification shall not be in conflict with the existing norms issued by the States/UTs as well as the Central Government from time to time.
- (v) The coastal and marine environmental management for the last two decades, to a large extent, been done through the satellite data. There is a greater need to enhance application of space technology for planning, regulation, monitoring and management of coastal and marine environment.
- (vi) The present practice of coastal zone management has not addressed adequately the issues related to capacity building in the country. There is an urgent need for capacity building at all levels starting from district administration, state machineries to national organizations.

Taking into consideration the above broad principles the following are the highlights of the recommendations of the Committee:-

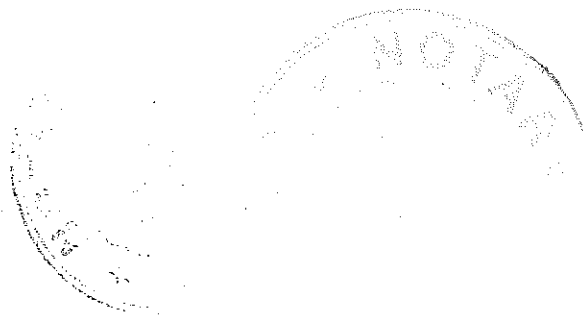
Overlapping of State/UT legislation with the provisions of CRZ Notification

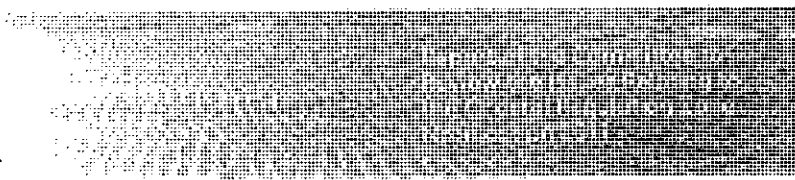
- The States and UTs also brought to the notice of the Committee the need for safe, hygienic and decent housing with basic infrastructure facilities for a large section of the coastal population, who since several decades have been living in unhygienic, disaster-prone slums and unsafe buildings. The Committee is convinced that the CRZ Notifications have not addressed this human issue comprehensively. Although the Committee agrees that the construction of



housing infrastructure would lead to congestion in the coastal areas, there is no alternative with the Governments as there are no mechanisms in place to prevent migration of population to coastal areas or to decongest the existing populated areas. In the absence of such mechanisms, it is imperative that affordable housing with basic infrastructure facilities is provided to these communities in the national interest.

- The restrictions imposed by the present CRZ Notification, 2011 especially in the CRZ-II and CRZ-III areas have been counter-productive as the slums and encroachments in the area have proliferated as the developmental plans approved by the State/UT Governments could not be taken up due to the overreaching powers of the CRZ Notification. On account of such impositions of the CRZ Notification, some of the human issues such as housing of local communities, slum rehabilitation, rehabilitation of people living in dilapidated and unsafe buildings could not be undertaken. Some of the States/UTs have termed the CRZ Notification, 1991 as well as 2011 as anti-people. On account of such restrictions and negative impact on the coastal State/UT Governments, there has been a strong resentment even to take up conservation and protection measures of ESAs.
- The Committee has observed certain conflicts/ overlaps of the provisions of CRZ Notification and other laws of State/UT Governments in the area relating to development of infrastructure in coastal areas. The CRZ Notification, 2011 provisions especially in the CRZ-II and CRZ-III areas override the Town and Country Planning Regulations of the coastal States/UTs in the CRZ area. This disparity between the CRZ and non-CRZ has led to several issues. Most State Governments have sought for uniform regulations in the State for smooth implementation. This suggestion of the State/UT Governments is found justified. The Committee is of the strong opinion that MoEF&CC should concentrate upon conservation and protection of the ESAs. The issues relating to CRZ-II & III are mostly related to Town and Country Planning regulations. Hence, the Committee is of the strong opinion that such issues of Town and Country Planning are left to the concerned State/UT Governments to implement as per the mechanisms and procedures that have been laid down by the concerned State/UT Governments.



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- The present CRZ Notification, 2011 has many ambiguities with regard to High Tide Line (HTL)/Low Tide Line (LTL) mapping, CRZ boundary demarcation and so on, which are prerequisites for CZMP, the preparation of which is considerably delayed. It is also observed that the Environment Departments of the States/UTs are extremely under-staffed to meet the challenges of coastal zone management (CZM). The existing staff in the States/UTs is mostly involved in addressing approvals and issues relating to CRZ-II and III. There have been very few instances where States/UTs have taken proactive steps in CRZ-I and CRZ-IV areas, the conservation of the ecosystems in it, combating pollution understanding the changes in the coastal areas and their impact and taken corrective steps in improving the general environmental quality of the coast. Hence, the Committee is of the opinion that the Environment Departments of the States/UTs and MoEF&CC should be sensitized to address CRZ-I and CRZ-IV issues and in turn as a part of decentralization and empowering the local bodies and provide such regulations that facilitate the States/UTs to undertake developmental activities that are ecologically sustainable.

Protection and conservation of Ecologically Sensitive Areas

- It has clearly emerged that the ecologically sensitive areas along the coastal and in the marine areas are extremely important to maintain the biodiversity of the marine life and also to maintain the functional integrity of the coast. Over a period of time the conservation and protection of ESA have been neglected and are under tremendous pressure due to increase in population and the developmental activities undertaken to meet the economic aspiration of the growing population. The destruction of ecosystems is a matter of concern and in several cases it is irreversible. The coastal ecosystems are important as they play a crucial role in the proliferation of marine fauna on which the local communities depend for livelihood. They reduce the vulnerability of coastal communities to natural disasters and play a crucial role in maintaining the functions of the coast including acting as a carbon sink. Hence, the Committee suggests that the Government should strengthen existing mechanisms, infrastructure, expertise and institutions at various levels to conserve and protect



the coastal ecosystems. The Government in this context may, in the larger interest of the country take appropriate steps in conservation, protection of ecosystems, while taking into consideration the basic requirements of the growing population.

Economic development along the coastal area

- The Committee is also of the opinion that new opportunities and initiatives need to be taken to address the economic and social development of coastal communities. Most of the traditional coastal communities that live on the resources from the coastal areas, especially fishing, need to be provided with adequate opportunities for economic development. In this regard, the Committee is of the opinion that while the ecosystems are being conserved and protected by the Governments, the local communities should also play an important role in the conservation and protection of the ecosystems. The local communities should be provided with an opportunity to take up tourism, artisanal fisheries such as traditional aquaculture and ornamental fish culture, in such ecosystem areas for their economic improvement. The Governments should work in this area, which will address both conservation and economic development of the communities thereby, reducing pressure on the already depleting fishery resources.
- The Committee has serious concern on the growing coastal pollution from industrial waste and sewage, dumping of solid waste, non-point source pollution from the agricultural areas, and so on. With the growing infrastructure in the coastal areas, especially in the cities and municipalities pollution levels are bound to increase. This is a serious issue which needs to be addressed by the respective State/UT Governments on a mission mode by preparing effective CZMP and ICZMP.
- Another matter of concern which the Committee has noted is the changes in the shoreline. The shoreline change is mostly due to anthropogenic activities. In this context, certain initiatives have been taken by the MoEF&CC through the NCSCM wherein the shoreline changes are being mapped and studied. These studies need to be taken into consideration while undertaking foreshore developmental activities (CZMP and ICZMP). The studies need to be carried on

further to ascertain the exact reasons of shoreline change so as to implement remedial measures.

Impacts of climate change and initiatives to address the coastal vulnerability

- The Committee appreciates the initiatives taken by MoEF&CC in setting up exclusive Centres for coastal management such as National Centre for Sustainable Coastal Management (NCSCM), Society of Integrated Coastal Management (SICOM) and State-level Project Management Units (SPMUs) including strengthening of the consortium institutions in each of the coastal States/UTs. These agencies could be further developed for undertaking research and development in the area of coastal management and also to address the social needs of the coastal communities in the States/UTs.
- The Committee after detailed examination of all issues raised by the State/UT Governments and taking into account the current international scenario in the area, including the emerging scientific technologies in the field of coastal and marine management, is of the clear view that the MoEF&CC should embark upon new initiatives for protecting and conserving the coastal and marine areas, which are endowed with rich but fragile ecosystems. While taking up conservation and management of ecosystems, the MoEF&CC shall also identify/assess development of technologies/infrastructure that would have minimum impact on the coastal and marine environment and also address to the economic aspirations of the growing population of the country.

The Committee after examination of the issues raised by the coastal States/UTs and its own analysis, which are detailed out in the subsequent chapters of this report has proposed a revised CRZ Notification in supersession of the existing CRZ Notification, 2011, the draft of which also forms a part of this report. The Committee suggests that the Government should examine the above-mentioned draft notification carefully and may also take into account any another emerging area/issues before considering it for implementation.



Terms of Reference of the Committee

1. The broad Terms of Reference (ToR) of the Committee are:

- a) to examine issues relating to Maharashtra raised by the State Government vide letters dated 27.08.2013 and 23.12.2013;
- b) to examine issues relating to Karnataka raised by the State Government vide letters dated 16.08.2013, 28.02.2014 and 18.02.2014;
- c) to examine issues relating to Kerala raised by the State Government vide letters dated 10.02.2014;
- d) to examine errors/inconsistencies in the CRZ Notification, 2011 and procedural simplification and
- e) to examine any other issues raised by the State Government(s) during their interaction with the Committee.

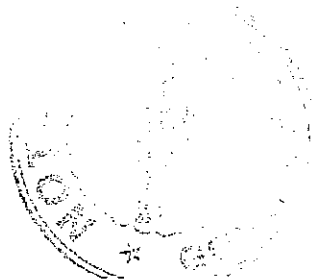
2. The Committee may interact with the State/ UT Governments, if necessary.

Sittings of the Committee

The Committee in accordance with the ToR had the following meetings:

- 8 July 2014 at Mumbai – to examine the issues relating to Maharashtra,
- 21 August 2014 at Bengaluru – to examine the issues relating to Karnataka,
- 22 August 2014 at Thiruvananthapuram – to examine the issues relating to Kerala,
- 27 October 2014 at New Delhi – to examine the issues of West Bengal, Odisha, Tamil Nadu, Puducherry, Goa, Daman & Diu, Gujarat, Andhra Pradesh and
- 18 December 2014 at New Delhi – meeting of the Committee to draft the Report.
- 9 January 2015 at New Delhi – meeting of the Committee to finalize the draft Report.
- The report will be submitted in the third week of January, 2015

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Chapter 1

Introduction, Approach and Methodology adopted by the Committee

1.1 Introduction

India's mainland coast extends to 5500 km and a total of more than 7500 km including the Andaman & Nicobar (A&N) and Lakshadweep Islands with nearly one-fourth of the country's population living within 50 km of the coast. A wide range of coastal ecologically sensitive areas such as mangroves, sea grass, coral reefs, tidal flats, estuaries, lagoons, sand dunes and salt marshes occur along the coast. A number of rivers flow into the Bay of Bengal on the east coast and into the Arabian Sea on the west coast, carrying large quantities of sediment. The east coast is dominated by large river deltas and sandy beaches, while the west coast consists of an intricate network of estuaries, backwaters and predominantly rocky coastline.

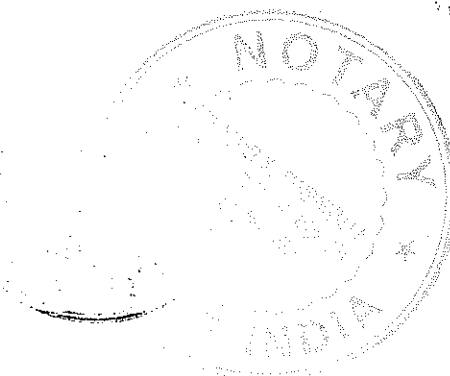
1.1.1 Importance of Coastal ESAs

Coastal habitats alone account for approximately one-third of all marine biological productivity and estuarine ecosystems (i.e., salt marshes, sea grasses, mangrove forests) are among the most productive regions. Coastal ESAs are home to unique flora and

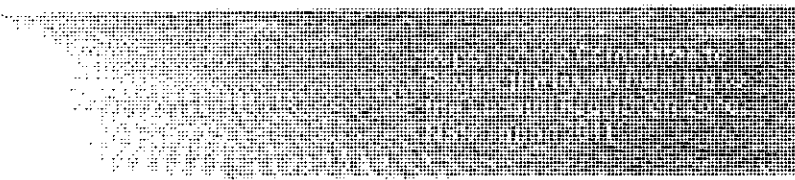


fauna. Coral reefs constitute less than 1% of the ocean floor but support over 25% of the marine biodiversity. Mangroves, beaches and coral reefs aid in controlling coastal erosion, shoreline change and also serve as a natural defense against coastal hazards such as storm surges, cyclones and tsunamis. The submerged

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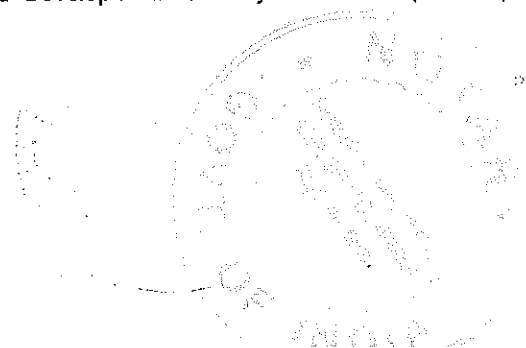
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vegetation of these shallow habitats serve important functions as traps of suspended sediment, important winter forage for migratory birds and nursery areas for juvenile finfish and shellfish. While reefs, mangroves and sea grasses are important breeding and feeding grounds for shellfish and finfish, sand dunes and beaches play a major role as interface between sea and land by preventing erosion due to storm waves. In view of the immense value of the ESAs indicated here, including its contribution in maintaining the biological integrity of the coastal habitats for vast coastal biodiversity representing different levels in the food chain, it is imperative that necessary protection and conservation measures are put in place at the earliest. These sensitive ecosystems provide various ecosystem services, which provide livelihood avenues to millions of coastal population, directly and indirectly.

Coastal ecosystems are also very efficient carbon sinks and have a major role in sequestering atmospheric carbon dioxide. India has about 3,703,970 hectares of coastal wetlands, which accounts for ~25% of the total wetland areas of the country. Among these wetland ecosystems, mangroves occupy 4628 km², salt marshes ~1611 km², inter-tidal mud flats ~24,136 km², coral reefs ~1420 km² and sea grass ~360 km². These coastal/ marine ecosystems are the most productive ecosystems of the world with a large potential for carbon sequestration. Overall, Indian mangroves are able to sequester about 1.5 metric tons of carbon per hectare per year. Recent data estimate that sea grasses together with salt marshes and mangroves are responsible for capturing up to 70% of the organic carbon in the marine realm making them one of the most intense carbon sinks on the planet.

In recent times, coasts have become a zone with multiple activities and stakeholders competing for coastal resources. However, coasts are also intensely prone to cyclones, storm surges, erosion and flooding. A combination of a contested space and a highly vulnerable environment means that coastal populations live in a high-risk landscape. The extent of erosion largely due to developmental activities along the coast is rapidly increasing. According to a recent study (2011) by the National Centre for Sustainable Coastal Management (NCSCM), almost 40% of the Indian coast is subject to coastal erosion. This figure is higher than earlier estimates by the Coastal Protection and Development Advisory Committee (CPDAC), which had



reported in 2004 that about 22% of the coast was undergoing erosion and it had increased to almost 30% by 2010. Studies have indicated that loss of beach space has a serious impact on fishing communities in India, because much of the small-scale fishery is beach based and the houses of fishermen are located close to the shoreline.

1.1.2 Coastal Pollution

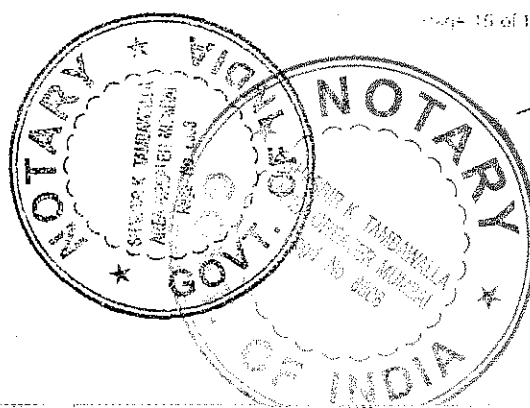
The coastal/ marine ecosystems are often considered the last receptacle of wastes. With increasing demographic pressure and activities along the coast, without a simultaneous increase in the treatment facilities available for the wastewater generated, pollution of coastal waters is rapidly increasing and is a matter of great concern. Major land-based pollution to the coast primarily includes domestic sewage – discharged directly into the sea or through the rivers, solid wastes dumped into waterways along the coastline, industrial effluents – untreated/partially treated and oil and grease – from land-based sources, marine sources such as ships, submarine seepage and refinery wastes. Municipal sewage is the main single source of pollution to the coastal waters due to land-based activities¹.

Key Issues along the Coast

- Destruction of coastal ecosystems for economic use or settlements
- Vulnerability to cyclones and storm surges
- Coastal erosion
- Pollution caused by industries, sewage discharge and agriculture in the drainage basin
- Overpopulation and settlements built at unsafe place or in wetlands
- Threatened food (e.g. fisheries) security
- Shortage in freshwater supply due to salt water intrusion.

It is estimated that 120 Class-I cities and Class-II towns of coastal areas generate about 6835 million liters per day (MLD) of wastewater per day, out of which, only 1492 MLD of wastewater undergoes various levels of treatment. The remaining is discharged directly to the coastal waters without any kind of treatment. This means that on an average 5343 MLD of untreated wastewater from municipal sources reach coastal waters; which is equivalent to 5.343 million m³ per day or 1.9 billion m³ per year. This figure is

¹ <http://www.cpcb.nic.in/comaps.php> accessed 8 December 2014



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almost five times the earlier estimate of $0.41 \times 10^9 \text{ m}^3$ (De Sa²). The disposal of solid waste generated by 120 coastal cities and towns are disposed in landfill sites, partly dumped openly and partly composted. About 16,734 tons per day of Municipal Solid Waste (MSW) was generated by 11 major coastal cities in 2011 (Status report on Municipal Solid Waste Management, CPCB, 2013). Some of the industries have adequate treatment facilities up to secondary/tertiary level.

In the case of small-scale industrial units and industrial clusters, treatment of wastewater is carried out by establishing Common Effluent Treatment Plants (CETPs). In Gujarat and Maharashtra, 24 CETPs discharge treated effluent to the coastal waters. Most of the CETPs comply with effluent standards. A first compilation of quantum of pollutants into the coastal ecosystem of India was given by De Sa (undated)² as follows:

S.No.	Waste/pollutant	Quantum (annual)
1.	Sediments	1600 million tons
2.	Industrial effluents	$50 \times 10^6 \text{ m}^3$
3.	Sewage – largely untreated	$0.41 \times 10^9 \text{ m}^3$
4.	Garbage and other solids	$34 \times 10^6 \text{ tons}$
5.	Fertilizer – residue	$5 \times 10^6 \text{ tons}$
6.	Synthetic detergents – residue	1,30,000 tons
7.	Pesticides – residue	65,000 tons
8.	Petroleum hydrocarbons (tar balls residue)	3500 tons
9.	Mining rejects, dredged spoils and sand extractions	$0.2 \times 10^6 \text{ tons}$

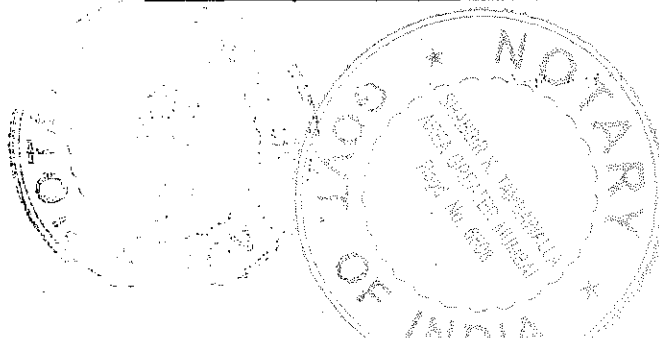
A conservative figure for the quantum of sewage currently reaching the coast is $1.95 \times 10^9 \text{ m}^3$ per year.

1.1.3 Coastal/Marine Fisheries:

The nature of fisheries in India is constantly changing with the emergence of new technologies and techniques in fishing, fuelled by local and global demand as access

²Present state of the coastal environment in India. <http://www.teriin.org/teri-wr/coastlin/papers/paper2.htm> accessed 9 December 2014

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to markets improves. The estimated marine resource potential of the Indian EEZ is about 4.24 million metric tons at current exploitation levels. As the following graph shows, there has been an increasing trend in marine fish catch in the last 60 years.

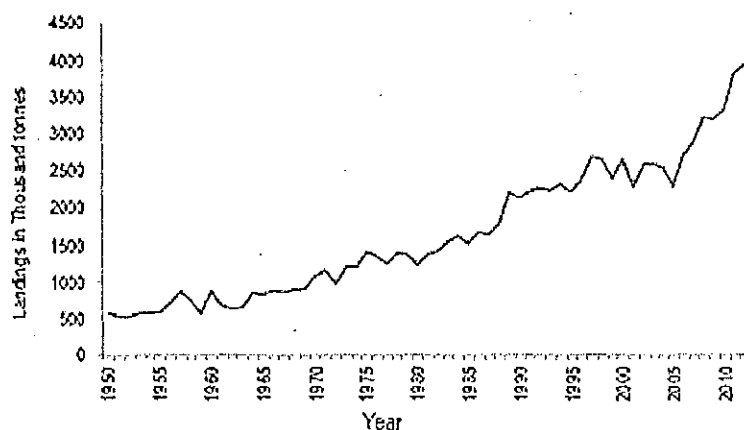
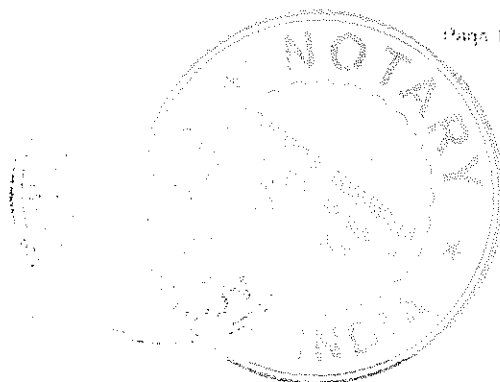


Fig. 1: Estimated marine fish landings in India from 1950 to 2012 (Source:CMFRI Annual Report 2012–2013)

However, CMFRI attributes the increase largely to a few species such as oil sardines, perches and penaeid prawns. However, catch of fishes such as Hilsa and Mackerel have declined. According to CMFRI (2011), inshore waters have been almost exploited to unsustainable levels. Many reasons have been attributed to the reduction in the fish catch in the near-shore area apart from overfishing. These include habitat destruction especially of coastal habitats such as mangroves and other wetlands including estuaries, resulting in the loss of safe nursery areas for spawning and juveniles, pollution from municipal and industrial sources due to large-scale coastal development, construction of aquaculture farms in coastal areas and so on.

In India, according to CMFRI Census (2010), there are 3288 marine fishing villages and 1511 marine fish landing Centres in the maritime States and UTs. The total marine fisher population was about 4 million comprising 864,550 families. About 38% of the marine fishers were engaged in active fishing with 85% of them having full



time engagement. About 63.6% of the fishers were engaged in fishing and allied activities.

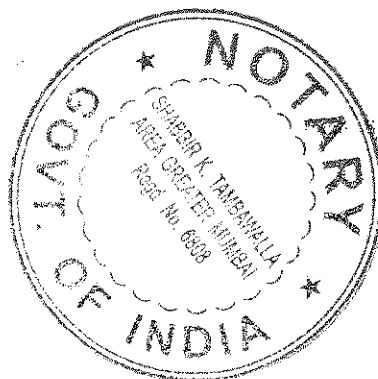
1.1.4 Assessment of Coastal and Marine Ecosystem Goods and Services

Coastal regions provide most of the identified ecosystem services and account for highest value on per hectare basis for any ecosystem. The goods from the coastal ecosystems generate provisioning services which include food, salts, minerals and oil resources, construction materials and biodiversity including genetic stock that has potential for various biotechnological and pharmaceutical applications. There are 13 major ports and 176 non-major ports along the India's 7500 km (including island territories). India is the sixth largest producer of fish with an annual potential yield of 3.92 million tons.

An estimated 200,000 traditional crafts carryout traditional fishing and about 35,000 mechanized fishing boats are enhancing their fishing capacity annually. Employment generation due to coastal ecosystem services may be categorized under heads such as marine fisheries, backwater fisheries, seaweed collection, salt production, coastal aquaculture/shrimp production and coastal tourism. Ecosystem based coastal and marine tourism provides huge employment opportunities, especially to the local communities. If the ESAs are managed properly and adequate tourism facilities provided, the tourism sector in this area can have tremendous employment opportunities.

Economic Evaluation of the Coast

- The total value of marine fisheries is estimated to be Rs. 32,844 crore for the year 2012-2013.
- The value of minerals found along the coastal/sandy beaches of the country is estimated to be around Rs. 1390 crore per year, based on annual extraction.
- The value of regulating function of mangroves and seagrass as sequesters of carbon has been estimated to be more than Rs. 600 crore per annum based on carbon values used in a previous MoEF&CC funded study on valuation of ecosystem services for forests in India.
- Dense and very dense mangroves account for 2368 km² (58% of the total mangroves cover), sparse mangroves account for 1514 km² (33%) and degraded mangroves account for 483 km² (10%).



1.1.5 Best Practices of Conservation management

Globally, diverse management practices are being followed for the conservation of coastal/ marine ecosystems. The management regime recommended by the International Union for Conservation of Nature (IUCN) is taken as one of the best practices followed internationally. The IUCN model of conservation is based on public policy and increasing attempts are made to include local communities in the conservation agenda. IUCN's prime objective is to foster a balanced, holistic and integrated approach for managing coastal ecosystems in order to meet long-term ecological, economic and social interests³.

IUCN Asia's Coastal and Marine Programme supports sound policy and integrated coastal management interventions as a balanced response to coastal ecosystem issues and to help meet the long-term needs of the users of the coast. Knowledge management and capacity development are key focus areas, aimed at strengthening both marine and coastal management. The following are the main objectives:

- Achieve sustainable development of coastal and marine area
- Reduce vulnerability to natural hazards
- Maintain essential ecological processes, life support systems and biological diversity
- Strengthen institutional and governance capacity for Integrated Coastal Management
- Build sustainable financing opportunities for coastal management
- Capture and disseminate lessons in best practice, both locally and globally

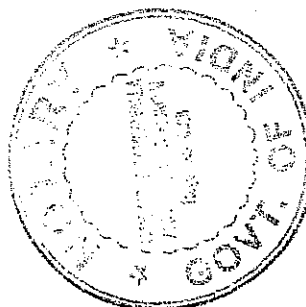
IUCN's core principle asserts that thriving coastal ecosystems are fundamental for sustaining healthy livelihoods and act as a regional link in strengthening coastal management practices at the local, national and trans-boundary scales.

³Extracted from: <http://www.iucn.org/about/union/secretaria/offices/asia/elq/mcp/> on 16th January 2015

1.1.6 The Coastal Regulation Zone 2011 Notification – Legislations and policy guidelines to protect the coastal environment

To regulate the developmental activities and to protect the fragile coastal environment, India has implemented coastal regulatory frameworks: Coastal Regulation Zone (CRZ) Notification, 2011 and Island Protection Zone (IPZ) Notification, 2011. The background to the issue of CRZ 2011 and IPZ 2011 is as follows:

- a) To protect the Indian coastline, a directive was issued in 1981 from the Central Government advising all coastal States/UTs to take necessary precautions to keep the beaches clean and regulate developmental activities.
- b) The CRZ Notification, 1991 was issued under Environment (Protection) Act [E(P)A], 1986 to regulate all development activities in coastal areas.
- c) This Notification prohibited and regulated certain activities within 500 m from the HTL on the landward side and within 100–150 m from the HTL on the landward side along water bodies influenced by tidal activities such as creeks and estuaries. The CRZ area was classified as CRZ-I, CRZ-II, CRZ-III and CRZ-IV. This Notification of 1991 was amended nearly 25 times.
- d) Keeping in view the issues raised by coastal State/ UT Governments and stakeholders, several expert committees were constituted by the Central Government to examine these issues.
- e) The Ministry constituted a Committee in July 2004 under the Chairmanship of Prof. M. S. Swaminathan to review various reports on CRZ, international practices and suggest the scientific principles for an Integrated Coastal Zone Management (ICZM) policy best suited for the country – to define and enlist various coastal and marine resources and recommend methodology for their identification and the extent of safeguards required for the conservation and protection and to review the CRZ Notification, 1991. The Committee submitted its report in February 2005.
- f) A draft Coastal Management Zone [CMZ] Notification, 2008 was issued, which was later withdrawn based on the suggestions and objections raised by the stakeholders.



- g) The Ministry constituted a Committee in June 2009 under the Chairmanship of Prof. M. S. Swaminathan to consider all the coastal issues and suggest the policy and legal framework for ICZM. The Committee submitted its report titled "Final Frontier" in July 2009. Based on the recommendations made in the report the Ministry issued two Notifications superseding the CRZ Notification, 1991: (i) CRZ Notification, 2011 and (ii) IPZ Notification, 2011.
- h) These two Notifications are being implemented and are monitored by the National Coastal Zone Management Authority (NCZMA) and State/UT level Coastal Zone Management Authorities (SCZMAs). The NCZMA and 13 SCZMAs have been notified under the E(P)A 1986.

1.1.7 ICZM Project implemented by MoEF&CC

To implement the National Environment Policy 2006, recommendations of "Final Frontier 2009", Public Accounts Committee (2009-2010) [PAC], and CRZ Notification, 2011 and IPZ Notification, 2011 regulatory framework with public participation, the Government of India (GoI) embarked upon the implementation of the Integrated Coastal Zone Management (ICZM) project. This project was approved by the Expenditure Finance Committee (EFC) and Cabinet Committee on Economic Affairs (CCEA) during 2010. The project is being taken up on a pilot scale with the assistance of the World Bank in the identified stretches in the States of Gujarat, Odisha and West Bengal. To implement this project, the MoEF&CC has set up the Society of Integrated Coastal Management (SICOM) located in New Delhi.

The objectives of the ICZM Project are as follows:

- a) To develop the capacity and institutions to implement the CRZ Notification, 2011 and achieve the objectives of integrated and sustainable coastal management as per the National Environmental Policy, 2006.
- b) To address the issues relating to climate change, which have a major implication on the coastal areas and coastal communities especially with respect to sea level rise (SLR) and increased frequency of cyclones and storm surges. Under the programme, an exercise of hazard mapping will be carried out to protect the coastal people and infrastructure located in the coastal regions.



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- c) To conserve and protect the fragile coastal ecosystems such as the mangroves, brackish water wetlands and coral reefs, including addressing the pollution of coastal waters and livelihood improvement of local communities.

1.1.8 Society for Integrated Coastal Management(SICOM)

SICOM was established under the Society Registration Act, 1986 by the MoEF&CC for implementing the World Bank Assisted ICZM Project in the country. SICOM is working as a National Project Management Unit for the project. In implementing the ICZM project, SICOM is coordinating with various Ministries, coastal State and UT Governments and SPMUs/Project Executing Agencies (PEAs) of the ICZM project. SICOM is also taking lead in designing the Phase II of the ICZM project which will include other coastal States and UTs. The major role and responsibilities of SICOM are as follows:

- (a) Act as a fulcrum between MoEF&CC, State Governments, NCSCM, other Ministries, research and academic bodies, NGOs and people.
- (b) To play a leading role in assisting MoEF&CC in implementing the CRZ and IPZ Notifications and preparing the CZMPs while coordinating with Sol, NCSCM and CZMAs.
- (c) To guide in the preparation of ICZMP factoring in the hazard line for identified areas in coordination with the State Governments.
- (d) To formulate Phase-II of the ICZM project wherein the other States/UTs would be included as approved in the EFC. Meanwhile, all the State/UT Governments which were not included in the Phase-I may be requested to form the SPMUs so that their capacity development process begins to help them in formulation of plan and their implementation.
- (e) To explore various possibilities of exchange programme in terms of visits, information exchange etc., with other countries especially in South East Asia, where similar environmental and demographic pressures exist.
- (f) To put in place monitoring systems for the three SPMUs independently to assess the implementation of the project.
- (g) To leverage NCSCM in ensuring preparation of appropriate ICZM Plan for identified areas, with NCSCM providing all the necessary technical inputs so

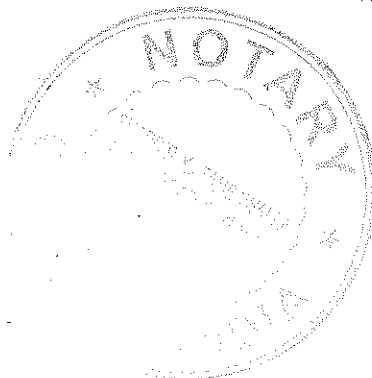
that the concerned Government can undertake an ecologically compatible and sustainable development of the area.

- (h) To prepare a comprehensive capacity development plan for all the stakeholders like Ministry of Shipping, Tourism, Petroleum, Agriculture, Fisheries etc., and execute them.
- (i) SICOM will also play a leading role with NCSCM in identifying the areas which have been destroyed/undergone serious damages due to various human interventions and take up steps through NCSCM and State Government to take up restoration and management of such sites.
- (j) To immediately create a web platform and link with similar facilities with coastal States/UTs, SPMUs for exchange of ideas, best practices, knowledge etc.

To accomplish the above scope of work and to take up the work assigned under the proposed notification, SICOM may build adequate capacity with skilled manpower. The role of SICOM is crucial as it would play a leading role in coordinating with as indicated at 1.1.8(a) to (j) above. Further, SICOM will be instrumental in facilitating capacity building and institutional strengthening in the area of coastal zone management in the country.

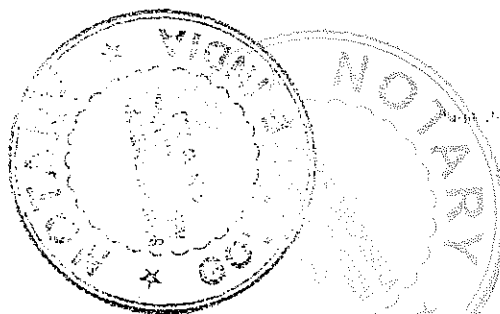
1.1.9 National Centre for Sustainable Coastal Management

NCSCM was established by SICOM under the MoEF&CC in 2010 with the vision of promoting sustainable coasts through increased partnerships, conservation practices, scientific research and knowledge management for the benefit of current and future generations and assist MoEF&CC and States in implementing the provisions of CRZ Notification. NCSCM has established six multi-disciplinary Divisions in the Centre to undertake research and development in the area of CZM practice through the development and provision of cutting-edge science, knowledge and networking with relevant national and international institutes of repute. These are being realized through inter- and trans-disciplinary scientific research, advisory capacities and by imparting knowledge into a seamless, holistic decision support system for effective implementation of CRZ Notification.



Fourteen institutions have formed a consortium with NCSCM, with Anna University Chennai as the Hub. It would guide and coordinate the implementation of CZM approaches leading to enhanced conservation of coastal resources and sustainable development along the coast of India through applied and futuristic research. The Centre would develop a central repository of information and knowledge on CZM practices in India and elsewhere. The outputs from research at NCSCM would aid in the better protection, conservation and management of the coast. The following are the specific roles and responsibilities of NCSCM:

1. Preparation of HTL / LTL for the entire coast using ortho-imageries
2. Preparation of CRZ I boundary maps (including ESAs, geomorphologically important zones and areas or structures of archaeological importance and value sites) in 1: 10,000 scale by acquiring the ecosystem maps and boundaries of marine protected areas from national agencies identified by the Ministry.
3. Validation of cadastral maps prepared by State/ UT Governments
4. Preparation of State of Coast Report, which would include assessment of the extent of change in coastal ecosystems
5. Development of a comprehensive digital coastal database to help in policy decisions
6. Monitoring mechanism: Pre- and post-monitoring of major coastal projects as directed by MoEF&CC
7. Develop guidelines to aid in effective implementation of the provisions of the CRZ and IPZ notifications
8. Develop guidelines for ICZM projects for the purpose of conservation of coastal areas and to involve local communities in decision making
9. Assessment of carbon sequestration potentials of major coastal ecosystems
10. Building capacity at all levels in coastal management along with SICOM



1.1.10 Recent Initiatives in Coastal Management by MoEF&CC

a. Use of space application and IT technology for coastal mangement

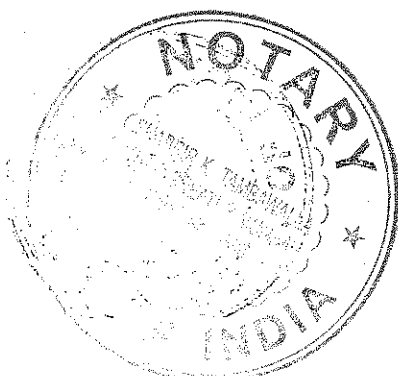
Since the implementation of the CRZ Notification, 1991, MoEF&CC has been relying upon satellite imagery for mapping vital coastal resources. The satellite imagery and data obtained by aerial photography undertaken by Sol shall be used for preparing CZMP, which would include HTL, LTL, land use (Fig. 2), demarcation of ESA etc. Further, these technologies can be used extensively for estimation of primary productivity, ocean resources and fishery resources, pollution monitoring, detecting algal blooms and for oil spill mitigation.



Fig. 2: Decadal Changes in land use pattern

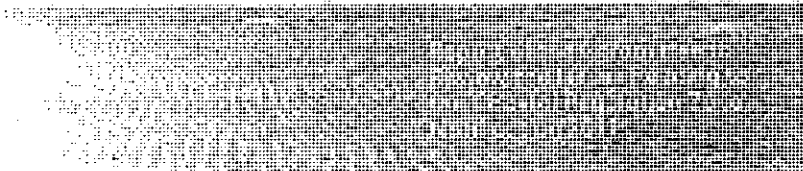
b. National Shoreline Change Assessment

Based on directions by MoEF&CC, NCSCM undertook the study of shoreline change for the entire coast of India in order to identify coastal areas where significant erosion and accretion have occurred and continue to occur, quantify the rates of erosion/accretion, analyze the impacts of coastal structures on the shoreline, create a national database for coastal erosion and accretion with 1972 as the base year and contribute to an understanding and prediction of future shoreline positions. Earlier, shoreline mapping and analysis were carried out by a manual cartographic techniques, which since early 1980s has been changed to a highly sophisticated geographic information system (GIS). A GIS database has been created with layers such as base shoreline, historical shorelines, erosion rates and critical erosion maps by State for the entire coastline of mainland India (Fig.3).

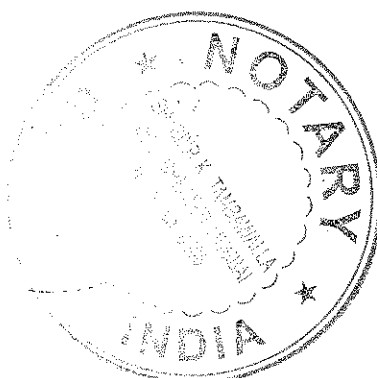


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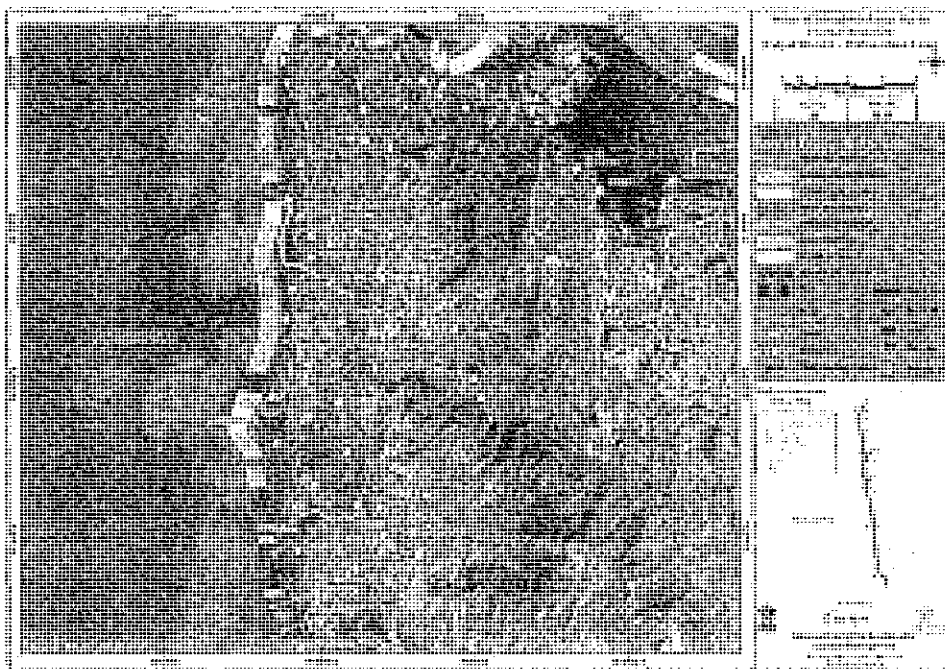
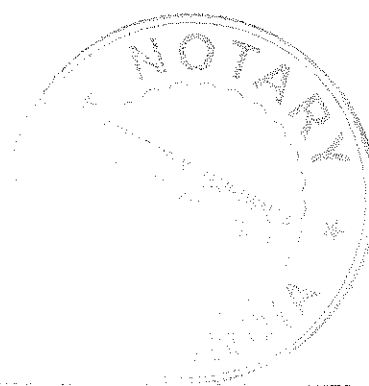


Fig. 3: Shoreline change along the coast of Maharashtra

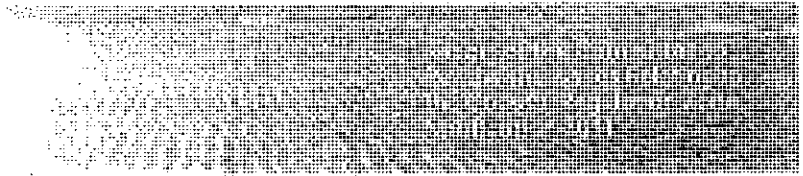
c. Hazard Line mapping

As per the CRZ Notification, 2011 "the 'hazard line' denotes the line demarcated by MoEFF&CC through NCSCM, taking into account water level fluctuations, sea level rise (SLR) and shoreline changes". SICOM is implementing the hazard line (Hazard Line) mapping project through Sol. In this regard, MoU has been entered between MoS&T and MoEF&CC on 10 May 2010. The Hazard Line mapping involves:

- (i) Survey and preparation of digital terrain model of 0.5 m contour interval for the entire mainland coast based on aerial photography and photogrammetry;
- (ii) collection of historical tide gauge data and analyses to determine flood levels;
- (iii) analyses of maps and satellite imagery to determine historic erosion line;
- (iv) preparation of Hazard Line based on erosion and flood line;



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(v) transfer of the Hazard Line to topographic maps and to the ground for implementation of CRZ Notification, 2011.

d. HTL demarcation using ortho photos

Based on directions from MoEF&CC and SICOM, NCSCM is in the process of delineating the HTL as per the requirement of the CRZ Notification using ortho photos available at Sol.

e. Mapping of ESAs

ESAs, which are part of CRZ Notification such as mangroves, coral reefs, sand dunes, turtle nesting ground/horseshoe crab habitats/nesting grounds of birds and sea grass beds, are being identified, delineated and mapped by NCSCM.

f. Information technology and awareness in all sectors

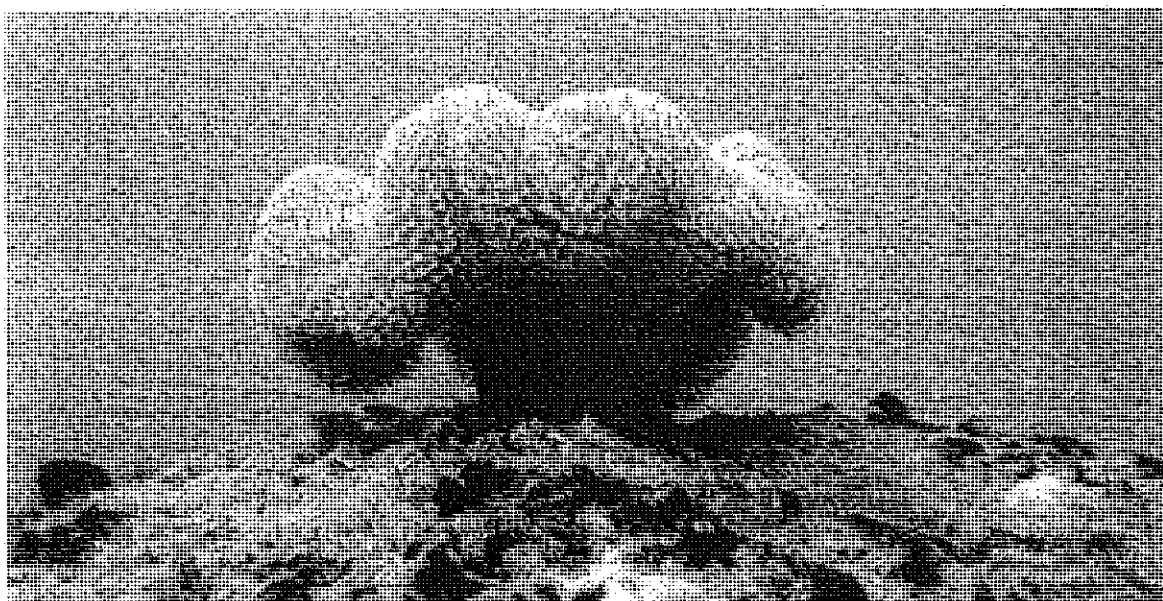
NCSCM is developing information and technological web map application tools that aid as decision support systems for policy makers. Such tools would also help communities address coastal issues and would eventually become one of the most-used resources in the coastal management community.



1.2 Approach and Methodology adopted by the Committee to address the ToRs

In view of the several representations received from the Governments of various coastal States/UTs, especially from the Governments of Karnataka, Kerala and Maharashtra requesting for amending the CRZ 2011, the Ministry constituted Committee to review the CRZ Notification, 2011 (Ref: No.19-112/2013-IA-III, dated 17 June 2014).

After constitution of the Committee, three meetings were held with the officials of the Governments of Maharashtra, Karnataka and Kerala on 8 July 2014, 21 August 2014 and 22 August 2014, respectively. Subsequently other States and UTs requested the Committee to present their issues with respect to the implementation of CRZ, 2011. Accordingly, a meeting was held with all coastal States and UTs on 27 October 2014 in MoES, Delhi. Copies of the presentation made and representations received are given in Volumes II and III of this report. Based on the issues raised by the respective coastal State/UT Governments and taking into account the provisions of the CRZ Notification, 2011 including the recent initiatives taken by the MoEF&CC towards coastal management, the Committee has addressed the ToRs listed in the Office Order and made its recommendations.



Chapter 2

Issues and Representations made by the Coastal State/UT Governments as per ToRs

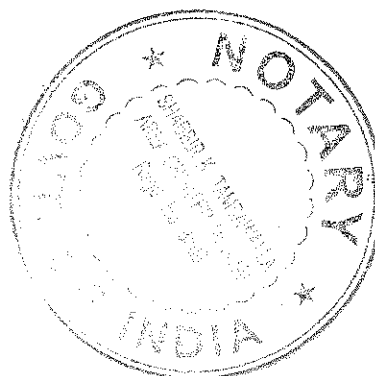
ToR-1(a) : "to examine issues relating to Maharashtra raised by the State Government vide letters dated 27.08.2013 and 23.12.2013".

TOR-1(b) : "to examine issues relating to Karnataka raised by the State Government vide letters dated 16.08.2013, 28.02.2014 and 18.02.2014".

TOR-1(c) : "to examine issues relating to Kerala raised by the State Government vide letters dated 10.02.2014".

(TOR-1(d) : to examine errors/inconsistencies in CRZ Notifications, 2011 and procedural simplification)

ToR-2 : The Committee may interact with the State Government, if necessary, and address any other issues raised by the State Government during their interaction with the Committee.



10/12/13

A. Specific issues indicated by the State/UT Governments

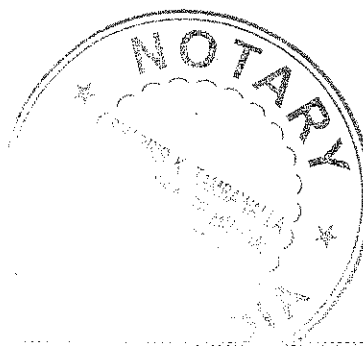
2.1 Maharashtra [ToR-1(a)]

Based on the above-mentioned ToR 1(a), the Committee visited Mumbai on 8 July 2014 and had discussions with the officials of various departments of Government of Maharashtra (GoM). The details of the issues raised and the suggestions/requests made by the various departments/agencies of GoM such as CIDCO, BMC, Slum Rehabilitation Authority (SRA) and State Tourism Department, are detailed in the following sections. The copies of the presentations along with the communications made to MoEF&CC vide the above-mentioned letters indicated in the ToR are in Volume II of this report:

2.1.1 Loss of buildable land due to demarcation of the HTL based on CRZ Notification, 2011

(a) Most of the lands in Navi Mumbai were below low tide level when it was acquired in 1971. Prior to acquisition, these coastal lands were under agriculture and salt pans. For undertaking agriculture, bunds were constructed to prevent the ingress of tidal waters. The bunds were constructed based on Dutch method. The development of Navi Mumbai was taken up in a phased manner by acquisition of land by CIDCO. The HTL being demarcated based on CRZ Notification, 2011, indicates that the total land loss could be around 1240 hectares of developable area. Further, additional land is to be provided to project affected people and R&R-related activities including providing 260 hectare of land for the development of Navi Mumbai Airport.

(b) The reasons for ingress of creek water into the land area were examined by the Committee in detail along with graphic presentations made by CIDCO. Over a period of time due to non-maintenance of the bunds and breaking of the bunds by locals for shallow water fishing, the seawater has ingressed into the land. Due to the salinity ingress, the HTL has further shifted landwards. In several of such areas



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where salinity ingression has taken place, mangroves have grown. On account of the shifting of the HTL on the landward side, it was indicated that approximately 744 hectares of net saleable land which is 60% of the total 1240 hectares that CIDCO would lose is estimated around Rs.37,200 crore (with an average price of Rs. 50,000/m²). Further, the land being allotted to the affected people due to the project, under the 'land for land' scheme would be coming under CRZ-I and CRZ-II. The people who have been affected by airport construction need to be located close to the creek as they are fishermen communities. On account of all these activities, CIDCO would lose further developable land area. In this regard, it was requested that the HTL as of 1991 should be retained.

(c) The Hon'ble High Court (HC) of Bombay in its Order dated 6 October 2005 has directed to observe total freeze on destruction of mangroves and to maintain an NDZ of 50 m width around any mangrove. Further, as per the above-mentioned Orders, no steps can be taken that would stop the ingress of saline water into areas with mangroves. Hence, CIDCO has stopped repairing the bunds and desilting of the ponds. The GoM has requested that the HTL demarcation as per CRZ Notification, 1991 should be allowed to continue.

(d) For the purpose of maintenance and desilting of Dronagiri holding ponds, CIDCO has again approached Hon'ble HC of Bombay. The Hon'ble HC directed MCZMA and MoEF&CC to decide whether holding ponds and channels fall in CRZ. It was indicated that MCZMA has submitted a report to MoEF&CC and MoEF&CC vide their letter dated 31 October 2013 have requested CIDCO to provide for five times compensatory mangrove afforestation in lieu of the mangroves along the holding ponds. The contention of the CIDCO is that none of the holding ponds and channels in Navi Mumbai falls in CRZ-I as they are not part of the creek. Some of the mangroves fall partly in CRZ-II as they are along the artificially created water bodies excavated out of the firm land. It was indicated that because the ponds were not desilted the water holding capacity in the ponds have decreased, thereby causing floods in the vicinity during monsoons.

2.1.2 Issues relating to slum redevelopment by SRA and redevelopment of dilapidated, cessed and unsafe building

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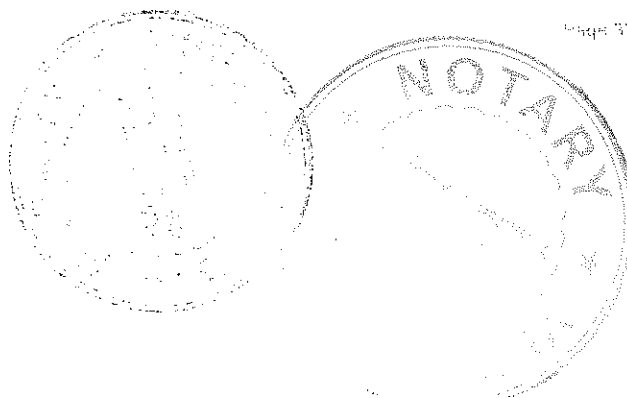
(a) The SRA Scheme is being implemented by GoM. It was indicated that large pockets of slums have settled along the seashore. About 291 slum pockets are present in CRZ-II, which houses 3.5 lakh huts with 15 lakh people living in such slums. It was indicated that in the CRZ-II areas the eligible Floor Space Index (FSI) within city is 1.67 while in suburbs it is 1.25 as against 3 or 4 FSI in the non-CRZ areas. The provisions of CRZ Notification, 2011 pertaining to slum rehabilitation scheme were explained in detail and the hardships faced by the slum dwellers and the environmental and social issues of slums explained.

(b) It was informed that as per the Notification, 2011, GoM had sought proposals on joint venture basis through wide publication in newspapers. It was also informed that not a single valid proposal was received even after repeated advertisements. On account of the provision in the CRZ Notification, 2011, the slum redevelopment in CRZ-II areas are languishing as the scheme indicated under the CRZ Notification, 2011 is not economically viable.

(c) The schemes with regard to the slum redevelopment in CRZ-II areas should be allowed to develop with current permissible FSI as prevailing outside CRZ. Further, no joint venture with Government organization should be made mandatory. The ratio of 51:49, Government:private party, as indicated in the CRZ Notification, 2011 be waived off and permitted to be developed by the proponent.

2.1.3 Municipal Corporation of Greater Mumbai on CRZ issues relating to redevelopment of dilapidated, cessed and unsafe building

(a) It was highlighted that the datum line of redevelopment of dilapidated, cessed and unsafe buildings is frozen as on 6 January 2011 by MoEF&CC vide corrigendum dated 29 March 2011 to the CRZ Notification, 2011. In this regard, it was indicated that declaration of dilapidated buildings is a continuous process based on ageing of structures. GoM declares buildings based on criteria as dilapidated. It was highlighted that the buildings which are now declared safe could become dilapidated in future. Hence, the Notification should provide for such dynamic situations. For undertaking redevelopment of dilapidated structures, the FSI/Floor Area Ratio (FAR) should not be frozen but enabling provision should be inserted in the notification for



providing FSI and FAR on that particular date on which the redevelopment is accorded permission. It was suggested that it would be desirable to specifically incorporate permissibility of reconstruction/redevelopment in accordance with Town and Country Planning Regulations applicable as on the date on which such reconstruction is approved by competent authority.

(b) It was requested that the corrigendum may be modified as "*The Floor Space Index or Floor Area Ratio for such redevelopment schemes shall be in accordance with the Town and Country Planning Regulations prevailing as on the date on which the project is granted approval by the competent authority.*"

2.1.4 Issues relating to Koliwadās and Goathans of Maharashtra

(a) It was also highlighted that in the CRZ Notification, 2011, Koliwadās and Goathans are classified as CRZ-III. It was indicated that presently there are 23 Goathans and 16 Koliwadās in Mumbai affected by CRZ. Declaring these Koliwadās and Goathans as CRZ-III would severely limit the development thereby defeating the objective of ensuring livelihood security to the fisher and other local communities in a sustainable manner. Further, it was indicated that there is no clarity in respect of availability of Town and Country Planning Regulations for redevelopment/reconsideration of dwelling units in Koliwadās/Goathans. In this regard, BMC requested that instead of CRZ-III these Koliwadās and Goathans be classified as CRZ-II and current DCR to be made applicable to facilitate development. Accordingly, Clause (g) of Sr. No.(8)(V)(III) for the CRZ Notification, 2011 be modified.

2.1.5 Issues relating to the development of coastal road project by MCGM

(a) It was indicated in the presentation that in the present scenario where the majority of the public use north-south local train, there has been several incidents of accidents. It was indicated that due to increase in population and large number of commuters taking the local train the accident rate has increased to around 2000

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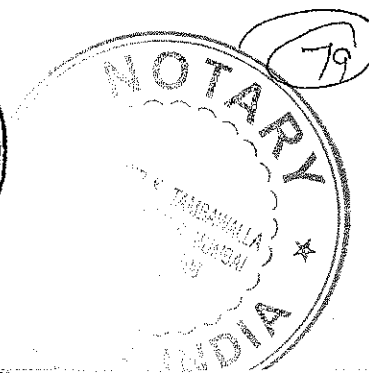
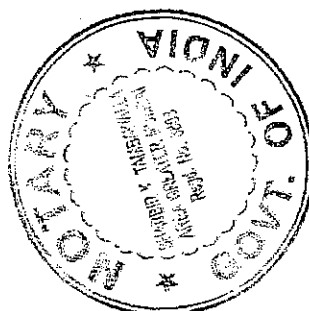
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deaths in a year. In this regard, the GoM proposes to construct 36 km long coastal road from Colaba up to Malad-Kandivali Link Road. The proposed road would be 4+4 access controlled freeway. For the proposed road, there shall be no land acquisition and no R&R. The proposed road would protect the beaches and fishermen's villages without obstructing the natural course of seawater. It was also clarified that for the construction of the road project, no significant damage would be caused to the mangroves or beaches. The road will be on stilts and in places through the tunnels. For the road project, approximately 9.8 km reclamation is proposed in the sea with a total area of 160 hectares and about 8 km reclamation in the mangrove areas. It was also indicated that in the mangrove stretch of 3.45 km of the road would be constructed on stilts and wherever mangrove destruction would take place re-plantation of mangroves will be taken up with the Forests Department. It was indicated that by construction of the road there would be significant reduction of traffic congestion on the existing roads and reduction in travel time.

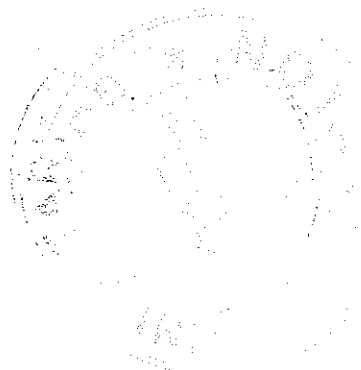
(b) To develop the above-mentioned road project, MCGM requested for amendment of para 3(iv) of the required in CRZ Notification, 2011 providing for "land reclamation for construction of coastal roads". In the reclaimed area, MCGM proposes to develop promenades, gardens and green spaces. It was indicated that no real estate development for commercial use shall be permitted and no relaxation of CRZ regulation on the landward side of the proposed road shall be sought.

2.1.6 With regard to new airport CIDCO vide their letter No. CIDCO/MD/2013/247, dated 23 December 2013 have sought for an in-principle approval for a proposal for development of islands airport in Thane creek, Navi Mumbai. As per the letter, the Navi Mumbai International Airport (NMIA) has obtained all necessary clearances including permission from the Hon'ble HC for removal of mangroves. The project involves 671 ha of private land and rehabilitation of 3500 families. The 3500 people affected by this project need to be rehabilitated. This is a serious issue that CIDCO is facing including escalating cost of airport development. In this regard, CIDCO intends to search for an alternative site for airport. CIDCO has proposed a development of an airport in an island in Thane creek which is west of existing NMIA site. As per the letter this islands airport in Thane creek would not require acquisition of private land and rehabilitation of any population. In the letter, CIDCO has



(a) A proposal has been forwarded to the MoEF&CC through the Ministry of Tourism (MoT), GoI by Department of Tourism (DoT), GoKA with reference to the report on CRZ submitted earlier by the Expert Committee headed by Prof. M. S. Swaminathan. The proposal sought amendments to the CRZ Notification, 2011 in line with the special provisions provided for the states of Kerala, Maharashtra and Goa and addressing various issues faced by local agencies in tourism development. Under the 12th Five-year plan MoT, GoI planned development of Tourist Circuits across India. DoT, GoKA for the year 2013-2014 had proposed development of Mega Coastal Tourism Circuit as a measure to boost coastal tourism in the State. The development comprises basic tourist amenities to be provided to the tourists in 23 beaches along the coast of Karnataka. To promote and enhance the tourism experience of tourists, DoT GoKA had submitted a proposal to the MoEF&CC seeking relaxation of CRZ norms by way of "Special Tourism Zones".

(b) The State has identified 41 beaches and 11 islands with good tourism potential. In Karnataka the coastal stretches very narrow because of the Western Ghats. In certain stretches the coastal areas are less than 100mts. On the average the coastal stretch is around 300mts. The national highway, and in some cases state highway, pass through this narrow stretch of CRZ, even within NDZ. The State Government of Karnataka requested for special relaxation to permit certain constructions of temporary nature on the seaward side of such road when the roads fall in NDZ for temporary tourism related activities. On the landward side of the road the tourism development as indicated in the CRZ Notification could be taken up subject to environmental conditions.



2.3 Kerala [ToR-1(c)]

The Committee visited Thiruvananthapuram on 22 August 2014 and had discussions with the officials of GoK represented by Chief Secretary, GoK. The Chief Minister, GoK also met the Committee and he explained the hardships faced by the Government with regard to CRZ. The issues raised by GoK are detailed in the following sections and the copy of the presentations is provided in Volume III of this Report.

2.3.1 Issues relating to fishermen

(a) Fishermen/traditional communities living by the sea and by the tidally influenced water bodies where CRZ-III is applicable currently are unable to construct houses/toilet/stores (for safe keeping of their implements). Being highly essential to live by the ecosystem for earning their livelihood, the above-mentioned activities need to be permitted in the NDZ of CRZ-III.

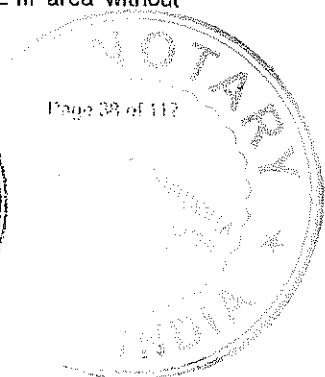
(b) The space for constructing dwelling units in the CRZ area is limited. Hence, family members are not in a position to construct dwelling units in the land rightfully received as family right/share in the NDZs of CRZ-III. Moreover, in case of a local/fishermen community who buy a piece of land within the CRZ area are unable to build a house as per the present provisions. These are highly essential requirements for the traditional/fishermen community, the right for the same need to be reinstated in CRZ-II and CRZ-III area.

(c) Kerala being criss-crossed with numerous inland water bodies under the purview of CRZ Notification, 2011 the CRZ area landward of HTL up to 100 m creates the same hurdle as above for traditional communities. The construction of dwelling units needs to be permitted on the banks of paddy fields/pokkali fields/aqua farms for their sustenance.

(d) Considering the stress due to population on the banks of the tidally affected water bodies (majority of the area having density of population $>2000/\text{km}^2$), the NDZ of CRZ-III along the banks of inland water bodies may be reduced to 50 m from HTL (landward) from the present stipulation of 100 m.

(e) The provision to permit reconstruction in the NDZ of CRZ-III area without

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increase in existing plinth area, existing FSI and existing density may be modified as *permit reconstruction in the NDZ of CRZ-III without increase in existing plinth area or up to 100 m² in case of dwelling units of traditional community*. This would help the fishermen/local community to reconstruct small huts and dwelling units into a better place to live.

(f) Presently, construction in backwater islands is possible only beyond 50 m from the HTL. For the traditional/fishermen community, this may be amended to the extent that "residential construction can be permitted landward of existing authorized structures and approved roads".

(g) Construction of dwelling units of coastal community including fisher folk may be permitted leaving 50 m from HTL of sea except along the highly eroding sea coast and 10m from HTL of backwater or landward existing authorized structures or approved road whichever is less in CRZ-III.

(h) Considering the specific coastal settings of the State having numerous barrier beaches, spits and barrier islands with width less than 1 km separating the sea from the backwater the NDZ may be reduced to 20 m in those areas for traditional coastal communities including fisher folk for the construction of dwelling units and other livelihood essential facilities.

(i) Permission for the construction of 3-4 floor housing buildings under Government projects such as Rajiv Stum Development Project in CRZ-III area after leaving 100 m from HTL of sea. This is required for providing better dwelling facility for the fisherman community.

2.3.2 Tourism issues

(a) Tourism in Kerala has become a significant contributor to the sustainable development of the State. Tourism contributes about 10% to the GDP of the State. Tourism creates employment opportunity to more than 25 lakh individuals in the State. Tourism sector can further grow only with the active support of the Governments, both Central and the State, with favorable policies and creating enabling environment for attracting investment in tourism infrastructure. Even though CRZ Notification helps in conserving the beaches and tidal-influenced water bodies



in a big way, it imposes limitations to tourism growth in the State, which heavily depends on the beaches and backwaters as its major tourism destinations.

(b) The Notification restricts the development of tourism infrastructure at the most potential tourism areas of the state such as beaches, backwaters and tidal-influenced water bodies. Hence, there is an urgent need for the reconsideration of the CRZ norms in the tourism potential areas in Kerala to facilitate controlled developments in tourism in a sustainable and responsible manner in the identified beach stretches in the State of Kerala. It is also essential to reconsider and modify the CRZ norms related to backwaters and tidal-influenced water bodies to enable environmental friendly tourism investments, as backwaters are the back bone of Kerala, creating large opportunity for employment and livelihood of the local population.

(c) Considerable number of tourism destinations that emerged in the State is in rural coastal areas and falls under CRZ-III, and hence no development is possible within 200 m of NDZ. This makes the destinations unattractive to the investors as well as the tourists. The NDZ for the tidal-influenced area for 100 m makes backwater-related tourism too restrictive and is unaffordable to the State as backwater tourism is the back bone of Kerala tourism industry.

(f) GoK suggested the following modifications to the CRZ rules in the case of Kerala state:-

(i) As per Section 8 (i) II of CRZ Notification, 2011, in CRZ-II, buildings shall be permitted on the landward side of the existing road, or on the landward side of the existing authorized structures. But as per Annexure III of the notification which describes the guidelines for the development of beach resorts for hotels, it is mentioned that the guidelines are for "designated areas of CRZ-III and CRZ-II". This imposes huge restrictions for tourism developments in CRZ-II area and is contradicting the statements in Section 8(i) II and III. In fact, Annexure III is referred only in Section 8(i) III which is meant for CRZ-III.

(ii) The NDZ for the beach stretches identified in rural areas falling in CRZ-III may be brought down to 100m instead of 200m. The same guidelines applicable as per Annexure III of the CRZ Notification, 2011 may be made

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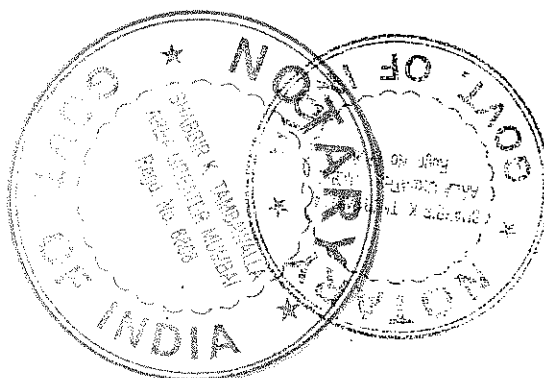


applicable at the 100–500 m area from HTL. It may be noted that as per 8 (i) III (ii) of the CRZ Notification, 2011, construction of residential buildings for fisher folk is permitted from 100 m to 200 m of the NDZ and the proposal is only to extend this provision to tourism development with restrictive guidelines.

- (iii) For beaches falling in the urban area, the prevailing CRZ-II norms has been proposed to continue by removing CRZ-II from the applicability of the provisions in Annexure III regulations of CRZ Notification, 2011. It may be noted that the above provision is not available in CRZ Notification, 1991 and is included as a new provision in CRZ Notification, 2011. There is anomaly in this provision as the restriction is imposed only to tourism development and not to any kind of other uses such as residential or commercial developments.
- (iv) The backwaters of Kerala and houseboats are considered to be very important for the tourism industry of Kerala and contribute significantly to the local employment opportunity and foreign exchange earnings. The banks of these backwaters and river mouths are enchanting picnic spots. Stretched over a total expanse of 1500 km, the backwaters have a network of 44 rivers, lagoons and lakes from north to south. Alapuzha, Kumarakom and Ashtamudi are internationally known backwater destinations with world-class tourist facilities. Malabar backwaters in Kannur and Kasargod districts are developing fast and are emerging areas utilizing backwater potential for tourism investments. The 100 m NDZ for backwaters and tidal-influenced water bodies are imposing huge limitation in tourism investments. The 100 m wide NDZ is not viable to any investor. It may be noted that after the introduction of CRZ Notification, 2011 in 1991, 50 m NDZ was applicable for most of the period which is now made 100 m in CRZ Notification, 2011. Also the regulation applicable to backwater islands as per CRZ Notification, 2011 is only 50 m NDZ.

2.3.3 Conservation of backwaters

The inclusion of Vembanad as a CVCA and the preparation of IMP for Vembanad



are major issues still remaining unresolved due to lack of clear directions and guidelines from MoEF&CC. This is a major impediment in the protection of the Vembanad ecosystem and sustainable development of the region. Application of two environmental laws to the same area is another matter of concern. The Ashtamudi and Vembanad backwaters are Ramasar sites and hence the wetland (Conservation and Management) Rules 2010 are applicable, while the same areas are also under the purview of CRZ.

2.4 Suggestions and comments made by other States/UTS including general issues [ToR-1(e)]

The Committee interacted with officials of the other coastal States/UTs, namely Odisha, Andhra Pradesh, Tamil Nadu, Puducherry, Goa, Daman and Diu, Gujarat, West Bengal. Most of the issues indicated by the above States/UTs were general in nature. All these issues are listed below:-

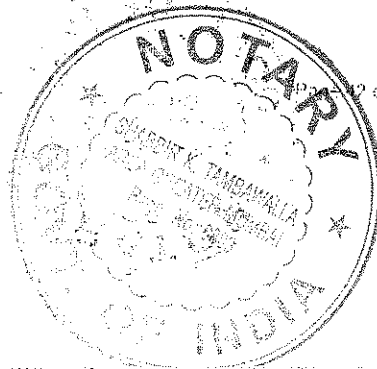
2.4.1 HTL demarcation and CZMP preparation

- (a) It was indicated by the States/UTs that for effective implementation, physical demarcation of HTL on ground should be expedited.
- (b) Several States/UTs indicated that they have expertise and institutional mechanism for HTL demarcation and CZMP preparation. In this regard the States/UTs sought for authorizing the institutions in each of the States/UTs for undertaking HTL and CZMP preparation.
- (c) It was indicated that the CRZ boundary along tidal influenced water bodies based on salinity ingress is highly confusing and in several cases not practical due to various hydro dynamic and geomorphological features. The States/UTS requested for doing away with this kind of parameter for determining CRZ boundary.

2.4.2 Monitoring and enforcement

- (a) It was indicated that the provisions under E(P) Act, 1986 is not effective for dealing with violations.

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- (b) Several States/UTs sought for quicker redressal mechanisms for complaint and guidelines issued for taking action against violations.

2.4.3 Requirement of guidelines for implementation of various provisions of CRZ Notification.

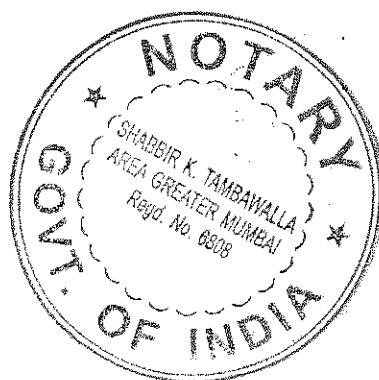
- (a) Many States indicated that both CRZ Notification, 1991 and 2011 does not provide for guidelines especially for FSI/FAR restrictions, ESA management, etc., including a simplified procedure for implementation of the notification. Hence the local communities are put into hardship due to the ambiguities prevailing in the notification.
- (b) Simplified procedures for clearance for projects such as fishing jetties erosion control measures break waters, water pipelines and navigational facilities should be made available.
- (c) All States/UTs sought for a clear cut list of activities that are either permitted or prohibited so that there is no ambiguity. It was also indicated that a large list with exemplifying clause is highly confusing.

2.4.4 Disaster management and hazard line mapping

- (a) It was indicated by the States/UTs that the Hazard Line to be mapped by the MoEF&CC will lead to large areas getting covered in the States/UTs especially in the east coast as there is a gentle slope in the coastal areas. A large extent of flood-prone areas is likely to be covered under CRZ, and imposing restrictions on such areas may be difficult due to high population density.
- (b) It was indicated that there should be no height restriction for cyclone shelters in the NDZ of CRZ-III.
- (c) Development of projects in coastal areas is delayed due to lack of clarity in determining the high erosion, low erosion and medium erosion. Hence, this should be mapped at the earliest. Due to the deficit of the above-mentioned information, development of the port projects has been delayed considerably.

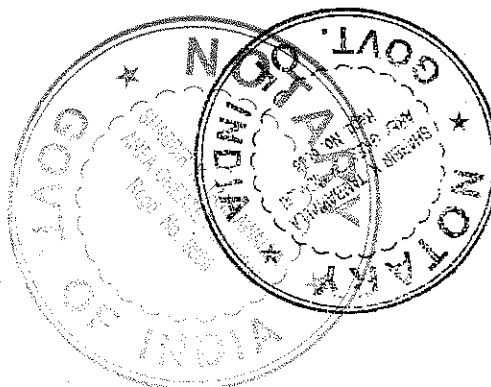
2.4.5 Fishery related issues including fish processing

- (a) Many States/UTs raised the issue with regard to providing for safe handling of fish, landing centres require ice and storage plants in the CRZ areas. It was indicate that the fishery-related facilities should be made permissible in the NDZ including certain temporary constructions in the sand dunes.
- (b) The small UTs especially Daman and Diu sought for allocating abandoned salt pans for fishery related activities as there is acute shortage of land.
- (c) Setting up an expansion of fish-processing units including warehousing (excluding hatchery and natural fish drying) were prohibited, whereas existing fish-processing units for modernization purposes were permitted to utilize 25% additional plinth area required for additional equipment and pollution control measures only subject to existing FSI/FAR norms and subject to the condition that the additional plinth area shall not be towards seaward side of existing unit and also subject to the approval of State PCB/PCC. However, the exemption clause with regard to utilization of additional plinth area is deleted in Para 3(iii) of CRZ Notification dated 6 January 2011. This is inhibiting the modernization of existing fish-processing units by adopting pollution control measures. The representatives of industry and public representatives of coastal districts have also demanded inclusion of the provision in the CRZ Notification, 2011.
- (d) The construction of building for livelihood activities such as peeling of prawns, fish-based small-scale non-polluting cottage industries/small shops and flour mills may be permitted in CRZ area other than CRZ-I and CRZ-IV. This will ensure jobs for the traditional community and will help to improve the livelihood of the local community.
- (e) In the fish landing centres approved by GoK wherein all foreshore facilities required for fishing and fishery allied activities such as traditional fish-processing yards, boat building or repair yards, net mending yards, ice plants, ice storage, auction hall and jetties may be permitted by Grama Panchayat in the CRZ area.



2.4.6 Protection of ESAs categorized as CRZ-I

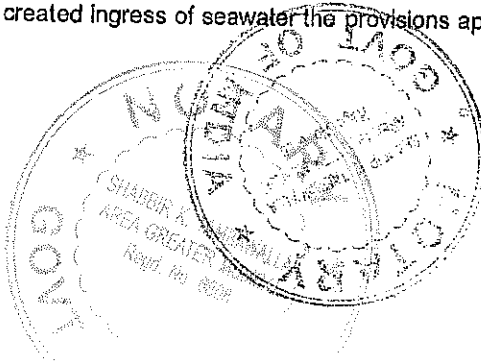
- (a) Several States/UTs indicated their difficulties in management of mangrove area and in the absence of proper guidelines certain essential development required for larger public could not be taken up in the mangrove area. It was indicated that mangrove patches should be classified based on the area, and minimum area for classification as CRZ-I should be specified to avoid wrong classification of areas and unnecessary litigations.
- (b) It was indicated that Maharashtra has 30,000 hectares of mangroves of which there are 17,000 hectares in Government land and 13,000 hectares in private land. Of the total mangrove area of 30,000 hectare, 4000 hectares falls within protected forest. The Judgment of Hon'ble High Court (HC) of Bombay dated 6 October 2005 has imposed total ban on destruction and cutting of mangroves in the entire State including prohibition on dumping of solid waste in the mangrove area. This Judgment applies to all mangrove land irrespective of its ownership. Further, as per the same Judgment, no construction can be taken up within 50 m on all sides of mangroves. GoM has been directed not to issue any development permission in the mangrove area. Further, as per the directions of Hon'ble HC, mangroves in Government-owned land is to be notified as "protected forest" while mangrove areas in private land shall be notified as "forest". For the purpose of protecting mangroves, the GoM has set up a Mangrove Cell headed by CCF. The Mangrove Cell was established in January 2012 with a main focus for conservation of mangroves and to promote coastal biodiversity. Mangrove conservation projects with UNDP-GEF and GIZ are being taken up by the Forest Department. The most of the destruction of mangroves is taking place in private land. To prevent further destruction of mangroves and to empower the Forest Department to take action against violations, delegation of Section 23 of E(P)A 1986, to the Forest Department has sought.
- (c) It was also requested to the Committee to provide for suitable provisions in the CRZ Notification, 2011, to permit certain constructions which can be accorded clearance at the State level especially for the development of marine interpretation Centres, low-intensity traditional aquaculture and hatchery activities in the CRZ-III areas. Request was also made to permit construction of



promenades at the edge of the mangroves so as to prevent felling and also to prevent solid waste dumping in the mangrove area. Clearing of mangroves and destruction of wildlife habitat in the CRZ-I areas should be explicitly declared as prohibited activity under CRZ-I. Based on the above-mentioned facts, GoM requested for the following:

- (i) to empower Section 23 of E(P)A 1986 to the State Forest Department to take punitive action against violations in CRZ-I areas;
 - (ii) to explicitly insert a provision under item CRZ-I of the CRZ Notification, 2011 that "Clearing of mangroves and destruction of wildlife habitat in CRZ-I areas as a prohibited activity";
 - (iii) to provide for construction of Marine Interpretation Centre in CRZ-III areas and construction of a walkway and research facilities in the mangrove area classified as CRZ-I. For undertaking the above-mentioned activities, the State Government shall be empowered to accord clearance under the Notification after due recommendations of the MCZMA.
- (d) Further, CIDCO for conserving 1471 hectares of coastal wetland, mudflats and mangroves, along with Forest Department proposes to construct a genetic resource conservation park and provide for raised broad walkway along with an information dissemination centre to be built in the adjoining land in the mangrove area. It was indicated that the CRZ Notification, 2011 does not provide for any incentive in undertaking certain development in CRZ-I for the purpose of promoting awareness and conservation of mangroves. CIDCO requested the Committee to consider development of such facilities for public use in the CRZ-I areas without destruction of the mangroves similar to the Forests Department's request indicated above.
- (e) In this regard, CIDCO explained in detail the legal provision pertaining to the inland mangroves and coastal mangroves as contained in the Forest (Conservation) Act [F(C)A], 1980, Maharashtra Felling of Trees (Regulation) Act, 1964, Maharashtra (Urban Areas) Preservation of Trees Act, 1975. It was requested that the Committee may distinguish between natural coastal mangroves and inland mangroves. Since, Navi Mumbai has inland mangroves mainly due to artificially created ingress of seawater the provisions applicable to

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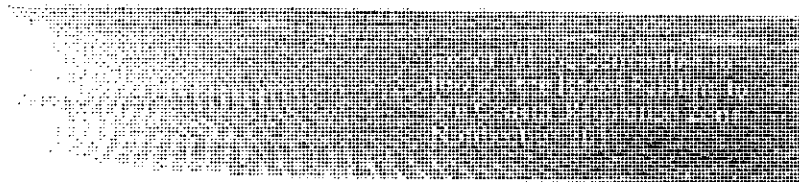


coastal mangroves shall not apply on such inland mangroves. Request for permitting construction of walkway, interpretation centre, genetic research park and so on within CRZ-I/CRZ-III areas was sought.

- (f) In the CRZ-I area, there is a need for preservation of land between LTL and HTL and the mangroves which have a strong ecological rationale should be integrated within the new development plan. With regard to CRZ-II areas, the zone defined as already developed and with infrastructure should become integral part of development/redevelopment as envisaged in the Town and Country Planning Regulations as brought out from time to time. In this regard, the land use zoning and the FSI should be decided as per the current needs and not tied down to 1967 Rules. Since the new DP is under preparation, BMC requested for inserting the following clause in 8(V)(iii), *"In case the Development Plan and DCR revised by following due process of public consultation, the provisions of the same will become applicable even in CRZ, after the same is approved by MoEF&CC."* Hence, GoM has requested for applicability of the uniform DCR for entire Mumbai.
- (g) It was indicated that as per the Notification, Achra-Ratnagiri and Malvan-Sindhudurg has been declared as Critical Vulnerable Coastal Areas (CVCA), where Integrated Management Plans (IMPs) are to be prepared. In the absence of such IMPs, no developmental activities are being permitted. Hence, it is requested that MoEF&CC may provide guidelines for preparing the IMPs.
- (h) It was indicated that in CRZ-I there has been systematic landfill, reclamation, unauthorized encroachment, cutting of mangroves, and so on. In this regard, the local authorities should be empowered to take up eco-developmental programme by creating garden, open spaces and promenades for sustainable conservation of CRZ-I. This step would reduce encroachments and degradation of the coastal environment.
- (i) It was mentioned that the mangroves in case of more than 10,000 m² are required to provide 50 m buffer. However, unfortunately, the buffer zone of 50 m has led to encroachment, illegal dumping, construction activity and slum redevelopment. Hence, it was requested that the 50 m buffer shall be maintained

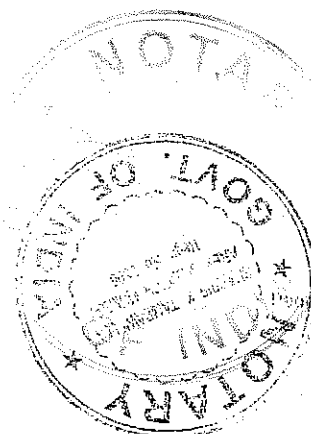


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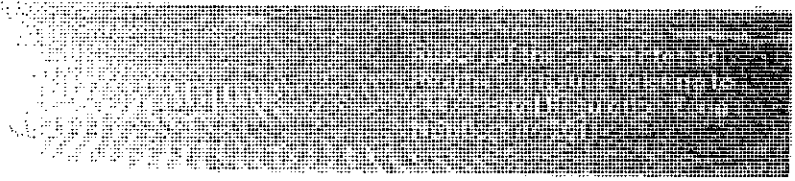


with green belt under social forestry or gardens. This would serve as a barrier to encroachment and also provide protection to mangroves.

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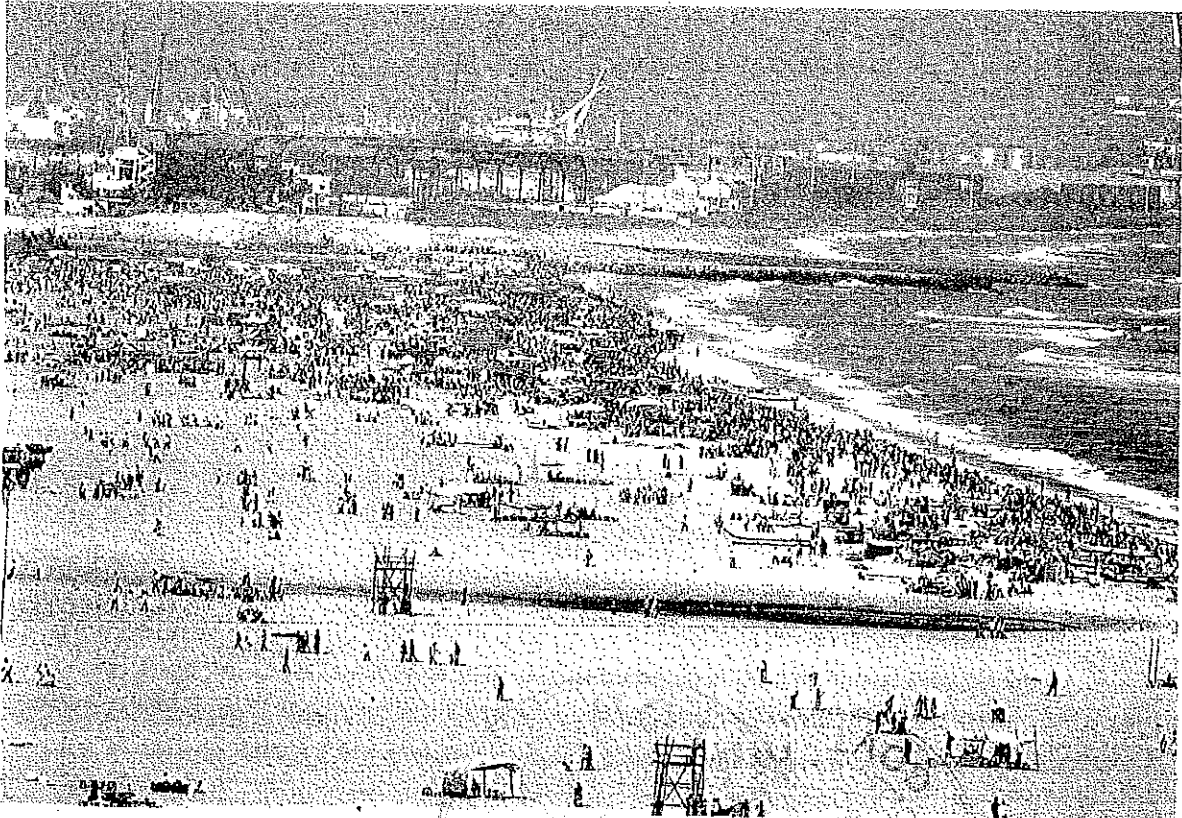


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2.4.7 Tourism

- (a) Apart from the specific issues raised by the States of Kerala and Karnataka with regard to tourism several other States also sought relaxation of the CRZ provision or promoting tourism in the CRZ areas. It was indicated that temporary structures for beach resort should be made permissible in the NDZ.
- (b) Specially the UT of Puducherry indicated that there are several heritage buildings which are more than 70 years old are located along the white town which falls under CRZ-II and has greater building coverage than the present permissible levels. As per the Town Planning norms of 1991, building height varies with existing road width and the coverage varies with plot size and usage of building. Hence, construction and reconstruction in CRZ-II should be allowed as per the prevailing Town Planning norms as on date.



2.4.8 Clearance of projects

- (a) Several States/UTs indicated that there is considerable ambiguity in the clearance of projects. The procedures are complicated and time taking. It was also indicated that the form for seeking clearance of projects in CRZ Notification, 2011 is complicated and very elaborate. Several States/UTs sought for delegation of powers for according clearance to projects in the coastal areas.
- (b) The projects attracting EIA Notification should be permitted as per the said Notification and those not attracting the EIA Notification shall be dealt as per the norms of the State Government by the concerned authorities.
- (c) As per the CRZ Notification, 2011 prior NOC from SPCB is mandatory for projects which are discharging effluents, solid wastes and sewage. It was indicated that only prior approval under Water (Prevention and Control of Pollution) Act, 1974 for disposal of treated effluent in the coastal water body may be made mandatory for the projects.
- (d) The CRZ insists a rapid EIA report including marine and terrestrial component except for construction project listed under 4(c) and 4(d). It is not clear whether rapid EIA is required for all projects expecting listed under 4(c) and 4(d).
- (e) CRZ suggest Comprehensive EIA with cumulative studies for projects in the stretches classified as low and medium eroding by MoEF&CC based on scientific studies and in consultation with the State Governments and UT Administration. Clarification was sought whether this is applicable for all kinds of projects and the availability of the data in this regard.
- (f) Whether Disaster Management Report, Risk Assessment Report and Management Plans are required for small projects such as hotels and guesthouse.
- (g) It was suggested that CRZ map indicating HTL and LTL demarcated by one of the authorized agency in 1:4000 scale is insisted in this regard standardization of cost for map preparation is required based on project cost.
- (h) No objection certificates from the concerned State Pollution Control Boards or UT Pollution Control Committees for the projects involving discharge of effluents, solid wastes, sewage and so on are required prior to CRZ clearance, this



procedure is difficult as no objection certificate from the Pollution Control Boards will not be issued by it prior to clearance by SCZMA.

- (i) In 4(ii), Activities [(a)-(i)] of the CRZ Notification, 2011 shall require clearance from MoEF&CC. Clarification is needed on the following: whether the recommendation of the project after appraisal by SCZMA is to be sent to MoEF&CC for clearance and whether the entire process is to be done by MoEF&CC.

2.4.9 Capacity building and institutional mechanism

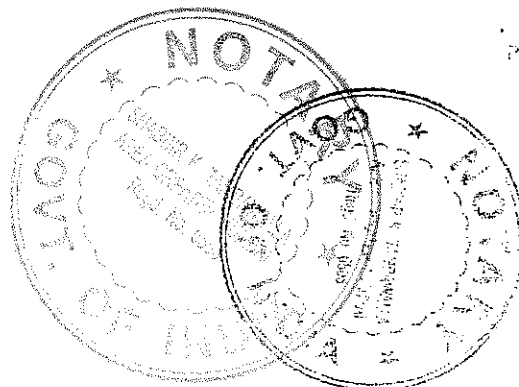
- (a) Several States/UTs indicated that the CZMAs have no adequate capacity including funding. They requested for financing and providing technical assistance to the State Governments in the area of coastal management. The States/UTs sought for the ICZM Project which is presently being implemented by MoEF&CC through SICOM and NCSCM. The States/UTs sought for extending the expertise of SICOM and NCSCM to their States/UTs as well for the purpose of preparing ICZMPs including capacity building.

2.4.10 Regularization of the dwelling units constructed in violation of the CRZ Notification

- (a) Some of the States/UTs especially Goa indicated that several dwelling units of local communities have been constructed in violation of the CRZ Notification. Keeping in view the larger public interest the State sought regularization of dwelling units of traditional coastal communities including fisher-folk.
- (b) The GoM sought for regularization some of the large constructions in Navi Mumbai undertaken in violation of the CRZ Notification. However, it was indicated that these constructions had all other requisite approvals.

2.4.11 Mining of minerals

- (a) Some of the Stats/UTs sought for permitting mining of sand based on scientific analysis including their removal. The Government of Gujarat indicated that



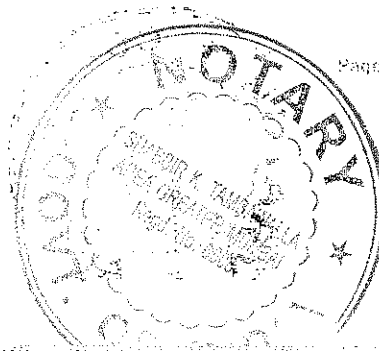
certain stretches of the coastline have large reserve of high quality of limestone. It was indicated that the Gulf of Kachchh and Saurashtra have vast limestone reserves amounting to 10,000 million metric tons. This limestone has high calcium content (more than 92%) and is extremely valuable. Several industries especially cement industries in these areas use the limestone. Many of the industries have been set up prior to 1991 based on the limestone reserve. These industries have been affected due to the provision of the CRZ Notification. The State Government has sought relaxation of mining of limestone and has requested to make it a permissible activity outside eco-sensitive area with subject to the condition of proper mitigation measures, preservation of erosion, saline water incursion, pollution of coastal waters and so on.

- (b) There is a need for clear regulations on estuaries. Estuary is a point of meeting of a river and sea; this area is special because of unique salt-tolerant flora they harbor and distinct fauna dependent on such floral components. Estuary is cradle for various life forms including mangroves. Regulation on estuaries should clearly define the carrying capacity of various bio-resources being removed from estuaries, for example, the sand mining by the mechanized method to be stopped.

2.4.12 Disparity in DCR in CRZ and non-CRZ areas

- (a) It was also presented that there are several disparities in the DCR with respect to CRZ and non-CRZ areas. Some of which include, the DCR within the CRZ area is applicable as on 1967 while in the non-CRZ area the DCR applicability would be as per the present regulations. The applicability of DP & CR of 1967 is retrograde and against the principle of planning. Therefore, it was requested that there is a need to adopt a uniform DCR for entire Mumbai which has been already conveyed to Secretary, Environment and Principal Secretary, Urban Development on 9 March 2012 by BMC and the same has been forwarded to MoEF&CC. It was also mentioned that the Municipal Corporation of Greater Mumbai (MCGM) has undertaken the preparation work of revision of the development plan of 2014-2034 and it was pointed out that, out of 458.28 km²,

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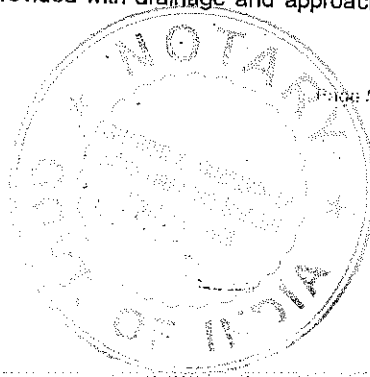
109.24 km² is under CRZ which amounts to 25%. This 109.24 km² of CRZ area includes 52.61 km² as CRZ-I, 43.48 km² as CRZ-II and the rest 13.15 km² as CRZ-III. It was also mentioned that by 2034 the population of this city would increase from 12.44 million to 14.37 million as on 2011. The GoM indicated that this disparity among various norms has led to confusion and has restricted development. In order to resolve such conflicts between the construction norms and to get uniformity, the GoM requested the Committee to resolve this issue at the earliest. Reiterating this, it was indicated that the DCR of 1967 regulations inhibits development in the city and it would be unrealistic and anachronistic keeping in view the growing population.

2.4.13 CRZ-II and III related issues pertaining to Town and Country Planning norms

- (a) Further, as per the CRZ Notification open spaces/parks has been classified as CRZ-III where no development can take place. In such areas, slums have come up. The Hon'ble Court has held that no redevelopment can be taken up in such CRZ-III areas. Due to the stalemate, neither slums can be redeveloped nor the open space developed. Keeping in view such complex problems, BMC suggested that there needs to be a fresh approach of integrated planning of CRZ-I and CRZ-III with rest of the city. GoM has requested for to provide uniform FSI/FAR for the city of Mumbai as per the prevailing Town and Country Planning Regulations for undertaking development of slum redevelopment schemes, redevelopment of dilapidated buildings, cessed and unsafe buildings.
- (b) The CRZ Notification, 2011 provides for prior clearance for demolition and reconstruction of public use structures, such as education, workshops, medical care and cultural activities by MoEF&CC. It was requested that since most of the structures are Government projects involving public interest timely clearance is required. Hence, they may be permitted to be cleared at the state level. It was also requested that projects of public interest such as water sewerage pipeline, bridges and roads could be approved the state level instead of being referred to MoEF&CC which is presently followed.

- (c) The Notification provides only for the traditional fishing activity. It is silent with regard to mechanized fishing activity that is being carried out even now. In view of the reduction in the fish catches and owing to the advanced technology available to take up coastal aqua culture and mariculture, there is a need to make provision for undertaking such activities in CRZ-IV and for the establishment of facilities required for such activities on the adjacent land. No norms are prescribed for regulated activities. In view of this, the GoKA has requested for "The activities impugning on the sea and tidal-influenced water bodies will be regulated except for traditional fishing and related activities undertaken by local communities" be modified as "The activities impugning on the sea and tidal-influenced water bodies will be regulated except for traditional fishing, coastal aquaculture and mariculture including facilities required for such activities on the adjacent land as well as related activities undertaken by local communities".
- (d) There are many riverine islands and long stretches of rivers with tidal influence. Traditional fishermen as well as other inhabitants are there all along the river and islands. These traditional families are finding it difficult to expand the dwelling units due to family expansion. CRZ for the islands in the State of Karnataka is presently 100 m or width of the river/creek. Therefore, the CRZ limit in the islands of the state as well as all along the rivers also to be limited to 50 m or width of the river/creek whichever is less as provided for Kerala. The GoKA has requested for 50 m width from the HTL on the landward side as the CRZ area for the islands within the backwaters.
- (e) The fishermen villages are generally thickly populated in the coastal area with all the civic amenities provided by the Government. These fishermen are confined to the same area. Hence, the fishermen may be permitted for construction/reconstruction of their dwelling units and to enable other infrastructure facilities. According to the existing Provision, CRZ-II comprises areas that have been developed up to or close to the shoreline. (Explanation – For the purposes of the expression "developed area" is referred to as that area within the existing municipal limits or in other existing legally designated urban areas which are substantially built-up and has been provided with drainage and approach roads

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and other infrastructural facilities, such as water supply and sewerage mains.) The GoKA has requested for the fishermen villages that have been substantially built up and be included under the definition of "developed area" in the explanation, as is allowed in the case of CRZ-II in urban local bodies.

- (f) Buildings shall be permitted only on the landward side of the existing road or on the landward side of the existing authorized structures. Clarification was sought regarding the term "existing road": the type of road (metalled/non-metal/murum, etc.) and date/year of construction of road.

2.4.14 Foreshore requiring facilities

- (a) The CRZ restrictions are hindering the development of port-related activities. At present all the minor ports of the state have been classified under CRZ-III. But all the minor ports are situated on the shore line of developed areas within the municipal limits and already have created substantive built up area with other infrastructure facilities. As per the notification these ports should have been classified under CRZ-II. But unfortunately the minor ports of the state have been classified as CRZ-III. Thus, the resulting restrictions on the development of water front industries would seriously undermine the developments of the ports of the Karnataka state.
- (b) Development of ports is mainly dependent on the construction of infrastructure facilities on water front area of the coastline. Port-based industries are vital to the economic development of the State; therefore, it was requested by GoKA that the Karnataka ports either be classified under CRZ-II or be totally exempted from the preview of CRZ in the interest of the trade and economy of the State.
- (c) At present, the CRZ clearance authority is given to the MoEF&CC in respect of port-related projects. The Karnataka Port Department is of the opinion that, as the development of the ports of the country comes under the purview of the Ministry of Shipping and Road Transport, it is advisable to empower the Ministry of Shipping, Road Transport and Highways, GoI, New Delhi to grant CRZ clearances for port projects in the best interest of the comprehensive and speedy development of the port sector.



(d) As per the CRZ Notification, 2011 expansion of the existing ports is required to obtain the permission from SCZMA or MoEF&CC but expansion/infrastructure addition, up gradation of the existing port facilities is very essential and equally inevitable for efficient management of the ports. Hence, expansion of the existing minor ports may be exempted from the purview of the CRZ notification.

2.4.15 Inland islands in coastal waters and estuaries

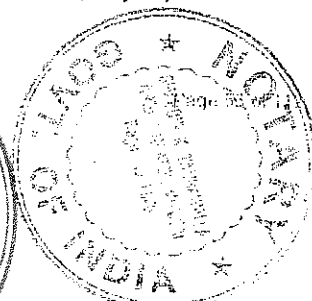
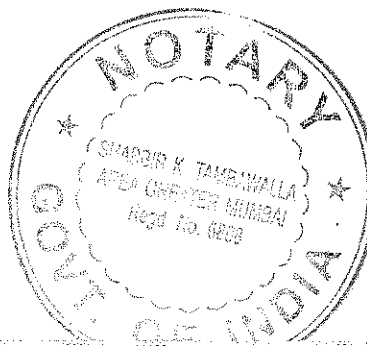
(a) The NDZ along backwaters, estuaries, creeks, and so on, of the state may be limited to 50 m instead of 100 m. It may be noted that in most of the period after the introduction of CRZ Notification, 1991, the NDZ applicable to backwaters was only 50 m. Also, as per CRZ Notification, 2011, the NDZ for backwater islands is only 50 m and the proposal is only to extend this provision to the entire backwaters and tidal-influenced water bodies.

2.5 Analysis of the CRZ Notification, 2011

(TOR-1(d) - to examine errors/inconsistencies in CRZ Notifications, 2011 and procedural simplification)

2.5.1 The Committee has examined the various issues raised by the coastal State Government and UTs vis-à-vis CRZ Notification, 2011. The Committee has also examined some of the relevant Court Orders in the matter. After taking into account the hardship faced by the people in the coastal areas especially due to the restrictions imposed on housing, road development and tourism development, the Committee is of the opinion that the present CRZ Notification, 2011 should be recast and a fresh notification shall be considered by the Government, which will supersede the CRZ Notification, 2011. This decision of the Committee is mainly founded on the premises that each of the coastal State/UT has well-laid Town and Country Planning Regulations including other developmental regulations which address most of the issues in the CRZ Notification, 2011. The imposition of the Notification by the Central Government on the State and UT Governments has restricted the housing development of the coastal communities. Although there is a need to protect the coastal environment, the housing need of the communities is equally important.

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2.5.2 The Committee examined the CRZ Notification, 2011 and its implementation by the MoEF&CC and the coastal State/UT Governments. With regard to the Notification, the Committee observed that the objectives of the Notification are well laid out which takes into account the future issues of the coastal environment. With regard to the jurisdictions listed in the Notification at item (i) and (ii) (iv) and (v) of para 1, there are no issues.

2.5.3 In the para (iii) with regard to the Hazard Line, the Committee is of the opinion that at this stage, it is an excellent time worthy exercise embarked upon by MoEF&CC. However, the Committee observed that it would take a long time for actual demarcation on the ground. Further, the hazard line, which takes into account water-level fluctuations, elevation, SLR and shoreline changes shall also be considered along with the geological factors at a later stage (e.g. plate movement of the Indian subcontinent, as there is subduction in some areas and emergence of land in other parts of the country). Till such time, the zone between the HTL and the Hazard Line should be treated only as "hazard management zone" and not for any other regulatory purposes. However, if the Hazard Line falls below 500 m, then a minimum of 500 m will be under regulation.

2.5.4 The respective State Governments need to take into account the issues relating to hazard management within their Town and Country planning norms for developmental activities. Several State Governments have also raised the issue of Hazard Line and its implications and its demarcation on the ground. The Committee is of the opinion that the MoEF&CC through NCSCM should move forward with the demarcation of Hazard Line as these are crucial input generated with valuable scientific data generated through Sol through aerial photography, photogrammetry and ground verification and erosion mapping by NCSCM using time-series high-resolution satellite imagery. The delineation of Hazard Line would be useful for the country to prepare proper hazard mitigation measures in the coastal areas. Further, the data generated by the Sol which is one of kind in the world; need to be factored into other developmental activities of the coast. It will be the responsibility of the State/UT Governments to include the coastal hazard mitigation activities/facilities

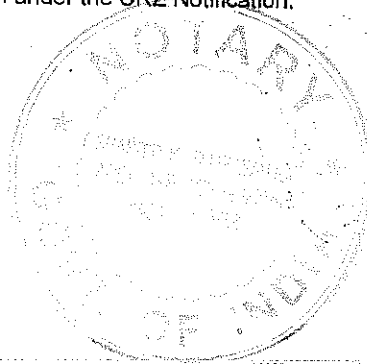


provided in the respective CZMPs. The State/UT Disaster Management Authorities shall be overall responsible to meet the challenges of disasters arising from coastal and marine areas.

2.5.5 With regard to para 2 of the CRZ Notification 2011, the Committee observed that the HTL demarcation which was to be completed within one year has not been completed so far. The Committee was apprised of the efforts taken recently by the MoEF&CC, where the methodology was finalized for demarcation of HTL. It has been decided that the ortho maps generated by the Sol during the year 2011 under the hazard mapping component would be used to delineate and provide authentic HTL at best possible accuracy. NCSCM has been authorized to coordinate with the State/UT Governments and the Sol to complete the HTL and LTL demarcation within the stipulated time of 2015. NCSCM has taken necessary steps for expediting the task on time. Most State Governments and UTs have provided necessary inputs in completing the HTL and LTL demarcation. This exercise, when completed, would resolve several outstanding issues, which has also been noted in the report of the high level Committee which reviewed various Acts administered by the MoEF&CC under the Chairmanship of T. S. R. Subramanian Committee at para 9.18. Once the HTL and LTL are demarcated, the CRZ boundaries and their classifications would become easy for demarcation.

2.5.6 With regard to Para 3, titled 'prohibited activities', the Committee examined it in detail and observed that several of the activities listed under prohibited activities have exemptions, which have led to ambiguity among the stakeholders. Several State Governments have raised the issue with regard to lack of clarity on clearance procedures for according environmental clearance for the proposed activities. Further, the Committee also is of the opinion that several of the activities listed under the prohibited activities are not exhaustive. It is also felt by the Committee that some of the activities relating to industrial activities are governed by the respective Acts and legislations. In order to avoid duplication and overlap, it is the opinion of the Committee that those respective Acts and legislations, norms should be strengthened further, to address issues relating to coastal areas rather than a separate legislation/provision under the CRZ Notification.

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2.5.7 The Committee is of the opinion that the very purpose of the issuance of a direction for coastal management by the Prime Ministers' Office in 1981, was to maintain beaches and its surrounding coastal areas clean. In spite of more than three decades of implementation of coastal management provisions by the Ministry and the State Governments, the conditions of the beaches in India, the coastal waters, the estuaries and other tidal-influenced water bodies remain highly polluted. Such a deterioration of water quality and the solid waste on the beaches has affected the coastal ecosystems and their regeneration capacity – deterioration of ground water with direct impacts on the livelihood of the coastal communities and coastal tourism. The Committee is of the opinion that it is high time that the Government takes a serious measure in controlling the discharge of effluents, untreated sewage, dumping of solid wastes in coastal areas and its waters. The "SWACHH BHARAT ABHIYAN" initiated by the Government should reach the coastal areas with high priority. MoEF&CC through its bodies such as SICOM, NCSCM and State Government should implement this programme vigorously.

2.5.8 Another major issue with regard to the security of the coastal areas, given the present security concerns, has arisen from 26/11/2008 terror incident in Mumbai. The Committee is of the opinion that necessary facilities for coastal patrolling and vigilance activities, coastal police station and other defense-related activities need faster clearances. Hence, such matters relating to national security should be accorded fast clearances by the respective State /UT Governments within a stipulated time.

2.5.9 Ground water drawal at Para 3 (xi) of the Notification is a matter of serious concern. The Committee was made aware of the ground water depletion and resultant salinity intrusion that is taking place along the coastal areas of the country due to large-scale and unregulated extraction. Several anthropogenic activities such as seawall, embankment and road construction, dredging and sand mining in the coastal areas disturb the coastal aquifers thereby altering the fresh ground water resources. Destruction of sand dunes and beaches has reduced the percolation of rainwater, thereby affecting the coastal groundwater recharge. The respective State

Ground Water Authorities including the Ground Water Authority at the Centre should take a serious concern of the issue and prepare guidelines for coastal area groundwater recharge mechanisms including protection of groundwater aquifer in the coastal areas. All construction activities such as roads and dwelling units should have built-in ground water recharge system. The Central Groundwater Board shall be entrusted to prepare an atlas of the coastal aquifers. This data shall be incorporated in the CZMP by the respective States / UTs.

2.5.10. With regard to Para 4 of the CRZ Notification pertaining to regulation of permissible activities, the Committee was given to understand by the State Governments that there are several activities that are not listed in the Notification; hence, the stakeholders, especially communities, face problems due to ambiguities. Further, even for the small dwelling unit in rural areas, the community has to obtain clearance from the CZMAs which are located in the State capital. Such hardships faced by the communities are a matter of concern. The Committee is of the opinion that the local-level body should be empowered to provide clearance to such matters in accordance with the 73rd and 74th Constitutional Amendment. The Committee is of the opinion that the construction projects which attract EIA should be dealt with as per EIA Notification only.

2.5.11 Further, several States have brought to the notice regarding para 4 (ii) which empowers MoEF&CC to accord clearance for small projects such as laying of pipelines, transmission lines, conveyance systems and public buildings. The Committee is of the opinion that the MoEF&CC should restrict itself to policy making in the area of coastal management and monitoring of activities. Such clearances for small projects could be undertaken by the State/UT Governments or other agencies. The MoEF&CC should address coastal management through creating adequate institutions and strengthen existing institutions. A strong scientific skilled manpower should be developed by the MoEF&CC to address the emerging future challenges of coastal management.

2.5.12 With regard to Para 5 relating to the preparation of CZMPs, the Committee is of the opinion that the demarcation of HTL is the most important aspect of CZMP.

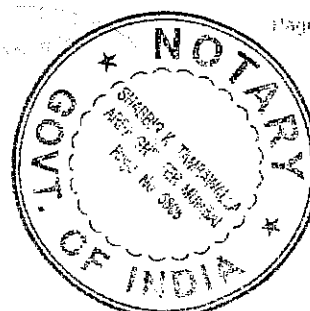
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With regard to preparing CZMPs, several State/UT Governments have indicated their concerns as there is lack of data, expertise, institutions and shortage of manpower, which is affecting the preparation of CZMP on time. These issues have remained unresolved since 1991. CZMP preparation even under 1991 Notification was not completed in spite intervention by the Hon'ble Supreme Court. Hence, the Committee is of the opinion that CZMPs shall be prepared by the States/UTs indicating the HTL, LTL, CRZ-I, CRZ-II, CRZ-III and CRZ-IV areas, the disaster management facilities and any other prohibited area declared by the States/UTs.

The States/UTs may also address some of crucial issues of coastal and marine areas including activities required for society such as coastal hazard mitigation, infrastructure for non-conventional energy, transportation, harvesting/extraction of resources, conveying systems, solid waste management, effluent and sewage treatment facilities and any other innovative schemes or those schemes suitable or unique to their location. The same could be included in the CZMP. It shall be ensured by the agencies and authorities that satellite based inputs/data shall be relied upon for preparing the CZMP. The above draft CZMP shall be recommended by the States/UT CZMAs and approval from the NCZMA shall be obtained. Thereafter, all the development activities including conservation and management of the ESA in the CRZ will be governed by the concerned bodies including those indicated in this Notification. All other projects of national importance declared by the Central Government shall be undertaken in CRZ area on a case to case basis based on EIA as provided in the E(P)A 1986.

Ministry shall put in place a monitoring mechanism, which will consist of State/UT CZMAs, NCZMA, SICOM and NCSCM. SICOM shall prepare a periodic status report of coast and marine areas which shall include the status of implementation of the CRZ Notification. This status report shall be prepared on a yearly basis and it shall provide recommendations and suggestions to the Ministry.

2.5.13 With regard to Para 6, relating to the enforcement of CRZ Notification, the Committee has been informed of a serious staff shortage in every State/UT. Further, the funds allotted by the State/UT Governments for coastal management is



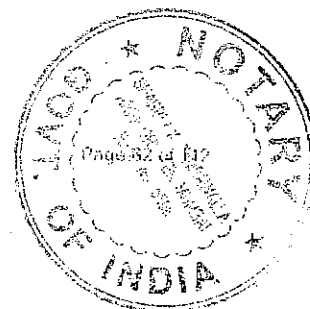
insufficient to address complex issues such as pollution, destruction of ESAs and land erosion, which are all matters of serious concern. These issues require continuous monitoring and rigorous enforcement of law. The Ministry, through its technical body SICOM, should set up appropriate mechanism for monitoring the coast and enforcement of coastal regulations.

2.5.14 With regard to Para 7 pertaining to classification of the CRZ areas, the Committee observed that this section of the Notification is most critical, as it divides the coastal areas into conservation and development zones. The very heart of the Notification is contained in Para 7 (i) which deals with CRZ-I. The ESAs, geomorphologic features and the valuable archaeological and heritage sites are some of the most important and critical aspects of coastal areas. In addition, the beaches, which are crucial in maintaining the integrity of the coast, are subject to extreme degradation and need to be considered as part of the ESA. These features and assets have to be preserved as they are incomparable and extremely invaluable. The ESAs such as mangroves, corals, mudflats, forest areas, salt marshes, turtle nesting ground, horse shoe crab areas, sea grass beds, migratory bird areas and their nesting grounds require utmost attention from the MoEF&CC and States/UTs. These areas, if lost, cannot be regained and the damages in most cases are irreversible. The Committee, from the data available, has observed that serious damages have occurred to these ecosystems and habitats, resulting in irreversible damage. Some of the main causes are encroachment, pollution and unplanned development.

2.5.15 Based on the above-mentioned facts, the Committee observed that the MoEF&CC should mainly focus on developing mechanisms for the conservation and protection of the coastal ecosystems, which is its prime mandate. There is an urgent need to conduct resource mapping of such coastal ecosystems and habitats, including ground-level surveys. It is a fact that these ecosystems and features listed under CRZ-I of the Notification are essential for the growth of fish and fisheries on which the local communities depend upon for their livelihoods.

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2.5.16 Further, the Committee was also informed by the States/UTs that several eco-sensitive areas are inhabited by people, and the inhabitants harvest the natural resources from the ecosystems for their livelihood. These communities, especially the large population living in and around ESAs such as Sundarbans, Bhittarkanika, Chilika, Coringa, Pichavaram, Gulf of Mannar, Pulicat, Vembanad and Gulf of Kachchh, need certain basic infrastructure for their life and livelihood. The Ministry through SICOM shall prepare the appropriate management plans in consultation with the State/UT Governments to address the conservation and protection of these ecosystems along with the livelihood of local communities.

2.5.17 Para 7.2, which is CRZ-II, is another important para of the Notification which affects some of the densely populated cities such as Mumbai, Chennai, Visakhapatnam, Kochi, Mangalore and Puri. The most crucial issue of the provision is restriction of building norms. The Committee has dealt with this issue in detail and had discussions with all State Governments. It is a fact that all coastal States/UTs have a well-defined Town and Country Planning Regulation and have adequate staff and mechanism to implement the regulations. The provisions in CRZ Notification are often overriding the Town and Country Planning Regulation of the State/UT Governments and could be considered as not appropriate from the legal point of view.

2.5.18 Hence, it was felt that the provisions of Town and Country Planning Regulations should be adhered to the coastal areas, subject to strict implementation of certain conditions which include protection of ESAs, prohibition of discharge of untreated effluents, prevention of activities that alter the shoreline, providing adequate open space and connectivity to provide for quick and timely relief during natural calamities, regulated ground water extraction, recycle and reuse of water including prohibition on dumping of municipal solid waste in coastal areas and waters.

2.5.19 The Committee was also made aware of the slums, dilapidated, old and unsafe structures that are present in large numbers especially in the city of Mumbai. The GoM has brought to the notice of the Committee and at several occasions to



GoI that the CRZ Notification has prevented the redevelopment of such slums, dilapidated structures and old buildings. The Committee was of the opinion that it is the responsibility of the respective State/UT Governments to undertake urgent and immediate steps to rehabilitate the people and provide for decent housing to the people living in slums, dilapidated structures and unsafe houses. This action needs to be taken within the ambit of the existing State/UT legislations.

2.5.20 With regard to para 7 (iii), CRZ-III relates to the rural areas, which are the largest geographical area of the coastal regions. These areas are inhabited by fishermen, farmers, salt pan workers and other coastal communities who depend on the coastal areas for their livelihoods. This stretch is important mainly from the local community point of view and has large tourism potential. The Committee is of the opinion that the local communities may be encouraged to take up tourism as a home stay option, which will provide alternative livelihood and also reduce pressure on coastal fishery. Further, some of the State/UT Governments, especially Kerala, Daman and Diu, have brought to the notice of the Ministry, the high population density of local communities living in such CRZ-III areas. The present regulations of NDZ of 200 m have been highly restrictive in the densely populated parts of the country, which has hindered the housing development of the local communities. The Committee is of the opinion that the housing issues of local communities must be addressed immediately.

2.5.21 Further, one important issue which was brought to the notice of the Committee include the small islands along the mainland coast of the country. While the Ministry has addressed the conservation and management of the oceanic islands of Andaman and Nicobar and Lakshadweep under the IPZ 2011 Notification, the issues relating to these small islands along the mainland have not been addressed. Most of these islands are inhabited and some of them are rather densely inhabited especially in West Bengal, Kerala and Karnataka. In view of the restriction of the present Notification, which mandates an NDZ of 50 and 100 m, development is hampered in these islands. Keeping in view the hardships of the local communities and the potential for tourism, the Committee recommends relaxing the restrictions in such islands.

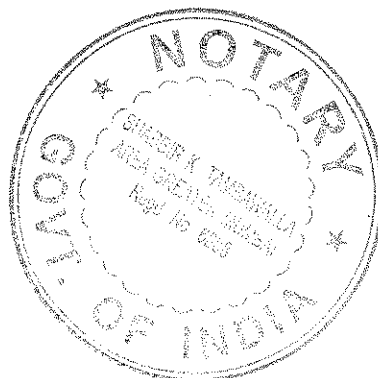
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2.5.22 Certain omissions and corrections required in the Notification were also brought to the notice of the Committee. These include:

- (a) the usage of the term "creek" while referring to the width in the place of "tidal-influenced water body";
- (b) the term "*permitted areas*" in para 3(iii) without defining the same, omission of word "studies" in para 3(iv)(d) "*...based on carried...*";
- (c) the omission of method of drawal of ground water within 200 m of HTL in para 3(xi)(a);
- (d) the requirement of phrase "Any other construction except those permitted under paras 4 to 8 *except facilities required for patrolling and vigilance activities of marine/coastal police stations*" in para 3(xiv);
- (e) omission of word "agencies authorized by MoEF&CC" in para 5(ii);
- (f) the requirement of term "regulations" in the place of "*regularization*" in para 8(i);
- (g) note the missing of phrase "shall be permissible in CRZ" at the end of para 8.V.3.(iii) and such others.

2.5.23 The Committee also noticed that the essential guidelines for several of the procedures to be followed under the Notification including for the demarcation of HTL and LTL were not made available to the agencies/public resulting in delays and lack of clarity. This has attracted litigations on several occasions. Similarly, there are ambiguities in the guidelines for CZMP preparation appended to the Notification resulting again in differences in approaches by the authorized agencies.



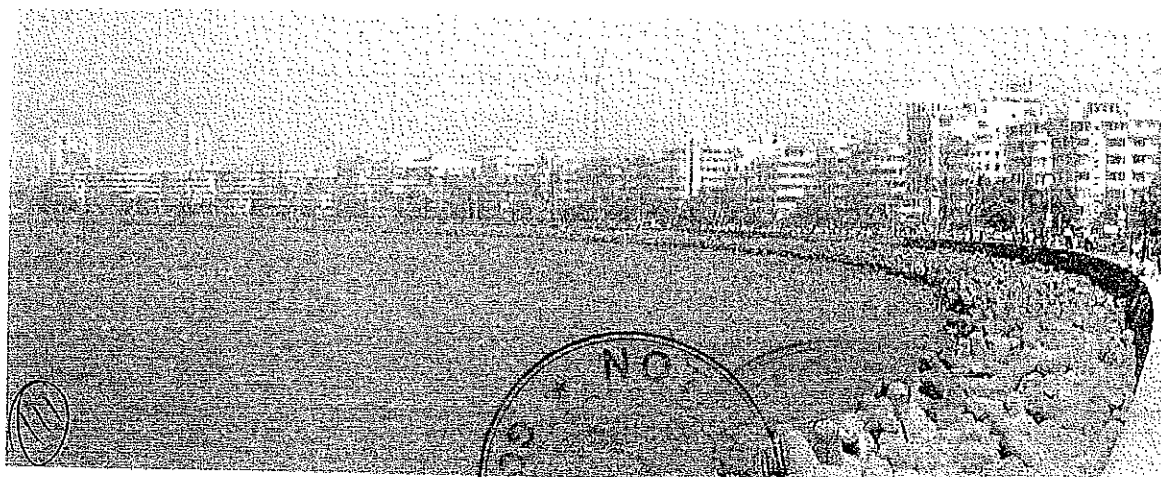
Chapter 3

Discussions on the Issues raised by the States and UTs

The Committee after examining the presentations and details provided by the Governments of Maharashtra, Karnataka, Kerala and other States/UTs with regard to difficulties and impediments in the implementation of the CRZ Notification, 2011 found that many of the issues raised by the States/UTs have several commonalities except for a few area specific matters. In this context, the Committee analyzed these issues topic wise and came to the following conclusions.

3.1 Development Issues in CRZ-II

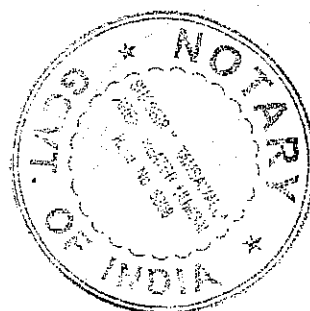
3.1.1 The Committee examined the issue with regard to the applicability of Development Plan (DP) and Development Control Rules (DCR) of various years as presented by Maharashtra. The DCR of 1967 which was applicable under the CRZ Notification, 1991 inhibits certain developments in the CRZ areas of the city. With the growing population and to address the housing issues of Mumbai and other coastal cities in the country it is important that the local Town and Country Planning Regulations are made applicable uniformly in the coastal areas. The disparity in the regulations, governing constructions in the CRZ area is hindering development and causing hardship to the local communities. In fact, it is found that the

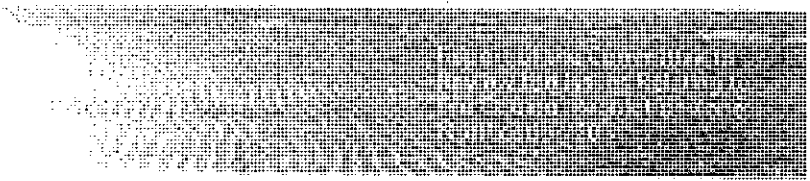


restrictions imposed have actually led to land encroachment and development of illegal slums particularly along the beaches of Mumbai.

3.1.2 The Committee examined the issues of slums in Mumbai in great detail. It was brought to the notice that these slums exist in extremely unhygienic conditions with no proper basic infrastructure. The slums are thickly populated and the population is prone to risks of flooding, cyclone, and so on. There are no proper roads or passage to evacuate the people during calamities. Since the slums are proliferating in unhygienic and inhuman conditions, it is the responsibility of the State Government to provide basic decent housing facility to the people. This is one of the fundamental requirements of the people. In view of the urgency and in the public interest, the Committee is of the opinion that the CRZ Notification, since its implementation from 1991, has not addressed the issues appropriately. The Committee also examined the Office Order of September, 1998 issued by MoEF&CC which freezes the FSI as on 19.2.1991 including the Orders of Hon'ble High Court of Bombay which has upheld the above Orders of MoEF&CC. The Orders of Hon'ble High Court of Bombay in freezing the FSI as on 1991 have also been examined. The Orders of the Hon'ble High Court in this matter does not prevent the Government to amend the law. Hence, the Committee is of the opinion that in view of the serious environmental and social issues arising due to proliferation of slums the matter should be left to the State Governments to implement the slum rehabilitation schemes as per the concerned State Government norms issued from time to time. The Committee is of the opinion that rehabilitation of the slum areas is an urgent matter to be addressed in most of the cities of the country particularly in the coastal areas as they are vulnerable to hazard from the sea. However, the Committee recommends that while undertaking such housing for slum rehabilitation in the CRZ-II areas, the following shall be strictly adhered to:

- a. All construction activities shall be undertaken in these coastal municipalities on the landward side of the road included in the approved developmental plan or authorized structure(s).
- b. All developmental activities shall be undertaken (in these municipal areas) as per the prevailing local Town and Country Planning Regulations subject to the following conditions:



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- (i) no discharge of untreated sewage/effluents;
 - (ii) no activities shall be undertaken that would cause shoreline change including disturbing the sediment balance in the coastal waters;
 - (iii) adequate provisions/facilities shall be built to provide for quick and timely rescue, relief and rehabilitation measures in case of natural calamities;
 - (iv) adequate open space shall be provided to meet the emergencies during natural disasters, to maintain aesthetics including adequate ground cover for fresh water recharge;
 - (v) all residential constructions shall be provided with groundwater recharge facilities;
 - (vi) all residential or commercial buildings shall be provided with water recycling systems and shall use the recycled water for non-contact purposes such as gardening, washing and flushing (through dual pipeline system);
 - (vii) no dumping of solid waste. The solid waste shall be managed as per the MSW Rules;
 - (viii) no conversion of land earmarked for parks, gardens, schools, hospitals and dispensaries, defense establishments, disaster management and other public utility purposes;
 - (ix) necessary provisions shall be put in place to ensure that the ambient air quality within the municipality is as per norms. All construction activities, transport, industrial activities and so on, shall follow strict air quality norms so as to provide congenial quality of air for people.

3.1.3 The Committee had detailed discussions with regard to the dilapidated, ~~ceased and unsafe buildings~~. The Committee examined the existing provision at para 8V(c) titled "Redevelopment of dilapidated, ~~ceased and unsafe buildings~~" under CRZ Notification, 2011 including the amendment to the Notification. The Committee observed that in para 8V(c)(2)(ii) of the Notification dated 6 January 2011 provided for FSI and FAR as per prevailing Town and Country Planning Regulations. However, in the amendment dated 29 March 2011 to the CRZ Notification, 2011, the Ministry has frozen the FSI/FAR as on 6 January 2011. Now, State Government seeks the implementation of the original provisions of CRZ Notification, 2011

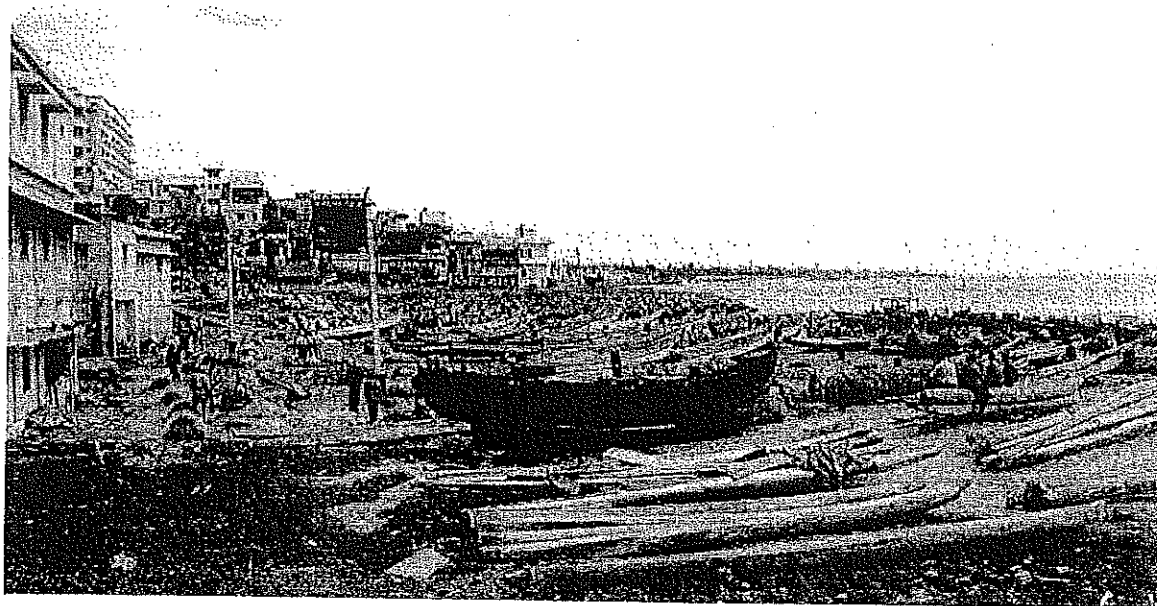
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which provides for FSI/FAR in accordance with Town and Country Planning Regulations prevailing as on date on which the project is granted approval by the State/UT Government.

The State Government has provided the reasons for such provisions mainly to provide safe housing to the tenements. The Committee after detailed discussions is of the opinion that the requests made by State Governments need to be accepted as this will facilitate people to have a safe and decent housing. The Committee also discussed the issue relating to collapsing of the old buildings in Mumbai especially during monsoon which causes huge loss of life and property. In view of the above difficulties faced by the people, the Committee accepted the requests of State Governments with regard to undertaking redevelopment of such buildings as per the provisions of Town and Country Planning Regulations subject to certain specific conditions which are listed under slum redevelopment at item 4.1.2 (i) to (ix) above.

3.1.4 The Committee examined the relevant para of CRZ Notification, 2011 pertaining to Koliwadās (these are fishing villages). As per the provisions, the Koliwadās are classified as CRZ-III within CRZ-II. The above provision restricts the development of Koliwadās. The State Government is of the view that such Koliwadās and Goathans (are villages) be classified as CRZ-II in order to bring them on par with other developments in Mumbai. This position is acceptable by the Committee as the fishermen communities living within city municipal limits classified as Koliwadās/Goathans/fishermen colony and so on, of Mumbai or elsewhere in such localities in the coastal areas of the country should be developed to meet the economic aspirations of the fishermen communities. The development of these areas shall be subject to the conditions listed in slum redevelopment at item 4.1.2(i) to (ix) above.

3.1.5 The open space and parks shall not be converted into developable areas. It shall be ensured that the open space, parks and so on in the approved Development Plan shall be maintained and no constructions shall be permitted except for toilets, wall, walkway and so on, required for non-commercial public use.



3.2 Development Issues in CRZ-III Including Dwelling Units of Fishermen

3.2.1 Several coastal States including Kerala brought to the notice of the Committee the need to reduce the No Development Zone in CRZ-III areas. The Committee after detailed discussion on the issues relating to local communities living in coastal areas was of the opinion that as per the information provided by State Government these local communities are put into great hardship due to the restrictions imposed by the CRZ Notification especially the NDZ specified in the CRZ-III areas. The local communities who possess land in such NDZ are deprived to construct or expand their houses. Further, the NDZ in the small islands in these water bodies is also restrictive and imposes restrictions on the housing/tourism facilities. It was brought to the notice of the Committee by State Government that some of these rural areas in Kerala, Karnataka and other places are thickly populated with more than 2000 people/km². Kerala being the State which has very less area for habitation is facing serious issues with regard to housing and other development activities. The Committee after detailed discussion is of the view that the rural areas may be divided based on the population density. The categorization of such populated rural areas shall be as thickly populated and other rural areas. The thickly populated rural areas shall be those which have a population density of more than 2161 people/km² which is as per class-III towns of 2001 census of India. Other rural areas would be those which are less than 2161 people/km². The

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Committee taking into consideration the hardships faced by the local communities and keeping in view the need for housing recommends that the NDZ may be reduced to (i) 50 m in the densely populated rural areas and (ii) 200 m NDZ along the other rural areas. The housing of the communities in densely populated areas could be taken up landward of the above NDZ subject to the following conditions:

- (i) In densely populated CRZ-III areas, development can be taken up in accordance with the local prevailing norms including the height regulations. The local authorities shall ensure that:
 - a. no activities shall be undertaken that would cause shoreline change including disturbing the sediment balance in the coastal waters;
 - b. adequate provisions/facilities shall be built to provide for quick and timely rescue, relief and rehabilitation measures in case of natural calamities.;
 - c. adequate open space shall be provided (to maintain aesthetics including adequate ground cover for fresh water recharge) and also to meet the emergencies during natural disasters;
 - d. all structures shall be provided with groundwater recharge facilities. Further, drawal of groundwater shall be regulated as per the norms laid down by the local ground water authority;
 - e. no discharge of untreated sewage/effluents. All buildings shall be provided with water recycling systems and shall use the recycled water for non-contact purposes such as gardening, farming, washing and flushing;
 - f. no dumping of solid waste;
 - g. no conversion of land earmarked for parks, gardens, schools, hospitals and dispensaries, defense establishments, disaster management and other public utility areas including areas meant for fisheries.
- (ii) Rural areas are those areas which are less populated. In such areas, development of new houses of local communities can be taken up beyond NDZ which is 200 m from the HTL. Expansion of existing houses in accordance with the prevailing local Town and Country Planning Regulations can be taken up subject to overall height of the construction not exceeding 9 m with ground plus one floor. For development of these rural areas, all provisions listed in a. to h. above shall be adhered to.



3.2.2 In the NDZ of CRZ-III areas, all traditional activities including fisheries, public amenities, recreational facilities and foreshore requiring facilities can be taken up in larger public interest as per the relevant provisions contained in the State and Central legislations and those contained in this notification. Repairs and reconstruction of existing authorized structure in the NDZ shall be taken up as per the local Town and Country Planning Regulations.

3.2.3 The Committee after detailed discussion on the issue is of the opinion that the dwelling units of the coastal communities in CRZ-III areas which have been constructed in violation of the CRZ Notification shall be regularized by the concerned States/UTs Government following the local town and country construction norms. If any of these violations are pending before the Court, the State Government may take up the matter, and with the approval of the Court such violations could be regularized.

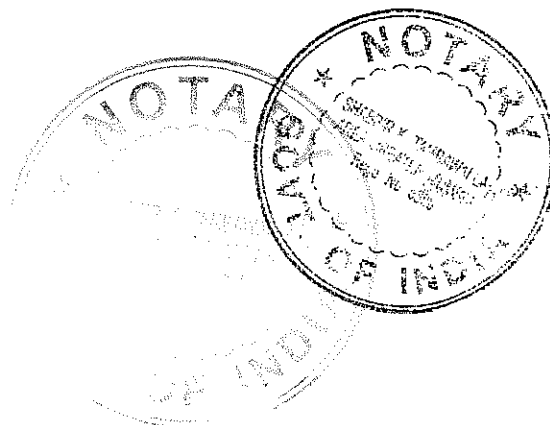
3.3 Fishery-Related Matters

The Committee is of the opinion that the modernization of the fish-processing units is necessary in order to improve the quality of processing and to maintain the norms stipulated for standards. Further, facilities for effluent treatment should be in place for the existing fish-processing units to ensure zero liquid discharge. Since the setting up of fish-processing units fall under the purview of the State/UT Governments, issues relating to modernization may also be dealt by the respective coastal State/UT Governments.

3.4 Tourism-Related Issues

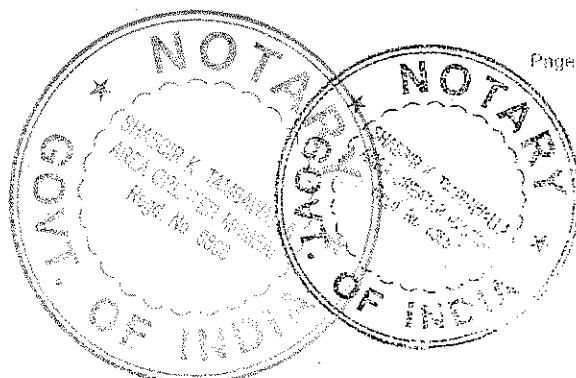
3.4.1 The Committee after examining each of the issues raised by Karnataka, Kerala and other States regarding difficulties in the implementation of the tourism-related projects and taking into consideration the potential for tourism, which could help regional economic development including the local communities, suggests the following:

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Tourism projects in the CRZ-II areas may be taken up as per the local Town and Country Planning Regulations. Tourism project(s) in the CRZ-III areas can be taken up as follows:

- (i) In the NDZ and in the intertidal area, temporary tourism facilities such as, cyclone shelter, toilets, wash rooms, change rooms, drinking water facility and temporary shack(s) can be taken up with the permission of the concerned local authorities. It shall be ensured by the local authorities that such facilities indicated above shall occupy only 33% of the area. Further, it shall be the responsibility of the authorities that the solid wastes are handled as per MSW Rules and no untreated effluents are discharged in the coast or in the waters. All disaster management mechanisms shall be put in place by the authorities for rescue and relief.
- (ii) Wherever there is a national or a state highway passing through the NDZ, the tourism facilities indicated at (i) above shall be taken up on the seaward side of the road. On the landward side of such road or NDZ, the following tourism activities can be permitted:
 - a. Eco-friendly resorts, hotels and other such facilities for tourism not exceeding 9 m in height with ground plus one floor with slope and tiled roof.
 - b. The total covered area of construction shall not exceed more than 33% of the total area. The open space in the site shall be utilized for greenery, non-paved parking, play fields, and so on. Green areas and open space shall be promoted so as to minimize the impact of storms and facilitate operation and rescue during natural hazards.
 - c. Drawal of freshwater from the aquifers shall be with the approval of the state ground water authority. Adequate facilities for groundwater recharging shall be provided.
 - d. No discharge of untreated sewage, no disposal of solid waste. The water shall be treated and reused within the project area for gardening, flushing and washing.
 - e. No operation of any hazardous or harmful activities which are detrimental to the coast and marine environment.



- f. To provide for adequate space for operation of livelihood activities of local communities who depend upon the resources of coastal and marine environment.

3.4.2 The Committee recommends that local communities including fishermen who possess houses in CRZ-III areas can be permitted to undertake tourism through home stay without changing the plinth area/design or facade of the existing structure.

3.5 Hazard Management

The Committee recommends that in addition to the CRZ categories and its jurisdiction, there shall be an HMZ, which is, the zone falling between the CRZ boundary and the Hazard Line on the landward side. The Hazard Line is being demarcated by the MoEF&CC through Sol and NCSCM. In this HMZ, the concerned State/UT Governments shall provide for necessary hazard management measures as per the HM Rules. The States/UTs shall prepare the hazard management plans for this zone and integrate it with the CZMP of their respective areas.

3.6 Demarcation of HTL/LTL

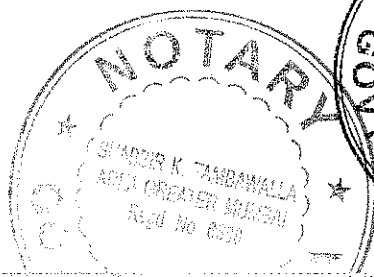
The Committee noted that the Ministry has assigned NCSCM to demarcate HTL and LTL based on the data/inputs provided by the Sol, NRSC and the coastal State/UT Governments. The above HTL/LTL is being demarcated by the NCSCM based on the advice of a Committee appointed by the Ministry. The HTL/LTL thus demarcated would be final and all the CZMP would be prepared based on the above HTL/LTL by the respective coastal States/UTs.

3.7 Preparation of CZMPs

3.7.1 This issue of CZMP preparation has been considered by the Committee, and the initiatives taken by the MoEF&CC in this regard have been appreciated. The HTL demarcation by NCSCM is a key step towards the preparation of the CZMPs. The uniform HTL all along the country shall resolve most of the issues related to it.

3.7.2 CZMPs shall be prepared by the States/UTs indicating the HTL, LTL, CRZ-I, CRZ-II and CRZ-IV areas, any other prohibited area declared by the States/UTs and

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the disaster management facilities superimposed on the approved Development Plan in case of CRZ-II areas (municipalities). In the case of CRZ-III areas, the CZMPs demarcating the HTL, LTL, CRZ-I, CRZ-III and CRZ-IV areas, any other prohibited area declared by the States/UTs and keeping in view the provisions contained in this Notification shall be prepared at the local body level.

3.7.3 The States/UTs may also address some of the important coastal issues, including climate change, renewable energy and any other innovative schemes suitable or unique for their location and include in the CZMP. Then this CZMP has to be recommended by the State/UT CZMAs and approved by the NCZMA. Thereafter, all the development activities in the CRZ will be governed by the local body as per the approved CZMPs.

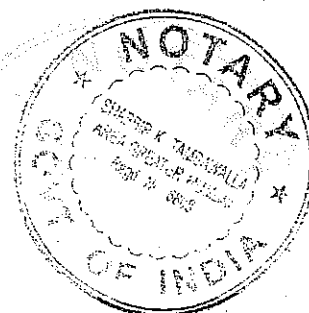
3.8 Tidal-Influenced Water Bodies

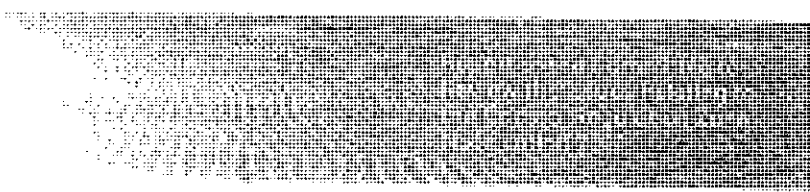
3.8.1 The Committee discussed the issues relating to the water bodies connected to the sea such as estuaries, rivers, creeks, backwaters, lagoons, ponds and the like which are termed as "tidal-influenced water bodies".

3.9 Enforcement of CRZ Notification

3.9.1 All activities proposed to be undertaken in the CRZ-II and CRZ-III areas other than those which attract EIA Notification, 2006 shall be governed by the concerned State/UT Government regulations subject to the conditions stipulated in the CRZ Notification and CZMPs approved by the NCZMA.

3.9.2 The Committee agrees to the request for speedy clearance of the projects. The Committee examined the process of clearance under CRZ Notification, 2011 including the various requirements/information sought at Annexure-IV of the Notification dealing with the application for clearances. It was felt that the information sought is required for all category of projects listed in the Notification which includes small houses of local communities, ice plants, fishing-related activities, agriculture, roads, rain shelters, community toilets and so on. Such information sought under Annexure-IV of the Notification may not be available with the agencies proposing to undertake the activities. Further, such detailed information may also not be required





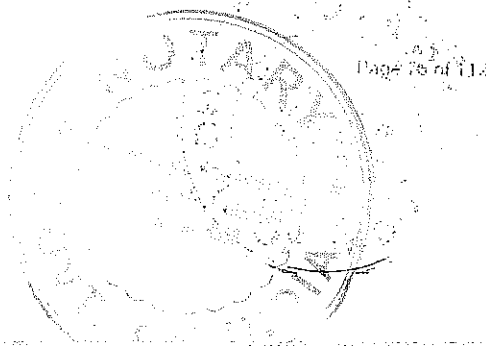
for small projects. With a view of simplifying the procedures for obtaining clearance under the CRZ Notification and to make it transparent and people friendly, each of the State Governments shall formulate the criteria for seeking clearance under the CRZ Notification along with an application form. The application form, details of the procedures, the agencies/local bodies that would clear the project, time limit for the clearance and so on shall be appended to the CZMP of the respective coastal States/UTs.

3.9.3 The Committee is of the opinion that all Acts, Notifications, governing the environmental issues shall operate independently and shall not be interdependent until unless specified. However, the project authority shall ensure that the projects are taken up for implementation only after receiving all statutory clearances.

3.9.4 The Committee examined the role of the CZMAs and the notification constituting the CZMAs. The Committee was of the opinion that the CZMAs should focus mainly on conservation and protection of the coastal areas especially the coastal ecosystem and geomorphological features which are so unique and fragile. The CZMAs rather than carrying out such scientific activity at the ground level are mainly involved in accordingly clearance and examining developmental projects particularly in the CRZ-II and III areas. This activity is a duplication of the Authorities and Agencies created under EIA Notification, 2006.

Hence, the Committee is of the opinion that all such activities and clearances with regard to developmental projects in CRZ should be considered and examined by the respective Authorities created under EIA Notification, 2006. The CZMAs including NCZMA should be responsible mainly for monitoring, enforcement and examining the implementation of the CRZ Notification, particularly, the status of ESAs and approval of CZMPs. The CZMAs should coordinate with NCSCM and SICOM with regard to protection and conservation of ecosystem including monitoring of pollution, erosion, accretion, and so on. The CZMAs should also play an important role in developing a State level capacity in various research and development including awareness in the area of coastal management. The MoEF&CC may provide necessary technical assistance and financial assistance under the ICZM Project to the coastal States/UTs for developing such expertise.

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3.9.5 The Committee examined several issues in the present CRZ Notification where the terminologies are not explained or defined. This has led to ambiguities, litigations, violations and difficulty to the people. Hence, the Committee is of the view that the Ministry shall clearly indicate the definition, jurisdiction, the process of clearance, timelines and so on, so that the people are not put to difficulty. Further, the transparency mechanism shall be built in the new regulations to ensure speedy clearance process.

3.9.6 It will be the responsibility of the concerned State Government to address issues relating to complaint and redressal mechanism. The Environment Division of the State and the PCBs are delegated with necessary provisions of EPA 1986 to take action against the violations. Further, the Committee under Shri T. S. R. Subramaniam has also addressed this issue which may be taken into consideration.

3.10 Monitoring, Institutional Mechanism and Capacity Building

3.10.1 The Committee is of the opinion that the State/UT Environment Departments which have a dedicated website for CRZ matters shall be updated regularly. The CZMPs shall be uploaded in the website after obtaining necessary approvals from Competent Authority. The notified areas under this Notification and decisions taken at the local level shall also be hosted on the dedicated website of the States/UTs.

3.10.2 Ministry will put in place a monitoring mechanism which will consist of State/UT CZMAs. The Ministry through specialized agencies shall strengthen the monitoring agencies and encourage monitoring through space and IT based technology. The Ministry will also put in place a third party monitoring system who will undertake periodic monitoring and evaluation of the coastal environment.

3.10.3 MoEF&CC through SICOM shall undertake strengthening of the existing institutions and periodic training and capacity building of the CZMAs and other stakeholders working in the area of coastal management. Further, the concerned State/UT Governments shall provide adequate infrastructure facilities keeping in



view the international scenario and emerging technologies in the area of coastal management.

3.11 Issues Related to Conservation of ESAs

3.11.1 The Committee after examination of the provisions of the CRZ Notification, 2011 it is observed that there is no adequate provision for management of ESAs which are categorized as CRZ-I including the geomorphological and archaeological features. It was brought to the notice of the Committee that the mangroves are present in the Government as well as in the private lands. While the protection is provided in the Government land by the concerned State Government agencies, the owners of private land, who have planted the mangroves and face difficulties as the mangrove land is declared as 'no development area. This provision of imposing no development on a private mangrove land is a disincentive to such land owners. While the Committee appreciates the efforts and initiatives taken by the private owners in developing mangroves, it is found that there are no incentives to such initiatives. Further, the Committee feels that the private land owners should also be enabled to undertake development as per the local Town and Country Planning Regulations.

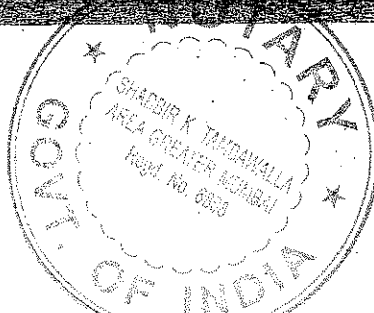
3.11.2 It was mentioned that the mangroves in case of more than 1000 m² are required to provide 50 m buffer. However, unfortunately, the buffer zone of 50 m has led to encroachment, illegal dumping, construction activity and slum redevelopment. Hence, to prevent such unauthorized and illegal activities which are harmful to mangroves, a walkway on stilts along the boundary may be permitted. The 50 m buffer could also be developed as a green belt under social forestry or gardens. Further, the Committee is of the view that marine interpretation centres and research facilities are a requirement to spread awareness about the mangroves and its flora and fauna associated with it. Such awareness about the mangroves and the associated flora and fauna by the public would bring out better conservation and protection of the mangroves. This would be a positive approach which may be encouraged. The walkways, promenades and social forestry could be promoted all along the mangrove buffer zone that would prevent illegal felling of mangroves and

also prevent dumping of waste in the mangrove area. In order to promote the conservation of mangroves, the Committee is of the opinion that the approval mechanism should be made simpler and faster and the State Government should be delegated the power to recommend and clear such proposals.

3.11.4 The Committee examined the issue of mapping the ESAs and preparation of the management plan in detail. It was brought to the notice of the Committee by NCSCM that the mapping activity of ESAs including the preparation of management plans for the conservation and protection of these ESAs are undertaken by the NCSCM.

3.11.5 The Committee taking into consideration the various aspects of mangrove conservation and the request made by the State Government to undertake certain development in larger public interest recommends as follows:

Mangroves in the coastal areas act as breeding, spawning and rearing grounds of several aquatic fauna that are important for biodiversity. Several species of finfish and shellfish live in mangrove areas on which the local communities depend for their livelihood. Further, the mangroves help in minimizing the impact of storms, floods, erosion and so on and are also carbon sinks. Keeping in view the importance of mangroves, the concerned State/UT Governments shall earmark adequate funds and identify suitable land for promoting, conserving and afforestation of mangroves in the respective areas. This activity shall be undertaken by the concerned State Governments/UTs.

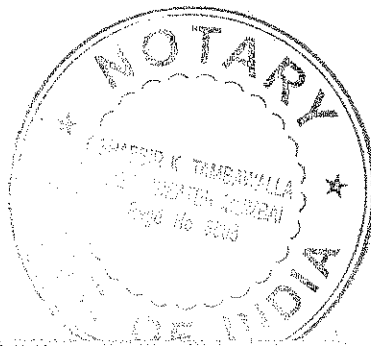


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The mangrove vegetation in the coastal areas are categorized as follows:

- (i) Mangroves declared as forest under Forest Conservation Act, 1980 – Notwithstanding anything contained in this notification, such mangroves declared by the concerned State Governments/UT Administrations/Central Government as forest land under the F(C)A, 1980 shall attract the provisions of the F(C)A, 1980 only.
 - (ii) Mangroves in (a) Government land not declared under Forest Conservation Act, 1980; (b) private land.
- 1(a) Mangroves in Government land shall be protected based on a detailed plan prepared by the concerned State/UT Governments. In case the mangrove area is more than 1000 m², a buffer of 50 m along the periphery of mangrove area shall be provided. This buffer zone of 50 m shall be utilized for constructing walkways, interpretation centers, promenades public facilities for developing parks, research facilities related to mangrove biodiversity, facilities for conservation and the like. Further, in the mangrove area and in the buffer, all activities are prohibited except for laying of pipelines, transmission lines, conveyor belts, construction of road on stilts and other conveying mechanisms that are required for public use. Defense establishments such as watch tower could be taken up in the mangrove area. In such cases where removal of mangroves is inevitable in public interest after examining all the alternatives, a minimum of ten times the area of mangroves shall be re-planted and protected within the coastal zone of respective States or UTs. Mangrove removal for the above purposes shall be undertaken only on the recommendation by CZMAs and on the approval of the concerned States/UTs.
- 2(a) Government land designated for agriculture, fishing, infrastructure meant for local communities, fresh water storage, aquatic bodies, public bodies and associated infrastructure facilities for public use in the development plan which was approved prior to approval of CZMP of 26 September 1996 under the CRZ Notification 1991 may be taken up.
- In case of such designated areas where mangroves have grown due to abandonment of agriculture, fishery related activities or lack of infrastructure

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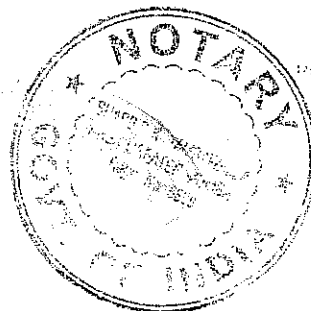


to prevent ingress of salinity into land/fresh water bodies, in such areas development can be taken up as per the development plan approved prior to 27 September 1996 subject to the condition that such development in the mangrove land are considered by a committee headed by the Chief Secretary of the States/UTs. For any mangrove area destroyed while undertaking developments as indicated above, compensatory mangrove afforestation should be taken up 20 times in lieu of the mangrove destroyed, in an area identified by NCSCM.

- (b) For mangroves in private land, incentives shall be provided by the concerned State/UT Forest Departments for promoting mangrove conservation/afforestation in private land, for which there will be no requirement of a buffer zone. The developmental activities in the private mangrove land can be taken up.

3.11.6 The Committee taking into account the provisions of the CRZ Notification in this regard agreed that the proposed notification should provide for the following:

- i. To clearly indicate that destruction of mangroves other than for the permissible activities under the notification is a prohibited activity.
- ii. The mangroves shall be mapped by the NCSCM who have already been assigned the work of mapping ESAs. Detailed management plan for protection and conservation of mangroves shall be taken up by the concerned Department in the State Government. 50m buffer shall be provided along the mangrove area wherever the mangrove area is more than 1000 m².
- iii. For the purpose of conservation, protection and to create awareness, certain basic public infrastructure such as walk ways, rain shelters, interpretation centres, research facilities, parks, forestry and promenades, field research facilities related to coastal ecosystems and marine interpretation centres, can be created. The walkway on stilts could be constructed along the buffer area of such mangrove patch. All such developments shall be for public purposes only. For any mangroves destroyed for such construction, compensatory mangrove plantation of ten times shall be taken up within the States/UTs. It shall be ensured that no benefit for construction shall accrue on the landward side of such constructions.



3.12 Other Issues

3.12.1 The Committee discussed in detail the issue relating to coastal road in the CRZ-IV which is the water area. GoM has proposed such roads not only to ease the traffic congestion but also due to lack of land available in the mainland for this purpose. The justification provided is that such road would provide for faster means of transportation and can be taken up with no rehabilitation/relocation. Although the project is being taken up in larger public interest, the environmental issues especially from the coastal environment need to be addressed in detail for taking up such projects. Large-scale reclamation may transform the coastline. The project may cause erosion and other associated impacts such as destruction of mangroves, loss of beaches and loss to fisheries affecting the fishing community. In this regard, the State Government may have to carry out a detailed study along with a feasibility report. If found feasible from both economic and environmental angles; the coastal road project could be incorporated in the CZMP for which a separate approval may be sought from the MoEF&CC after following due procedures. The MoEF&CC shall examine the project under CRZ as the project falls within CRZ-IV category.

3.12.2 The Committee discussed in detail with regard to the new airport proposed by Maharashtra in an island in Thane creek. It was the view of the Committee that the GoM may reconsider the proposal since climate change and subsequent SLR is a serious issue. Further, in view of the increasing frequency of cyclones, storm surges, currents and so on, the feasibility from technical angle needs to be examined critically by the GoM. Though in several countries offshore airports are operating, this issue needs to be examined from both economic and environmental angles.

3.12.3 The request regarding the usage of old industrial buildings in CRZ area for developmental activities which are non-polluting in nature including tourism and other service sector activities was considered by the Committee. The Committee agrees with the proposal, however, the plinth area of such structures shall not be altered.

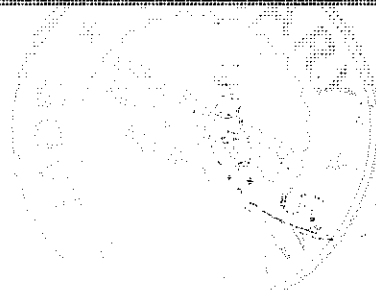
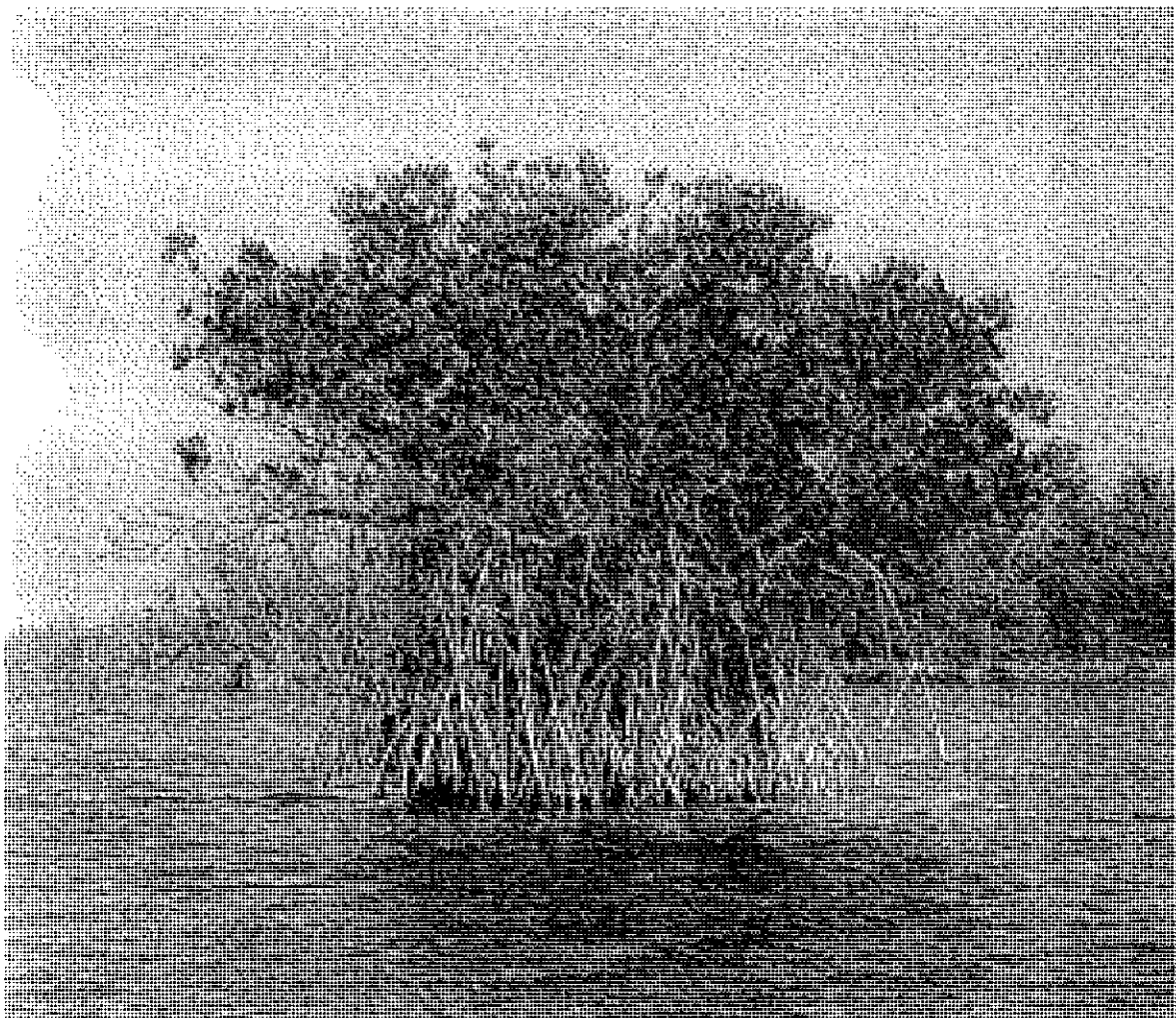
3.12.4 The Committee after taking into account the request of GoG seeking relaxation in mining of limestone in CRZ area was of the opinion that the limestone reserves are valuable and should be utilized for developmental purposes. The

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limestone reserves of Gulf of Kachchh and Saurashtra need to be examined and studied in detail by reputed scientific national institutes such as CSIR – Central Mining Research Institute, Dhanbad, National Cement and Building Material Institute, Faridabad and NCSCM. Based on the recommendations of these Institutes, selective mining with appropriate safeguards related to ground water, coastal erosion and others could be carried out. The mining of such minerals could be indicated in the CZMP of the State/UT which shall be prepared based on the above studies.

3.12.5 The Committee recommends that all other projects of national importance declared by the Central Government shall be undertaken in CRZ on a case-to-case basis based on EIA as provided in the EPA 1986.



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Chapter 4

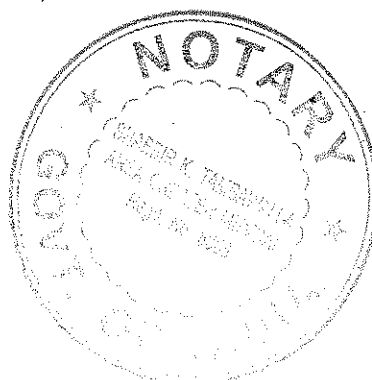
Recommendations and Proposed Draft CRZ Notification

4.1 Recommendations

The Committee after examining in detail the issues of coastal environment, the hardship faced by the communities, the need for economic development of the country and based on the six principles, recommended the following:-

- A. The coastal areas have fragile ecosystems which are sensitive to various parameters such as salinity, temperature, turbidity, pollution and disturbance to the substrata. Even small changes in these parameters lead to partial or total destruction of these ecosystems, which in most cases are irreversible; hence, they should be preserved and conserved. From the data made available, it is observed that these ecosystems have undergone destruction over a period of time. Such irreversible damages cause serious impact to the livelihood to the local communities as these ecosystems sustain the productivity of the coastal areas. Further, these ecosystems such as mangroves, coral reefs, sea grass beds and coastal forests act as barriers to cyclones, flooding and erosion and also act as major carbon sinks. In view of the immense importance of the ESAs, the MoEF&CC may formulate concrete proposals and initiate activities for the conservation and protection of these ecosystems.
- B. The ecosystems while rendering immensely useful goods and services to the environment and coastal communities, can also attract tourism if properly managed. Hence, it is important that the Government takes major initiatives in identifying, conserving and drawing up concrete framework based on certain successful models worldwide including that of IUCN for the conservation, protection and promotion of eco-tourism in such areas. These would provide alternative livelihood to local communities, thereby, reducing pressure on the fish and fisheries.

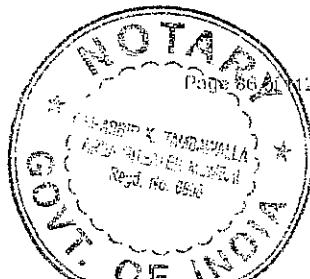
- C. The Committee strongly opined that ESAs mapped under CRZ-I should be identified based on scientific assessment, each of which shall be notified. The States/ UTs through reputed scientific authorized agencies shall undertake conservation, protection measures as per the management plan based on the guidelines prepared by MoEF&CC.
- D. The coastal areas also are places where several historical, archaeological and heritage value structures and areas are present. These features need to be protected and conserved from the historical point of view. The MoEF&CC in cooperation with the Ministry of Culture should undertake identification, mapping and conservation programmes of such areas.
- E. The sea bed and the bed of the tidally influenced water bodies are the breeding, spawning and rearing grounds of several coastal/marine species on which the local communities depend upon. Several activities such as indiscriminate mining and dredging have destroyed the benthic flora and fauna. Such activities have affected the coastal processes leading to accretion, deposition and change in hydrodynamics and morphodynamics. Hence, there is a need to protect and regulate the activities that are detrimental to the integrity of the water bodies and their bed.
- F. The marine waters and the coastal areas have been sites for disposal of sewage, effluents and solid waste. This indiscriminate dumping and disposal over a period of time has made the coastal waters and several of the coastal stretches toxic. It is a fact that the coastal cities are growing but there is inadequate solid waste management or sewage treatment facilities to address the pollution-related problems. If left unattended, the implications would be serious and could be irreversible. Hence, the Government, at local, State and Central level, should take serious note of this issue and address the problem at the earliest. The State Pollution Control Boards should be entrusted to take up the Government's initiative of "Swachchh Bharat Abhiyaan" in the coastal and marine waters as well.
- G. It is observed that the CRZ Notification has tried to address some of the issues related to Town and Country planning in it. The Committee was informed by all the coastal States and UTs that they have well-laid Town and Country Planning



Regulations. The regulations of the CRZ Notification in category II and III areas, especially with regard to construction, have affected the housing, slum redevelopment, redevelopment of dilapidated structures and other dangerous buildings. It is strongly felt that the concerned State Governments should be left to address the housing needs of the communities as per the State/UT Government norms. Providing decent housing to all communities is of prime importance and is a fundamental requirement of the people.

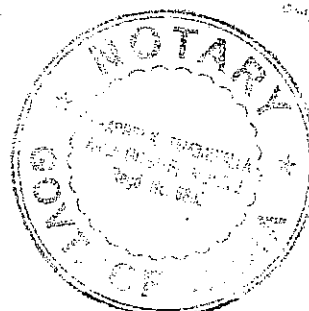
- H. The States and UTs also brought to the notice of the Committee the need for safe, hygienic and decent housing with basic infrastructure facilities for large sections of the coastal fisher and other population who since several decades have been living in unhygienic, disaster-prone slums and unsafe buildings. The Committee is convinced that the CRZ Notifications have not addressed this human issue comprehensively. Although the Committee agrees that the construction of housing infrastructure would lead to congestion in the coastal areas, there is no alternative with the Governments as there are no mechanisms in place to prevent migration of population to coastal areas or to decongest the existing populated areas. In the absence of such mechanisms, it is imperative that housing with basic infrastructure facilities is provided to these communities in the national interest.
- I. It has been brought out to the Committee by all the States/UTs that the CRZ Notifications have been made very complex and its interpretation and implementation is difficult. It was also observed that certain terminologies used in the CRZ Notification such as the word "existing" "HTL" etc were not defined in right time. Some of the issues being scientific, appropriate guidelines were not issued by the Government to the public. Hence, lot of ambiguity exists even today and several court cases and disputes have arisen due to such complexities. The HTL/LTL demarcation, boundaries of CRZ-I, CRZ-II and CRZ-III and so on, are complicated. It is recommended that the Ministry addresses each of the issues in detail and brings out guidelines, criteria and so on.
- J. The other major issue that has come before the Committee is the conflicting and overlapping jurisdictions and provisions in the CRZ and other laws. The CRZ Notification, 2011 provisions especially in the CRZ-II and CRZ-III areas override

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the Town and Country Planning Regulations of the coastal States/UTs in the CRZ area. This disparity between the CRZ and non-CRZ had led to several issues. Most State Governments have sought for uniform regulations in the State for smooth implementation. This suggestion of the State Governments is found justified since currently there are a lot of ambiguities with regard to HTL/LTL mapping, CRZ boundary demarcation and so on, which are prerequisites for CZMP, the preparation of which is considerably delayed. It is also observed that the Environment Departments of States/UTs are extremely under-staffed to meet the challenges of CZM. The existing staff in the States/UTs is mostly involved in addressing approvals and issues relating to CRZ-II and CRZ-III. There have been very few instances where States/UTs have taken proactive steps in CRZ-I and CRZ-IV areas, the conservation of the ecosystems in it, combating pollution and improving the general environmental quality of the coast. Hence, the Committee is of the opinion that the Environment Departments of the States/UTs and the MoEF&CC should be sensitized to mainly address CRZ-I and CRZ-IV issues and in turn allow the concerned Departments in the States/UTs to address the issues relating to CRZ-II and CRZ-III themselves as they relate mostly to town and country planning arena.

- J. The Committee is also of the opinion that new opportunities and initiatives need to be taken to address the economic and social development of coastal communities. Most of the traditional coastal communities, who live on the resources from the coastal areas, especially fishing, need to be provided with adequate opportunity for economic development. In this regard, the Committee is of the opinion that while the ecosystems are being conserved and protected by the Governments, the local communities should also play an important role in conservations and protection of the ecosystems. The local communities should be provided with an opportunity to take up tourism, artisanal fisheries such as traditional aquaculture and ornamental fish culture, in such ecosystem areas for their economic improvement. The Governments should work in this area which will address both conservation and economic development of the communities thereby, reducing pressure on the already depleting fisheries.



- K. Another matter of concern which the Committee has noted is the change in the shoreline. The shoreline change is accelerated by anthropogenic activities. In this context, certain initiatives have been taken by the MoEF&CC through the NCSCM wherein the shoreline changes are being mapped and studied. The above-mentioned studies need to be taken into consideration while undertaking foreshore developmental activities. Also, the studies need to be carried further to ascertain exact reasons of shoreline change.
- L. The Committee appreciates the initiatives taken by the Ministry in setting up exclusive Centres for coastal management such as NCSCM, SICOM and State level Project Management Units including strengthening of the consortium institutions in each of the coastal States/UTs. These agencies could be further developed for undertaking research and development in the area of coastal management and also to address the social needs of the communities in the States/UTs.
- M. The Committee after detailed examination of all issues raised by the States/UTs Government and taking into consideration the international scenario in the area of CZM including the emerging scientific technologies in the area of coastal and marine management is of the clear view that the MoEF&CC should embark upon new initiatives for protecting and conserving the coastal and marine areas which have such precious and fragile ecosystems.

Based on the discussions with the States/UTs with respect to each of the issues raised by them, the decisions therein and the recommendations given above the Committee proposes a draft CRZ Notification, which, if approved by the MoEF&CC, shall supersede the CRZ Notification, 2011.

4.2 Proposed Draft CRZ Notification

Whereas, the Ministry of Environment, Forests and Climate Change (hereinafter referred to as MoEF&CC) issued Coastal Regulation Zone (hereinafter referred to as CRZ) Notification, 2011 vide S.O.19(E) dated 6th January, 2011 under Section 3 of Environment (Protection) Act, 1986;

And whereas, the coastal and marine ecosystems also contain Ecologically Sensitive Areas (hereinafter referred to as ESAs) which sustain high biodiversity and offer immense value of ecosystem services to people for their livelihood;

And whereas, the ESAs such as mangroves, coral reefs, turtle nesting ground etc., provide protection to local communities from natural hazards such as cyclone, flood, tidal surges, sea level rise, etc.;

And whereas, certain ESAs provide for breeding, spawning and rearing grounds of economically important finfish and shellfish in the coastal and the marine areas on which the local communities depend for their sustenance;

And whereas, certain ESAs such as mangroves, coral reefs, forests under Forest Act (1980), sea grass beds and the like and the geomorphological features such as beaches, sand dunes, mudflats etc., are important as they play a critical role in maintaining the integrity of the coastal and marine dynamics including helping in recharging the fresh water aquifers;

And whereas, coastal areas including the ESAs offer great opportunity for promotion and development of eco-tourism including beach tourism;

And whereas, the large amount of flora including that of ESAs along the coastal and marine areas act as a carbon sinks that help in reducing global warming;

And whereas, the coastal and marine environment of the country is highly diverse in terms of flora, fauna, geomorphological features, climatic conditions, hydrodynamics and demographic patterns;



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And whereas, certain areas along the coastal and marine regions have natural features that provide for increased scenic beauty, structures/monuments which are archeologically and heritage-wise valuable and such areas provide for high and incomparable aesthetic/historic value;

And whereas, the sea bed and the bed of the tidally influenced water bodies are being indiscriminately mined for sand and other resources, thereby, destroying the benthic flora and fauna that also affect the sediment dynamics;

And whereas, the coastal and marine areas are experiencing increase in pollution load mainly from industries and sewage generated not only from coastal infrastructure/townships and cities but also from the discharge of effluents, pesticides and sewage generated in the hinterland far away from the coast brought through the rivers;

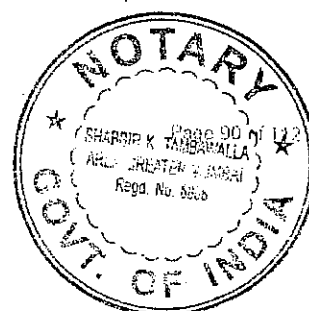
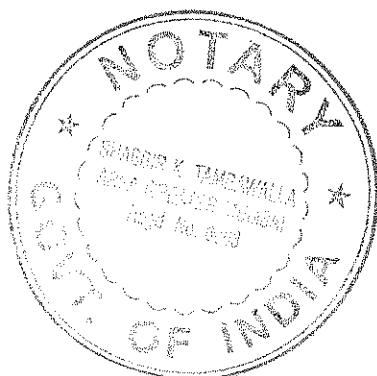
And whereas, the livelihood of the local communities are affected due to depletion of economically important fish stock on account of destruction of marine ecosystems also due to indiscriminate effluent discharge and solid waste dumping;

And whereas, the coastal and marine areas are experiencing impacts of climate change including sea level rise;

And whereas, the State Governments and Union Territories (UTs) have expressed that the CRZ Notification, 2011 did not provide adequate measures and incentives for conservation and management of ESAs and areas along the coastal and marine areas;

And whereas, the Ministry is made aware of the conflict between certain State/UT level legislations and the provisions contained in the CRZ Notification, 2011 and these conflicts are adversely affecting the housing and livelihood of the local communities;

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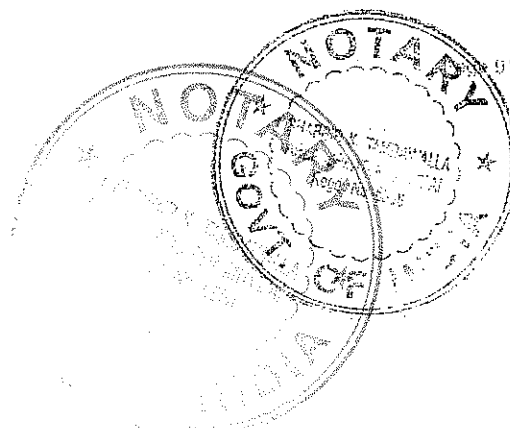


And whereas, all the State Governments/UTs have requested the MoEF&CC to simplify the procedures laid down in the CRZ Notification, 2011, thereby making it people friendly and transparent;

And whereas, in the CRZ Notification, 2011 where the objective was to ensure livelihood security to the fishing communities and other local communities living in the coastal areas, to conserve and protect coastal stretches, its unique environment and its marine area and to promote development in a sustainable manner based on scientific principles by taking into account the dangers of natural hazards in the coastal areas, sea level rise; declared the coastal stretches of the country and the water area up to its territorial water limit, excluding the islands of Andaman and Nicobar (hereinafter referred to as A&N) and Lakshadweep and the marine areas surrounding these islands up to its territorial limit, as CRZ and restricted the setting up and expansion of any industry, operations or processes and manufacture or handling or storage or disposal of hazardous substances as specified in the Hazardous Substances (Handling, Management and Transboundary Movement) Rules, 2009 in the aforesaid CRZ;

And whereas, the MoEF&CC has received several representations from various coastal States and Union Territories (UTs) regarding the difficulties in implementing the CRZ Notification, 2011;

Having understood the above and the value of the coastal and marine ecosystems, the benefits that they offer and their potential to offer to mankind and the need for their conservation and preservation, in exercise of powers also conferred by clause (d) and sub rule (3) of rule 5 of Environment (Protection) Act, 1986 and in supersession of the Notification of the Government of India in the MoEF&CC, number S.O. 114(E), dated the 6th January, 2011 except as respects things done or omitted to be done before such supersession, the Central Government hereby declares the areas as CRZ and imposes the following restrictions on setting up and expansion of industries, operations, processes and the like in the CRZ.



2. In this draft notification, unless the context otherwise requires

- (i) 'High Tide Line (hereinafter referred to as the HTL)' means the High Tide Line as demarcated by the National Centre for Sustainable Coastal Management (hereinafter referred to as NCSCM) based on 2011-12 satellite data generated specifically for this purpose by Sol under the Integrated Coastal Zone Management Project of MoEF&CC. The HTL demarcated by NCSCM based on the above data would be the final HTL for all purposes under this draft notification.
- (ii) 'Low Tide Line (hereinafter referred to as the LTL)' means the Low Tide Line as demarcated by NCSCM based on 2011-12 satellite data and the data generated by SOL. The LTL demarcated by NCSCM based on the above data would be the final LTL for all purposes under this draft notification.
- (iii) 'Hazard Line' means the line demarcated by the Survey of India (hereinafter referred to as Sol) taking into account the extent of flooding on the land area due to water level fluctuations, sea level rise and erosion/accretion (shoreline change) occurring over a period of time;
- (iv) 'Coastal Zone Management Plan (hereinafter referred to as the CZMP)' means the plans mandated under the CRZ Notification to be prepared by the concerned State/UT Governments based on the criteria/guidelines laid down in this draft notification at Annexure-B. The CZMP prepared by the State/UT Governments and approved by NCZMA will be notified under E(P)A, 1986 after holding public hearing as provided for in the said Act.;
- (v) 'Densely populated rural areas' means those coastal areas which have a population density more than 2161 people per sq km (as per Class-III towns of 2001 Census of India) within the smallest census unit along the coast prescribed in the census of 2001;
- (vi) 'Rural coastal areas' means those coastal areas which have a coastal density of less than 2161 people per sq km (as per Class-III towns of 2001 Census of India) within the smallest census unit along the coast prescribed in the census of 2001;

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- (vii) 'Tidally influenced water bodies' are those water bodies influenced by tidal effects of the sea such as estuaries, creeks, backwaters, lagoons, and the like connected to the sea;

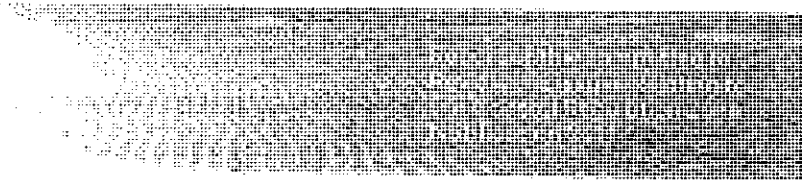
3. Jurisdiction of this draft notification

- (i) Land area from HTL to 500m on the land ward side along sea front;
- (ii) Land area between HTL to 100m or width of the water body, whichever is less, on the landward side along the tidally influenced water bodies;
- (iii) Land area between HTL and LTL which is termed as inter-tidal zone;
 - (a) Water area and the bed area of the sea from LTL to the limit of the territorial waters or International Maritime Boundary Line (IMBL);
 - (b) In case of tidally influenced water bodies, the bed area between LTL on one side of the bank to the LTL of the opposite side of the bank;
- (iv) The CRZ is applicable to all mainland islands, which are located in the tidally influenced water bodies and those islands which are located in the offshore of the mainland. Oceanic islands of the Andaman & Nicobar and Lakshadweep are dealt with in the Island Protection Zone (IPZ) Notification 2011.

4. Hazard Management Zone:

In addition to the above, there shall be a hazard management zone (hereinafter referred to as HMZ), which is the zone falling between the CRZ boundary and the hazard line on the landward side. The hazard line is being demarcated by MoEF&CC through NCSCM. In this HMZ the concerned State(s)/UT shall provide for necessary hazard management measures as per the HM Rules.

5. Roles and responsibilities of authorities and agencies under this draft notification,

- 
- (i) MoEF&CC shall be responsible for overseeing the implementation and enforcement of this n.
- (ii) National Coastal Zone Management Authority (hereinafter referred to as NCZMA constituted under E(P)Act, 1986) shall be responsible for according approval to the CZMPs prepared by the concerned States/UTs Government along with other responsibilities/duties entrusted by MoEF&CC.
- (iii) SICOM established by MoEF&CC under the Society Registration Act, 1860 shall be responsible for coordinating with various Central Ministries/ State/UT Governments and other agencies with regard to implementation of the notification including the CZMAs. SICOM shall coordinate and facilitate transfer of requisite data from different authorised agencies such as, MoEF&CC, ISRO, SAC, NCSCM, Sol, NIOT etc., to the States/UTs for the purpose of preparing CZMPs and other management plans. SICOM shall undertake capacity building and also facilitate in institutional strengthening of various agencies including the CZMAs and other stakeholders.
- (iv) State/UTs shall be responsible for preparing the CZMPs of their respective areas including any other management plans listed under this draft notification. Further, the CZMAs shall be responsible for recommending the CZMPs prepared by the States/UTs, overseeing the implementation of the CZMPs and enforcing the provisions of this draft notification.
- (v) NCSCM established by SICOM as a Society under Tamil Nadu Societies Act 27 of 1975 shall be the research and development Centre in the area of coastal and marine zone management. NCSCM will be responsible for providing HTL/LTL, the necessary inputs for demarcation, delineation and guidelines for management of ESAs, CZMPs, ICZMPs and the like.
- (vi) Authorised agencies are reputed scientific bodies identified by MoEF&CC for the purpose of preparing the CZMPs for the States/UTs based on the guidelines. These authorised agencies can also take up implementation of the management plans if so assigned by the concerned State/UT Governments.

6. List of prohibited activities in the CRZ area:

- (i) Setting up of new industries and expansion of existing industries except,-

(a) those directly related to waterfront or directly needing foreshore facilities;

Explanation: The expression "foreshore facilities" means those activities permissible under this draft notification and they require waterfront for their operations such as ports and harbours, jetties, quays, wharves, erosion control measures, breakwaters, pipelines, lighthouses, navigational safety facilities, coastal police stations, projects of national strategic importance and the like.;

(b) projects of Department of Atomic Energy;

(c) facilities for generating power by non-conventional energy sources and setting up of desalination plants in the areas not classified as CRZ-I(i) based on an impact assessment study including social impacts;

(d) reconstruction, repair works of dwelling units of local communities including fishers in accordance with local town and country planning regulations;

- (ii) manufacture or handling of oil storage or disposal of hazardous substances as specified in the notification of Ministry of Environment and Forests, No.S.O.594 (E), dated the 28th July 1989, S.O.No.966(E), dated the 27th November, 1989 and GSR 1037 (E), dated the 5th December, 1989 except,-

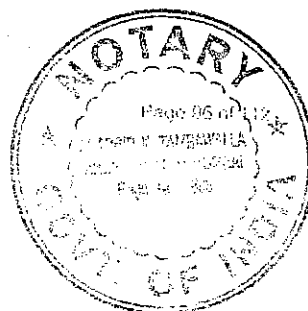
(a) transfer of hazardous substances from ships to ports, terminals and refineries and vice versa;

(b) facilities for receipt and storage of petroleum products and liquefied natural gas and facilities for regasification of Liquefied Natural Gas (hereinafter referred to as the LNG) in the areas not classified as CRZ- I subject to implementation of safety regulations including guidelines issued by the Oil Industry Safety Directorate in the Ministry of Petroleum and Natural Gas and guidelines issued by MoEF&CC and subject to further terms and conditions for implementation of ameliorative and restorative measures in relation to environment as may be stipulated by in MoEF&CC.

- (ii) Provided that facilities for receipt and storage of fertilizers and raw materials required for manufacture of fertilizers like ammonia, phosphoric acid, sulphur, sulphuric acid, nitric acid and the like, shall be permitted within the said zone in the areas not classified as CRZ-I.

- (iii) setting up and expansion of fish processing units including warehousing (excluding hatchery and natural fish during in permitted areas):
(Provided that existing fish processing units for modernization purposes may utilize twenty five per cent additional plinth area required for additional equipment and pollution control measures only subject to existing Floor Space Index/ Floor Area Ratio norms and subject to the condition that the additional plinth area shall not be towards seaward side of existing unit and also subject to the approval of State Pollution Control Board or Pollution Control Committee.)
- (iv) Reclamation, bunding or disturbing the natural course of seawater except for those measures,-
- (a) essential for setting up, construction or modernisation or expansion of foreshore facilities like ports, harbours, jetties, wharves, quays, slipways, bridges, sealinks, roads on stilts, and facilities meant for defense and security purposes and other facilities that are essential for activities permissible under the notification;
 - (b) required for control of erosion, based on scientific studies including Environmental Impact Assessment (hereinafter referred to as the EIA);
 - (c) essential for maintenance or clearing of waterways and channels for ports / harbours / jetties based on EIA studies;
 - (d) required to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structures for prevention of salinity ingress and freshwater recharge based on studies carried out by any agency to be specified by MoEF&CC.
- (v) Setting up and expansion of units or mechanism for disposal of wastes and effluents except facilities required for,-
- (a) discharging treated effluents into the water course with approval under the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974);
 - (b) storm water drains and ancillary structures for pumping;
 - (c) treatment of waste and effluents arising from hotels, beach resorts and human settlements located in CRZ areas other than CRZ-I and disposal of treated wastes and effluents;

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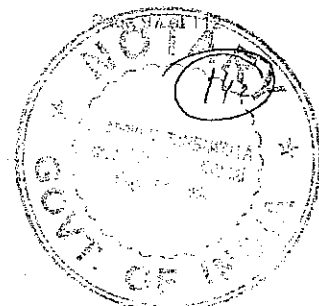


1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

- Note:-The MoEF&CC will issue a separate instruction to the States and Union Territories in respect of preparation of action plans and their implementation as also monitoring including the time schedule thereof, in respect of paras (v), (vi) and (vii).

- (a) In the areas which are inhabited by the local communities for drinking and domestic use it shall be done only using manual methods.
- (b) In the 200m-500m zone the drawl shall be permitted only when done manually through ordinary wells for drinking, horticulture, agriculture and fisheries and where no other source of water is available.

(x) Construction activities in CRZ-I except those specified in this draft notification. Any other activities that need to be prohibited/ permitted by the concerned States/UTs other than those mentioned above or any discrepancies noticed by the State/UT Government with regard to the CRZ area between 1991 and 2011 shall be rectified and be specified in the CZMP. Only those essential activities required at



larger public and national strategic interest and duly justified with approval at the highest level of the State/UTs shall be brought out clearly in the approved CZMP and can be implemented after the CZMP is approved by NCZMA and notified by MoEF&CC.

7. Classification of the CRZ:

For the purpose of conserving and protecting the coastal areas and marine waters, the CRZ area shall be classified as follows:

A. CRZ-I are those coastal zones which are ESAs, geo-morphologically important zones and archaeological and heritage areas.

a. Ecologically Sensitive Areas (ESA)

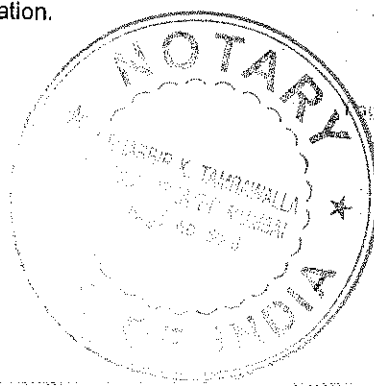
- (a) Mangroves
- (b) Corals and coral reefs and associated biodiversity
- (c) Salt marshes
- (d) Sea grasses
- (e) Horse shoe crab habitats
- (f) Turtle nesting grounds
- (g) Bird nesting grounds
- (h) The national parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas declared under the provisions of Wild Life (Protection) Act, 1972 (53 of 1972), the F(C)A, 1980 (69 of 1980) or E(P)A 1986 (29 of 1986); including Biosphere Reserves would be conserved and protected as per the provisions of the respective Acts/notifications/guidelines.

b. Geo-morphologically Important Zones

- (a) Intertidal areas
- (b) Sand dunes
- (c) Mudflats
- (d) Sandy beaches

c. Areas or structures of archaeological importance and heritage value sites.

The conservation, protection and management framework for the CRZ-I shall be as given in Annexure-A of this draft notification.



B. CRZ-II: The areas that have been developed up to or close to the shoreline along the mainland.

Explanation- The expression "developed area" referred to as that area within the municipal limits declared by the States/UTs from time to time or in other existing legally designated urban areas which are substantially built-up and has been provided with drainage and approach roads and other infrastructural facilities such as water supply and sewerage mains;

(1) Regulation of activities in CRZ-II shall be as follows:

(a) buildings, including slum rehabilitation, reconstruction of dilapidated structures and unsafe buildings, shall be permitted only on the landward side of the existing road or road proposed in the Development Plan or on the landward side of existing authorized structures;

(b) buildings permitted on the landward side of the existing road or road proposed in the Development Plan or existing authorized structures shall be subject to the local town and country planning regulations issued from time to time:

Provided that no permission for construction of buildings shall be given on landward side of any new roads which are constructed on the seaward side of an existing road

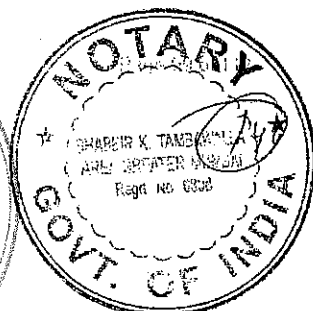
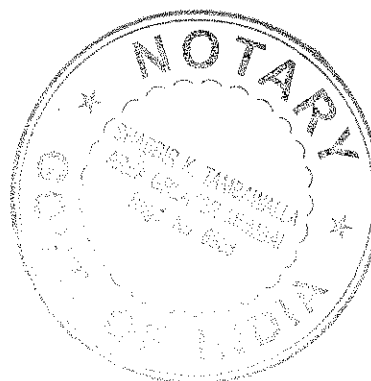
(c) Construction of buildings shall be taken up subject to the following conditions:-

(i) it shall be ensured that there is no discharge of untreated sewage and efforts shall be made for zero discharge;

(ii) no untreated or treated effluents shall be discharged. Any industrial unit operating in CRZ-II shall ensure that there is zero discharge maintained. The treated effluent shall be recycle and reused;

(iii) all residential or commercial buildings shall be provided with water recycling systems and shall use the recycled water for non-contact purposes such as gardening, washing and flushing;

(iv) adequate open space shall be provided to meet the emergencies during natural disasters and also to maintain aesthetics.



(v) adequate open space shall be provided for groundwater recharge. All residential constructions shall be provided with groundwater recharge facilities;

(vi) no dumping of solid waste in the CRZ area. The solid waste shall be managed as per the MSW Rules issued from time to time;

(vii) no conversion of land reserved for parks, gardens, schools, hospitals and dispensaries, defense establishments, disaster management and other public utility purposes;

(2) In the case of mainland islands, a No Development Zone (NDZ) of 10 m from the HTL shall be provided. Developmental activities shall be taken up on the landward side of the NDZ subject to clause (1) (c) above. In the NDZ of such islands, temporary structures relating to fisheries, agriculture and the like can be developed.

(3) The clearances and approvals for the permissible activities in CRZ-II shall be accorded by the States / UTs themselves through the respective Municipalities without referring to CZMA but shall be as per the approved CZMP and the provisions contained in the CRZ Notification. All constructions proposed to be undertaken in the CRZ-II areas other than those which attract EIA Notification, 2006 amended from time to time shall be governed by the concerned State/ UT regulations para 7B(1). Any discrepancy in the CRZ-II area, prior to 1991 and post 1991 identified by the State/UT Government shall be brought before NCZMA with the recommendations of the CZMA. The NCZMA after taking into account the larger public interest shall examine the above discrepancies and convey its decision to the State/UT Governments. Such decisions of the NCZMA shall be included in the CZMPs.

C. CRZ-III- These are areas which are relatively undeveloped including mainland islands and can be divided for the purpose of this regulation into (a) Densely Populated Rural areas and (b) Rural areas. Development in CRZ-III shall be undertaken as follows:-

(a) Densely Populated Rural areas are those coastal panchayat areas which have a high population density as defined in clause 2(v) of this draft notification. In such

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areas, construction and other permissible activities shall be taken up beyond 50 m of HTL (NDZ) on the landward side in accordance with only the local prevailing norms of the State/UT. The local authorities are mandated under this draft notification to ensure that:

- (i) adequate provisions/facilities shall be built to provide for quick and timely rescue, relief and rehabilitation measures in case of natural calamities;
 - (ii) adequate open space shall be provided (to maintain aesthetics including adequate ground cover for fresh water recharge) and also to meet the emergencies during natural disasters;
 - (iii) height regulations shall be as per the prevailing State/UT norms;
 - (iv) all structures shall be provided with groundwater recharge facilities;
 - (v) drawal of groundwater shall be strictly regulated and norms laid down by the local ground water authority followed
 - (vi) it shall be ensured that there no discharge of untreated sewage. Efforts shall be made for zero discharge;
 - (vii) no untreated or treated effluents shall be discharged. Any industrial unit operating in CRZ-II shall ensure that there is zero discharge maintained. The treated effluent shall be recycle and reused.;
 - (viii) All buildings shall be provided with water recycling systems and shall use the recycled water for non-contact purposes such as gardening, farming, washing and flushing.
 - (ix) no dumping of solid waste in CRZ area. The solid waste generated shall be managed as per MSW Rules as amended from time to time.
 - (x) no conversion of land earmarked for parks, gardens, schools, hospitals and dispensaries, defense establishments, disaster management and other public utility areas including areas meant for fisheries.
 - (xi) in case of the mainland islands a distance of 10m shall be maintained as NDZ. All developmental activities indicated above shall be taken up on the landward side of the NDZ.
- (b) Rural areas are those areas as defined in 2(vi) and which are not covered under para 7(C)(a) above. In such areas, development of new houses of local communities can be taken up beyond the NDZ which is 200 m from the HTL.



Construction of new houses and expansion of existing houses in accordance with the prevailing local Town and Country regulation can be taken up, such that the overall height of the construction does not exceed 9m with ground plus one floor and a sloping roof. Total covered area of construction shall not exceed 33% of the total area.

- (c) In the NDZ of CRZ-III areas, all traditional activities including fisheries, public amenities, tourism facilities as indicated at 7(C)(e) and foreshore requiring facilities, can be taken up in larger public interest as per the relevant provisions contained in the state and central legislations and those contained in this draft notification. Repairs, reconstruction of existing authorized structures shall be taken up as per the local Town and Country Planning Regulations.
- (d) In case of the mainland islands falling in densely populated rural areas of CRZ-III a distance of 10m shall be maintained as NDZ. Beyond the NDZ on the landward side, development as indicated as per 7(C)(a)(b) above shall be taken up.
- (e) Tourism project(s) in the CRZ-III areas can be taken up as follows:
- (i) in the NDZ temporary tourism facilities such as toilets, wash rooms, change rooms, drinking water facility, and temporary shack(s) can be taken up with the permission of the concerned local authorities. It shall be ensured by the local authorities that such facilities indicated above shall occupy only 10% of the area. Further, it will be the responsibility of the authorities to ensure that the solid wastes are handled as per MSW rules and no untreated sewage is discharged in the coast or in the waters. All disaster management mechanisms shall be put in place by the authorities for rescue and relief.
 - (ii) wherever there is a national or a state highway passing through the NDZ, the tourism facilities can be taken up on the seaward side of the road as per para 7(C)(e)(i) above. On the landward side of such road or NDZ, the following tourism activities are permitted with the following:
 - a. Resorts, hotels and other such facilities for tourism not exceeding 9 m in height with ground plus one floor with slope and tiled roof.
 - b. Total covered area of construction shall not exceed 33% of the total area. The open space in the site shall be utilized for greenery, non-paved parking, play fields, and so on. Green areas and open space shall be

promoted so as to minimize the impact of storms and facilitate operation and rescue during natural hazards.

- c. Drawl of groundwater is not permitted. Adequate facilities for groundwater recharging shall be provided.
 - d. Zero discharge of sewage shall be maintained. The tourism units shall undertake 100% recycling and reuse of treated water. The treated water shall be used within the project area for gardening, flushing, washing and the like.
 - e. No disposal of solid waste. The solid waste generated from the tourism unit shall be managed as per MSW rules as amended from time to time. Any violation of the MSW rules shall attract stringent punitive action as prescribed under the relevant Acts/Rules.
 - f. No operation of any hazardous or harmful activities which are detrimental to the coast and marine environment.
 - g. Provide adequate space for the conduct of livelihood activities by local communities.
- (e) The local communities including fishermen who possess houses in CRZ-III areas can be permitted to take up tourism activities through home stay without changing the plinth area/ design or facade of the existing houses.
- (f) The clearances and approvals for the permissible activities in CRZ-III shall be accorded by the States/UTs themselves through the respective Local Bodies without referring to CZMA but shall be as per the approved CZMP and the provisions contained in the CRZ Notification. Further, the CRZ-I areas indicated in para 7(A) above falling within CRZ-III areas shall be governed as per the provisions listed under the same para.
- (g) All activities proposed to be undertaken in the above CRZ-III areas other than those which attract EIA Notification, 2006 shall be governed by the concerned State/UT Government regulations subject to the conditions stipulated under category of CRZ-III above.

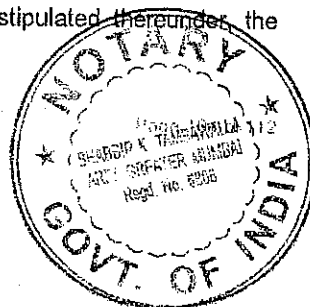
D. CRZ-IV – These are the water areas falling below the LTL including the bed and the substrata up to territorial water limits. In CRZ-IV developmental activities shall ensure that-

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- (i) Minimum or no impact to the sediment and littoral movement, except for mechanisms and facilities required for foreshore developmental activities including ports, harbors, erosion control measures and the like, subject to the provisions contained in the para 6(i), (iv) and (viii) of this draft notification and also based on sediment model studies.
 - (ii) Untreated effluents are not discharged into the waters. The industrial units shall maintain zero discharge. The effluent generated shall be recycled and reused within the unit.
 - (iii) Municipal sewage generated shall be treated and reused for various non-contact purposes such as gardening, washing and the like.
 - (iv) No solid waste shall be dumped in the CRZ-IV area. The solid waste shall be managed in accordance with the provision of MSW rules as amended from time to time.
 - (v) No reclamation of the sea bed except for port and harbour, fisheries-related activities and other infrastructure required in the larger public interest such as bridges, sealinks on stilts, roads, important national installations related to coastal security, tourism shall be accorded clearance by the respective authorities at the State/UT level. With regard to monuments/memorials proposed by the State/UT Government recommended by the local CZMA to be approved by MoEF&CC on a case-to-case basis taking into account the erosion control and other disaster mitigation measures. Wherever reclamation, if any, for the above projects are permitted, the original HTL as demarcated in the approved CZMP shall prevail.
 - (vi) The clearances and approvals for the activities in CRZ-IV that do not attract EIA Notification 2006 as amended from time to time and that do not require special permission as given in (vi) above shall be accorded by the States/UTs themselves without referring to CZMA but shall be as per the approved CZMP and the provisions contained in the CRZ Notification

8. Enforcement, monitoring and transparency mechanism:

- (i) For the purpose of implementation and enforcement of the provisions of this draft notification and compliance with conditions stipulated thereunder, the

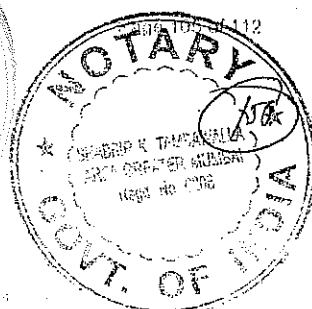
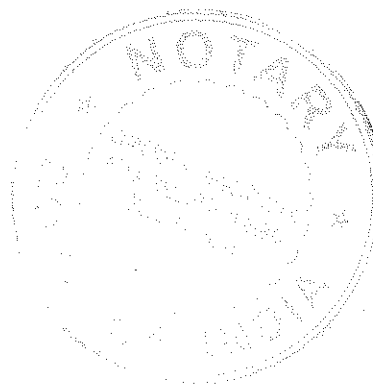
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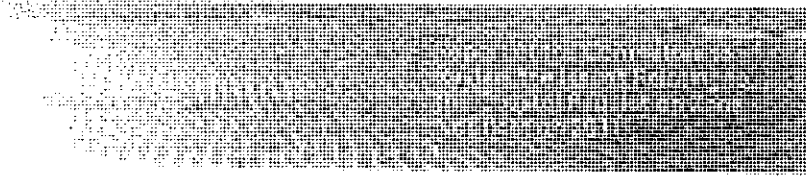


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powers either original or delegated are available under Environment (Protection) Act, 1986 with the MoEF&CC, State Government or the UT Administration, NCZMA and SCZMAs;

- (ii) The composition, tenure and mandate of NCZMA and State or UT CZMAs have already been notified by MoEF&CC in terms of Orders of Hon'ble Supreme Court in Writ Petition 664 of 1993;
- (iii) The State or UT CZMAs shall primarily be responsible for enforcing and monitoring the implementation of this draft notification and to assist in this task, the States and UTs;
- (iv) The monitoring of the implementation of the provisions of this draft notification shall be based on satellite data generated from time to time along with field verification to be carried out by CZMAs. SICOM and NCSCM shall be the repositories of such satellite data which shall be provided to various authorities and agencies mandated for monitoring and enforcement of the notification;
- (v) The approved CZMPs along with any other notified areas under this draft notification and decisions taken by various authorities and agencies mandated to enforce this draft notification shall be hosted on the dedicated website of the States/UTs;
- (vi) Ministry through SICOM shall bring out definitions, FAQ, guidelines for each of the activities indicated in the Notification and provide wide publicity in local languages.





Annexure-A

CONSERVATION, PROTECTION AND MANAGEMENT FRAMEWORK FOR CRZ-I

The coastal and marine Ecologically Sensitive Areas (ESAs) and the geomorphological features play a vital role in maintaining the functions of the coast. Mangroves, beaches, coral reefs etc., aid in controlling coastal erosion, shoreline change, saltwater intrusion and also serve as natural defense against coastal hazards such as storm surges, cyclones and tsunamis. The ESAs maintain the biological integrity of the coast by providing direct and indirect ecosystem services to the coastal livelihood. In addition, several invaluable archeological and heritage sites are also located along the coast. Hence conservation and protection of the above areas/ features/ sites become necessary.

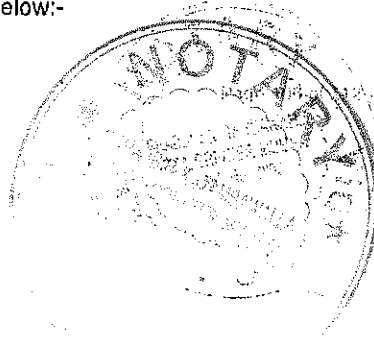
The conservation, protection and management framework for the CRZ-I is as follows:-

a. Ecologically Sensitive Areas (ESA)

1. General measures

- (i) All ESAs shall be identified and boundary delineated by NCSCM using satellite data.
- (ii) The State/UT Governments through the authorized agencies shall prepare CZMP as per the guidelines contained in the Notification at Annexure-B highlighting the conservation and protection of the CRZ-I areas.
- (iii) All ESAs to be notified under E(P)A, 1986 by the concerned States/UTs following the above process.
- (iv) Those activities permissible under this notification shall be included in the CZMPs
- (v) The following specific conditions shall be adopted for the conservation, protection and management of each of the ESAs given below:-

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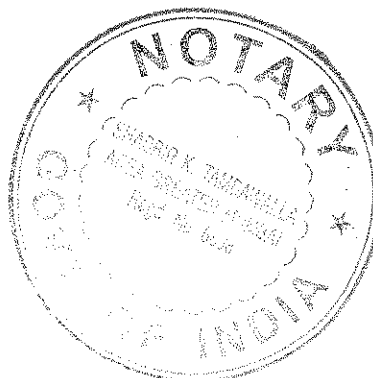
I. Mangroves:

Mangroves for the purpose of this draft notification are categorized as follows:

- (i) Mangroves declared as forest under Forest Conservation Act, 1980:- Notwithstanding anything contained in this draft notification, such mangroves declared by the concerned State Governments/UT Administrations/Central Government as forest land under the F(C)A, 1980 shall attract the provisions of the F(C)A, 1980 only.
- (ii) Mangroves in (A) Government land not declared under Forest Conservation Act, 1980 and (B) private land.

A: Government Land :

- (a) Mangroves in Government land shall be protected based on a detailed plan to be prepared by the concerned State/UT Governments. In case the mangrove area is more than 1000 sqm, a buffer of 50m along the periphery of mangrove area shall be provided. This buffer zone of 50m shall be utilized for constructing walkways, interpretation centers, promenades, public facilities for developing parks, research facilities related to mangrove biodiversity, facilities for conservation and the like.
- (b) In the mangrove area and in the buffer, all activities are prohibited except for laying of pipelines, transmission lines, conveyor belts, construction of road on stilts and other conveying mechanisms that are required for public use. Defense related establishments such as watch towers could be taken up in the mangrove area.
- (c) In such cases where removal of mangroves is inevitable in public interest after examining all the alternatives, a minimum of 10 (ten) times the lost area of mangroves shall be re-planted and protected within the coastal zone of respective States or UTs. Mangrove removal for the above purposes shall be undertaken only on the recommendation by CZMAs and on the approval of the concerned States/UTs.
- (d) Any discrepancy in the mangrove area between prior to 1991 and post 1991 and falling within municipal limits be identified by the State/UT Government and brought before NCZMA duly recommended by the CZMA. The NCZMA after taking into account the larger public interest and national importance shall



examine the above discrepancies and convey its decision to the State/UT Governments. Such decisions of the NCZMA shall be included in the CZMPs. In the process if mangrove areas are to be reclaimed to undertake projects for larger public interest, the State/UT Government shall undertake 10 (ten) times mangrove afforestation in lieu of the mangrove land area reclaimed for the purpose.

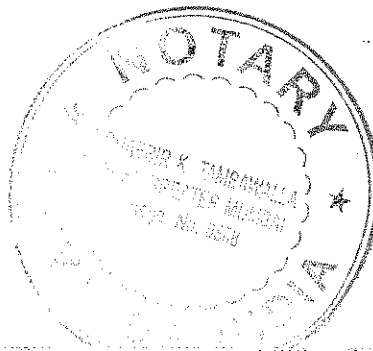
(B) Private Land:

Mangroves in private land, (incentives shall be provided by the concerned State/ UT Forest Departments for promoting mangrove conservation/ afforestation in private land) will not require buffer zone. If any developmental activities are desired in the private mangrove land, such development can be taken up as per the provisions contained for CRZ-II or III, as the case may be.

II. Corals and coral reefs and associated biodiversity:

- (i) Destruction of coral and coral reefs and the surroundings is a prohibited activity.
- (ii) All coral and coral reefs shall be protected except for those small quantities required for research purposes.
- (iii) Coral and coral reefs transplantation activities shall be through recognized research institutions wherever required for regeneration after obtaining necessary approvals under Wildlife (Protection) Act 1972.
- (iv) The dead and/or destroyed coral areas shall be taken up for rejuvenation and rehabilitation. The conservation and protection of corals and coral reefs shall be taken up as follows:
 - a) active and live coral and coral reefs identified and delineated shall be declared and notified as ESA under E(P)A 1986.
 - b) it shall be ensured that no activities that are detrimental to the health of corals, coral reefs and its associated biodiversity such as mining, effluent and sewage discharge, dredging, ballast water discharge, ship washings, fishing other than traditional non-destructive fisheries, construction activities and the like are taken up in and around the coral areas.

III. The National Parks, marine parks, Sanctuaries, reserve forests, wildlife habitats and other protected areas declared under the provisions of Wild Life (Protection)



Act, 1972 (53 of 1972), the F(C)A 1980 (69 of 1980) or E(P)A 1986 (29 of 1986); including Biosphere Reserves would be conserved and protected as follows:

- (i) conservation and protection of the above listed areas shall be as per the provisions of the respective Acts/notifications/guidelines.
- (ii) efforts shall be made to increase the forest area in the coastal region in order to prevent loss of life and property from increased storms, tides and floods.
- (iii) the concerned State Governments/UTs shall provide for adequate funds for such measures to undertake shelter belt plantation or bio-shields with planting material suitable to the location.

IV. Salt marshes: The conservation and protection of salt marshes shall be as follows:

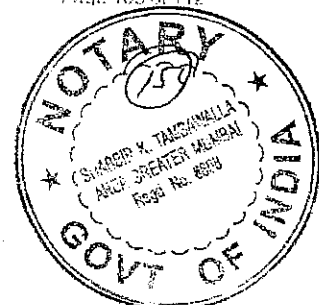
- (i) the salt marsh areas shall be conserved and protected and efforts shall be made to promote the endemic biodiversity in the salt marshes.
- (ii) only those activities required for overhead conveying/transmission of cables and underground laying of transmission line cables and so on, shall be permissible.
- (iii) traditional fishing is permissible in salt marshes.
- (iv) Temporary tourism facilities around the salt marsh areas could be considered subject to adhering to strict norms laid down in the guidelines.
- (v) certain salt marshes which have less biodiversity, identified by NCSCM and demarcated in CZMP can be considered for salt pan activities.

V. Turtle nesting grounds shall be protected and conserved as follows:

- (i) turtle nesting grounds identified by the concerned States/UTs shall be protected as per Wildlife (Protection) Act of 1972.
- (ii) no activities shall be permitted in and around the turtle nesting ground including those causing light and sound pollution except for those required for conservation and protection of these sites.
- (iii) strict management plans for protecting the turtle nesting grounds shall be undertaken and implemented by the concerned State/UT Authorities.

VI. Horse shoe crabs habitats shall be protected and conserved as follows:

- (i) the habitat identified shall be taken up for conservation and protection.



- (ii) no activities shall be taken up in and around these habitats which affect the horse shoe crab ecosystem.

VII. Sea grass beds shall be protected and conserved as follows:

- (i) identified sea grass beds shall be conserved and protected.
- (ii) no developmental activities that have adverse effect on the sea grass bed shall be undertaken.
- (iii) efforts shall be made to propagate sea grass beds along the coastal waters where ever possible by States/UTs as it acts as a carbon sink.

VIII. Nesting grounds of birds shall be protected and conserved as follows:

- (i) the nesting ground of birds including their local migratory route shall be protected. No developmental activities which have adverse impact on the nesting grounds and the migratory routes shall be undertaken including construction of wind mills, transmission lines and the like in the locality.
- (ii) efforts shall be made to increase the forest cover and mangrove cover including enriching the biodiversity of salt marsh and other coastal water bodies so as to provide for suitable habitat for the avifauna.

b. Geomorphologically Important Zones shall be protected and managed as follows:-

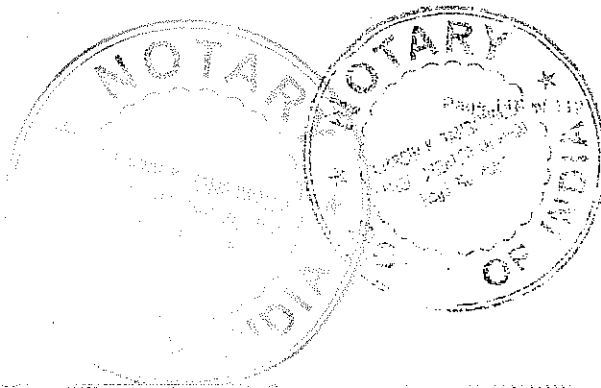
I. Sand dunes identified shall be conserved and protected as follows:

- (i) sand dunes identified shall be notified under E(P)A 1986;
- (ii) no developmental activities be permissible except for providing ecofriendly temporary tourism facilities on stilts such as walkways, tents and the like;
- (iii) mining of sand from sand dunes is a prohibited activity except for the removal of rare earth minerals with proper replenishment using the tailings or other suitable sand.
- (iv) no activities on the sand dunes shall be taken up that would lead to erosion/destruction of sand dunes;
- (v) afforestation, if any, on the sand dunes shall be done only with native flora
- (vi) the States/UTs shall prepare management plans for the demarcated sand dunes which shall be approved by the Ministry.

II. Sandy beaches:

- (i) no developmental activities except for those foreshore facilities permitted, shall be undertaken on the beaches

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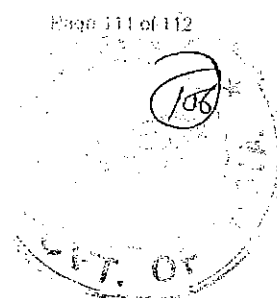
- (ii) mining of beach sand is prohibited except for the removal of rare earth minerals with proper replenishment using the tailings or other suitable sand
- (iii) when the permissible developmental activities are taken up on the beaches if loss of beach in the neighborhood is predicted, necessary beach nourishment to compensate for the losses shall be undertaken by the project authorities and its long term maintenance shall be ensured by them
- (iv) the States/UTs shall prepare management plans for the demarcated beaches which shall be approved by the Ministry.

III. Mudflats:

- (i) developmental activities such as construction of foreshore facilities, laying overhead transmission lines and underground pipelines/ conveying systems/ transmission lines, salt pans and the like are permitted.
- (ii) the States/UTs shall prepare management plans for the demarcated mudflats which shall be approved by the Ministry.

IV. Other areas falling between LTL and HTL:

- (i) no developmental activities except for those foreshore facilities permitted in this draft notification shall be undertaken in these intertidal areas.
 - (ii) mining is prohibited except for the extraction of rare earth minerals with proper backfilling. The States/UTs shall prepare management plans for rare earth mining activity which shall be approved by the Ministry.
- c. Areas or structures of archaeological importance and heritage value sites.
- (i) all archaeological and heritage sites identified by Archaeological Survey of India, State Archaeological agencies shall be responsible for conservation and protection of these structures of sites as per the provisions of the respective Acts/notifications/guidelines.
 - (ii) no activities that are detrimental to the identified areas or structures of archaeological and heritage value shall be permitted.
 - (iii) it shall be ensured that these structures or areas are preserved and activities undertaken without changing the façade/plinth of such structures. Such structures could be considered for use in accordance with the relevant norms after undertaking careful designing of the interiors without changing the exterior architectural design of the structure.



Annexure-B

Preparation of Coastal Zone Management Plans (CZMPs)

- (i) Coastal Zone Management Plans (CZMPs) shall be prepared by the States/UTs indicating the HTL, LTL, CRZ-I, CRZ-II, CRZ-III and CRZ-IV areas including the disaster management facilities and any other prohibited area declared by the States/UTs.
- (ii) For the purpose of conserving and protecting the CRZ-I area the steps indicated in Annexure A shall be followed
- (iii) Other facilities/ development/ infrastructure specifically mentioned in this draft notification, shall also be included in the CZMP.
- (iv) The States/UTs may also address some of the crucial issues of coastal and marine areas including activities required for society such as infrastructure for non-conventional energy, transportation, harvesting /extraction of resources, conveying systems, solid waste management, effluent and sewage treatment facilities and any other innovative schemes/schemes suitable or unique to their location. The same could be included in the CZMP.
- (v) It shall be ensured by the agencies and authorities that satellite based inputs/ data shall be relied upon for preparing the CZMP.
- (vi) The draft CZMP shall be recommended by the States/ UTs CZMAs and approval from the NCZMA shall be obtained.
- (vii) Thereafter, all development activities including conservation and management of the ESA in CRZ-I will be governed by the concerned bodies including those indicated in this draft notification.
- (viii) Coastal projects requiring foreshore facilities that are declared as nationally important by the Central Government, shall be undertaken in CRZ area on a case to case basis, based on EIA as provided in the E(P)A 1986.

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REPORT OF THE COMMITTEE
CHAIRMAN
BROE S. SWAMINATHAN
TO REVIEW THE
COASTAL REGULATION ZONE
NOTIFICATION 1981

February 2005

Ministry of Environment and Forests
New Delhi



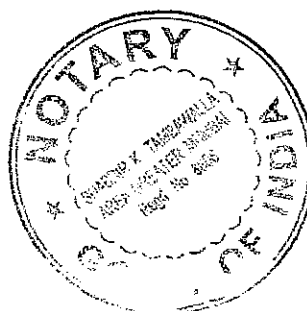
**REPORT OF THE EXPERT COMMITTEE ON COASTAL
REGULATION ZONE NOTIFICATION, 1991**

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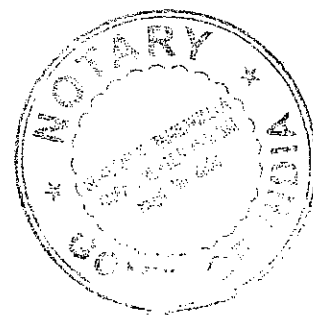
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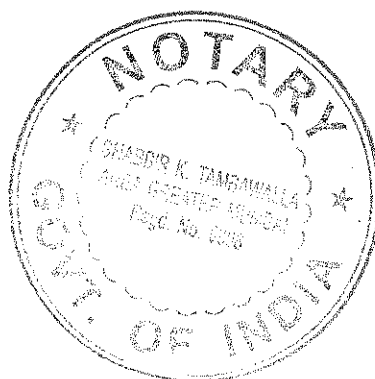
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PREFACE

1. Experts on the origin of life, with the DNA molecule as the chemical substance of heredity, all accept that life began in the ocean. Oceans and coastal regions have since long attracted the awe, admiration, respect and reverence of human communities all over the world. Before the arrival of the aviation industry, oceans provided the channel of communication among different continents. Unfortunately, in the post-industrial era, oceans started becoming dumping grounds for unwanted material including toxic wastes and began losing their devotional aura. Their scenic beauty however became the bedrock of thriving tourism industries.
2. The renewable living aquatic resources of the sea represent a unique gift of nature to humankind. Coral reefs are the aquatic counterparts of tropical rainforests in terms of richness of biological diversity. Because of the multiple benefits provided by the coastal environment for human health, wealth and well-being, demographic pressures on coastal resources started increasing during the last century. Extreme cases of intensive pressure of human population on coastal ecosystems are seen in Kerala, as well as in mega-cities like Mumbai. Over 25% of India's population will live in coastal areas during this century. Many large cities and urban habitations are also near the seacoast. Therefore, an integrated and ecologically and socially sustainable coastal zone management system should be put in place jointly by government agencies and coastal communities.
3. The recent Tsunami tragedy underlines the urgent need for revisiting our disaster management and coastal infrastructure development strategies. We should establish soon a Network of Rural Knowledge Centres based on the integrated use of the internet, ham radio, cable TV, vernacular press and loud speakers. With the enhancement of our capacity for issuing early warning on impending coastal storms and tidal waves as well as our existing capacity to predict wave heights and location of fish shoals through the Indian National Coastal Information System (INCOIS), we need a mechanism to reach the un-reached with the right information at the right time. This is where our strength in Information Communication Technology (ICT) will be extremely valuable. We should develop a Digital Gateway for Sustainable Coastal Zone Management as part of our Disaster Management and coastal area conservation programmes.
4. Characteristic of her foresight and vision, the then Prime Minister of India, Smt. Indira Gandhi had proposed in 1981 that no permanent constructions should be undertaken within 500 metres of the high-tide line. This suggestion was given legal content by the Ministry of Environment and Forests through the Coastal Regulation Zone Notification dated 19th February, 1991 under the Environment (Protection) Act, 1986. Since then, numerous representations have been made for exemptions from the provisions of 1991 Notification. The Ministry of Environment and Forests therefore set up in July, 2004 a Committee to review the Coastal Regulation Zone Notification (CRZ) of 1991. This report contains the recommendations of the Committee.
5. In my view, if our recommendations are implemented sincerely and speedily, the concept of sustainable coastal management will not remain a piece of rhetoric but can become a reality. However, for achieving this goal, we must harness the power of partnership among all stakeholders. The livelihood security of the economically and socially underprivileged sections of the coastal communities and the ecological, scenic and cultural security of coastal areas should become mutually reinforcing. We have recommended the



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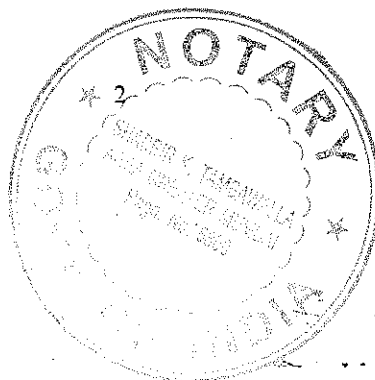
setting up of a National Board for Sustainable Coastal Zone Management under the Chairmanship of the Union Minister for Environment and Forests with the Union Minister for Ocean Development as Co-chair, for providing a structured platform for policy oversight and for promoting symbiotic partnerships and a shared commitment to conservation among all the stakeholders. To be effective, such a National Board should be supported by a professionally-led Coastal Zone Management Authority as well as a National Institute for Sustainable Coastal Management, designed to serve as the repository of national, regional and global information and data on policy and legal affairs. To attend to the special needs of Andaman and Nicobar and Lakshadweep group of islands, it will be useful to establish a National Centre for Coastal Zone Management in island ecosystems. Since the variations in terrain, topography, climate and economic geography are so widespread along our long coastlines, these institutions should undertake specific micro-surveys to enable the listing of coastal assets in great detail. Until the micro-surveys are completed, we should strictly adhere to the current rules of CRZ notification 1991. Also, such public policy facilitation institutions should develop the capacity for fostering professional conflict resolution mechanisms. They should also develop expertise in ecological economics as applied to the coastal zone. Above all, they should spearhead an ecological literacy movement through ICT based Rural Knowledge Centres.

6. The Tsunami tragedy, to quote Prime Minister Dr. Manmohan Singh, provides an opportunity for strengthening socially and scientifically, our capacity for safeguarding human and ecological security in coastal areas. It also provides an opportunity for enhancing the economic well-being of the fisher and farm families along the shoreline through an integrated bio-shield-cum- bio-village programme.

7. It has been a privilege for me to have had the opportunity of working with dedicated and distinguished colleagues on this Committee. A wide range of government, academic, professional and civil society organizations guided us in our work. My gratitude goes to all of them. In particular, we are indebted to Hon'ble Shri A. Raja, Union Minister for Environment and Forests for his interest and to Dr. Prodipto Ghosh, Secretary, Ministry of Environment and Forests for his active participation in all our meetings. Above all, my sincere thanks go to Mr. A. Senthil Vel and Dr. E.V. Muley for their untiring efforts to enable the Committee to complete its work within the stipulated period.

Chennai
9th February, 2005

(M.S. Swaminathan)
Chairman



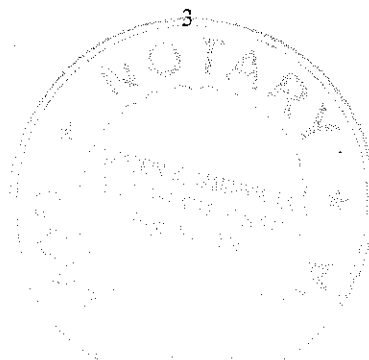
Introduction

Coastal environment plays a vital role in nation's economy by virtue of the resources, productive habitats and rich biodiversity. India has a coastline of about 7,500 kms of which the mainland accounts for 5,400 kms, Lakshadweep coasts extend to 132 kms and Andaman & Nicobar islands have a coastline of about 1,900 kms. Nearly 250 million people live within a distance of 50 kms from the coast. The coastal zone is also endowed with a very wide range of coastal ecosystems like mangroves, coral reefs, sea grasses, salt marshes, sand dunes, estuaries, lagoons, etc., which are characterized by distinct biotic and abiotic processes. The coastal areas are assuming greater importance in recent years, owing to increasing human population, urbanization and accelerated developmental activities. These anthropogenic activities have put tremendous pressure on the fragile coastal environment.

The coastal areas are also the place where natural disasters are also experienced. The entire East coast of India, the Gujarat coast along the West coast and the islands of Lakshadweep and Andaman and Nicobar face frequent cyclonic conditions which some times cause large scale destruction of life and property. The Super Cyclone had caused massive destruction along the coast of Orissa in 1999 and its impact was felt several kilometres inland. The tsunami, which occurred on 26th December, 2004 was one of the most serious and unexpected natural catastrophes to occur along the Indian coast. The major destruction caused by this tsunami was to the life and property located along the coast of Andaman and Nicobar, Tamil Nadu, Pondicherry and Kerala. It would take several years to restore the damages caused by this natural catastrophe. While it is agreed that no human interference is possible to control such an event but precautionary measures such as coastal area planning for locating coastal communities in safer areas, protecting and propagating the natural protecting systems such as mangroves, coral reefs, shelter belt plantations, along with installation of early warning systems, timely evacuation and relief measures can minimize loss of life and property to a large extent.

For the purpose of protecting and conserving the coastal environment the Ministry of Environment & Forests issued the Coastal Regulation Zone Notification dated 19.2.1991 under Environment (Protection) Act, 1986. This notification regulates all developmental activities in the Coastal Regulation Zone area.

The Ministry after gaining experience from implementation of the Coastal Regulation Zone Notification over a decade, suggestions received from stakeholders and NGO's and taking into the lessons learnt for the Coastal Zone Management programme of other countries, the Ministry is of the opinion that there is a need to ensure that the regulations are firmly founded on scientific principles to ensure effective protection to valuable coastal environmental resources and without unnecessarily impeding livelihood or legitimate coastal economic activity or settlements or infrastructure development. For this purpose, the Ministry is of the opinion that the CRZ Notification should be reviewed to make the approach to coastal environmental regulation more holistic and ensure protection to coastal ecological systems, coastal waters and vulnerability of some coastal areas due to potential sea level rise and other natural hazards. The Coastal Zone Management Plans (CZMPs) need to be reviewed at predetermined intervals to take into account the changes in geomorphological features that take place due to the ocean dynamics and settlement patterns. There has been significant degradation of coastal resources in recent years due to poorly planned developmental activities and overexploitation of natural resources.



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Keeping in view the above issues, the Central Government is of the view that there is a need for a comprehensive review of the CRZ Notification, 1991. This review is to be carried out in the light of the findings and recommendations of the previous Committees constituted by the Ministry to address specific issues relating to CRZ, judicial pronouncements relating to the Notification and the concerns raised by various stakeholders including NGOs.

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Government of India
Ministry of Environment & Forests
IA-III Division

Paryavaran Bhavan,
CGO Complex, Lodi Road,
New Delhi-110003

Dated, the 19th July, 2004

ORDER

Sub: Constitution of an Expert Committee to review and make recommendations with regard to implementation of Coastal Regulation Zone Notification, 1991 – regarding.

The President is pleased to constitute an Expert Committee to carry out a quick but comprehensive review of the Coastal Regulation Zone Notification, 1991, in the light of findings and recommendations of all previous Committees, judicial pronouncements, representations of various stakeholders and suggest suitable amendments, if necessary, to make the regulatory framework consistent with well established scientific principles of coastal zone management. The composition of the Committee will be as follows:-

1.	Dr. M.S. Swaminathan , Chairman, MSSRF, 3rd Cross Street, Institutional Area, Taramani, Chennai - 600113, India.	Chairman
2.	Prof. Bharat H. Desai , Associate Professor, International Legal Studies Division, School of International Studies, JNU New Delhi-110 067 (Legal Expert on CRZ).	Member
3.	Prof. S. Ramachandran , Director Institute for Ocean Management, Koodal Building, Anna University, Chennai - 600 025 (Marine Biologist/Biodiversity Issues).	Member
4.	Dr. M. Baba , Centre for Earth Science Studies (CESS), Post Box No.7250, Akkulam, Thiruvananthapuram - 695 031 (Marine Geologist).	Member
5.	Prof. U. Sankar , Madras School of Economics, Anna University, Chennai-600 025 (Environmental Economics)	Member
6.	Dr. Ms Janki B. Andharia , Professor, Tata Institute of Social Sciences, Tata Institute of Social Sciences, Postbox 8313, Deonar, V.N. Purvav Marg, Sion-Trombay Road, Mumbai-400 088 (Socio-economic aspects).	Member
7.	Dr. Shailesh B. Nayak , Space Application Centre (SAC), Ambavadi Vistar P.O., Ahmedabad - 380 015 - Telephone: 079-6761188, 6740256, Fax: 079-6748809, 6767708 (Remote Sensing and GIS).	Member
8.	Shri V. Sunder , Department of Coastal Engineering, IIT, Chennai. (Shore line change).	Member
9.	Prof. A.K. Maitra , Ex-Director, SPA & HOD, Deptt. Of Environmental Planning, New Delhi N-3D, Saket, New Delhi-110 017	Member

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	(Mob. 9810413591) (Regional Planning).	
10.	Dr. Mohan Joseph , Director, Central Marine Fisheries Research Institute (CMFRI), Indian Council of Agricultural Research, Post Box No. 1603, Tatapuram PO, Ernakulam, Kochi - 682014.	Member
11.	Secretary , Department of Ocean Development, Block No.12, CGO Complex, New Delhi-110 003.	Special Invitee.
12.	Secretary , Environment & Forests, Paryavaran Bhavan, CGO Complex, New Delhi.	Special Invitee
13.	Additional/Joint Director , MoEF.	Member Secretary.

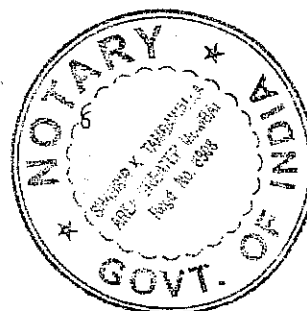
2. **The Terms of Reference of the Committee will be as under:-**

- (a) To review the reports of various Committees appointed by the Ministry of Environment and Forests on coastal zone management, international practices and suggest the scientific principles for an integrated coastal zone management best suited for the country;
 - (b) To define and enlist various coastal and marine resources and recommend the methodology for their identification and the extent of safeguards required for conservation and protection;
 - (c) To revisit the CRZ, Notification, 1991 in the light of above and recommend necessary amendments to make the regulatory framework consistent with recommendations on (a) and (b) above and the Environment (Protection) Act, 1986;
3. The Chairman may associate any other expert in the relevant field in the deliberations of specific issues concerning coastal zone management.
 4. The Committee will submit its report within two months.
 5. The Committee may hold the meeting in Delhi or any other place as desired by the Chairman and also undertake site visits if required.
 6. TA/DA as well as sitting fees of Non-official Members of the Committee shall be borne by the Ministry as per Rules.

Sd/-
(A. Senthil Vel)
Joint Director

The following experts were Co-opted by the Committee:

1. Dr. J.R.B Alfred, Director, Zoological Survey of India, Kolkata.
2. Dr. N. Sanjappa, Director, Botanical Survey of India, Kolkata.
3. Dr. Y.S. Yadava, Member Secretary, Aquaculture Authority, Chennai.
4. Cmdt. M.M. Sharma, Indian Coast Guards, New Delhi.
5. Shri Ronesh Ray, Heritage and Architecture, New Delhi.
6. Dr. S. Ayyappan, Director General, Fisheries, New Delhi.
7. Director, National Institute of Oceanography, Goa.



CHAPTER 1

1.0 COASTAL ZONE MANAGEMENT – NATIONAL AND INTERNATIONAL PRACTICES

1.1 Indian Initiatives

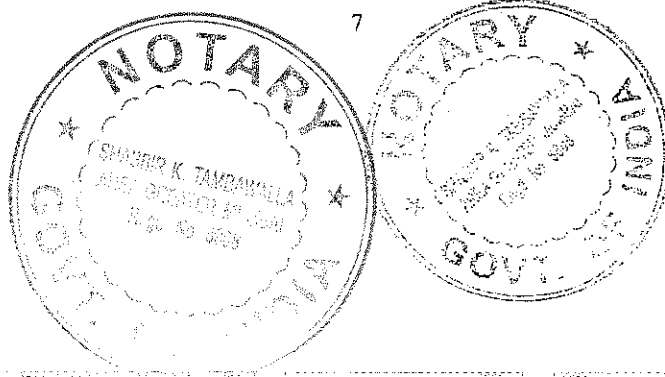
The then Prime Minister (PM) Smt. Indira Gandhi in 1981, after taking a note of unplanned development in the coastal areas wrote letters to all the coastal States to take adequate measures for protecting the coastal environment. As the follow-up of the PM's directive, the then Department of Environment & Forests initiated preparation of a guideline for protecting the beaches of the country. These guidelines were prepared by experts and were provided to the coastal State Governments/Union Territory Administrations for implementation in 1997. However, none of the State/UT Governments took the guidelines seriously since, it had no statutory backing.

Taking into note the failure of such guidelines without statutory backing, the Ministry of Environment & Forests carried out an in-house consultation and issued a draft Coastal Regulation Zone (CRZ) Notification, 1989 under Environment (Protection) Act, 1986 inviting suggestions and objections from public. Based on the comments received from the public, the Ministry finalized the CRZ Notification on 19.2.1991. This Notification regulates all developmental activities in the CRZ area.

Marine resources management programmers were initiated as early as 1897, when the Indian Fisheries Act was passed. Several issues related to coastal management were addressed by various Ministries and Departments of State and Central Governments. However, all these management initiatives were concentrated on specific issues such as coastal erosion, coastal pollution, ports and harbours, etc. The Coastal Regulation Zone Notification issued in 1991 was the first major legislation that was aimed at regulating various coastal activities and protecting the coastal environment. Several institutions have taken up projects and pilot studies in the area of coastal zone management. Important being the Integrated Coastal and Marine Area Management (ICMAM) studies by Department of Ocean Development, Integrated Coastal Zone Management (ICZM) studies funded by Ministry of Environment & Forests and executed by agencies like Institute of Ocean Management of Anna University, Centre for Earth Science Studies, Thiruvananthapuram, Institute for Wetland Management and Ecological Designs, Kolkata, participatory management approaches and coastal system research by M.S. Swaminathan Research Foundation, Chennai, coastal mapping by Space Application Centre, Ahmedabad, Fisheries Management by Central Marine Fisheries Research Institute, Kochi and oceanography by institutes like National Institute of Oceanography, Panjim and National Institute of Ocean Technology, Chennai.

1.1.1 Indian coast

India's coastline has been undergoing physical changes throughout the geological past, although the last tectonic phase in the Indian peninsula has been one of the general emergence, the present coastal geomorphology of India has evolved largely in the background of the post-glacial transgression over the pre-existing topography of the shore,



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coast and offshore zones. The Holocene sea fluctuated in the course of the last 6,000 years and the marked regression is indicated between 3,000 to 5,000 years B.C.

There are more than 100 rivers, which bring large quantities of sediments to the coast. The mightier ones are the Ganges, Brahmaputra, Krishna, Godavari and Cauvery on the east coast and Narmada and Tapi on the north-west coast.

The continental shelf is narrow along the east coast. On the west coast, the wide shelf of about 340 kms of the north tapers to less than 60 kms in the south. With a monsoon climate, the southwesterly winds during the period from June to September bring high waves closer to the southwest coast. The east coast generally becomes active during the cyclones of the northeast monsoon period (October-November). The tidal range also varies significantly from south to north. While the southern coast, have a tidal range of less than 1 metre, the northwest peaks at 11 metres and the northeast reaches 4 metres.

Gujarat coast can be classified into five regions viz., the Rann of Kachchh, the Gulf of Kachchh, the Saurashtra Coast, the Gulf of Khambhat and the South Gujarat Coast. The coastal area of Gujarat including the Rann of Kachchh is the largest in the country and covers an area of about 28,500 sq km. The Ranns of Kachchh comprise of the Great Rann and the Little Rann, which remain saline desert for the greater part of the year. The area of the lower Indus deltaic plain situated on the west of the Great Rann of Kachchh is characterised by the tidal creeks (e.g. Kori creek) and mangroves. High tidal flats with or without salt encrustations are seen. In the Gulf of Kachchh shoreline has extensive mudflats and is highly fringed by coral reefs at many places. Mangroves, algae, salt marsh, dunes and salt pans are common. The Saurashtra coast is less fringed, but has numerous cliffs, islands, tidal flats, estuaries and embayments. Dunes (near Mahuva), sandy beaches, spits, bars, bays, marshes and estuaries predominate. Raised beaches are present around Veraval and Porbandar. The presence of 23 strandlines (old shorelines) for most part of the Saurashtra coast and the cliffs with undercutting reveal the dynamic nature of mudflats, dunes and sporadic beaches. The different levels of mudflats and other features are indicative of high tidal range (upto 11 m). The paleomudflats are related to the phenomenon of regression of the Flandrian sea. The south Gujarat coast is comparatively uniform and is broken by few indentations. Series of estuaries, creeks, mudflats and marsh vegetation are present. The river mouths of Purna, Ambica and Damanganga are eroding. Deposition is observed near Umargam. Similar geomorphology continues upto Mumbai in Maharashtra. This region has extensive creek systems which are flanked by mudflats, mangroves and salt pans. Numerous islands both barrier and offshore are observed. Isolated cliffs and sandy beaches are seen.

The southern Maharashtra and Goa coasts are characterized by pocket beaches flanked by raised platform, rocky cliffs and promontories (all of Deccan basalt), estuaries, bays and mangroves. Mudflats are found mainly along estuaries, bays and creeks. Ratnagiri has rich mangrove forests. Iron ore mines are located at Redi. The Marmagao bay flanked by Mandovi and Zuari estuaries is the largest estuarine system on this part of the coast. Beaches in Goa are long, linear and wide and are flanked by headlands (promontories). These beaches are extensively used for recreation.

The coastal zone of Karnataka is narrow except around estuaries. Headlands and pocket beaches characterize the northern coast (Ankola-Karwar) and long linear beaches are seen on the southern coast. Spits, estuaries, mudflats, shallow lagoons, islands and few



patches of mangroves are also observed. Erosion is seen near Mangalore and deposition in Kalinadi creek near Karwar. Mangalore is found to be emerging as evidenced from geological and tide records. Consequent to this, change in the course of rivers near the coast is quite common here.

On contrast to the Mangalore coast, Kerala coast is described as a sub-mergent coast. Lateritic cliffs, rocky promontories, offshore stalks, long beaches, estuaries, lagoons, spits and bars are characteristics of Kerala coast. The sand ridges, extensive lagoons and barrier islands are indicative of a dynamic coast with transgression and regression in the recent geological past. The central Kerala coast around Kochi is of recent origin. There are about 700 land-locked islands (including barrier islands) in Kerala. The mudbanks of Kerala are unique transient nearshore features appearing during monsoon. Though there are 41 rivers bringing enormous quantity of sediments, deltas are not formed due to the high energy condition of the coast. Cochin-Vembanad is one of the largest estuarine systems in the country. Ashtamudi is another major estuary in Kerala. It is estimated that 30 kms of the coast is undergoing high erosion and 21 kms is accreting. About 360 kms of the 570 kms coastline is protected by seawalls. There are rich heavy mineral deposits in Chavara. Though the Kerala coast is described as a mangrove forest in the resourced history, it is left with just 16 sq. kms of mangroves restricted mainly at Valapatanam and Puthuvaipu (Kochi).

The Tamil Nadu (including Pondicherry) coast is straight and narrow without much indentations except at Vedaranyam. Fringing and patch reefs are present near Rameswaram and Gulf of Mannar. Ichavaram, Vedaranyam and Point Calimere have well developed mangrove systems. In Tamil Nadu about 46 rivers drain into Bay of Bengal forming several estuaries adjoining coastal lagoons. The Cauvery River and its tributaries form a large delta supporting extensive agriculture. The other landforms of the Tamil Nadu coast are rock outcrops of Kanyakumari, mudflats, beaches, spits, coastal dunes and strand features. Deposition is observed at Point Calimere, Nagapattinam, South Madras, etc., while erosion is reported at Ovari Paravammattam, Mahabalipuram and North Madras near Ennore. Rich deposits of heavy minerals are available in Muttam-Manavalakuruchi coast. The southern tip is also known for the Tera sands.

The Coastline of Andhra Pradesh is long with indentations only in the extreme south (in the saltwater lagoon of Pulicat lake) and between the Godavari and Krishna deltas (which are growing outwards). North of Godavari delta is rocky, south of Krishna delta is a sandy and in between the interdelta is vegetated with mangroves. The residual hills and ridges of the north are common here. The deltaic coast comprises of bays, creeks, extensive tidal mudflats, spits, bars, mangrove swamps, marshes, ridge and swale areas and coastal alluvial plains. The Kolleru lake is situated in the interdelta. This was formed due to the coalescence of the deltaic deposits of the rivers and later it was cut off from the sea. The Pulicat lake has extensive tidal flat and 12 km long spit, where Sriharikotta is situated. The lake is shrinking especially from the northern side. The deltaic and southern coast are rich in agriculture and aquaculture production. These coasts are frequented by cyclones.

The Orissa coast is mainly depositional in nature formed by the Mahanadi and the Brahmani-Baitarani deltas. It is exposed to severe cyclones (latest in October, 1999). The Chilka lagoon is the largest natural water body of the Indian coast. The width of the beaches of the Orissa coast vary. The Bhitarkanika and Hatmunda reserve mangroves are extensive (190 sq. km). Gopalpur is rich in heavy minerals. Mudflats, spits, bars, beach ridges, creeks,



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estuaries, lagoons, flood plains, paleomudflats, coastal dunes, salt pans and paleochannels are observed along the Orissa coast.

The West Bengal coast represents a typical deltaic strip with almost a flat terrain. The Hoogly and its distributaries form the most conspicuous drainage system and form an estuarine system. The Sundarbans with coverage of about 1,430 sq. kms, is one of the largest single block of the halophytic mangrove systems of the world. The major geomorphic features are mudflats, bars, shoals, beach ridges, estuaries, extensive network of creeks, paleomudflats, coastal dunes, large number of islands (e.g Sagar) and salt pans.

In Lakshadweep Islands, situated in the Arabian Sea, there are about 36 islands (11 inhabited), a number of sunken banks, open reefs and sand banks. These coral islands are 3-9 metres above Mean Sea Level (MSL), have an area of 32 sq. kms and all of them have well developed coral reefs. Lagoons are integral part of all Lakshadweep islands.

The Andaman and Nicobar group of islands of Bay of Bengal are about 350 in number. These islands are volcanic in origin and emerged part of a mountain chain. The coastline has coral reefs, sandy beaches, lagoons, mangroves, creeks, bays, cliffs, saline areas and forestland. The southern most island (Indira Point) is the country's southern most point, latitudinally. An active volcanic island is observed in Nicobar group of islands.

1.1.2 Indian Laws and Regulations

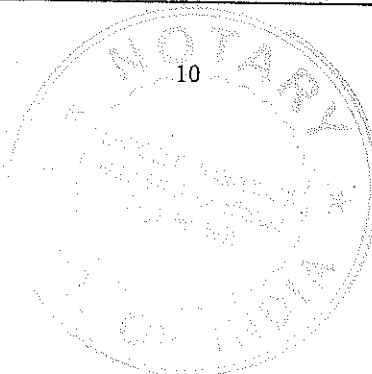
Apart from the Coastal Regulation Zone Notification, 1991 there are many legislations /Acts and rules related to coastal activities. The following are the important ones: Indian Fisheries Act, 1897; Indian Ports Act, 1902; Merchant Shipping Act, 1974, Wildlife (Protection) Act 1972; Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981; Indian Coast Guards Act, 1974; and Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981 and Environment (Protection) Act 1986; The Petroleum Act, 1934; National Environment Tribunal Act, 1995; Hazardous Wastes (Management and Handling) Rules, 1989.

In addition to this, India has signed and ratified several international conventions relating to oceans and related activities. Some of these are related to marine environment and applicable to coastal area also. The important ones are the following: MARPOL 1973/1978; London Dumping Convention, 1972; Convention on Civil Liability for Oil Pollution Damages (CLC 1969) and its Protocol, 1976; Fund, 1971 and its Protocol, 1979; CITES, Convention on Biodiversity, 1992 includes coastal bio-diversity also.

1.1.3 Institutional Infrastructure

The Ministry of Environment and Forests and the Department of Ocean Development are the two nodal Departments that deal primarily on the coastal and ocean areas. In addition to this, there are several Ministries, Departments, State Government Bodies looking after several issues relevant to coastal management in this country and are listed below:

Departments/Agencies	Responsibilities
Ministry of Agriculture	Fisheries Management, Coastal Aquaculture
Ministry of Defence (Coast Guard)	Oil Pollution, Poaching, etc



Pollution Control Board	Coastal Pollution
Ministry of Commerce	Marine Products Development, Special Economic Zones
Ministry of Surface Transport	Ports and Harbours
Ministry of Tourism	Tourism Development
Ministry of Urban Development	Town and Country Planning
Ministry of Industries	Coastal Industries
Ministry of Mines	Coastal and Offshore Mining
Ministry of Home	Disaster Management
Ministry of Petroleum and Natural Gas	Exploration and Exploitation of Oil and Natural Gas.
Ministry of Chemicals and Fertilizers	Storage and Handling of Chemicals and Fertilizer in the port areas.
State/Union Territory Environment Department	Coast and Marine Management under Water Act, Air Act.

However, Coastal Regulation Zone Notification 1991 implemented by the Ministry of Environment and Forests (MoEF), is the single regulation that takes care of most of the activities in the coast.

1.2 Committees and Reports

During the last 14 years of implementation of the CRZ Notification, the MoEF has been receiving several representations/suggestions from various stakeholders including NGO's requesting MoEF to amend the notification for permitting certain activities. Taking into consideration these requests/representations, the Ministry has been constituting Committees consisting of experts to look into specific issues raised by the Central Governments, State Governments, local communities, Association and NGOs. Most of the Committees were constituted to address specific issues from time to time. The details of the Committees constituted so far, their recommendations alongwith the action taken by MoEF is briefly discussed below -

1.2.1 Shri B.B. Vohra Committee – on issues relating to tourism

Shri B.B. Vohra Committee was constituted on 1st January, 1992 mainly to examine CRZ vis-a-vis coastal tourism. The Committee submitted its report on December 31, 1992. One of the recommendations of the Committee was reduction of distance of the NDZ in selected coastal stretches for promoting tourism. The Ministry amended the CRZ Notification, 1991 on 18th August, 1994, reducing No Development Zone (NDZ) area all along the Tidal water bodies from 100 to 50 mts. The amendment also permitted construction in NDZ. This amendment was challenged in the Supreme Court of India in W.P. No.664 of 1993, and the above amendment was quashed and status quo maintained.

The B. B. Vohra Committee report also noted that the HTL demarcation was not clearly defined. Based on the recommendations, the Ministry defined the HTL and demarcation agencies in the amendment dated 8th August, 1994.

The B. B. Vohra Committee Report also recommended no drawal of Groundwater in the NDZ including CRZ area, except by manual extraction. The Report recommended

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landscaping in the NDZ by dressing of sand dunes, live fencing along the resorts and permitted playfields but not swimming pools in the NDZ.

Vide the same amendment dated 8th August, 1994, the Ministry prohibited flattening of sand dunes in the CRZ area, while maintaining status quo as in CRZ Notification with regard to height and Floor Space Index (FSI), subject to ground+one only. For the construction of basement, NOC was to be obtained from the Ground Water Board. Public access between two resorts was suggested as 6 mts by the Committee, however the Ministry maintained 20 metre distance between two resorts.

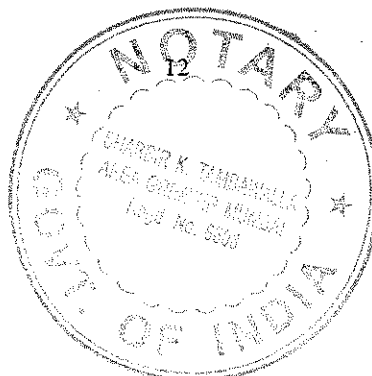
1.2.2 Prof. N. Balakrishnan Nair Committee - on issues relating to Kerala on Coastal Regulation Zone

The Balakrishnan Nair Committee which was constituted on 30th December, 1996 recommended inclusion of census towns and panchayats, which are substantially built up to be declared as urban areas (CRZ-II). The extent of CRZ area in case of inland tidal water bodies to be relaxed, to permit all ports and harbour constructions and port related industries. However, the Ministry took no action with regard to these suggestions. The report also recommended storage of petroleum products in CRZ which was considered by the Ministry and an amendment was issued on 9th July, 1997 after obtaining the views of Ministry of Petroleum & Natural Gas. The Committee also recommended reclamation to be made permissible for the approved projects, which the Ministry did not consider. It also recommended locating non-polluting industries, relaxation for tourism potential areas and construction of fishermen houses in 200-500 mts. These recommendations were not considered by the Ministry. The Committee also recommended drawl of ground water between 0-200 metres by manual method, which was considered in the amendment dated 9th July, 1997. The report recommended setting up fish processing units. But the Ministry in its amendment dated 9th July, 1997 amended the Notification permitting modernizing of the fish processing units and setting up of effluent treatment plants for such existing plants. The report also suggested reduction of CRZ to 50 mts along tidal water bodies keeping in view the unique conditions of Kerala. However, the Ministry took no action in this regard. The amendment of 9th July, 1997 has been challenged in the High Court of Delhi since suggestions/objections from the public had been waived off while issuing the said amendment. The matter is subjudice as on today.

1.2.3 Fr. Saldanha Committee (I) - to advice on withdrawal of groundwater and extraction of sand in Andaman & Nicobar Islands

The Committee which was constituted on 5th December, 1996 and submitted its report in January, 1997. The report recommended extraction of groundwater extraction by manual method in 50-200 metres from the HTL for local communities of Andaman & Nicobar Islands.

With regard to mining of sand the Committee recommended mining of sand in the CRZ area for a short period for 1-2 years only, since the sand was of coral origin, which takes several years for formation. The rate of replenishment of this biological sand is very slow. Based on the recommendations of the Saldanha Committee, the Ministry amended the Notification by permitting mining of sand in the CRZ area, and thereafter MoEF has been periodically extending on yearly basis. The recent ICZM studies carried out by the Institute for Ocean Management, Chennai has indicated severe adverse impact due to sand mining.



The Committee has also examined the Supreme Court's Order in one of the matters pertaining to Forest Division, wherein the Supreme Court has permitted mining of sand on a reducing balance. The Ministry has now amended the CRZ Notification, 1991 permitting mining of sand in the CRZ area for a quantity of 28,266 CBM for a period upto 31st December, 2005 with a condition that no further permission would be granted. This Committee agrees with the condition.

1.2.4 Fr. Saldanha Committee (II) - to examine specific issues relating to CRZ

The Committee was constituted on 26th June, 1997 and the report was submitted in September, 1998. The report recommended construction of dwelling units within 200 metres in CRZ-III. For permitting such dwelling units in CRZ-III the report laid down criteria which included construction of dwelling units only for bonafide traditional settlers subject to the condition that the area is adequately protected with sea-wall, the proposed construction is on the landward side of the existing buildings and the construction shall not be more than 100 sq m with 4.5 m height.

Based on the Fr. Saldanha Committee report the Ministry had issued a Draft Notification inviting suggestions and objections for amending the CRZ Notification, 1991. Based on the suggestions and objections received, the Ministry did not amend the CRZ notification.

1.2.5 Shri D.M. Sukthankar Committee (I) - to examine the issues relating to Mumbai and Navi Mumbai

This Committee was constituted on 29th May, 2000. The report recommended increase in Floor Space Index (FSI) for undertaking slum redevelopment schemes and rehabilitation of dilapidated structures. The report also recommended Transfer and Developmental Rights (TDR) in Coastal Regulation Zone area wherever the FSI has not been consumed fully. With regard to Navi Mumbai the Committee recommended to amend the notification so as to provide for expansion of mega cities in Coastal Regulation Zone areas. In case of the violations in the 161 Versova the Committee recommended development of plots which have been allotted in the inter tidal area and also construction of missing links in Coastal Regulation Zone area. The Ministry took no action on the report since the report had 3 dissent notes from its members. Further the recommendations were not in line with the CRZ notification. With regard to amendment pertaining to increase in FSI, the Ministry had to comply with the directions of High Court of Bombay in the W.P. No.1019 of 1999, which prevented increase in FSI in CRZ area.

This committee observes that the Sukthankar committee did not take into consideration the environmental issues while framing the recommendations.

1.2.6 Shri D.M. Sukthankar Committee (II) - to prepare a National Coastal Zone Policy of India (NCZP)

The above Committee was constituted in March, 2000 and the report of the Committee was submitted to the Ministry in September, 2000. For the first time Ministry had constituted an Expert Committee to examine the issues of coastal zone management in a holistic manner.

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The report was submitted in September, 2000. The report suggested a legislative framework for framing Coastal Zone Management Policy. The recommendations of the report were based on the study report prepared by CESS.

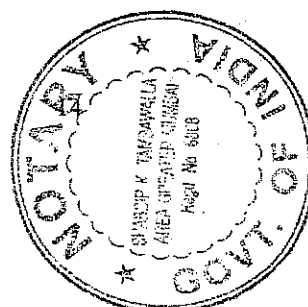
The report recommended that the coastal zone should be demarcated based on risk from erosion and flooding. The report listed out areas/features that have to be protected and the high-risk zone and low risk zone in the coastal area. List of various developmental activities were also annexed in the report, which can be taken up in low risk and high risk areas. The report also suggested the environmental clearance procedure to be adopted for such developmental activities. No action was taken on the report.

This Committee feels that the Ministry should have initiated actions with regard to demarcation of sediment cell and preparation of shoreline management plan maps as suggested by the Committee. The recommendations of the Committee for siting developing activities based on the vulnerability to the coast due to natural hazards such as erosion and flooding is a right approach.

1.2.7 Dr. Arcot Ramachandran Committee – on Ocean Regulation Zone

The Department of Ocean Development constituted an expert committee under the Chairmanship of Dr. Arcot Ramachandran, former Secretary, DST to recommend the activities that need to be included in the seaward side of the coast. The Committee submitted its report in the year 1996. The Committee suggested inclusion of several activities for prohibition/regulation in the ocean part of the coastal zone. These activities include construction of Ports and Harbours, waste disposal, sea bed mining, OTEC plant, oil and natural gas exploration, ship breaking, etc., which are not covered under CRZ. The ocean area from Low Tide Line upto territorial waters was proposed as Ocean Regulation Zone (ORZ) and this zone was categorised into Ecologically sensitive area (ORZ-I), Sea off developed areas (ORZ-II) and Sea off undeveloped and underdeveloped areas (ORZ-III). The activities that are to be prohibited in ORZ-I include construction of civil and other manmade structures like breakwaters, disposal of untreated waste etc. Exceptions to these activities were to be given based on the no impact distance from the outer limits of the ecologically sensitive areas. The reclamation of seabed for human settlement, construction of artificial islands, etc., dumping of plastics are also to be prohibited in all the three zones. Regarding permissible activities in ORZ II and ORZ III, some of them include disposal of treated wastes, the volume and characteristics of which will be limited within the waste assimilative capacity of receiving seawater body. EIA was made mandatory for all the activities irrespective of the zones. The report was received by the Ministry of Environment & Forests from Department of Ocean Development and no action was taken on the report by Ministry of Environment & Forests.

This Committee is of the opinion that the ocean waters upto the territorial limits should be an integral part of the coastal zone management. There are several activities in the coastal areas such as dredging, seawall constructions, breakwater construction, jetties, etc. which have direct impacts on the inter-tidal area. Therefore, it is necessary that such activities taken up in the waters are examined from the point of coastal zone management.



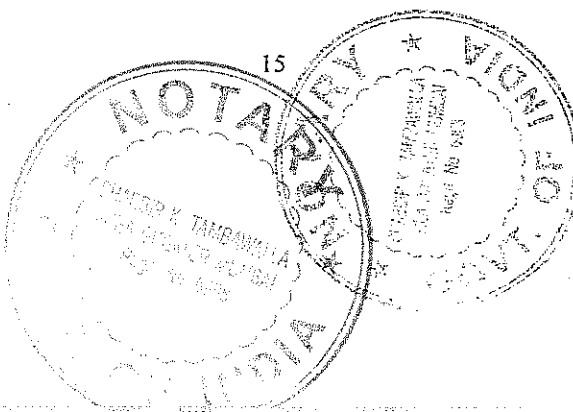
1.2.8. Prof. M. S. Swaminathan Committee – to review the CRZ Notification, 1991

The present Committee was constituted by the Ministry to carry out quick but comprehensive review of the CRZ Notification, 1991 in the light of the findings and recommendations of all the previous Committees, judicial pronouncements, representations of various stakeholders and suggest suitable amendments to make the regulatory framework consistent with well-established scientific principles of coastal zone management. The Terms of Reference of the Committee are given in the Order constituting the Committee.

1.2.9. Summary of the Recommendations of the Committees on which the Ministry had taken action

(i) **Shri B. B. Vohra Committee** – on issues relating to tourism.

Sl. No.	Issues	Recommendations	Action Ministry of Environment & Forests
1.	Depth of the No Development Zone (Hotel industry will require 20-30 km of coastline).	FHI – To reduce the No Development Zone (NDZ) in identified areas. NGO – Concerns of SLR, ecology. Reduction of No Development Zone based on Region specific features with Environmental Impact Assessment.	Amended on 18 th August, 1994. - Reduced NDZ along the tidal water bodies to 50 mts uniformly. - Permitted construction in NDZ. - Quashed by Supreme Court in 1996.
2.	High Tide Line demarcation	Not defined clearly. MoEF to define and decide the agency for demarcation.	Amended on 8 th August, 1994 and 2000. 7 agencies authorized – NHO, Centre for Earth Science Studies, IRS Anna University, Space Application Centre, National Institute of Oceanography, IWED, NIOT. - Guidelines issued.
3.	Depth of NDZ along tidal water bodies	Ministry of Environment & Forests to decide	Amended on 8 th August, 1994 and 21 st May, 2002 Upto the point of tidal influence i.e., 5 PPT during summer.
4.	Groundwater drawl in NDZ (Hotel asso, to draw by mechanical pumps in NDZ)	No change to be made only manual extraction in 200 – 500 mts	
5.	Landuse in NDZ	Landscaping can be done in NDZ by dressing of sand dunes. Live fencing. Playfields but no	Amended on 8 th August, 1994 No flattening of sand dunes.



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		swimming pool in NDZ.	
6.	Height and FSI	No change. Basement based on No Objection Certificate from Groundwater Board. Ground + one.	No change
7.	Corridors between hotels	Gap of 6 mts instead of 20 mts.	No change
8.		To improve enforcement. High Unhygienic conditions prevailing.	No action

(ii) **Fr. Saldanha Committee** - to advise on withdrawal of groundwater and extraction of sand in A&N Islands.

Sl. No.	Issues	Recommendations	Action Ministry of Environment & Forests
1.	Availability of water	- Water supply is less acute. - Large scale groundwater not permitted. - Alternative sources to be studied.	Amended on 31.1.97 Permitting manual drawl of groundwater in 50-200 metres.
2.	Sand from Coastal Regulation Zone area	- Sand in Coastal Regulation Zone can be mined for a short period for 1 or 2 years only. - Alternate sources to studied.	Amended on 31.1.1997 Permitting mining of sand in CRZ area on yearly basis.

(iii) **Father Saldhana Committee-- (II)** - to examine specific issues relating CRZ

Sl. No.	Issues	Recommendations	Action Ministry of Environment & Forests
1.	Criteria to reduce CRZ along tidal water bodies	Can be reduced if - - Areas falls in CRZ-II, - Population density is more then 400 person/km, 1/3rd area of panchayat is built up, - Area of the barrier island is less than 1000 metres, - Area elevated more than 100 mtres.	Draft amendment 11 th January, 2002 but not finalized in view of large number of objections from NGOs from Bombay.
2	Criteria for construction of dwelling within 200 mts in CRZ-III	Dwelling of fisherman and bonafide traditional settlers, subject to - Where the area is	-do -

		protected. • Landward side of existing building. • Constructions permitted upto 4.5 mt with 100 sq. mts plinth.	

(iv) Prof. Balakrishnan Nair - on issues relating to Kerala

Sl. No.	Issues	Recommendations	Action Ministry of Environment & Forests
1.	Setback of 500 mts - Notification does not taken into account the unique features of the coastal areas and is detrimental to development on long run. Untenable and unjustified.	A multidisciplinary Committee to be constituted.	No action.
2.	Delineation of CRZ-II • To include census towns and panchayat substantially built up.	No action proposed	No action.
3.	Extent of CRZ inland incase of tidal water bodies	No action proposed	No action
4.	Operation of Ports and Harbours	No action proposed	No action
5.	Port related industries recognized the need to permit port related industries.	No actions proposed in absence of concrete suggestions	No action
6.	Handling, storage and distribution at ports.	To permit handling of substances as mentioned in 2(ii)	Amended on 9.7.1997 Permitting 13 POL products. The list was provided by Ministry of Petroleum & Gas
7.	Powers to be delegated for reclamation	Not agreed	No action
8.	Already approved projects land reclamation to be permitted	No comments	Amended on 9.7.1997 Reclamation for construction modernization and expansion of ports.
9.	Non polluting industries to be included	Multidisciplinary Committee to be assigned to permit industries with additional environmental safeguards and pollution control measures.	No action
10.	Bunding for	No comments.	No action



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	Aquaculture		
11.	Relaxation for tourism area	To be studies by Multidisciplinary Committee.	No action
12.	Construction of fishermen houses in 200-500 mts	To permit construction	Fr. Saldhana Committee constituted to frame criteria for such constructions.
13.	Drawl of Groundwater	Manual drawing of groundwater in 0-200 mts	Amended on 9.7.1997 Permitting manual drawl of groundwater in 50-200 mts for the entire country.
14.	Fish processing units to be permitted	To permit for modernizing and to equip effluent treatment plants.	Amended on 9.7.1997
15.	Setback as 50 mts along tidal water bodies.	To reduce to 50 mts due the unique conditions of Kerala.	No action.

(v) **Shri D. M. Sukthankar (I) - on Mumbai**

Sl. No.	Issues	Recommendations	Action Ministry of Environment & Forests.
1.	To increase FSI for the SRD.	To permit increase in FSI for such SRD schemes	No action in view of the judgment of the High Court of Mumbai.
2.	To increase FSI for the dilapidated str. MoEF has issued a clarification the FSI shall be as on 19.2.1991.	To permit increase in FSI for such schemes	No action in view of the judgment of the High Court of Mumbai.
3.	To permit TDR in CRZ area	To permit TDR generated in CRZ within CRZ	No Action
4.	Violation of CRZ by construction of Navi Mumbai by destruction of mangroves.	To permit Navi Mumbai as there is need of counter magnet townships.	No action.
5.	To permit dumping of solid waste	Not recommended.	Supreme Court directed Government of Maharashtra to relocate landfill sites.
6.	Constructions within inter-tidal areas	To permit where already construction carried out	No action since CRZ to be amended.
7.	To permit Government housing schemes already initiated prior to 19.2.1991.	Recommended	Amended on 21 st May, 2002.
8.	Missing link roads in CRZ-I areas to be permitted.	Recommended.	No action.

1.3 Coastal Zone Management - International Best Practices

1.3.1 Developed countries

(i) United States of America

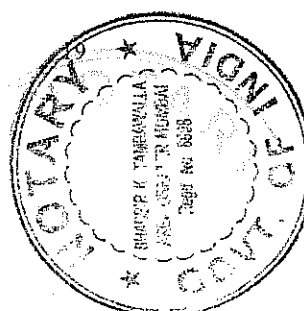
It is estimated that about 60% of the population are living along the coastal areas of USA. The maritime jurisdiction is 12 nautical miles from the shore. The major coastal and marine issues are discharge of effluents, decline in fishery stocks, development of off-shore oil platforms, coastal erosion and natural coastal hazards including storm surges. For the purpose of protecting the coastal environment, USA has issued marine and coastal sectoral laws in 1972, which is called Coastal Zone Management Act in 1972. The Act lays-down a framework for voluntary cooperation between Federal Government and coastal States. The approach for coastal zone management is top down and bottom up and is focused on regulatory mechanism including coastal planning.

The Coastal Zone Management is supervised by National Oceanic and Atmospheric Administration (NOAA) of Department of Commerce. The Coastal Zone includes coastal waters upto 3 miles of shore with land boundary being flexible in order to protect the sea from the effects of land based activities or to deal with sea level rise. The Act identifies 10 National Policy objectives such as Protection of natural resources, coastal development, public access, etc. Each coastal State brings out its own Act such as California Coastal Act of 1976, Connecticut Coastal Management Act, Massachusetts Coastal Zone Management Programme. Federal grants are provided to the coastal States to develop, administer and manage the programmes. The main activities at all levels of government are directly linked. Under the Coastal Zone Management Authority all three levels of government, federal, state and local, are given important roles to play and considerable flexibility in defining those roles.

At the national level the OCRM is the administering office. It interprets the statute through rules and regulations, interacts with oversight and reauthorize committees in the Congress, and approves (or rejects) state management programmes and programme amendment submitted to it for approval. Additionally, it awards grants to states for planning and administration of coastal programs, evaluates the progress of the states in implementation and oversees implementation of federal consistency provisions of the Coastal Zone Management Authority.

The states are the action arm of the coastal management systems. The states follow the frame and guidelines laid out in the federal act. States, for example, determine the boundaries of the coastal zone, the key coastal problems, the policies and laws that address them, and the state and local organization required to be involved in implementation. Within each state, a designated lead agency is the author and lead implementor of the coastal management programme and the recipient of federal grants and matching funds for planning or administration. Frequently, the states provide technical assistance to other entities, build constituencies, research coastal management issues and trends, and promote new policies.

Local Government, includes cities, counties and substate regional entities, are often primary implementors of state coastal policies and programs. They use traditional land use power and infrastructure improvement to achieve coastal policies objectives. Another



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important means of implementation is through state agencies with resource management mandate, such as state agencies with submerged lands, fish and wildlife, or environmental responsibilities. These units work closely with the lead state agency, and as a result can receive federal funds and benefit from the federal consistency under the Coastal Zone Management Authority.

(ii) The United Kingdom

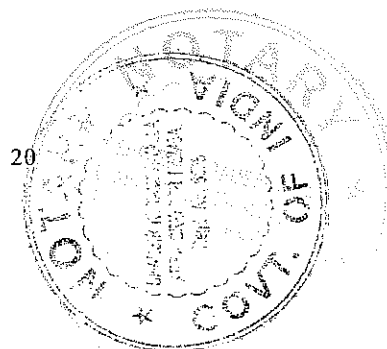
The major coastal and marine issues are pollution from industrial and townships, damage to productive ecosystems, resource depletion, erosion of coastal areas. In United Kingdom, there are various laws for protecting the marine sectoral laws and for the coastal environment. There is no single law for protecting the coastal environment. There are laws for fishery conservation, special ecological zones and other flora and fauna. About 30 legislations apply to coastal developmental activities. Most of them are sectoral and applies either to the land or to the sea. The urban areas are planned as per Town & Country Planning Act, 1990. Due to lack of an integrated policy for protection of coastal environment, the coastal zone management is not implemented properly. Erosion and flooding are the major issues. Shoreline management plans based on sediment cell concept have been prepared on priority and are being implemented.

(iii) Canada

About 25% of the population of Canada is supposed to be living along the coastal areas. Some of the major issues of Canada coast is loss of wetland, decline in fishery stocks resource conflict, pollution from non-point and point sources including off-shore oil development. There are various laws and Acts, which include Fraser River Estuary Management Programme of 1985, Great Lakes Water Quality Programme, 1987, Atlantic Coastal Action Plan, 1986 and Canada Ocean Act, 1996. The Ocean Act has the framework for integrated management of sea and protection of the marine environment from land based activities that have an impact on estuaries, coastal waters. The Act has 3 parts, Part-I defines Maritime Zones (12 mile territorial sea, 24 mile contiguous zone & 200 mile EEZ) in accordance with UNCLOS. The Part-II of the Act has management of ecosystems while the Part III has responsibilities and jurisdiction of agencies. The approach adopted for the coastal zone management programme under Canada Ocean Act is top down. There is also involvement of consensus building. It has been observed that community based programmes are highly effective.

(iv) The Netherlands

About 60% of the total population is known to be residing along the coastal areas of Netherlands. The major coastal problems of the Netherlands include impacts due to construction of coastal defence, water pollution from industries and agricultural areas, loss of wetland, sea level rise, adverse environmental effects due to sand mining, off-shore oil and gas platforms. The coastal management is mainly at the national level. For the purpose of protecting the coastal environment, the Netherlands has North Sea Harmonisation Policy, 1984, Dynamic Preservation Strategy, 1991 and Coastal Defence Act, 1995.



(v) Australia

About 75% of the population is known to be living along the coast. The marine zone includes 12 nautical miles of territorial sea and 200 nautical miles of EEZ. The main problems faced by the Australian coast are habitat destruction, resource depletion, stakeholder conflict, and Government fragmentation due to sectoral approach, offshore development programmes, and excessive coastal fisheries. The primary level of coastal management is mainly the responsibility of the State and the national and local levels. Various laws have been enacted which include State level and Federal level legislations/policies such as Western Australia State Coastal Review of 1994 and 1995, Queensland Coastal Management Bill, 1995, Victoria Coastal and Bay Management Act, 1995, New South Wales, Revised Coastal Policy, 1996, Tasmanian Draft State Coastal Policy. The Commonwealth Coastal Policy, 1997 and the National Ocean Policy of 1996. The Australian Government is moving towards Integrated Coastal Policy.

(vi) Spain

About 35% of the population are living along the coastal areas of Spain. Coastal erosion, tourism development, general urbanisation, sedimentation, loss of productive ecosystems, inter-governmental duplication, marine pollution, competition for fishery resources. The coastal management programmes are mainly initiated at the national level but the regional and local levels government play a role. Some of the legislations include Shore Act, 1988, Regional Guidelines for Coastal Zone, 1992 have been put in place. The Coastal Management Programmes are mainly regulatory in nature having top down and bottom up approach. There has been very little move towards integrated coastal policy.

1.3.2 Developing Countries

(i) Brazil

About 38% of the population is living along the coastal areas of the country. The major coastal and ocean issues include destruction of mangroves, coastal erosion, large scale tourism, urbanisation, shipyard development, non-point source of pollution, multiple use competitions, excessive offshore fisheries. The primary level of implementing coastal zone management programmes are at national level. Various legislations have been enacted by the Brazilian Government, which included Ocean Planning of 1974, Environmental Laws of 1980, Coastal Programme, 1983. The approach for coastal zone management is top up especially for protecting coastal ecosystem. Very little effort has been taken for integrating coastal zone management issues.

(ii) Thailand

About 70% of the population is residing in the coastal stretches of the country. The main issues of coastal and marine areas are destruction of coral reefs, mangrove deforestation, decline in fishery stocks and pollution from agricultural areas. The primary enforcement of coastal management programmes is from the national level. Various national initiatives have been taken up which includes National Coral Reef Management Strategy, 1991, Integrated Coastal Management Plan in Ban Don Bay and Phangaga Bay. The coastal zone management has been moderately effective and some initiatives have been taken up for integrated management of the coastal area.



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(iii) Malaysia

About 70% of the population is living along the coastal areas of Malaysia. The main coastal and marine issues are erosion, mangrove destruction, coral reef destruction, and pollution from tourism and industries. The initiatives taken for coastal zone management are mostly at national level, which includes National Coastal Erosion Study, 1984, National and Coastal Resource Management Policy, 1992, South Johore Coastal Plan, 1992. The approach is mostly regulatory for preventing erosion and conservation of mangrove forest. Few initiatives have been taken for integrated coastal zone policy.

(iv) China

About 40% of the population is living along the coastal areas of China. The major environmental issues include large scale economic development, pollution, reclamation, mangrove loss, coral, sand mining and fishery depletion. The initiative taken for coastal management is generally by the Provincial Governments. There is no comprehensive regulatory framework for managing the coastal activities. Pilot studies of integrated coastal zone management programmes have been initiated in Xiamin Province. Very little initiatives have been taken for the protection of the coastal environment.

(v) Sri Lanka

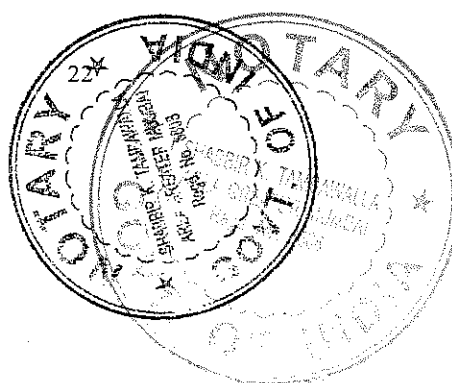
About 34% of the population lives in coastal areas in the country. The coastal stretches are thickly populated. The provincial level has autonomy to implement coastal programmes. The initiatives taken for coastal protection is mainly national. The various coastal and management programmes and legislations include Coast Conservation Division, 1978, Coast Conservation Act, 1983, Coast Permit System, 1988, Coastal Zone Management Plan, 1980, Marine Pollution Prevention Authority, 1990 and Special Area Management Plan, 1996. The setback line on the landward side is 300 mts based on coastal erosion rate, exposure to cyclones, geomorphological characteristics, vulnerability to coastal habitats, cultural sites, etc. The seaward reference line is mean sea level. Developmental activities are regulated in the zone. The coastal zone management plans are prepared for each of the identified sites and enforced by the local bodies. Sri Lanka has taken initiatives for integration of coastal zone management programmes and has been relatively effective.

1.3.3. International agencies

The coastal zone management approach suggested by various multilateral and bilateral agencies such as:

(i) United Nations Conference on Environment and Development (UNCED) (AGENDA 21)

Chapter 17 deals with Protection of the Oceans, all kinds of Seas, including Enclosed and Semi-enclosed Seas, and Coastal Areas and the protection, Rational use and Development of their living resources. This chapter recommends Integrated Management and Sustainable Development including EEZ, with emphasis on marine environment protection, sustainable use & conservation of living resources and climate change. It also recommends integrated policy and decision making process for all sectors, identification of existing and



projected use of coastal areas and their interactions, concentration on well-defined issues concerning coastal management, application of preventive and precautionary principles in planning and implementation of major projects, address issues of pollution, erosion, loss of resources and habitat destruction to be addressed with participation of people in planning and decision making.

(ii) United Nation Environment Programme (UNEP) Guidelines

The guidelines state "integrated management of coastal areas is required to lay the foundation for sustainable development." ICZM guidelines are given in three main stages: initiation, planning (preparation of ICZM master plan), and plan implementation. Many of the challenges to sustainable development (population pressure, industry growth, coastal tourism) are illustrated in the context of the Mediterranean region. UNEP suggests multi-disciplinary approach, problem solving, not problem transfer, priority on prevention rather than cure and precautionary approach. With regard to the management area UNEP does not recommend specific boundaries. However, the first step of the planning stage is to prescribe definition of coastal area boundaries. The goals are to provide guidelines for legal and institutional strategy in area management and planning, form ad hoc committees for dispute resolution and combine land use control and economic tools for pollution control and conservation. The guidelines endorse use of the National Coastal Management Act or other legal means of ensuring enforcement of various sectoral laws. Guidelines utilise a "top-down" approach.

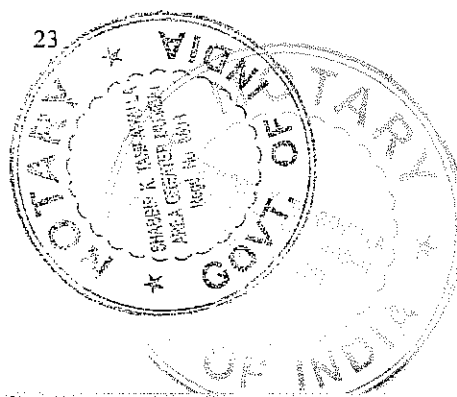
UNEP suggests an administrative structure which includes national and regional government budgets, for infrastructure and pollution control by means of fees, taxes, economic incentives and for conservation and also allocate funds from interested environmental groups, park entry fees, etc.

(iii) Organisation of Economic Cooperation and Development (OECD) Guidelines

These guidelines are the result of investigations using country information papers prepared by respondents in several countries and a survey carried out. The main stress is on ecologically sustainable development of the coastal zone. Recommendations are given for structure and processes for Integrated Coastal Management (ICM), including creation of the institutional body, generation of information, assessment of current policies, preparation of alternative plans, selection of a final plan, and monitoring and evaluation. OECD recommends multidisciplinary approach, problem solving, not problem transfer, priority on prevention rather than cure and precautionary approach. Guidelines do not recommend specific boundaries. However, the first step of the planning stage is precise definition of coastal area boundaries. The Functions/Goals are to achieve and maintain critical stocks of resources, maintain or enhance critical environmental quality, preserve certain natural resources (usually public goods) and maintain the amenity value of the coastal zone.

The guidelines suggest that legislation is needed to create institutional bodies or the management council (legal agency) and to allow for coordination. Of importance is "a consistent government policy at national or regional level that provides clear direction and support for integration."

Guidelines state that a major factor of successful ICM is how well the government implementing the programme can raise its own funds, either independently or with assistance



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from the national government. This flow of financial resources must be dependable and ongoing. It is emphasised that scientific analysis, natural resource monitoring, and impact assessment play a crucial role in successful ICM.

(iv) International Union for Conservation of Nature (IUCN) Guidelines

Guidelines are provided for the development of a coastal area plan that can be applied at a national level, through a review of coastal problems and the need for Integrated Cross-Sectoral Management (ICSM). The process by which ICSM can be achieved by seven steps which include problem definition, assessment and analysis, issues and options, formulation, adoption, implementation and monitoring and evaluation. Guidelines state that the starting point of ICSM is sustainable development. Therefore, the guidelines endorse a long-term and intra and inter-generational focus. To be effective, the effort should be holistic, that is, interdisciplinary, combining social and natural sciences.

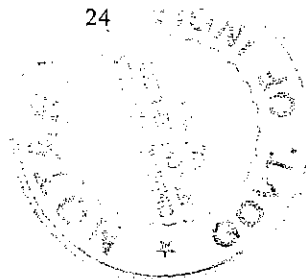
However, the guidelines provide no specific recommendations or suggestions for setting up those legal and institutional arrangements; they only emphasise the need for integration among the legal, administrative, socio-economic, and biogeophysical components among the public, scientists, managers, and users, including some form of dispute resolution.

(v) World Bank

Guidelines are designed to "ensure that development and management plans for coastal zones are integrated with environmental (including social) goals and are made with the participation of those affected." Included are sections on institutional roles and responsibilities and on triggering of the need for ICZM. A three-stage process of plan formulation, programme implementation, and monitoring, enforcement, and evaluation is recommended. The principles are based on precautionary principle, "polluter pays" principle, use of proper resource accounting, Transboundary responsibility, and Inter-generational equity. The management zone includes all of the coastal resources of interest and all activities that are capable of affecting the resources and waters of the coastal zone (implies from the watershed to the 200 nautical mile limit). Functions suggested are to strengthen and harmonize sectoral management, to preserve and protect the productivity and biological diversity of coastal ecosystems and to promote rational development and sustainable utilization of coastal resources. The goals set are Agreed-on goals and objectives by line agencies and sub-national governments. Legislation for boundary setting and zoning of the coastal area but not necessarily a comprehensive coastal zone act. Funding to put ICZM programme in place can come from budgets of existing government agencies. New funding for research needs and new institutional arrangements should come from the national government, with assistance from international agencies. The guidelines also suggest to give the value of natural coastal resources and the fact that the coastal zone is a "dynamic area with frequently changing biological, chemical and geological attributes."

(vi) World Coast Conference Report

Guidelines stress the urgent need for coastal states to strengthen their capabilities for ICZM; and the need to develop strategies and programmes by the year 2000. ICZM is described as the most appropriate process for anticipating and responding to long-term concerns and needs while addressing the present day challenges. It is to be achieved through a planning process involving data collection and analysis, monitoring and evaluation, and an



implementation process. The Principles follow the principles set out in the Rio Declaration – in particular, sustainable development and its long-term focus and the precautionary principles. Case studies illustrate a wide diversity of strategies, from only the land side of the coastal zone to somewhat integrated coastal and ocean management. The ICM functions/goals are to anticipate and respond to long-term concerns while addressing present-day challenges and opportunities, stimulate sustainable development of coastal areas and promote increased economic development and benefits. The guideline suggests strong tie between the IPCC and the World Coast Conference, natural science aspects are stressed, with emphasis on the role of vulnerability assessments in ICZM and the effects of sea level rise.

1.4 Scientific Principles in Coastal Zone Management

Conflicts in coastal management are primarily because coast requires space for functioning whereas coastal space is required for various uses. In addition to this there are competitions for resources among various stakeholders.

Current approaches in Coastal Zone Management are based on environment protection and conservation of resources rather than sustainable development and this is not adequate.

Coastal Zone Management based on Environmental Protection approach is defensive or remedial in practice (National Parks and Sanctuaries), relies primarily upon regulations and zoning to set limits on environmental damage and works well where Governments have the resources and will to impose regulations and it also aims towards long term preservation of ecosystem.

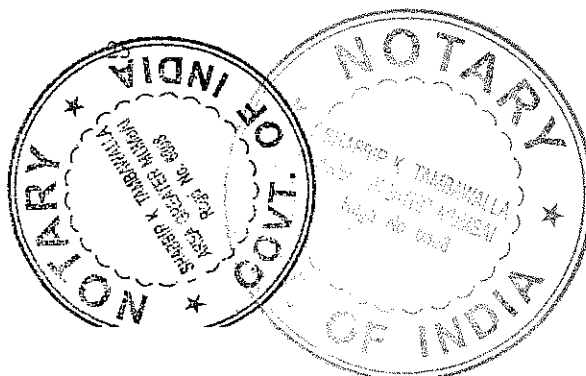
1.4.1 Specific Management Methodologies to implement Coastal Zone Management

1.4.1.1 Zoning

A popular management action employed as part of Integrated Planning and management is zonation. A zonation scheme aggregates activities that are appropriate to one another and segregates those that are contrary. Likewise, it ensures that areas that are able to sustain multipurpose development are identified and those for protection are covered by legislation. Therefore, areas of coastal erosion and flood control, vulnerable areas to natural hazards, water catchments, habitat protection, and marine resources management, including fisheries, can be identified and mapped. Suitable areas for aquaculture, recreation, tourism, industrial use and sand mining can also be identified. Zonation is a useful tool in development and planning. Using a zonation strategy and resource specific management plans, action plans could be developed for specific sites that are currently experiencing critical resource use conflicts or have proposed resource development that may result in such conflicts.

1.4.1.2 Vulnerability Mapping

Most of the developed countries such as USA, UK, New Zealand have prepared the vulnerability maps of the coastal areas. The New Zealand vulnerability map is based on rate of erosion and flooding of coastal areas. The western coast of USA, has been mapped based on the vulnerability to natural disasters. For the purpose of demarcating vulnerability map along the western coast of USA, seven parameters have been taken into consideration, which include evaluation, geology, geomorphology, sea level trends, horizontal shoreline



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displacement, tidal ranges and wave heights. The document pertaining to "Coastal Hazard Database for the U.S. West Coast" (available from National Technical Service, US, Departemnt of Commerce, 5285, Port Royal Road, Springfield, VA 22161) shows in detail the procedure adopted for mapping the vulnerability line based on the above seven parameters. All developmental activities are located based on the vulnerability map. In case of U.K., the vulnerability maps are prepared on the basis of erosion and flooding.

1.4.1.3 Setback zones

According to shoreline setbacks or exclusion zones, certain uses are restricted within a specified distance. The benefits of setback zones are:

- (a) Avoidance of risks arising due to cyclone, flooding, erosion and other geomorphologic/geological events such as tsunamis.
- (b) Sufficient spaces for the functioning of the coast.
- (c) Protection of sensitive ecosystems.
- (d) Public access and preservation of the natural beauty of the shoreline.

Different set back zones for different activities on their impacts:

e.g.	Housing	20 m-200 mts
	Tourism	50 m-200 mts
	Non-polluting Industries	300 m-500 mts
	Polluting Industries	more than 1000 m

Different Setback Zones in different areas based on their importance:

e.g.	Critical Habitats	1000 m
	Infrastructure developed areas	200 m
	Under developed areas	500 m

Different Setback Zones in different areas based on their risk

Based on geomorphic events such as erosion and natural hazards such as earthquakes, cyclones, etc., the coast could be classified into the following zones and setback distances are determined accordingly.

e.g.	High Risk Zone
	Low Risk Zone
	No Risk Zone

Different Setback Zones in different areas based on geomorphology/geology

Based on geomorphology of the coast such as rocky cliff, muddy coast or sandy coast, the setback zones could be decided.

Different Governments have adopted, different setback zone based on developed activities, geomorphology, ecosystems etc. The setback zones adopted by different countries/States are as given below:



COUNTRIES	SETBACK ZONE
Brazil	33 m
Colombia	50 m
Costa Rica (Public Zone)	50 m
Costa Rica (Restricted Zone)	50-200 m
Chile	80 m
Denmark	1000 – 3000 m
Ecuador	8 m
France	100 m
Greece	500 m
Hawaii	13 m
India	500 m
Indonesia	50/400 m*
Mexico	20 m
New Zealand	22 m
Norway	100 m
Oregon	Permanent vegetation line (variable)
Philippines (Mangrove Green Belt)	20 m
Sweden	100 m
Spain	100-200 m
Uruguay	250 m
USSR-Coast of the Black Sea	3000 m
Venezuela	50 m

1.4.1.4 Special Area Management Plans

Advantages of Area Specific Management Plans:

- Considers the physical settings of the coast, its resource and its developmental potentials.
- Considers the area specific issues and problems.
- Enables the participation of local uses and communities.
- ICZM approach is much easier because of limited areas.
- Easy to implement and easy to correct.
- Designed for sustainable development.

The Coastal Zone Management has two Approaches:

- (i) Top Down – In this approach, there is no participation of people. Decisions are made by Governments. The decisions of the public are not given due weightage.
- (ii) Bottom Up – In this approach there is participation of public in planning and development. There is also provision for collaborative management through multi-stakeholder process/voluntary participation of all the parties concerned.



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1.4.1.5 Integrated Coastal Zone Management (ICZM)

ICZM is a continuous and dynamic process that unites government and the community, science and management, sectoral and public interests in preparing and implementing an integrated plan for the protection and development of coastal systems and resources. ICZM is a unitary programme and it has to manage development and conserve natural resources and, while doing so, it has to integrate the concerns of all relevant sectors of society and of the economy. Also, it is important that coastal economic development be generated for the people of a country, not just for those who are already rich and powerful. The goal of the ICZM is to improve the quality of life of human communities who depend upon coastal resources while maintaining the biological diversity and productivity of coastal ecosystems.

Major functions of Integrated Coastal Zone Management:

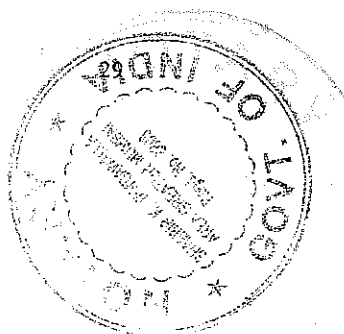
- Area Planning - plan for present and future uses of coastal and marine areas; provide a long term vision.
- Promotion of Economic Development - promote appropriate uses of coastal and marine areas (e.g. marine aquaculture, ecotourism).
- Stewardship of Resources - protect the ecological base of coastal and marine areas; Preserve biological diversity; ensure sustainability of uses.
- Conflict Resolution - harmonize and balance existing and potential uses; address conflicts among coastal and marine uses.
- Protect of Public Safety - protect public safety in coastal and marine areas typically prone to significant natural, as well as human-made hazards.
- Proprietorship of Public Submerged Lands and Waters - as Government's are often outright owners of specific coastal and marine areas, manage government-held areas and resources wisely and with good economic returns to the public.

The status of ICZM programmes in different countries

Country	Research and inventory	CZM authority linkages between departments	Sectoral plan	ICZM planning	Implementation in progress	Evaluation and feedback
Bangladesh	✓	X	✓	X	X	X
Barbado	✓	✓	X	✓	X	X
Belize	✓	✓	✓	✓	X	X
China	✓	✓	✓	✓	X	X
Ecuador	✓	✓	✓	✓	✓	✓
Egypt	✓	✓	X	X	X	X
Israel	✓	X	✓	✓	✓	✓
Netherlands	✓	✓	✓	✓	✓	✓
New Zealand	✓	✓	✓	✓	✓	✓
Sri Lanka	✓	✓	✓	✓	✓	✓
Syria	✓	✓	✓	✓	✓	✓



USA	✓	✓	✓	✓	✓	✓
Croatia	✓	✓	✓	✓	✓	✓
Turkey	✓	X	✓	✓	X	✓
Germany	✓	X	X	X	X	X
Greece	✓	X	X	✓	✓	X
Indonesia	✓	✓	✓	X	X	X
Malaysia	✓	✓	✓	✓	X	X
Mexico	✓	X	✓	✓	X	X
Philippines	✓	✓	✓	✓	✓	✓
Tanzania	✓	✓	X	✓	X	X
Thailand	✓	✓	✓	X	✓	X



CHAPTER-2

2.0 COASTAL AND MARINE RESOURCES – THREAT & SAFEGUARDS

2.1.0 Non-Living Resources in coastal and marine areas

The non-living resources include the sand, rocks, heritage and archeological sites etc. The coastal and marine areas have a wealth of minerals resources. Some of these minerals have high economic potential such as oil and gas, monozite, rutile etc. Apart from these minerals the sand, rocks, cliffs etc. not only play a major role in maintaining the functional integrity of the coastal but also provides a substrata for the several organism. Sandy beaches are required for turtle nesting sites. There are several valuable man made and natural sites that have archeological and heritage importance. These may be of prehistoric and/or historic significance. The importance of some of the non-living resources is described below-

2.1.1 Hydrocarbons

Hydrocarbon sector in India has been the key driver of energy security in the country in recent times, as nearly 45% of the total energy needs of the economy are accounted by oil and gas. In order to boost exploration activities in a time bound manner, Government have initiated programmes of reforms in the hydrocarbon sector.

Most of the oil and gas reserves are found in inland and shallow offshore areas. Some oil and gas fields are also located in the deep water areas. Since most of the available areas are totally virgin, significant efforts are required to build the geological knowledge base through aggressive data acquisition programs. Major petroleum reserves have been identified in the onshore and offshore region like Bombay High, Gulf of Kachch, Godavari basin, offshore regions of Andhra Pradesh. Keeping in view the importance of oil and gas for the nation's economy and security this sector should be encouraged to develop after taking into consideration all the environmental issues.

2.1.2 Placers and other Minerals

Placer deposits are found as a result of selective concentration of valuable minerals lineated by mechanical disintegration from preexisting rock. A placer deposit is conceived as segregated group of sediments that correspond to a common tectonic and geomorphological processes and climatic setting. The coast of India has large deposits of the placer minerals, which are distributed in pockets along the east and west coast of the country. Some of the minerals are found at the seabed at varying depths. It is reported that the Maharashtra and Goa coast have deposits of ilmenite, magnetite deposits in pockets and also along the sea bed with depth ranging from 1m to 17 m. While the Kerala and Karnataka coast have the large deposits of ilmenite, monoxide, zircon, rutile, and garnet. These deposits are found from the shore to a depth of 15 m. The Chavara and Varkala sector in Kerala have deposits ranging upto 25 sq kms. Along the east coast Tamil Nadu, Andhra Pradesh and Orissa sector has some of the riches deposits ilmenite, magnetite, garnet, sillimanite, zircon, rutile and other heavy minerals. Along Tamil Nadu these deposits are found upto the depth of 1m from the shore while in Andhra Pradesh and Orissa the deposits are found from the shoreline to a depth of 15 m. It is estimated that of the coast line of 7,500 kms placer mineral deposits are found in 2,643 kms stretch with a resource availability of 340 metric tonnes. At present, mining of these minerals are being undertaken by Indian Rare Earth Minerals, Kerala Rare



Earth Minerals and few private sector units. The mining of placer minerals and other minerals, which are not found elsewhere should be permitted to be mined, subject to incorporating appropriate environmental safeguard measures in their mining plan.

2.1.3 Salt and Chemicals

The high temperatures and windy conditions prevailing along the coastline are congenial for several salt pan activities. These saltpan activities are mainly concentrated along the coast of Gujarat, Tamil Nadu and Andhra Pradesh. The methods adopted for this activity are a simple technique where a tidal water is embanked and taken into the pans located in the along the inter tidal areas of the coastal stretch. Salt is formed in these pans by natural evaporation of the seawater. In case of the coastal areas of Tamil Nadu especially in Tuticorin the brine is pumped from the groundwater, which are taken into the pans for solar evaporation.

The coastal stretches of Gujarat have also several industries, which are based on salt as raw material. The saltpan activities not only provide livelihood for large number of unskilled workers but also provides raw material for several such chemical industries. The adverse impact of the saltpan activities includes salinity ingress into groundwater, destruction of mangroves and mudflats. There is also occupational health hazards associated with this activity, since the workers in the salt pans are in constant contact with the high concentration of brine solution. This activity needs to be regulated.

2.1.4 Fresh Water

The freshwater for the coastal areas of the country mainly comes from surface water (pumped from inland sources) and ground water. Rainwater harvesting and desalination are beginning to be practiced in areas facing scarcity. Since the demand for the surface water sources are ever-increasing in the hinterland, the sustainable source for freshwater requirement of the coastal areas is groundwater.

The principal aquifers in the coastal area belong to unconsolidated sediments of Quaternary and Upper Tertiary age, deposited under various sedimentary environments like fluvial, back swamp, deltaic, sub-marine and marine environments. These aquifers occur both in unconfined and confined condition. Two major problems are likely to be cropped up consequent to extensive ground water development in coastal areas are saltwater intrusion and land subsidence.

The Cenozoic sedimentary formations constitute the regionally extensive coastal aquifers in Malabar and Coromandal coasts (artesian aquifers encountered down to a depth of 400 m) and coastal fringes in Kutch and Saurashtra. Alluvial and Deccan Trap formations also form part of west coast aquifers. In eastern coasts, the coastal belts constitute a narrow elongated crescent shaped area, formed in the outfall regions of the major rivers like Mahanadi, Godavari, etc., where the groundwater is saline down to a depth of 100-135 metres.

The coastal area of West Bengal comprised of Bengal Delta formed by Hoogly-Bhagirathi river systems and underlain by unconsolidated fluvial sediments. Groundwater is saline down to a depth of 110-150 m within 20-30 km inland from the coast. The quality of groundwater in coastal areas by and large is fresh, except in certain areas where it is found to



be saline/brackish, either due to salinity ingress or inherent salinity in the geological formations constituting the aquifer systems.

Table: Groundwater resource potential in coastal states.

State/Union Territory	Resources (Million ha. metre/vr)	Development (%)
Andhra Pradesh	3.52909	26.10
Goa	0.02182	8.30
Gujarat	2.03767	49.29
Karnataka	1.61750	33.06
Kerala	0.79003	18.99
Maharashtra	3.78677	34.70
Orissa	2.01287	15.22
Tamil Nadu	2.64069	62.55
West Bengal	2.30914	32.19
UT of Dadra & NH	0.00422	12.81
UT of Daman	0.00071	80.00
UT of Diu	0.00037	94.84
UT of Lakshadweep	0.003042	39.12
UT of Pondicherry	0.01746	77.63
Total	18.79875	Average 35.38

The major problems in the groundwater sector of coastal areas are over development leading to the ever-increasing fresh water demands, declining water table leading to reduction in sustainability of tubewells and salinity ingress in coastal aquifers. A regulated development regime is crucial particularly, in the coastal areas due to the high vulnerability for salinity intrusions causing and permanent damage of the aquifers. Similarly, groundwater recharge schemes need to be taken in the coastal areas on a priority.

If the fresh water withdrawal results into a critical situation for salt water intrusion, groundwater development may be regulated. Once the aquifer is already threatened with the danger of salt water intrusion, the following remedial measures like limited water usage, artificial recharge, creation of pumping trough, construction of cut-off walls and direct salt water removal are adopted. To increase the amount of stored water in otherwise depleted aquifer consequent to extensive developmental activities, artificial recharge by injecting fresh water can be done. To break the contact between fresh and salt water an artificial impervious barrier, may be constructed which will close the aquifer near the sea to store the fresh water and prevent it from being wasted as well as isolating it from the sea water. Drilling a battery of deep wells, close to the sea-front and along a line parallel to that front in order to pump salt water only would deepen the fresh water zone and would compel the salt water mound to retreat towards sea. Subsidence of the ground surface due to heavy pumping of confined aquifers have occurred in the coastal areas.

The roof water and other rainwater harvesting techniques practiced in Lakshadweep and in a few villages of Kerala, Tamil Nadu, etc., need to spread to the entire coastal belt for the sustainability of the groundwater, which should be used only in emergencies. For larger requirements, if surface water sources are inadequate, instead of depending on the traditional



systems desalination schemes needs to be adopted as it is declared for Chennai. It is worth mentioning at this point that desalination has been successfully practiced by the industrial units and some localities (e.g. Narippayur, Ramnad in Tamil Nadu).

2.1.5 Renewable Energy Resources (OTEC, Wave Energy, Tidal Energy, Wind Energy etc.)

The ocean energy is due to wave action, tidal action, thermal differences between the bottom and the surface layer called Ocean Thermal Energy Conversion (OTEC), salinity gradient and ocean currents. Usage of ocean energy sources for generation of electricity is in experimental stage all over the world including in India.

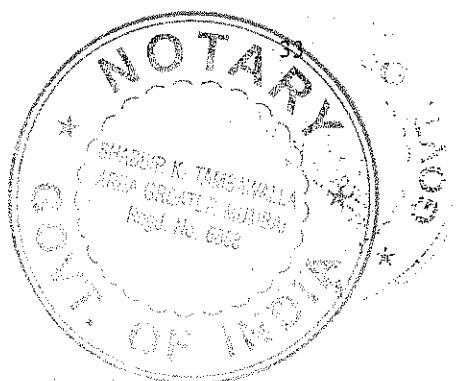
The wave energy potential in India varies from location to location and an experimental 150KW wave energy plant of DOD is operational at present at Vizhinjam, Kerala. The plant has structures like caisson on which the wind turbine is mounted. Wave action generates wind force in the caisson and the movement of wind due to wave action rotates the turbine, which is used to generate electricity. Since the power developed from the wave energy plant is low, variable and cost prohibitive, a stand alone wave energy power plant is not economical for the coast of the mainland. However in isolated remote locations like islands they might be economically viable.

OTEC is based on the principle of evaporating liquid ammonia by circulating the warm ocean surface water in a chamber and the vapour generated is used to drive turbine to generate electricity. The vapour ammonia is cooled to become liquid using ocean bottom water that has a temperature of 8 to 10 Deg. Celsius. Location of deep water with a temperature of 8 deg. In tropical waters holds key for the economic viability of the OTEC system. Such locations are available close to islands of Lakshadweep and Andaman and Nicobar. The National Institute of Ocean Technology (NIOT) has already fabricated a floating OTEC plant, which is under testing in the sea off Tuticorin. OTEC has good potential for application in India. The major impact from the OTEC plants is sudden change in temperature of the surrounding seawater due to discharge of cold water from the plant and as it may affect the biota around the discharge area.

Extraction of electricity using tidal energy almost resembles the energy generation methods adopted in hydro-electric power systems. In areas, where the tidal amplitude is more like Gulf of Khambhat, Gulf of Kachchh and Hooghly estuary, the high tide water is encircled in a dam-like structure and during low tide, the sluice gates are opened to drive the turbine located at the gate. The rotation of turbine generates electricity. The Committee feels that such non-conventional energy methods should be promoted especially in the coastal villages and in the islands of A&N and Lakshadweep.

2.2.0 Areas of Incomparable Value

Significant or irreversible risk and harm to human health and life as well as critical to ecological systems and resources including unique species and other natural and manmade entities such as Monsoon cycles, Royal Bengal Tiger, Valley of Flowers, resulting in serious and large scale detrimental impact, would be considered incomparable. As such the society will not accept and measure these risks and harm in terms of monetary or conventional goods



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and services. Being irreplaceable and invaluable, they shall be given special and overriding priority for allocation of resources for protection and conservation.

2.2.1 Areas of Scenic Aesthetic Value, Heritage and Archaeological Sites and Areas of Outstanding Natural Beauty

Sea and its coast is an aesthetic gift of God, only comparable with the majestic mountains. The sound and serenity provided by the sea is one of the most sought after endowments of nature. Therefore, aesthetic considerations should play a significant role in development of the coastal areas.

The view of the vast expanse of the sea is in itself of great aesthetic value. Therefore any development that obstructs the view of the sea is undesirable. Unfortunately, it is not physically possible to provide unobstructed views from everywhere in built up settlements. Very careful analysis of topography, physical features and built form is called for to ensure that certain vantage points are protected to provide unobstructed views and the beach areas should be free from any obtrusive structure. The identification of locations, and control over development can only be ensured through the Development Plan prepared by the local civic authority. Close interaction between MOEF and local civic bodies is called for to ensure environmentally sustainable development.

Apart from the view of the sea, the landform, vegetation, etc around the coastal area are of aesthetic value, which deserves conservation. The same process of careful analysis is called for by the civic authorities while preparing Development Plans so that these areas of scenic beauty are conserved and kept out of obtrusive development. Some of these areas of scenic beauties may be classified as areas of outstanding natural beauty, and these may be graded for their significance and ecological importance.

There are several man made structures in and around the coastal stretches, which are of heritage value. Only a small number of them have been listed by the ASI as monuments of national importance or by the State Archaeological Survey of India (ASI) as monuments. Majority of the ancient structures are unprotected by any legislation although they are of significant historic and/or architectural value, at least to the local people.

In order to protect these monuments and conserve them, the British practice of recording is based on fairly systematic and transparent criteria; which are as follows: (i) world heritage monuments, (ii) monuments of national importance, (iii) monuments of local importance which are graded into three classes of A, B, and C according to their: (a) architectural merit, (b) historic value, (c) part of an ensemble of buildings, where a collection of buildings form a homogenous architectural presence, e.g.; Regents Park Crescent, Bath Crescent etc. (d) modern buildings by great modern architects; e.g. the National Centre for Performing Arts in Mumbai at Nariman Point. The local civic authority then determines the degree of protection they would accord in accordance with the grading. The process of listing is transparent and accessible in the public domain. These monuments become part of the development control ensured through the Development Plan.



The reptilian population that the coastal and marine habitat harbours consist of the 26 species of sea snakes, 5 species of sea turtles. Nesting sites of an amphibious snake is reported from the shores of North Andaman Islands. Leatherback sea turtle, *Dermochelys coriacea* is the sole representative of the family *Dermochelyidae* and is a rare species. The remaining four species namely the Green turtle (*Chelonia mydas*), the Olive Ridley (*Lepidochelys olivacea*), the Hawksbill (*Eretmochelys imbricata*), and the Loggerhead (*Caretta caretta*) are contained in a single family, *Cheloniidae*. Various mammals that are present in the Indian waters are in endangered list. All the five species nest on Indian coast. Marine mammals belong to three orders Cetacea, Carnivora and Sirenia. 120 species occur worldwide and of these 40 are reported from Indian Ocean. 25 species of marine mammals belonging to the order Cetacea and Sirenia are reported from Indian waters. Sea cow, Dugong dugon occurs in near shore waters of Gulf of Mannar, Gulf of Kachchh and Andaman and Nicobar Islands. Dolphins and some whales live or breed in tropical waters, such as humpbacks, are occasionally seen near shore areas.

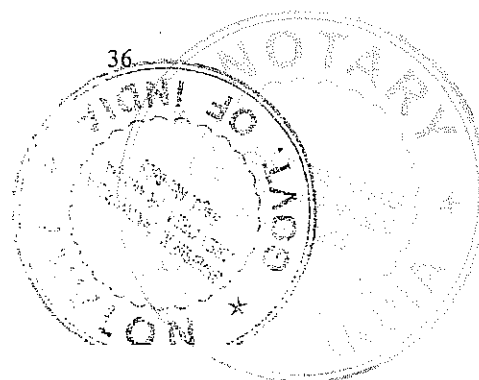
The coastal habitat and marine environment offers areas for reproduction, recruitment, feeding and shelter and should be protected. The euphotic zone of the sea (of nearly 200 m depth) is teeming with life having phyto-zooplankton, copepods, eggs, larvae of fishes, jelly fishes, molluscs, pelagic fishes, turtles and mammals. The sediments and chemicals, the runoff water carries to the sea, have profound effect on fertilization of eggs of marine species. Many areas in Andaman and Nicobar Islands, Gulf of Kachchh and Gulf of Mannar have large quantities of sediment laden freshwater runoff impinging on coastal reefs, causing high levels of coral mortality. The conservation of these faunal resources will help in the sustainability of coastal fishery and thereby ensure livelihood of the coastal communities.

2.3.2 Fisheries

The fisheries in India as such can be put under 4 phases namely underdeveloped, developing, mature and senescent. Some of the fishes and shellfishes are over exploited and some are underexploited and 51 resource groups contribute more than 75% of the total marine fish landings of India. About 40% of the resource groups are in mature or senescent phase, 60% in developing phase and tending towards the next phase. Most of the stock exploited at near optimal/beyond optimal level. The fishery sector provides employment to 1 million active fishermen of which 0.2 million are in the mechanized sector, 0.63 million are artisanal and the post-harvest employs 1.2 million (25% women). The annual production is 2.7 million tonnes. There is a need for concern in the fisheries sector since there is dwindling catches over the last 4 years. Low quality catch have led to unemployment and there is no alternative employment or means of income generation for the fishing communities.

There are 33 minor and 6 major fishing harbours serving as base for over 20,800 traditional non-mechanised crafts, 55,000 small scale beach landing motorised crafts, 51,500 mechanised crafts and 180 deep sea fishing vessels.

Variety of gears and methods are adopted in the fisheries sector. The small mesh (8-10 mm) targeting for juvenile prawns leads not only in depleting the stock as also traps non targeted groups leading to significant discards. A species of catfishes is extinct, as the brooders have been indiscriminately caught and the trawlers have been destroying the entire sea bottom of coastal waters where several of the demersal species inhabit. Experts opined that gill nets and hooks and lines are the best gear to exploit the resource. According to them



a Mechanised bottom trawling within 30 m depths has to be regulated and purse seines should avoid catching brooders. To ease pressure on the fisheries sector such as usage of Multi-gear, targeting multi-species, Open Access Fisheries etc., can be adopted. There is no National Marine Fisheries Policy and there is a need for popularization of code of conduct for responsible fisheries.

India has 3,638 fishing villages and 2,251 fish landing centres. The total marine fish production is about 2.695 million tonnes. Out of which, nearly 50% comes from nearshore waters and contributed by traditional fishermen. The major problems in coastal fisheries are overfishing, habitat destruction and degradation, pollution, post-harvest damages due to lack of infrastructure, fishing during monsoon, conflicts, among mechanised and traditional sectors, inter-state problems, etc. In addition to these, fishing communities also face compensation from other resource users. For example, coastal tourism interferes with traditional fishermen in their activities by replacing them and denying access to their traditional fishing grounds and beaches. Thus, the livelihood of the fishermen is threatened.

Fisheries experts are unanimous in the need for preserving the coastal areas, particularly on the guidelines to preserve the beaches, mangroves, lagoons, estuaries, intertidal habitats, rocky outcrops, swamps, mudflats, coral reefs, oceanic islands, small highly populated islands ("Thuruthu") of west coast backwater system etc. Fisherman require freedom for construction of sheds for dry docking boats and storage of fishing gear, engines etc., for construction of fish drying platforms, construction of fish curing tanks, storage sheds, construction of ice plants, cold rooms, ice storages, erection of repair yards for small crafts, diesel and kerosene supply installations, boat building and repair, construction of sheds for net mending, storage, auction of fish, construction of dwelling houses, public facilities, community halls, places of worship, construction of permanent latheries, seawater intake systems, effluent treatment tanks, nursery ponds, grow out ponds, pump houses, Seawater reservoirs, traditional curing of fish in pits and tanks, drying of fish (cement platforms), racks, peeling of shrimp in sheds, handling and packaging of processed and semi-processed fish/shellfish in sheds, ice storage, cold room storage of fish and ice vending, storage of dried fish before weekly sale to wholesalers, traditional fish processing in "Chappas" by small scale fish processors, crab and lobster fattening in tanks with seawater pumping, beach ponds for recreational fish keeping, educational ponds for marine biodiversity, dolphinarium, oceanaria, marine aquaria, turtle conservatories, constructions related to open sea mariculture, laboratories working on live marine fish and shellfish breeding, wet labs where flowing seawater is needed, pollution control labs, coastal fish survey and monitoring stations, fisheries patrols, etc.

2.4.0 Coastal Ecosystems

The Indian coast has diverse coastal flora and fauna. Some of them are endemic to certain areas. The Islands of Andaman & Nicobar and Lakshadweep and the Sunderbans are some of the hot spots where such endemic flora and fauna are found. These coastal ecosystems are not only protect the coast from the natural phenomena but also provide livelihood security to nearly one quarter of the Indian population. Some of the major ecosystems are listed below alongwith their importance and threats -

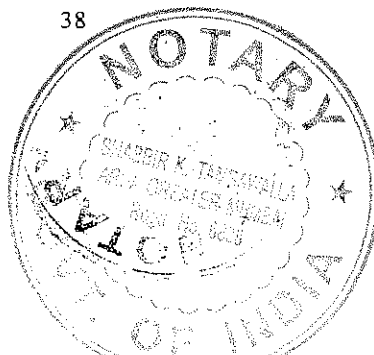
2.4.1 Mangroves

Mangrove vegetation is found in the tropical and subtropical coasts. Mangroves consist of a number of species of trees and shrubs that are adapted to survival in the inter-tidal zone. They are basically land plants growing on sheltered shores, typically on tidal flats, deltas, estuaries, bays, creeks and the barrier islands. The best locations are where abundant silt is brought down by rivers or on the backshore of accreting sandy beaches. Their physiological adaptation to salinity stress and to water logged anaerobic mud is high. They require high solar radiation and have the ability to absorb fresh water from saline/brackish water. Mangroves occur in variety of configurations. Some species (e.g. *Rhizophora*) send arching prop roots down into the water. While other (e.g. *Avicennia*) send vertical "Pneumatophores" or air roots up from the mud. In size, mangroves range from bushy stands of dwarf mangroves found in Gulf of Kutchh, to 30 m or taller stands found in the Sunderbans. Mangroves propagate by producing water borne "propaguls", which are not seeds but rather embryonic plants.

The mangrove swamp harbours a complicated community of animals, which are not evident. The roots provide a rich substratum for variety of attached animals, especially barnacles, bivalves, worms and truncates. Fish, molluscs and crustaceans find shelter in between roots. In the mud there are large numbers of burrowing crabs, molluscs and fishes. The branches of the trees are evidently habitats of insects, lizards, snakes and birds, including the migratory ones. All the animals depend on the leaves and detritus which when carried by the estuary contribute to the production of organic matter, which is the basic food available to other animals and plants. Plankton and other micro organisms, which proliferate in the mangrove and its surroundings, are eaten by fishes, prawns, crabs and mollusc larvae. Many of them are commercially important, such as king and banana prawns, mud crabs, barramunds, mackerel, mullet, threadfin salmon, bream, whiting, huderik and flatheas. Mangroves provide the nutrients and rich feeding grounds for many marine species from various tropic levels. The fertility generated by the mangroves extend also to the marine areas. Hence many productive fishing grounds of the world are found adjacent to mangrove areas. The mangrove forest is also a special nurturing ground for the juveniles of many important species of finfish and crustaceans.

Almost the entire Indian Coast was rich in mangrove vegetation till the recent past. Significant mangroves are still available in Sunderbans (West Bengal), the deltaic regions of Mahanadi of the Bhitarkanika area (Orissa), the Krishna and Godavai delta in the Andhra Pradesh, fringing the coast in Andaman and Nicobar islands, on the coral reefs and fringing the mainland in the Gulf of Kutchh, the deltaic regions of Kori creek in Gujarat coast and Pichavaram-Vedaranyam of the Tamil Nadu coast. Compared to the estimate of mangrove spread of the late eighties of 6740 Sq km, the present estimate of 4120 sq. km show that the mangroves are fast degrading in the country. They are destroyed due to their use as fuel, fodder and conversion of these area for agricultural, aquacultural and industrial purposes.

The mangroves of Sunderbans are the largest single block of tidal holophytic mangroves of the world. The major species of this dense mangrove forest include *Heritiera fomes*, *Rhizophora* spp., *Bruguiera* spp., *Ceriops decandra*, *Sonneratia* spp. and *Avicennia* spp., *Nypa fruticans* are found along the creeks. This mangrove forest is famous for the Royal Bengal Tiger and crocodiles. Mangrove areas are being cleared for agricultural use. The mangroves of Bhitarkanika (Orissa), which is the second largest in the Indian sub-



continent, harbour high concentration of typical mangrove species and high genetic diversity. Mangrove swamps occur in profusion in the intertidal mudflats on both side of the creeks in the Godavari-Krishna deltaic regions of Andhra Pradesh. These and the well-developed mangroves of Pichavaram and Vedaranyam are degraded mainly due to construction of aquaculture ponds and salt pans.

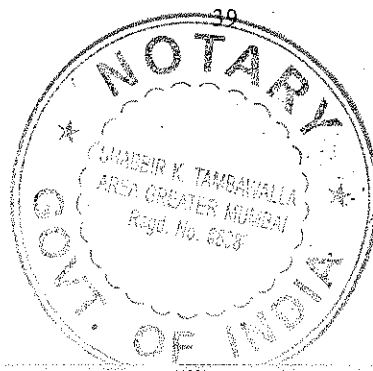
On the west coast of India, mangroves, mostly scrubby and degraded occur along the intertidal region of estuaries and creeks in Maharashtra, Goa and Kamataka. The mangrove vegetation in the coastal zone of Kerala is very sparse and thin. In Gujarat (north-west coast) mangroves *Avicennia marine*, *Avicennia officinalis* and *Rhizophora mucronata* are found mainly in Gulf of Kachchh and the Kori creek. Mangroves are of scrubby type with stunted growth, forming narrow, discontinuous patches on soft clayey mud. The condition of the mangroves is improving especially in the Kori creek region, which is a paleodelta of the Indus river. On the Andaman & Nicobar Islands, the small tidal estuaries, neritic inlets and the lagoons support a dense and diverse undisturbed mangrove flora.

In addition to the diversity of the habitat, the mangroves play an important role in a sediment repository, stabilises shoreline, a buffer against storm surges (that would otherwise have a more damaging effect on the coast. Its positive impact was noticed in the Bangladesh cyclone of 1991. In the recent Gujarat and Orissa cyclones the devastation was reported to have been lesser where sufficient mangrove buffers were present. The major ecosystems provide a safe and favourable environment for breeding, spawning, rearing of several fish and shell fish, reptiles and mammals. Some of the shellfish and fishes are highly economically important.

Threats to mangrove ecosystems:

While mangrove forests have specific ecological role in the coastal ecosystem and they provide a life support system and income for millions of people, thus destruction is wide spread for shorter economic benefits. This happens because mangroves are too often considered wastelands of little or no value unless they are "developed". In the recent times there has been increased ingress to convert them into agricultural areas. The irony of the situation is that the conversion of mangroves for aquaculture is detrimental to the very same activity as the shrimp fry (baby shrimp) availability decreases, as the mangroves are the natural wild fry collection habitats. The overdose of chemical fertilizers and pesticides not only destroy the aquaculture farms but also become detrimental to the remaining mangrove ecosystems in the vicinity. Even in the case of capture fisheries low recruitment will consequently affect production. With the fishing grounds already overexploited, mangrove destruction can only further reduce stock recruitment and production.

In general the mangroves are resistant to many kind of environmental perturbations and stresses. However, mangrove species are sensitive to excessive siltation or sedimentation, stagnation, surface water impoundment and major oil spills. Salinities high enough to kill mangroves result from reductions in the freshwater inflow and alterations in flushing patterns from dams, dredging and bulk heading. Seawalls, bunds and other coastal structures often restrict tidal flow, resulting in the killing of mangroves.



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It is important to recognize that many of the forces, which detrimentally alter mangroves, have their origin outside the mangrove ecosystem. Traditional settlers of the mangrove area normally do not cause destruction to the system.

Management approach:

The value of the mangrove resource in terms of its marketed products can be expressed in economic terms. The "free" services provided by the mangroves are difficult to measure and consequently are often ignored. These "free services would cost considerable energy, technology or money if provided from other than natural resources. Since these values are seldom taken into account in the governmental decision process, the total value of the mangrove resource is most often quite significantly understated.

With the purpose of conserving the remaining mangroves the CRZ declared total prohibition on development in the mangrove areas. This has created awareness on its importance. Afforestation programmes are initiated at least in a few locations. Substantial reduction in the conversion of mangrove forest into aquaculture farms was noticed particularly after the Hon'ble Supreme Court's intervention in 1994/95. Mapping and research on mangroves improved. The management issues include developers consider the ban on mangroves as a threat and destroy them directly and indirectly reducing its coverage, the Sundarban mangrove biosphere area which has about 3 lakh resident population has to be given special provisions for certain developmental activities. The local governments, at several occasions, neither endorsed central government's view nor evolved efficient mechanisms to protect, resulting in their turning blind eyes to the wanton destruction. Distinction between mangroves and their associates are required.

The committee recognizes the importance of the mangroves in protecting the coastal areas and the coastal communities from storm, cyclones, flooding etc. Government should take up aggressive programmes to conserve the existing mangroves and initiate intensive mangrove plantation programmes at identified mangrove potential sites so as to develop bioshields.

2.4.2 Coral Reefs

Coral reefs are one of the most productive and complex coastal ecosystems with high biological diversity. They occur in shallow tropical areas where the sea water is clean, clear and warm. The high productivity is owing to the combination of its own primary production and support from its surrounding habitat. Reef building corals are a symbiotic association of coral animals and zooxanthellae, the microscopic algae from 160 to 800 tonnes of calcium carbonate per acre are deposited each year on coral reefs. The corals are generally slow growing colonies of animals with growth rate ranging between one and ten centimeters in height annually. Even though corals live in nutrient poor waters, their capability to recycle the scarce nutrients (by the whole nutrient community) is enormous. This nutritional advantage, the exotic marine life of different hues and shapes combined with their ability to build physical habitat -the limestone structures built by the corals with the aid of their zooxanthellae - makes the coral community a truly remarkable habitat.

The coral reefs are classified depending on their locations into fringing, patch, barrier and atoll. The fringing reefs are contiguous with the shore and they are the most common - by occurring reef form, found in Andamans. Patch reefs are isolated and discontinuous

patches, lying shoreward of offshore reef structures as seen in the Gulfs of Mannar and Katchchh. Barrier reefs are linear offshore reef structures that run parallel to coastlines and arise from submerged shelf platforms. The water body between the reef and the shore is termed as lagoon. Barrier reefs are seen in Nicobar and Lakshadweep. Atolls are circular or semi circular reefs that arise from subsiding sea floor platforms as coral reef building keeps ahead of subsidence. The examples are the atolls of Lakshadweep and Nicobar. When the reef building do not keep pace with subsidence reefs become submerged banks as seen again in Lakshadweep.

Indian coral reefs are mainly in the Andaman and Nicobar and Lakshadweep islands. On the main land coral reef formations are found in the Palk Bay, Gulf of Mannar, Gulf of Kutchchh and Malwan coast. When sea grasses grow on Kavaratti atoll, mangroves are prevalent on Andaman and Nicobar coral reefs. Primary productivity of Indian coral reefs is comparable with that of the reefs of the rest of the world.

Functions of Coral Reefs

- Coral reefs are natural protective barriers against erosion and storm surge. The coral animals are highly adapted for capturing plankton from the water, thereby capturing nutrients.
- Largest biogenic calcium carbonate producer.
- They provide substrate for mangroves.
- Coral reefs provide habitat for a large variety of animals and plants including avifauna.

Threats to Coral Reefs

Coral reefs are constantly degraded. The degradation is both due to natural and anthropogenic reasons. The natural causes may be due to the outbreak of reef destroying animals, storms, "bleaching" and depletion of essential symbionts. According to a study, the most destructive cause of coral reefs is man. The destruction may be due to chemical pollution, mechanical damage, nutrient loading or sediment loading. The pesticides or fertilizers reaching coral reefs from agricultural areas, destructive fishing practices, heavy metals from industrial sources, petroleum hydrocarbons, etc. chemically damage the corals. Dredging, shipping, tourism, mining or collection is detrimental to the coral reefs. Nutrient loading due to aquaculture practices sewage discharge both from land and ships cause pollution leading to eutrophication and oxygen depletion. Similarly sediment loading resulting from construction activity, run off of sediments, dredging and turbidity can choke the coral growth.

The corals of Indian mainland consisting of fringing reefs and coral patches are severely threatened by siltation, pollution from industry, sewerage from settlement, shipping, thermal plants, tourism, mining and collection, fishing etc. Symptoms of degradation are visible in the islands also mainly due to mining and fishing.

Management Approach

All the development activities in the coral areas are at present prohibited. Considerable awareness and research also was initiated after adoption of CRZ. Future management action shall include. Effective enforcement / punishment mechanisms against illegal mining is still lacking. The industries and activities existing before the initiation of



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CRZ have damaged the coral reefs. Necessary actions are required to check further damage. Schemes for enhancing the present coverage by suitable intervention including financial support are necessary. The implementing agencies though are convinced about the need for regulation needs further vitalisation.

The committee suggests that the government should take up measures in protecting and conserving the coral areas on war footing.

2.4.3 Seagrass Beds

Sea grasses are specialised angiosperms that resemble grass in appearance and form dense underwater meadows. They are the only group of higher plants adapted to life in the salt water. They occur in shallow nearshore coastal waters that are sheltered from high wave energy and in estuaries and lagoons.

Major Sea grass meadows in India occur along the south east coast of Tamil Nadu and in the lagoons of a few Lakshadweep Islands. There are some grass beds around Andaman and Nicobar islands also, but they are poorly documented. Flora comprises 14 species of sea grass dominated by *Thalassia hemprichii* and *Cymodocea species*. The total standing crop is species of marine algae have been observed in the beds of sea grass. Few economically important species of algae such as *Gracilaria edulia* could be cultivated in the sea grass beds on a large scale.

Functions of Seagrasses

Seagrasses function as stabilizers and sediment accumulators of inter tidal and sub tidal areas of the coast. There are only 58 described species of sea grass worldwide, within 12 genera, 4 families and 2 orders. IUCN has accorded high priority for the conservation of sea grass. Fourteen species of seagrasses have been recorded from Indian coast. They are commonly distributed from inter-tidal to sub-tidal region down to 8 m depth. Associated faunal population, especially juveniles are abundant in the seagrass and algal bed areas. In the lagoons wherever seagrass beds are widespread, in such areas, the population of fish and migratory birds is also higher. It is due to the availability of food and shelter in such habitat. It is reported that the net primary production of *Cymodocea serrulata* was 6.4 g/cn²/d and this was 6 times more than that by the phytoplankton. They trap the nutrients and supply them to the ecosystems. *Halophila ovalis* biomass in Ashtamudi estuary varies from 3.648 g/m² (dry weight). Common seagrasses found in Lakshadweep coral island are *Thalassia* Lakshadweep coral islands are *Thalassia hemprichii*, *Cymodocea rotundata*, *Halophila ovata*, *Syringodium isoetifolium* and *Halophila univervis*. The seagrass *Portesia coarctata* is an important socio-economic component distributed in and around certain island of Sunderbans.

In Tamil Nadu, seagrass species diversity is high in Gulf of Mannar and Palk Bay while it is low in the Bay of Bengal. The rich growth of seagrasses along the Tamil Nadu coast and Lakshadweep islands is mainly due to high salinity, clarity of the water and sandy substratum. Since the seagrass require comparatively calm areas for distribution, about 30% of the total lagoon area was covered by seagrass meadows. The green tigerprawn *Penaeus semisulcatus* contributes over 50% of total prawn catch of Palk Bay, and it is mostly captured from the seagrass meadows.



Sea grass ecosystems provide a sheltered, nutrient rich habitat for diverse flora and fauna. Sea grass beds physically help to reduce wave and current energy, help to filter suspended sediments from the water and stabilise bottom sediments to control erosion. The habitat complexity within sea grass beds enhances the diversity and abundance of animals. Sea grasses on reef flats and near estuaries are also nutrient sinks, buffering or filtering nutrient and chemical inputs to the marine environment. They provide a direct source of food for herbivorous animals such as some urchins and fish, green turtles and dugongs. They form a nursery and often feeding areas for fish, crustaceans, molluscs and other invertebrates many of which are economically important (e.g. Penaeid shrimp, pearl oysters). They are a major input to food chains, which provide an indirect source of food for many marine organisms (e.g. Sea urchins, turtles). The high primary production rates of sea grass are closely linked to the high production rates of associated fisheries. The associated economic values of sea grass beds are also very large, although not always easy to quantify.

Threats to sea grass beds

Large scale exploitation of marine algae is depleting these resources. A sea grass called *Enhalus acoroides* is now a threatened species. Dugong, a mammal dependent on sea grass for food, is also on the verge of extinction. Several causes have been suggested for deterioration of sea grass beds. Eutrophication, siltation, trawling, coastal engineering constructions and removal for commercial purposes are the major threats for sea grass beds.

Sea grass occurs in shallow water bodies and since water bodies are not brought under regulations, the CRZ notification is ineffective to protect sea grass beds as the seagrass beds are below the Low Tide Line. The major seagrass beds should be mapped and identifying areas for preservation. Dredging should be carried out far away from seagrass beds as siltation/turbidity destroys seagrass beds.

2.4.4 Sea Weeds

Seaweeds, the larger and visible marine plants, are one of the important living resources of the oceans. These are found attached to rocks, corals and other submerged strata in the intertidal and shallow subtidal zones of the sea. To be very specific, seaweeds are thalloid plants called algae, which means they have no differentiation of true tissues found in land plants such as roots, stems and leaves. They only have leaf-like appendages. Based on the colour of their pigmentation, sea weeds are broadly classified into different classes and families such as Cyanophyceae (blue-green), Chlorophyceae (green), Phaeophyceae (brown), Rhodophyceae (red) etc.

In Indian coast about 770 species of seaweed species are distributed, of this 184 species are green (Chlorophyta) 166 species are brown (Phaeophyta) and 420 species are red algae (Rhodophyta). Seaweeds are growing in shallow coastal waters wherever sizable substrate is available. It is estimated that the total standing crop of seaweeds available in India is 91,339 tonnes (wet weight) consisting of 6,000 tonnes of agar yielding seaweeds, 16,000 tonnes of algin yielding seaweeds. The standing crop of algae yielding seaweeds, *Sargassum* and *Turbinaria* is abundant in Indian waters. In Kerala, the biomass of seaweed is around 0.5 km² and mostly they are present upto 0.15 m depth level. By the biodegradation of seaweeds methane like economically important gases can be produced in large quantities. Extracts of selected seaweed species show antibacterial activity. Iodine yielding seaweed (*Asparagopsis taxiformis*) resources are available in the sub-tidal reefs of Saurashtra coast.

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Seaweeds are also used as the potential indicators of pollution in coastal ecosystem, particularly heavy metal pollution due to their ability to bind and accumulate metals strongly.

The total world seaweed production is estimated to be about 1821×10^4 tonnes (wet weight) annually. Of this, about 4.83% is being harvested from the eastern and western Indian Ocean. The potential harvest from the Indian Ocean is 870,000 tonnes of wet weight. From this, only 22,000 tonnes, largely red and brown sea weeds are actually harvested from both western and eastern Indian Ocean. About 20,000 marine algal species are reported to be distributed throughout the world whereas it has been estimated that the yield of seaweeds along the Indian coast is only about 70,000 tonnes on fresh weight basis. About 624 marine algal species of various groups are recorded from Indian waters, with a maximum number of 302 species in Tamil Nadu, followed by 202 species in Gujarat, 152 species in Maharashtra, 89 species in the Lakshadweep group of island and 75 in Goa.

Uses of sea weeds

Seaweeds are important as food for humans, feed for animals, fertilizer for plants. Seaweeds are used as a drug for goiter treatment, intestinal and stomach disorders. Products like agar-agar and alginates, which are of commercial value, are extracted from seaweeds.

Functions of seaweeds

Food for marine organism, habitat for breeding grounds, source of sediment.

Threats to seaweeds

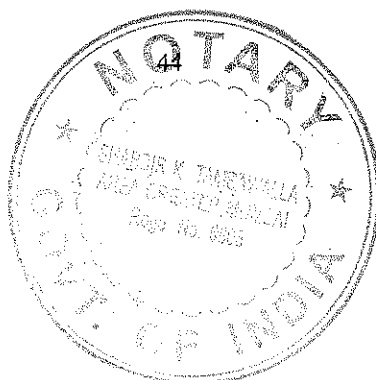
Over exploitation for commercial uses and CRZ regulations do not apply to as the water part hence sea weeds are not covered.

2.4.5 Horseshoe (HS) Crab Habitats

Horseshoe crab is an important component of the food chain. Beach geomorphology is the most important factor in determining beach stability for the nesting behaviour of marine animals. Nesting behaviour of the Indian horseshoe crab, *Tachpleus gigas* (Muller) in India. The H.S Crab breeds practically through out the year. Migration and concentration in large numbers of mating pairs, in the intertidal zone, is a characteristic feature of the life history of horse shoe crab. Along the coast of India, *T. gigas* is common in selected beaches in the north east coast. Balramgari in Orissa is one of the favourite breeding spots. Urgent measures need to be taken up for the protection and conservation of horseshoe crabs as these habitats are being destroyed by various developmental activities.

2.4.6 Turtle Nesting Grounds

Most of the turtle locate their nesting grounds when they mature. Of the seven or eight species of sea turtles, two species are unique in displaying one of the most spectacular reproductive phenomena, the mass nesting. In India there are three major mass-nesting sites of the olive ridley (*Lepidochelys Olivacea*), all on the east coast, in Orissa. The nesting at Gahirmata (a part of Bhitarkanika sanctuary) at the mouth of the river Maipura near Dhamra, is the largest sea turtle rookery in the world with 100,000 to 500,000 turtles nesting there each year. There are smaller rookeries at the mouth of the Devi River (north of Puri) and



Rushikulya in Ganjam district in Southern Orissa. Recently a small nesting site has been located in Payyoli beach, north Kerala.

2.4.7 Coastal Forests and Wildlife

The coastal forest includes the natural forest and the shelter belt plantations undertaken by the Forest Department. These coastal forests are not only habitats for several flora and fauna including wildlife but also protect the shoreline from erosion, cyclones and flooding. Most of the coastal forests are found in along the western ghats including western coastal part of Maharashtra, Goa, Karnataka and Kerala. Coastal forests are found along the Tamil Nadu and Andhra Pradesh coasts. Several of the local communities depend upon the resources from these forest areas.

2.4.8 Protected areas - Marine Parks and Sanctuaries

The following definition of marine protected areas was developed at the 4th world Wilderness Congress and adopted by IUCN at its 17th General Assembly in 1988:

Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.

Sites, which fit in this definition, have been given a variety of names. In common with protected areas on land they may be called 'reserves', 'sanctuaries', 'parks', or have some other title. To clarify the situation and guide protected area managers, the IUCN, through its Commission on National Parks and Protected Areas, has developed and refined a list of the categories of protected area. Ten categories were identified in 1978 and, following the most recent review, the list has been reduced to six. These are areas managed mainly for:-

- I. Strict protection (i.e., Strict Nature Reserve/wilderness Areas)
- II. Ecosystem conservation and recreation (i.e., National Park)
- III. Conservation of natural features (i.e., Natural Monument)
- IV. Conservation through active management (i.e., Habitat/Species Management Area)
- V. Landscape/seascape conservation and recreation (i.e., Protected Landscape/Seascape)
- VI. Sustainable use of natural ecosystems (i.e., Managed Resource Protected Area).

The current focus on biodiversity conservation is an important influence on MPA programmes. This has implications for site selection but it remains unclear whether much will change. The types of area listed by IUCN as especially important for marine biodiversity, for example, are the sorts of site which have been selected traditionally as MPAs:

- Areas of high diversity
- Areas of high endemism
- Areas of high productivity
- Spawning areas that serve as a source of recruits
- Nursery grounds
- Migration stopover points and bottlenecks.

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The need for community involvement in Marine Protected Areas (MPAs) cannot be stressed strongly enough. Members of the community can be involved in roles as varied as identifying sites, putting forward proposals, being involved in consultations and being responsible for the management of MPAs. In addition to the existing marine sanctuaries and protected areas, the government may identify similar areas, where there is occurrence of high marine biodiversity including migratory sites of fauna, nursery grounds of fishes and reptiles and declare such sites as protected areas.

2.5.0 Coastal Geomorphic Systems

2.5.1 Coastal Dynamics

Coastal environments are among the most changeable on the earth's surface, although this statement must be qualified as there are several facets to "change." At the outset, it must be emphasized that many coastal changes are circulatory in space or periodic in time. The idea of change is not a new one in coastal studies. Descriptions of coastal changes date from the Middle Ages, especially in the context of harbour silting and seafood harvests. What is new is a realization that these changes may be linked, perhaps via tortuous pathways. Testing-out these links from a data mass is a considerable challenge. For coastal scientists, many of the best clues come from geologists, meteorologists and biologists. In recent years, all these disciplines have undergone a revolution in approach, with greater emphasis being placed on dynamic processes rather than static description. Allied to this has been a general stiffening of methodology and increasing sophistication in techniques. The widespread introduction of information technology and attendant data acquisition and handling methods is beginning to have a profound effect on the field sciences, coastal studies included.

While careful assessment of coastal changes must form the cornerstone of effective coastal management, it is often insufficient to monitor sequential variations without paying due regard to the causes of change. There are several good reasons for this:

- (i) By exploring the root cause it is possible to provide a better basis for understanding, thus allowing more confident prediction.
- (ii) The results of such an examination are likely to be more universally applicable.
- (iii) Reliance only upon indicators of response may understate the overall problem.
- (iv) Environmental reaction may be tempered or buffered by external influences.
- (v) Reaction may be incremental, or related to thresholds. An obvious case arises with cliff erosion. Simply measuring the retreat of the cliff top says very little about the causative factors, which may in time accelerate or decelerate the process.

Knowledge of these causes would obviously assist attempts at stabilization. The human influence on coastlines looms large. Man is a major factor in coastal change, at various scales. The impact may take many forms: it can be gradual or sudden, premediated or inadvertent. The ability of coastal environments to buffer such impacts is crucial. Hence it is important to understand the interaction between the solid and fluid media, which characterises the coastal environment.

Coastal geomorphological features like beach, sand dune, mudflat, estuaries, cliffs, etc. are characterised by unique ecosystems like mangroves, coral reefs, seagrass beds, etc.



These ecosystems are important for the sustainability of the biodiversity and productivity of the coastal zone.

Some of the features/formations due to these interactions are described below:

2.5.1.1 Mudbanks

Mudbanks, defined as transient accumulations of dense fine-sediment suspensions, which form sub-circular/elliptical depositional areas having dimensions from 2-5 km alongshore and 1.5 to 4 km offshore, occur yearly along some stretches of the west coast of southern India. Mud banks nearly always occur shortly after the arrival of the southwest monsoon in late May/June. However, instances of earlier formation (and sometimes of no formation) have been noticed. They usually form in the same place each year and often show a down coast migration during their brief existence (generally 1.5 months). When active they are noted for their wave damping effects that a 1.8 m high wave outside the mud bank is reduced to 0.5 m within the mud bank, within a distance of 1.1 km. This reduction can be 100% in a fully developed mud bank. The mud bank also provides protection to the coastal zone, by way of allowing accretion. However due to the presence of mud banks the downcoast, areas are found to be eroding during the monsoon. The mud bank provides an attractive environment to the local fishermen in which they can continue fishing while the 2-3 m high monsoon waves make fishing outside the mud bank impossible. The mud bank appears to be a biologically fertile, perhaps due to the abundance of organic matter ($\approx 5\%$) attached to the sediment particles or perhaps due to the reduced turbulence and the enhanced turbidity, which seem to attract the juvenile fishes and the larger fishes, which feed upon them. Mudbank accretes the coast behind, boosts fishing and it is a economic harbinger to the fisher folk. However, it erodes the down coast and it is unpredictable. The challenges are to predict mud bank formation, artificial generation, take precautions against down coast erosion, integrated management of mud bank areas taking into account the phenomena, coastal protection, socio-economics and infrastructure development.

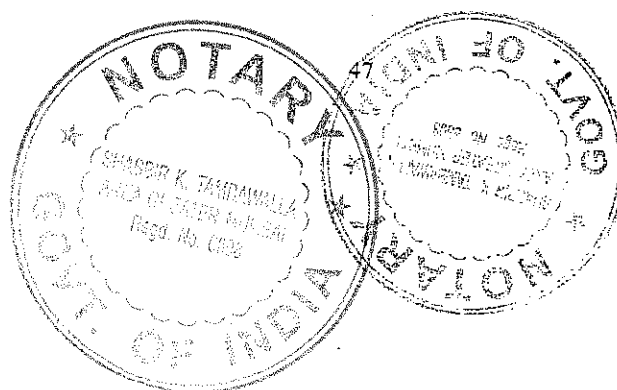
2.5.1.2 Beaches

Beaches consist of accumulated, unconsolidated sediments transported to shore and moulded into characteristic forms by wave generated water motion. Beaches are located between the lowest low tide level and a landward limit, which is usually defined by a coastal cliff, a foredune ridge, and permanent vegetation or, by some physical man-made structure. Quantitative limit can be broadly termed as the highest high tide line. The unconsolidated sediments range in size from rock fragments to fine-grained sands and mud. The general composition of beach materials tends to vary with locations, but the processes that create and maintain beaches throughout the world are similar.

Beaches are not stable entities, but rather are dynamic landforms that are constantly subjected to erosion and/or accretion. The changes on a beach are responses to processes acting from outside the beach. These include waves and currents as well as inland dune systems, which induce the erosional and depositional cycles. Difference in beach form (or type) and position reflect the local balance or imbalance between deposition and erosion.

Functions

- Beaches act as a buffer against coastal erosion



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- Habitats for many plants and animals
- Spawning ground for turtles
- Provide the energy base to support the beach's diverse population of deposit and filter-feeding organisms
- At highest level of food web, beaches serve as energy sources for many species of coastal birds and fish
- Aesthetics

Major uses

- Supports fishing and related activities
- Acts as the activity area for coastal population including settlements
- Beach sand serves as a major source of construction aggregate though declared illegal
- Mining of placer deposits & minerals
- Recreation and Tourist attraction
- Construction of ports, wharfs or piers over the beaches
- Agriculture

Threats

- Industrial and settlement siting and related constructions
- Overexploitation by sand mining (for construction and minerals)
- Constructions on the beach decrease the aesthetic value of beaches
- Activities which accelerate the erosional processes (such as river dams, barrages, and diversions that either trap sedimentary materials, thus preventing their entry into the coastal zone, or reduce the river water's transport power)
- Poorly designed coastal engineering works (that alter longshore currents or wave forces and lead to undesirable erosion and deposition patterns)
- Coastal dredging/mining projects (that remove beach-building materials from the longshore transport process)

Management approach

- Site specific studies may be required at each locality to ensure wise planning decisions
- Develop a setback line for construction activities
- Where a major obstruction to longshore sand transport is built, plan adequate sand by e-passing system or replenishment
- Use soft solution rather than hard solution to solve beach erosion problems i.e. nature-synchronous techniques
- Maintain a prominent fore dune ridge
- Restrict mining of sand from dune, beach or nearshore if it induces erosion
- If storm alters the beach, let the normal beach cycle return the sand
- Identify sustainable multiple use like: Tourism/human settlement/ agriculture; Spawning ground/source of food for humans; Tourism/spawning ground/food.

2.5.1.3 Sand Dunes

Coastal Sand dunes develop where the sediment transport by the wind is impaired through the interaction of air stream with surface vegetation in the coastal region. The



sediment for dunes is derived from marine sand delivered to the beach by waves. Dunes range from well vegetated, coast parallel ridges to non-vegetated irregular topography. Fore dunes are in a pioneer stage of dune formation and are susceptible to removal by storms or high tides. They will be still receiving a significant wind-blown sand-input. Rear dunes are in an intermediate or mature stage and are stable. The embryo dune, which occurs within 200 mts from the shore should not be altered/disturbed.

Man's impact on coastal dunes has caused extensive ecological and geomorphological changes. Increasing pressures place the dune communities under immense physiological stress, both from direct damage (trampling, grazing) and indirect damage through alterations in climate, soil and moisture regimes. Many dune systems around the world are in advanced stages of despoliation as a result of man's activities. In some cases the dunes have been completely removed.

Functions

- Acts as sand reserve for coastal protection and stability
- Provide protection and shelter for supply and recharge of fresh water aquifer in coastal areas.
- Habitat for several plants and animals
- Constitute important agricultural, industrial and recreational resource
- Protects the coast and the coastal communities living behind the dunes from tidal surges, large waves such as the tsunami waves.

Major uses

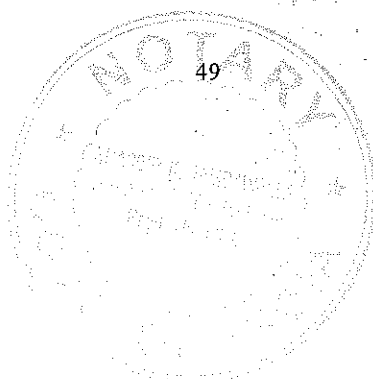
Dune-based activities include agriculture, mineral extraction, active and passive recreation. Over the last century the impact of recreation has been considerable, many dune systems having suffered badly from an uncontrolled influx of visitors. In some countries the coastal dunes are an essential part of integrated shore protection measures (as in Netherlands, UK, USA).

Threats

- Sand mining for minerals and construction
- Dressing of sand dunes
- Leveling for construction of beach resorts
- Leveling for industries.
- Road, rail and other infrastructure development included unplanned tourism facilities.

Management approach

- Conservation of fore dunes
- Preservation of rear dunes in the intermediate stage
- Restriction of sand mining
- Promote usage of alternative materials for construction activities
- Develop setback lines for beach resorts
- Develop setback lines for siting industries
- Develop artificial dunes and stimulate dune growth



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- Identify multiple uses like coastal protection, water recharge, recreation, agriculture and urban/industrial use and zonate for different uses.

2.5.1.4 Earth Cliffs

The most important characteristic of 'earth cliffs' is their tendency to instability and rapid change, unlike 'rock' cliffs where change is infrequent and particularly localized.

The form of earth cliffs and the process by which they are changed depend primarily upon rock cohesion, groundwater conditions, the effectiveness of marine erosion of the foreshore, the cliff foot, and the debris derived from the cliff, the amount and effectiveness of cliff-foot protection, both natural and man-made, offshore relief, sea level change;

Marine cliffs are usually considered to be special case of slope development in which the removal of weathered material from the base is especially efficient. The type and structure of the rock in which the cliffs are cut affect to a considerable extent not only the cliff form but also the dominant processes modifying it.

Usage

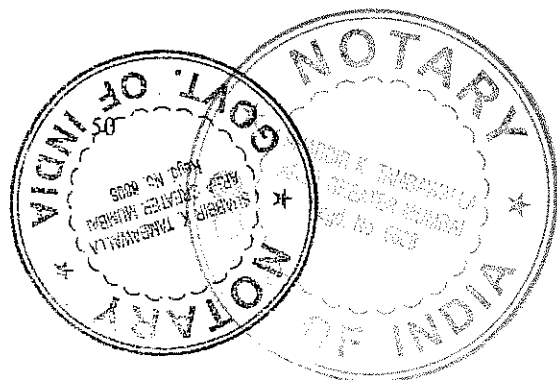
Cliffs and the immediate cliff-top are used mainly for the establishment of resorts, all forms of agriculture and recreation. Earth cliffs in coastal areas act as barriers against strong winds, cyclonic storms thereby protecting the life and property at the area. The urban use of cliff-top land poses most problems for the management of cliffs.

2.5.1.5 Rocky Cliffs

The principal value of rocky cliffs does not lie in agriculture, forestry, or any other commercial development, but in their exhilarating scenery and wildlife. Rocky cliffs are usually composed of hard materials such as sandstone, limestone, slate, basalt, serpentine, or granite. They are rarely smooth: the action of wind and sand, waves and spray, picks out the softer materials to form a complex pattern of ledges, flats, cracks, and gullies. This provides some flatter surfaces on which vegetation can establish with lichens nearest the sea, salt-tolerant flowering plants higher up and more normal, inland vegetation towards the cliff-tops. Rocky cliffs are distinctive in terms of their habitat and vegetation. The rocky cliffs are natural barriers to strong winds especially during the cyclonic conditions. Hence, the rocky cliffs should be protected.

Uses & threats

The economic uses of rocky cliffs are extremely limited. The rock itself is sometimes used for the extraction of valuable minerals, e.g. chromium from serpentine, or as a road stone as with granite and basalt, limestone for cement factories. These activities usually produce serious scars but are localized. A few industrial plants may be located on cliff-tops and whilst these are generally considered visual intrusions in the landscape, their effects are again fairly local.



2.5.1.6 Rocky Foreshores

Rocky foreshores occur most extensively where the coastal region is mountainous or atleast rugged. Topographically they are more variable than other coastal habitats. Depending on the geological character of the coast they range from steep, inaccessible cliffs to wide, gently-sloping platforms. The majority of rocky shores, on open coasts, experience the relatively stable conditions of fully marine situations. The CRZ notification prohibits mining of rock in the CRZ area.

Functions

- Provide anchorage for many types of algae and mussels
- Habitat for different crabs and molluscs
- Provide aesthetically important site
- Coastal protection

Uses

- Tourism
- Commercial exploitation of algae

Threats

- Unplanned tourism structures
- Pollution
- Mining of rocks for construction purposes.

2.5.1.7 Sand Bars

Sand bars in the nearshore and longshore area and swales on the beaches are sand reserves. These sand bars play a very important role in coastal processes. These are formed by wave beach interaction.

2.5.1.8 Estuaries

An estuary is a semi-enclosed coastal body of water, which has a free connection with the open sea and within which sea water is measurably diluted with fresh water derived from 'land drainage'. Estuaries depend upon fresh-water flow from upland rivers in order to maintain their characteristic processes. The two-way flow of estuaries, the currents set up by the mixing of fresh and saline water and the continuous variations, which take place in both velocity and discharge through the tidal cycle all provide a marked contrast with fluvial processes.

The most important control of estuarine processes is the tidal range. This determines the tidal current and residual current velocities, which in turn has impact on sediment movements.

When tidal range is less than 2 m (microtidal) the estuarine processes are dominated by fresh-water discharge from upstream of the estuary mouth and by wind-driven waves



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outside the mouth. The dominant fresh-water flow produces a salt-wedge estuary with a delta at its mouth. However, on the seawards of this delta, wind waves produce spits and barrier islands, which enclose a bar-built estuary. It is often difficult to distinguish between different types of estuaries.

Estuaries which experience tidal ranges between 2 m and 4 m (the meso-tidal range) are no longer dominated by salt-wedge circulation, instead tidal currents begin to assume importance.

The outstanding feature of estuaries, from the aspect of applied ecology, is the high productivity, which results from the constant supply of nutrients to a sheltered but dynamic habitat. Estuaries and tidal marshes are regarded as amongst the most fertile natural areas in the world. The greatest immediate commercial value of this high productivity, however, lies in fisheries within the estuary, mostly for bivalve molluscs.

The CRZ notification regulates all developmental activities along the CRZ area of the estuaries upto the extent of 5 Parts Per Thousand (PPT) of salinity felt upstream of the estuary. The measure of 5 PPT salinity during the driest period is one of the issues for implementing the CRZ Notification, 1991. Some of the estuaries become dry during peak summer seasons as there is no flow of fresh water. In some situations based on the geomorphological characteristics and hydro dynamics of the estuary, a salt wedge is formed at the bottom of the estuary while the upper surface has freshwater. Further, due to constructions of barrages, dams, upstream of the river, the salt water flow from the sea is also affected in the estuaries. Hence the Committee feels that biological indicators such as the extent of mangroves found upstream and presence of salt marshes may also be taken into consideration along with the salinity level of 5 PPT measured at the bottom of the estuary for determining the extent of tidal influence in the estuary.

Major Functions

- Spawning, nursery and feeding ground
- Beds for clams and mussels and sea grass beds
- Sites of mangrove, marsh stability
- Shifts sediments, creates mudflats
- Controls coastal stability
- Controls salinity
- Transports nutrients
- Cleanses the system of pollutants by flushing away the waste products
- Absorbs wave energy
- Absorbs floods

Major uses

- Human settlement and urbanisation on the banks
- Industrial sites
- Sheltered sites for locating ports and harbours
- Fishing grounds
- Sources for clams and mussels
- Aquaculture and mussel culture
- Transportation routes



- Filtration ponds
- Salt production
- Tourism
- Disposal grounds for urban and industrial waste

Threats

- Reclamation
- Pollution from urban and industrial waste disposal
- Reduction in fresh water discharge due to dams
- Prevention of fresh water flow.
- Dredging for water-ways

Management approach

- Restrict reclamation for essential activities
- Prohibit disposal of untreated waste
- Ensure sufficient fresh water discharge to maintain estuarine characteristics
- Ensure sufficient tidal exchange
- Determine the waste treatment level based on the assimilative capacity of the particular estuarine system and away from critical habitats
- Zonate areas for aquaculture, salt manufacture, ports & industries and tourism to avoid critical habitats and conflicts in use
- Avoid locating chemical plants with toxic discharge near estuaries

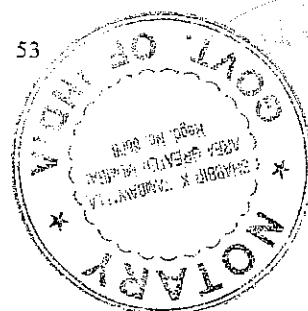
2.5.1.9 Lagoons

Lagoon is shallow body of brackish or seawater partially separated from an adjacent coastal sea by barriers of sand or shingle, which may leave narrow openings through which seawater can flow. Coastal lagoons are usually found on low-lying coasts and are normally aligned with their largest diameter parallel to the seashore. In general, lagoons are associated with coastlines, which have experienced or are experiencing change in the relative land-sea level. Lagoons associated with coral reefs of atolls have different characteristics and functions. These are treated separately with corals.

Human activities often affect the structure of lagoons, primarily by hydraulic works (e.g. dikes, dams, and artificial bars), also by land-reclamation activities and through changes in the inland watershed. Lagoons are highly productive ecosystems. Large oscillations in the populations of individual species occur. Many species migrate into lagoons to feed, thereby taking advantage of the considerable production of organic matter and the lack of competing species: although phytoplankton and benthic plants are the primary producers upon which the ecosystem ultimately depends, much of their production is consumed only after its decay and decomposition by microbial organisms, i.e. the detritus food-chains are quantitatively important in lagoons. The CRZ notification lists lagoons as tidal influenced water bodies. However, the water part of the lagoon is not covered in the notification.

Functions

- Nursery, breeding and feeding grounds for marine fauna
- Habitat for mussels and clams



- Seagrass beds
- Absorbs flood waters
- Absorbs wave energy
- Influences shoreline stability
- Act as sediment buffers

Uses

- Natural sites for harbours
- Potential aquaculture sites
- Recreational uses
- Sites for industrial purpose
- Culture and removal of mussels, shrimps, crabs, fish, etc. for human consumption and forms a valuable source of protein for the populations

Threats

- Reclamation
- Pollution due to urban and industrial waste disposal
- Modifications for aquaculture
- Discharge from aquafarms
- Constructions like dike, artificial bars, jetties affect the structure of lagoons.
- Construction of dams affect the freshwater discharge

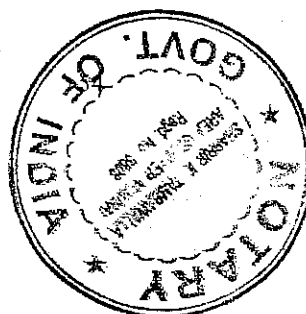
Management approach

- Reclamation be permitted only for essential activities based on EIA
- Discharge of untreated effluents be prohibited
- The number of boats for recreation be restricted based on carrying capacity estimates
- Discharge points be decided based on studies on circulation systems of lagoon
- Discharge points be away from critical habitats, like sea grass beds and mussel and clam beds
- Zonate areas for multiple uses like recreation, aquaculture etc.

2.5.1.10 Mudflats

Mudflat is formed by the deposition of fine inorganic material and organic debris in particulate form, which has been held in suspension in the sea or in estuaries. Because of the fine texture of this material, deposition tends to occur where the turbulence of the sea is most abated and the gradient of the underlying land is low. Mud-flats are thus formed in the sheltered parts of embayments, inlets, and estuaries or behind the protection of shingle spits or dune systems. Mudflats are also referred as tidal flats.

This environment is rich in invertebrate life. Moreover, mudflats possess special ecological significance because they are the main feeding grounds for many migratory birds and wild fowls, which congregate on the coast in great numbers during migration periods and in the winter months.



The CRZ notification is silent about the protection/conservation of mudflats. However, the Coastal Zone Management Plans have listed the mudflats as eco-sensitive areas.

Functions

- Mudflats that harbour large populations of several species of birds and other fauna.
- Act as flood plains controlling floods
- Controls flow regions and act as sediment source for the shore
- Coastal stabilisation

Major uses

- Fishing grounds
- Nursery grounds
- Potential area for agriculture
- Potential new land for development

Threats

- Reclamation
- Urban and industrial waste disposal
- Waste disposal/effluent discharge

Management approach

- Restrict reclamation
- Prohibit discharge of untreated waste
- Restrict dumping of dredge spoil
- Identify multiple uses and zonate for different uses
- Ensure enough amount of sediment laden water to sustain fertility of mud flats.

2.5.1.11 Deltaic Areas

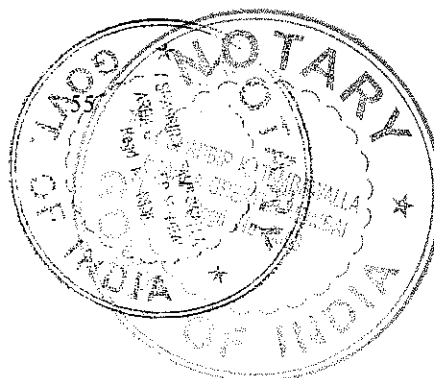
Deltas form where riverine and marine systems meet. The piling up of carried sediments at the mouth of the river creates deltas of various sizes and shapes. Deltas are highly productive and have fertile soils, which attract large agricultural settlements. The CRZ notification is silent about the delta formation.

Functions

- Barriers to tide, wind and wave actions
- Sites of mangrove, marsh and seagrass beds

Uses

- Human settlements
- Industrial sites, ports and harbours
- Agriculture
- Salt production



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Threats

- Reclamation
- Flooding

Management approach

- Identify multiple uses and zonate different uses
- Take into account threats due to floods/cyclones
- Ensure sufficient drainage and tidal flow

2.5.1.12 Tidal Inlets

Tidal inlets form at the confluence of terrestrial fluvial systems with the sea. Inlets play an important role in coastal ecosystems facilitating mixing of water, sediments, nutrients and organisms between terrestrial and marine environments. These are also the water routes across the coast for ships between inland harbours and the open sea. Efforts to keep the inlets permanently open and in the same position necessitate dredging and stabilisation structures. The tidal inlets are grouped under the tidal influenced water bodies with CRZ notification. The water part of the tidal inlets is not covered under the notification.

Major uses & Functions

- Helps to sustain the brackish water systems
- Provides water routes between inland waters and open sea
- Provides the route for marine organism to estuarine habitat for breeding/spawning

Threats

- Dredging for maintaining the channel increases turbidity
- Channel stabilisation disrupts the natural by e-passing of sediment.

Management approach

- Channel dredging and stabilisation should consider its impacts on shoreline stability
- Tidal inlet stabilisation interventions be avoided at identified critical habitats

2.5.1.13 Barrier Islands

Barrier islands occur along the lowland coasts. They run parallel to the mainland coast but are separated from the mainland by lagoons and bays. Barriers are best developed where the tidal range is relatively low and the wave energy is low. Barrier islands are formed by the long-shore extension of spits, which subsequently are broken through by storms - forming series of disconnected islands. They also form due to the post-glacial sea level transgressions, which swept sediments to the present day coastline. The best examples of barrier island formation in India are the stretch of barrier beaches extending along the Kerala coast. The CRZ notification does not put any separate regulation for such islands.



Threats

Sand mining, pollution from tourism activities and erosion.

Management approach

Discourage settlements and agriculture, regulate tourism activities, restrict permanent constructions.

2.5.1.14 Lakes

Many of the processes found along the shores of lakes are similar to those found on seacoast. There are several distinctive aspects about the lakes shores particularly with relating to geomorphology, hydrodynamics and the ecosystems. The Pulikat lake is comparatively different from that of Chilika lake. These semi enclosed water bodies act as breeding and spawning grounds for several fishes and shellfishes. The local communities depend upon these resources. The lakes are categorised as tidal influenced water bodies under a CRZ notification however the water part is not covered in the notification.

2.5.1.15 Salt-marshes

Salt-marsh can be defined as natural or semi-natural halophytic grassland and dwarf brushwood on the alluvial sediments bordering saline water bodies whose water level fluctuates either tidally or non-tidally.

Salt marshes are a source of minerals (clay, salts, sand) trapped from the floods, which will be resupplied after removal. They are also a source of plant materials, which can be utilized for agricultural purposes. A part of these materials may be transported, as detritus, towards the near-shore waters, contributing to their fertility. The salt marshes are one of the most productive habitats. The marshes act as buffer areas during flooding and storm surges. Direct protection of tidal marshes against pollution from the sea seems to be practically impossible, as an open relationship with the tides is a prerequisite for the survival of the marsh ecosystem. The CRZ notification does not included such salt marshes.

Functions

Habitat for various flora and fauna helps recharging of groundwater by trapping rainfall and provide protection to the coast.

Threats

Reclamation, cutting and removal of marsh vegetation for agriculture and construction of embankments.

Management approach

Regulate reclamation, development activities to be permitted based on EIA and only treated effluent be allowed.



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2.5.1.16 Islands

Islands are created by geologic processes like changes in the sea level or the eruption of volcanoes or through coral building process. For many small islands, such as Lakshadweep and Andaman- Nicobar, the entire area of the island can be considered to be the coastal zone.

It is well known that islands are particularly vulnerable to natural phenomena such as cyclones, subsidence, etc. and coastal management and planning efforts should take into consideration the likelihood of such occurrences.

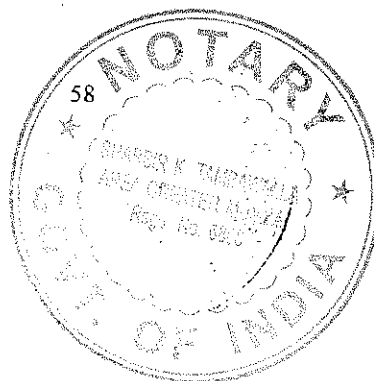
The Andaman and Nicobar group of Islands and Lakshadweep Islands are the major marine islands in the country. The former has 325 islands out of which 38 are inhabited while the latter is an archipelago of 36 tiny islands of which 10 are inhabited. The Andaman- Nicobar islands have forests and hilly terrains in many islands. Though narrow, the islands are marked by bays, lagoons, creeks and reefs. Lakshadweep islands are basically coral atoll formation. The CRZ notification categorises Andaman & Nicobar, Lakshadweep Islands as CRZ-IV and has stipulated separate conditions for developmental activities in the CRZ area. It was brought to the notice of the Committee that in most cases the width of the island is much less than 500 metres. These groups of Islands harbour some of the richest and unique biodiversity in the world. Due to their scenic beauty, the islands are considered to be tourism potential zones. Keeping in view the need for economic development of the island communities, the activities such as high yielding agriculture, fisheries and tourism may be promoted. The Committee is of the opinion that a holistic approach may be adopted rather than sectoral approach. An ICZM approach is one of the most appropriate management tools for managing the fragile island environment.

2.6 Coastal Communities

About 20% of the Indian population resides in the coastal area and they desire their resources from the coast. The coastal population is dependent on fisheries, agriculture, aquaculture, horticulture, tourism, boat building, traditional manufacturing units and allied activities.

From both on economic and livelihood perspective, fisheries are one of the most important of the resources available in coastal areas. It is estimated that the fishermen population living along the coastal areas of the country is around 67,30,300 (as per livestock census 1992) of which 26.86,000 are males, 19,80,000 are females and 23,64, 000 are children. This fishing population are involved in full time or part time fishing. The population involved in full time fisheries is around 7,38,000 while part time fishing is 7,13,000. The population, which is involved in marketing and other allied activity pertaining to fishing are about 6,89,000.

Living aquatic resources make a crucial contribution to food security, particularly in the coastal zone, as a source of high-value protein, providing the sustenance that supports livelihoods, social structures and economic development. For example, in South Asia, fish contributes more than half of the animal protein intake in the diets of coastal communities. In the Maldives and Bangladesh, for instance, fish contributes as much as 80 percent of the animal protein intake. This has direct nutritional implications for the fishery-dependent and poor marginalised coastal communities.



2.6.1 Livelihood and Social Dimension

A focus on the social dimension, although intertwined with the environmental, physical economic and the political remind us that development is about people and not merely about economic growth captured in macro statistics. In this context, the concerns of the poor and marginalised sections of the coastal communities must be reflected in the state policy. The fact that development is conflict ridden must be recognised and the role of the state in resolving such conflicts has not been unproblematic.

India's natural capital – land, water, forest and air – is being depleted at an alarming rate and those communities who depend on it for their livelihood are being displaced and marginalised.

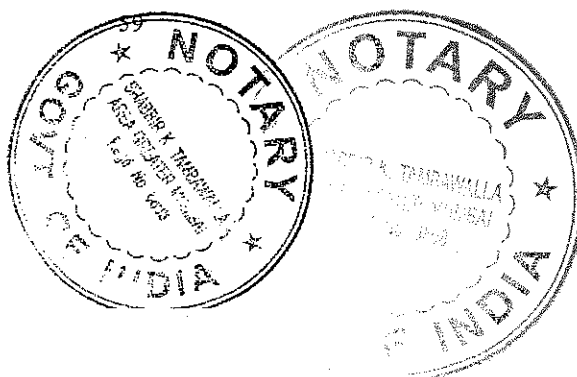
The CRZ policy, the goals of biodiversity conservation and local people's livelihood security need to be placed at the centre stage of all decision making pertaining to infrastructure development or economic considerations of revenue generation. If objectives and principles of National Environment Policy, 2004 are to be upheld, governance structures become significant.

We must recognise the ecological, human and economic significance of coastal areas, and of the resources within them. These dimensions have not been sufficiently incorporated in the implementation of environmental laws and regulations and in the macroeconomic policies. Often it is the alert interventions by public interest groups the positive attitude of the judiciary which has played a crucial role in protecting and enhancing environmental resource conservation in India.

In a country like India, where a large number of people are dependent on natural resources for their survival, social dimensions of livelihood and ecological security have to be incorporated. In Coastal Regulation Zone policy, the goals of biodiversity conservation and local people's livelihood security need to be placed at the centre stage of all decision making pertaining to infrastructure development or economic considerations of revenue generation. If objectives and principles of National Environment Policy, 2004 are to be upheld, governance structures become significant. In harnessing scientific and technological know-hows the key ideas to be included in the new Coastal Regulation Zone policy framework are:

- (i) Recognise the vital contribution that coastal ecosystems make a sustaining livelihoods, particularly of fishing communities.
- (ii) Distinguish clearly between needs of locals for drinking water and other natural resources and those of commercial interests. Under the garb of permissible "human activity", commercial interests have plundered the environment.
- (iii) Institute inadequate institutional mechanisms to implement and enforce the new Coastal Regulation Zone legislation.
- (iv) Facilitate the preparation of well-coordinated land-use project plans, site plans, using GI and other planning methods through multidisciplinary teams.

There is a general obligation to protect threatened or endangered species and natural systems, of special importance to sustaining life, providing livelihood, or general well-being. If for exceptional reasons of overriding public interest such a protection can not be ensured, there shall be due process for the purpose and offsetting measures that must be taken, by the proponents of such activity, for the purpose will include restoration or replacement as far as



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possible of the lost environmental value to the same public as well as the critical ecological systems. This, however, may be permissible only in the rarest of the rare cases and not allowed as a pretext for laxity in complying with statutory obligations, to provide fait accompli for relaxation of established norms or obligations emanating from public trust.

2.7.0 Infrastructure

Development infrastructure such as electricity, water, gas, roads, bridges etc., are designed to serve multiple uses and is usually planned and provided by Government. Developing infrastructure systems in coastal zones can have wide arrange of environmental impacts. The details of some of the infrastructure and its impact on the costal environment is described below -

2.7.1 Zonation and Planning for Locating Infrastructure Facilities

Several major urban centres have come up along the coast line. The average coastal population density is 432 persons per sq. km as against 256 persons for the entire country. Apart from protecting the community and resources, there is a need for providing necessary infrastrucutural facilities for the communities to maintain a better standard of living and their economic development. While the coastal areas have a tremendous developmental potential, there needs to be proper planning process so as to integrate developmental process with the Regional Plans. Coastal Regional Plans are required to work out broad Regional Policy for development under the concerned State Town and Country Planning Act. The Regional Plans should indicate broad settlement system depending upon the potential of development and the Coastal Zone Management Plans should be an integral part of the regional plan. This plan should give broad framework for development code and the regulations for controlling constructions and building activities. It must be ensured that the development and management should be incorporated within this plan. For the purpose of protection from natural hazards, the development plan also should indicate protection measures against the natural hazards.

2.7.2 Coastal Aquaculture and Mariculture

The potential area available in the coastal regions of the country for aquaculture is estimated between 1.2 to 1.4 million hectares. Presently, about 157 000 ha area is under shrimp farming with an average production of about 100 000 tonnes of shrimp per year. Andhra Pradesh is the most important State for tiger shrimp (*Penaeus monodon*) farming. In 2002 - 2003, it accounted for 47.1 percent of the total production of farmed shrimp, followed by West Bengal (26.3 percent), Orissa (11.0 percent), Kerala (5.73 percent), Tamil Nadu (5.3 percent) and Karnataka (1.6 percent). The practices adopted by the shrimp farmers range from traditional to improved traditional within the Coastal Regulation Zone (CRZ) and extensive shrimp farming outside the CRZ, with an average productivity of 660 kg per hectare per year. About 91 per cent of the shrimp growers in the country have farm holdings in between 0 to 2 ha, 6 per cent between 2 to 5 ha and the remaining 3 per cent have an area of 5 ha and above. Farmed shrimps contribute about 50 per cent of the total shrimp exports. The State-wise details on potential brackishwater area, area under culture and production as on 31.3.2004 are given in Tables 1 and

Presently, about 280 shrimp hatcheries have been set-up in the coastal States with an installed capacity of 12 475 million seed (Post larvae) per annum. Out of this, as many as 148 are set up in Andhra Pradesh, followed by 73 in Tamil Nadu. As *P. monodon* is the most



popular farmed species in India, most hatcheries raise tiger shrimp. However, some hatcheries also breed *P. indicus* and freshwater prawn – also known as scampi (*Macrobrachium rosenbergii*). The state-wise details of shrimp/ scampi hatcheries is given in Table 3.

It is estimated that there are about 33 feed mills producing shrimp feed in the country with an installed production capacity of 1 50 000 metric tonnes. Besides, there are a large number of small-scale feed manufacturers, mostly located in Andhra Pradesh. The current feed requirement of the sector is about 1 35 000 metric tonnes. Shrimp farming provides direct employment to about 0.3 million people and ancillary units provides employment to about 0.6 – 0.7 million people.

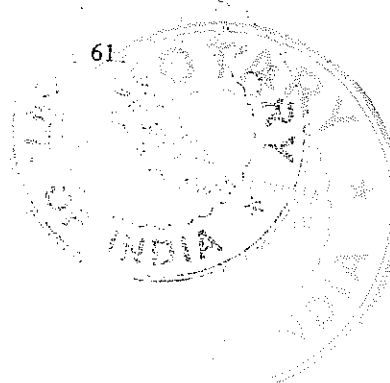
The Supreme Court's delivered its judgment on shrimp aquaculture in December 1996. The judgment said that that aquaculture is an industry and hence covered by the prohibition in the CRZ Notification, 1991. The Court permitted traditional and improved traditional practices within the CRZ. It further directed that farming practices outside CRZ were to be regulated to ensure that there was no impact on the environment. As setting up of shrimp hatcheries is a permitted activity in the CRZ Notification, 1991, the Court maintained a status quo on the setting up of shrimp hatcheries in its above-referred judgment.

The Aquaculture Authority has been set up under Section 3 (3) of the Environment (Protection) Act, 1986 to perform the functions indicated in the Supreme Court judgment delivered on 11 December 1996. Constituted vide Ministry of Environment and Forests' Notification No SO 88 (E) dated 6 February, 1997, the Authority is functioning under the administrative control of the Government of India in the Ministry of Agriculture, with its headquarters at Chennai. Justice G. Ramanujam, a retired Judge of Madras High Court, heads the Authority, which has seven-member composition.

The Aquaculture Authority is mandated to exercise powers under section 5 of the Environment (Protection) Act, 1986 for issuing directions and for taking measures with respect to matters referred to in clauses (v), (vi), (vii), (viii), (ix) and (xiii) of subsection (2) of Section 3 of the said Act. The Authority is further responsible to ensure that agricultural lands, salt pan lands, mangroves, wet lands, forest lands, land for village common purposes and the land meant for public purposes should not be used (or) converted for construction of shrimp farms and it shall also implement the "Precautionary Principle" and the "Polluter Pays Principle" in sustainable development of coastal shrimp farming activities.

There are few economic activities, which have globally witnessed high growth rates as shrimp farming in a large number of countries, situated both in the eastern and western hemispheres during the last two decades. In India, commercial-scale shrimp culture started gaining roots during the mid-eighties. It was a relatively late start in India; by this time, shrimp farming had reached peak in most of the neighbouring Asian countries, especially China and Taiwan. The boom period of commercial-scale shrimp culture in India started in 1990 and the bust came in 1995-96, with the large-scale outbreak of white spot disease (w.s.d). The fact that some States in India were new to commercial-scale shrimp farming, the general ignorance of good farming practices, and the lack of suitable extension services, led to a host of problems. Presently, the repeated occurrence of w.s.d and the lack of good quality shrimp broodstock are the major constraints faced by the shrimp aquaculture sector.

Sustainable shrimp farming entails issues ranging from farm level management to integration of shrimp farming into coastal area management, shrimp health management and



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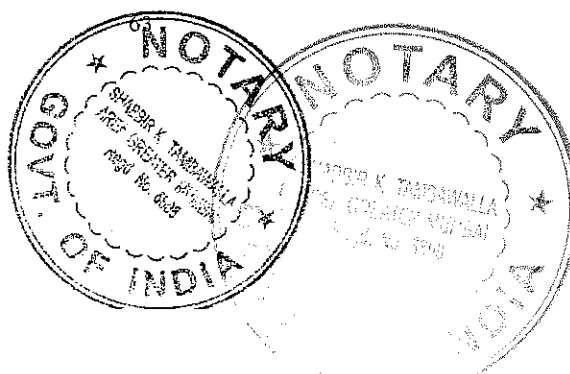
policy, socio-economic and legal issues. However, it must be admitted that the days of production-oriented shrimp farming are gone. Present day production has to take note of not only the markets but a host of technical issues as well as the concerns of the environment.

In many areas, shrimp farms have developed in close proximity (in clusters) along the creeks and estuarine watercourses. The Kandaleru creek in Andhra Pradesh is an excellent example of farms set up in large-scale clusters. As sustained development of shrimp culture relies on good-quality source water, over-development of shrimp farms – either through management intensification or increased farm area – along a creek can impact estuarine water quality to levels unacceptable for shrimp farming. This brings to focus the need for investigations on carrying capacity, which will address not only the physical areas of shrimp farms, but also their density and geographical distribution along a watercourse.

Of the many good management practices that are currently in vogue and adopted by the farmers, low stocking densities in grow out ponds have proved to be successful in attaining sustainability. The Aquaculture Authority permits up to 6 nos/ m² for farms within the CRZ and up to 10-nos/ m² outside the CRZ. Adoption of low stocking densities is one of the key elements of sustainability of shrimp farming in the country.

While production from capture fisheries around the world has stagnated, aquaculture is viewed as a strong option to increase fish production, and play a vital role in providing food and nutritional security. Returns from shrimp farming continue to be rewarding, benefiting small-scale farmers and communities, as well as entrepreneurs engaged in seed production, farming operations or ancillary activities. Sustainable utilisation of available areas and infrastructure can lead to the development of unexploited resources with the potential of generating a large number of jobs and enormous social and economic benefits to the coastal regions of the country. The Committee feels that:

- In many areas, shrimp farms have developed in close proximity (in clusters) along the creeks and estuarine watercourses. Setting up of farms in such areas should be considered after an assessment of the carrying capacity of the open water (or Environment Impact Assessment) and incorporation of remedial measures like common wastewater treatment plants to reduce organic loading in the open waters.
- Potential areas for shrimp aquaculture in the country should be re-assessed through remote sensing. The identified areas should also find a place in the Integrated Coastal Zone Management Plan of the coastal States/ Union Territories to ensure optimal utilisation of the scarce coastal resources and planned and sustained development of the coastal region in future. This would also avoid inter-sectoral conflicts with the other legitimate users of the coastal resources.
- No drawal of groundwater should be permitted for carrying out shrimp farming within or outside the CRZ. The other restrictions imposed by the Supreme Court (example: ban on conversion of agriculture land, use of mangrove forests, etc.) should continue to ensure that shrimp farming is only done in inherently saline and degraded land, which otherwise is unsuitable for any other productive purposes. The latter category should also include such agricultural lands, which are classified as agricultural land in the revenue records but have been rendered unproductive due to long disuse.



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The minor ports handled about 115 Million MT during 2003-2004. As per the Tenth Plan document for port sector, projection of 415 Million Tonnes have been made for all the major ports by the terminal year 2006-07. A number of development projects have been identified during Tenth Plan period with a total investments of around Rs.16,000 crores and the targeted capacity to be created will be around 470 Million Tonnes. In addition, the Minor Ports are poised to handle around 150 million MT by the end of Tenth Five Year Plan.

In addition there are engineering structures to protect the ports, harbours, intake structures, inlets and entrance channels (breakwaters).

2.7.4 Coastal Protection Structures

The Indian coastline is marked with a variety of geomorphological features; namely tidal flats off the Gujarat coast, flat beaches off Goa and a few regions off Maharashtra and Karnataka, mud banks off the Kerala coast, presence of the large number of outcrops particularly, off the Tamil Nadu coast on the western coast, the Southern tip of the Indian peninsula, the culmination of India, Arabian Sea and Bay of Bengal, although the wave activity is severe, the sediment movement in this stretch is not significant. The west coast is exposed to the wave activity being seasonal, net "Littoral drift" or the sediment transport is quite varied. There are pockets of net drift towards North; pockets of nil net littoral drift as well as pockets of net drift towards the South.

In the east coast, the seabed is generally steep, frequently exposed to cyclones, so the wave activity is seasonal. The net drift is to an extent of about 1×10^6 m³/annum. This quantity of sediment transport focused towards one direction is probably the largest in the world, which indeed is a challenging task to Coastal Engineers, planners and managers.

The general problems along the Indian coast are:

- Silting up of entrance channels
- Closing of river mouths
- Problems concerning aquaculture
- Silting up of intake structure
- Inundation into land
- Sand bar formation near mouths of inlets, rivers and estuaries
- Erosion of the coast.

Of all these problems, coastal erosion is a major concern, while other problems being equally important to be addressed. Coastal protection need to be given top priority as this is extremely important even for the fixing of the High Tide Line. Any structure (hard measure) should be considered only if soft measure is not possible. The agency considering the hard measure, particularly groins or breakwaters should be made responsible for protecting the shoreline at least 500 m on either side of the shoreline from erosion. In case of breakwaters for harbours, the stretch of the shoreline to be considered for protection should be atleast 1 km on either side of the structure. The agency responsible for the construction of the said structures should be made responsible for the monitoring of the shoreline for a minimum period of one year so as to cover the seasonal variation in the wave climate, which dictates its dynamics.

Similarly, within the said distance, if rivers, inlets or any water course is blocked by sand bar formation on its up drift side due to the construction of barriers jetting into the sea,



suitable control measures are to be incorporated in the planning state of the project. Here again, the agency responsible for the construction of the said structures should be made responsible for the monitoring of the shoreline for a minimum period of one year.

At locations, where shoreline advances towards the ocean, construction of huts, houses to be banned (strict enforcement absolutely essential).

The construction sequence as per the season is extremely important. This should be spelt out clearly prior to obtaining the necessary clearance/sanction from the appropriate authority/body.

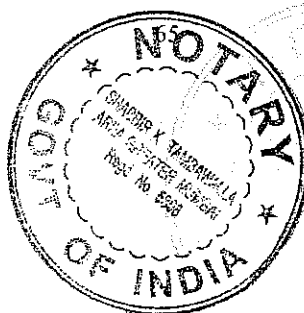
The sizes of the stones usually adopted for the construction of seawalls, groins or breakwaters are arrived at using empirical formulae. If the weight of the individual stones adopted for construction is underestimated, this would result in the scattering of such stones all over the seafloor resulting in several other problems (typical examples are the seawalls along Royapuram in Tamil Nadu, North of Paradip port, a long stretch of the coast of Karnataka and few other locations). Verification of the stability of the cover layer of these structures in Laboratories (CWPRS, IIT Madras, NIT Karnataka, IHH Poondi are some of the Institutes that carry out such studies) should be made mandatory prior to the commencement of such projects.

2.7.5 Settlements (including cities)

It is estimated nearly one quarter of the Indian population is living along the coastal area. This population is likely to grow in coming years. The settlement along the coast includes large metropolitan cities towns, census towns etc. The majority of the coastline has a settlement, which are of rural nature inhabited by fisherman, agricultural, cottage industries etc. The shoreline real estate is in strong demand for human settlement agriculture trade industry amenity and marine support activities for shipping, fishing and recreation. While the waterfront expansion may be necessary or the coastal cities it may jeopardize coastal resources. The sewage let out from these major cities and towns are the major source of pollution of coastal waters. Expansion of townships and cities has put certain ecosystems such as mangroves, salt marshes, and mudflats under pressure. The settlements of local communities have to be protected against natural calamities. The coastal areas of some of the major coastal cities are also place where several unplanned constructions have cropped up such as the slums. These slums are located mostly in the seafront. The unhygienic conditions of such slums and the adverse environmental impact caused by these slums are a matter of concern which the Ministry has to address and take action in a time bound manner in order to provide decent housing and living conditions for all communities living along the coast.

2.7.6 Tourism

It is universally accepted that the tourism industry is an infrastructure industry, an economic driver and is an intrinsic part of the development of a region. It is the country's largest employment generator and foreign exchange earner. The Ministry of Tourism aims to increase foreign tourist arrivals from the present level of 2.8 million to 5.0 million. Coastal states are unable to tap this great economic potential to their advantage. Due to the high aesthetic value of the coast there is an enormous potential for tourism development. High capital investments in various sectors like beach resorts, location of industrial complexes, human settlements are being planned in the coastal zone for the economic development of the



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country. The Tourism in the coastal areas of India has been on a high growth curve during the last few years and particularly during the last two years i.e., 2003-2004 and 2004-2005. The foreign tourist arrivals to places like Kerala and Goa have been booming to unprecedented levels, showing a growth of 25 to 30% every year. These coastal states are the most sought after by foreign tourists. At the same time there is a very high demand for such beach tourism among the domestic tourists also. Particularly in Goa a large number of charter flights are landing every week bringing foreign tourists to the state.

Kerala is also developing new beach resorts in Bekal area and Maharashtra is developing the coastal area of Sindhu Durg for tourism. Similar developments are also taking place in coastal areas of other states, like Tamil Nadu, Andhra Pradesh and Orissa.

It is expected that there will be 20% plus growth in tourism in all the developed coastal areas and beach resorts during the next five years. There is already a shortage of hotel rooms in many such areas, particularly in Kerala and Goa. It is expected that there will be high demand for new construction of hotels in the coastal areas during the next five years, particularly during the next three years. State governments will also be taking action in extending the areas of existing developments and looking for new sights

2.7.7 Infrastructure for National Security

Extensive security interests exist in the coastal zone and the coastal seas because they are the frontiers where invasion and other anti-national activities like smuggling might occur. Naval ports and harbours, coastal airfields, and special bases of all kinds are sited in the coastal zone, usually with high priority and intense security.

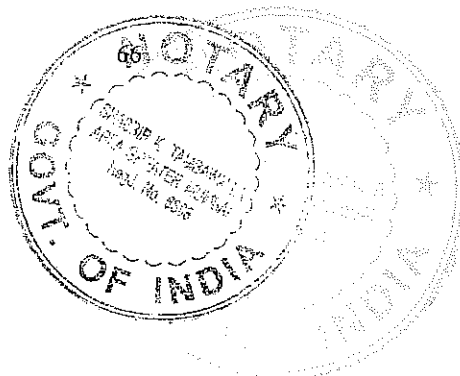
2.8.0 Natural Hazards

Storms, cyclones, tidal surges, flooding, erosion etc. bring about large scale destruction of life, property and natural resources in the coastal regions of the country every year. In Bay of Bengal, storm surges attain heights of several meters, causing severe devastation. The 1999 "Super Cyclone" which devastated the Orissa coast was one of the severest to hit Indian coasts. In addition, heavy monsoonal rainfall and the swelling up of river discharge augment the coastal floods. The result is that water piles up along the low lying coast as a surge flooding vast areas and causing loss of life and damage to property. The country has been experiencing loss of resources and degradation of coastal ecosystems as a result of changes in the shoreline due to erosion

However, the intensity of natural hazards such as storms, cyclones, tides, waves etc are not felt to the same extent along the inland tidal water bodies as they do along the coast facing the sea. Tides, tidal currents and river discharge are the main physical processes in the inland tidal water bodies.

2.8.1 Coastal Erosion

Coastal erosion is a common problem in many parts of the country. The causes of beach erosion are either natural or man-made. Sometimes, it is a combination of both. While the former is a relentless process which is often impossible to resist, the latter is often due to man's ill-planned activities and can certainly be contained, or even reversed. Coastal erosion in one area may lead to accretion in another area, which is a transient phenomenon. The cause



of erosion and accretion can be due to natural and/or anthropogenic activities (See Table below).

No.	Nature	Man Made
1.	Rise in sea level	Dams, dykes and other coastal structures causing rise and concentration of tides.
2.	Protruding head lands, Reefs, Rocks causing erosion on the down drift side	Groins, Breakwaters or jetties causing erosion on the down drift side.
3.	Tidal entrances & river mouths causing interruption of littoral drift	Manmade entrances causing interruption of littoral drift
4.	Shoreline geometry causing rapid increase of drift quantity	Fills protruding in the ocean to an extent that they change local shoreline geometry radically. Such fills are often bulk headed.
5.	Removal of beach material by wind drift	Removal of material from Beaches for construction and other purposes.
6.	Removal of beach material by sudden outbursts of flood water.	Digging or dredging of new inlets, channels and entrances. Offshore dumping of materials.

Erosion due to natural phenomena: The combined action of different processes on the coastline like waves and tides maintain the stability of the shoreline. If, for any reason, the sediment supply to a section of beach is reduced due to littoral drift/sea level rise or constant impact of waves, it can cause severe erosion. Even cliffs can get undermined at their base and slumped.

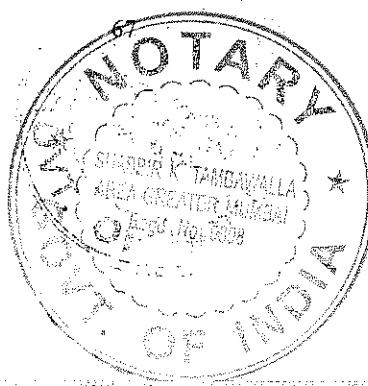
River deltas are especially prone to dramatic changes. Shift in the course of rivers leads to changes in the sediment supply. Tributaries are abandoned as the river shifts its course. The abandoned delta lobes, having lost their sediment supply, erode as a result of wave action and tidal flow. New deltas are created and protrude into the sea when there is sufficient sediment supply.

Catastrophic events like severe storms, tidal surges and cyclones cause the sea level to rise to abnormal heights and cause severe erosion.

Man-induced erosion

Coastal activities can also directly or indirectly result in beach erosion. The following are some examples:

- (i) Dams on rivers reduce or arrest the river-borne sediment supply to the sea, upset the sediment budget and can, in some cases, deprive the beach of its normal source of sand.
- (ii) Harbours often have shore-perpendicular/inclined solid quays and breakwaters, which obstruct the longshore transport of sand and cause accretion on the updrift side, and erosion downdrift.
- (iii) Sand removal above replenishable quantities from the coast upsets the longshore sand transport budget and can result in erosion downdrift.



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- (iv) Groins and jetties and other structures on the coast/shoreline interfere with longshore sand transport and can result in erosion when these are ill-designed.
- (v) Artificial inlets, when they are very narrow can often have high current velocities which prevent long shore sand transfer from one side to the other, resulting in erosion.
- (vi) Seawalls, bulkheads and breakwaters, which are shore protective structures, have side effects in terms of erosion of adjacent areas.

Precautions against erosion: The three nature friendly options are 'do nothing', 'retreat' and 'supply sediment' to the affected area. Removing the causes for coastal erosion is another method. There are other technological options available to control/prevent erosion. One of the most practised methods is to construct seawalls on the eroding coast. Over a period, it has been concluded that there is more harm done to the coast by these seawalls, since they disturb natural sediment budget, which leads to erosion in adjacent coastal area. Soft engineering measures such as coastal vegetation, beach nourishment, etc. are preferred for coastal protection. Setback limits are fixed in coastal areas so as to prevent major developments coming up in the eroding zone and reduce the impact of erosion. The location of these lines is based on scientific criterion taking into account the extent and nature of beach erosion.

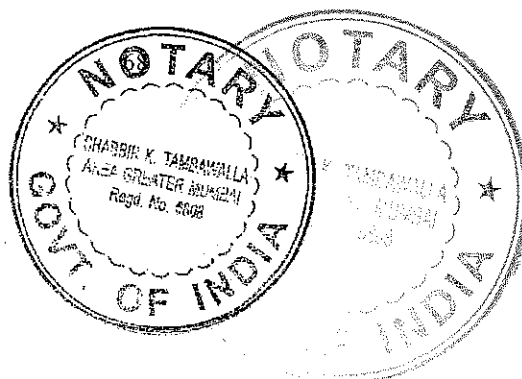
The purpose of the establishment of setback lines is two-fold. In the first place, they are intended to ensure that beach erosion is not triggered or worsened as a result of coastal construction activity, which interferes with beach processes. However, this may not always be possible or successful. For example, the location of a harbour or an artificial inlet is often determined by economic or physical needs, rather than by the consideration of erosion. The consequences have to be managed if it is decided to carry out construction activity beyond the limits. In the second place, perhaps the primary objective is to protect buildings and investments, e.g. housing, roads or plantations, by locating them away from the zone of probable worst-case erosion.

2.8.2 Cyclones and Storm Surges

Concerned State Government/UT has to identify the coastal areas, which are prone to cyclone and storm surges. Though it may not be possible to relocate the people and property from such areas, the Governments ought to take up measures to minimise the risk by installation of early warning systems/alarms, communication systems, cyclone shelters, early evacuation measures and movement of relief measures to the affected.

2.8.3 Flooding

Flooding due to cyclones, storm surges etc: Coastal storms can be devastating because of their sheer speed and effects on coastal water level. Onshore winds and atmospheric pressure fluctuations combined with wave effects create storm surges. The magnitude of a storm surge at a given point depends on wind vectors, shoaling depth gradients and coastal configuration. In semi-enclosed seas like the Bay of Bengal, storm surges may attain heights of several metres. Surges plus high waves penetrate considerable distance inland, especially on low-lying coasts like mudflats and deltas. Heavy loss of lives and damage to properties usually accompany storm surges. Salt intrusion and ground water



contamination are also part of storm surge damage. With the present technology and information, the occurrence of cyclones can be predicted but it would be still difficult to pinpoint the exact nature and magnitude of the hazard that would occur in the coastal area. Sometimes the magnitude of the cyclone is so large that it brings about devastation not only in the coastal districts but also well interior into the hinterlands. Even the most developed countries with sophisticated early warning systems suffer huge loss of property and lives in the coastal areas due to flooding caused by hurricanes, typhoons, tidal waves, tsunamis and storm surges.

Flooding due to river discharge in inland tidal water bodies (still water flooding): Banks of water bodies get flooded due to rise of water level as a result of precipitation and river discharge. This rise in the water level without the influence of wind leads to water logging in the adjacent areas. Data is available in historical records with the Central Water Commission/ irrigation departments and these flood lines are also depicted in the topo sheets for certain areas. This flood line if demarcated shall also include the unforeseen rise of water due to man's intervention.

2.8.4 Sea level rise due to Greenhouse effect

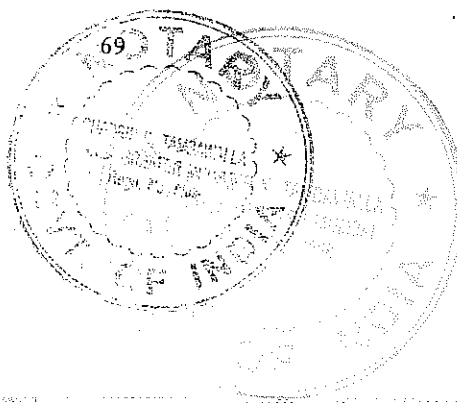
Sea level rise is one of the major factors influencing coastal erosion. As the sea level rises low lying areas will be inundated, the reach of active marine forces like the waves will be raised relative to the land surface, which will lead to coastal erosion and drowning of estuaries. Recent estimates of global sea level rise vary from a high scenario of one metre to a low scenario of 15 cm during the next century.

2.8.5 Salt Water Intrusion

Many coastal communities rely on potable ground water for requirements of water. Often it is the only reliable source, seawater not being potable without expensive desalination. Both fresh and salt water seep into the coastal terrain; the fresh water, being less dense, overrides the salt water often forming a shallow lens between the recharge and the discharge zones. In these shallow, unconfined aquifers, permeability is often very high, due to porous or even cavernous sediments, and consequently the through flow (transmissibility) is rapid. Thus natural fluctuations in the in the freshwater head, often due to seasonal factors, can have a marked effect on the position of the saltwater-freshwater interface. Several processes disturb this relationship. Perhaps the most common is the abstraction of ground water by pumping. Lowering of the freshwater head encourages the incursion of salt water, which can rapidly render the supply undrinkable. Removal or lowering of coastal dunes has similar effect. Dunes act both as recharge zones and as support for an elevated water table. Draining of coastal wetlands, and cutting or dredging of coastal navigation channels may breach the brackish interfacial zone often leading to increase in salinity. The projected rises of world sea level in the next century may also lead to severe salt intrusion problems. The shallow coastal aquifer is liable to pollution. Coastal ground water extraction may lead to subsidence. Siting wells and boreholes further inland is not a long-term solution and alternative supplies may have to be provided.

2.8.6 Tsunami

The devastating earthquake of magnitude 9 occurred off the west coast of northern Sumatra which lies in the Andaman-Nicobar Island arc on December 26, 2004 at 06:28:50



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IST. This earthquake has generated tsunami which travelled crossing the boundaries of Sumatra and reached the entire Bay of Bengal rim, Indian Ocean islands, west coast of India and African coast.

The Andaman - Nicobar Arc in the Bay of Bengal is a zone of frequent earthquakes. The earthquake is generated by the subduction of the Indo-Australian plate under the Asian (Burma) plate below the Andaman archipelago. It is known to the scientific community that all under-sea earthquakes do not generate tsunamis. Only those earthquakes with a maximum intensity and right characteristics generate tsunami. The tsunami waves generated at the earthquake site off Sumatra travelled in all directions.

As per the known scientific information, the tsunami waves travel at a speed of more than 700 km in deep sea. The tsunami waves have a very long wave length of more than 750 km and a very short crest of height often less than 1m. Hence in the deep sea areas, the ships and other ocean vessels do not even notice them. These waves slow down when they enter continental shelf areas due to which the wave length decreases and the crest starts peaking up. Very near to the shore line, the crest takes the shape of a wall and enters the coast. It is reported that during the present tsunami the height of the crest near the shore reached around 10 meters in the east coast and 5 meters in the Kerala coast. There was a general belief that the waves will not reach the shadow zone. But in the present instance the waves reached the shadow zone (e.g. Kerala), which is believed to be due to processes such as wave diffraction and reflection.

It has been observed that the tsunami waves reached the coast unawares. In the directly exposed coasts, they approached as waves, which broke at different points in the shelf and finally entered the land. But in the shadow zones, enclosed bay areas, deep sea islands without a shelf (eg. Maldives & Lakshadweep), they were felt as sudden increase in the water level at the coast. Once the waves entered the land, they generated a flood flow. The affected areas were submerged and the high speed and turbulence of the flow uprooted houses and trees in addition to throwing away of the floating objects. In those coasts where the land was sloping towards the sea, the entire water returned to the sea with tremendous force, carrying whatever was uprooted.

The Andaman- Sumatra section of subduction zone had produced many large and destructive earthquakes in the past some of which also generated destructive tsunamis. The M8.7 earthquake of 1833 is reported to have ruptured about 550 Km segment of this arc southeast of the current source; it also generated a tsunami. Another great earthquake of 1861 (M8.5) broke a segment north of the Equator, also triggering tsunami. 1833 and 1861 earthquakes and the attendant tsunamis occurred before the introduction of harbour tide gauges data for these events. However, there are better documents of tsunamis due to earthquakes of 31 December 1881 and 26 June 1941, both of which caused a run-up in the eastern coast of India. The 1941 earthquake occurred during the Japanese occupation of the Andaman islands. It appears to have ruptured the region near the Andaman Islands. There are anecdotal accounts of 3,000 deaths from the eastern coast, resulting from a tsunami associated with this earthquake.

Historically an earlier earthquake appears to have occurred in the Andaman offshore on 28 January 1679, with its felt area similar to the 1941 north Andaman event. This earthquake may have also generated tsunami, which was probably not properly documented.



In the context of CRZ provisions, during the present episode of tsunami in the Indian coast, the following preliminary observations are made:

- The maximum damage has occurred in low lying areas near the coast.
- High casualties are found in most thickly populated areas.
- The mangroves, forests, sand dunes and coastal cliffs provided the best natural barriers against the tsunami.
- Heavy damage is reported in areas where sand dunes were heavily mined (eg. Nagapatinam & Kolachal) and where coastal vegetation was less.

The buffer provided in the Coastal Zone and our approaches for conservation of mangroves/sand dunes/coral reefs/coastal forests were all put to test during this event and were found to be reasonably effective even in calamities of this magnitude. This leads us to the necessity for effective mechanism to correct our approaches and to incorporate vulnerability indices in the management practices of the coastal zone.

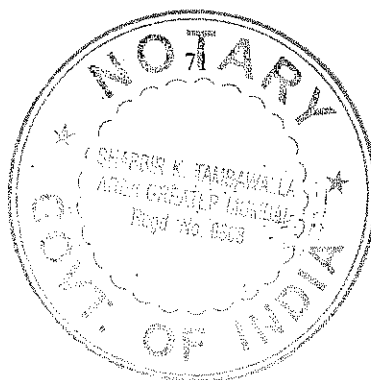
2.9.0 Coastal Pollution

The major activities that are responsible for coastal pollution in India are discharge and disposal of untreated domestic and industrial wastes, discharges of coolant waters, harbour activities such as dredging, cargo handling, dumping of ship wastes, spilling of cargo's chemicals and metal ores, oil transport, fishing activities, etc. The mechanised fishing activities such as draining of waste oil, painting of fishing vessels, scrapping of metal linings of fishing boats, dumping of waste and trash fishes, etc. The oil transport, oil exploration and oil refining activities, ship breaking, recreation and tourism activities, salt production, etc. also create concern in the coastal pollution sector.

Domestic wastes are discharged mostly in untreated conditions due to lack of treatment facilities in most of the cities and towns. It has been estimated that approximately, 5,060 km mld reach the coastal waters of the country (Table below).

Table: State & Union Territory-wise Wastewater Generation, Treatment and Disposal in Cities and Towns along the Coast (source: CPCB).

State	No. of Cities/Towns	Wastewater Generated (MLD)	Treatment Facility Available (MLD)	Untreated Wastewater Disposed (MLD).
Andhra Pradesh	8	203.90	0.00	203.90
Goa	3	17.00	38.50	0.00
Gujarat	13	329.06	76.00	253.06
Karnataka	3	72.00	27.50	44.50
Kerala	19	326.45	27.50	298.95
Maharashtra	6	2,508.6	126.00	2,382.64
Orissa	4	114.90	0.00	114.90
Tamil Nadu	12	488.02	226.01	262.02
West Bengal	6	1,466.0	0.00	1,466.08
Andaman & Nicobar Islands	1	6.00	0.00	6.00
Pondicherry	2	28.94	0.00	28.94
Total	77	5,560.90	521.51	5,060.68



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India is one of the largest industrialized nations in the world. Major industrial cities and towns of the country such as Surat, Bombay, Cochin, Madras, Vishakapatnam and Calcutta are situated on or near the coastline. The estimated total quantity of waste discharged by about 308 large and medium industries is estimated to be approximately 1.35 million cu. metres per day as per the Central Pollution Control Board.

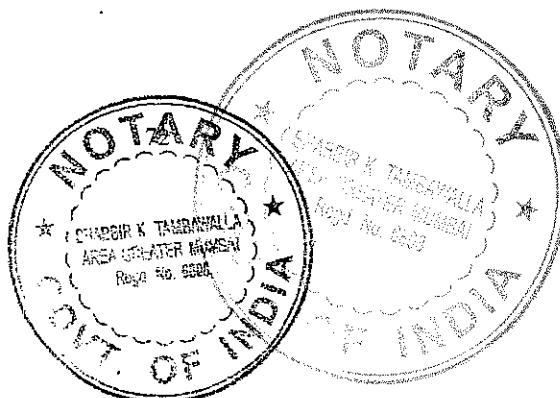
There have been cases of accidental spillages and leaks from the offshore and on shore oil installations leading to pollution of coastal areas and waters of the country. The responsibility for the prevention of pollution is shared by the Coastal States and the Central Government. The pollution control boards of the maritime States/Union Territories work in close coordination with the Central Government's Ministry of Surface Transport (MoST) through the Indian Merchant Shipping Act(1958) (for control of pollution from and offshore platforms in the EEZ), and the Indian Ports Act (1963); the Ministry of Petroleum and Natural Gas (MPNG) (concerning pollution oil platforms and structures); and the Ministry of Environment and Forests (MEF) Water (Prevention and Control Pollution) Act (1974), Environmental (Protection) Act 1986, and Coastal Regulation Zone Notification 1991, (for the control of pollution arising from land-based sources in the sea).

In 1996, the Coast Guard formulated National Oil Spill Disaster Contingency Plan (NOS-DCP). This lays down a series of actions to be taken in the event of a major disaster. It also contains standard formats for reporting spills as well as forwarding data on equipment holding in the country. It maintains oil pollution response equipment and chemicals.

But there is a need to strengthen the infrastructure of Pollution Control Boards and Coast Guards in the area of surveillance, monitoring and immediate response action for mitigating spills and accidental discharges into the water.

The quantity of waste water discharged by aquaculture farms is 10-12 MLD. Pesticides and fertilizers used in agriculture also find its way into the coastal waters. Government of India formulated comprehensive policy statement for abatement of pollution. The policy aims at prevention of pollution at source, apply the best available technology, implementation of the principle of 'polluter pays' policy, emphasis on protection of heavily polluted areas and river stretches, involvement of the public in decision making.

Control measures taken in the country at the present are providing treatment facilities for municipal sewage, providing effective treatment facilities for industries, development and implementation of industry specific effluent standards and primary criteria for coastal water quality, identification of 17 categories of highly polluting industries and CREP programme adopted for effective implementation, National River Action Plans, industrial zoning, implementation of effluent treatment system for aquaculture, implementation of National Oil Spill Disaster Contingency Plan, enactment of environmental laws and Acts and its implementation.



CHAPTER-3

3.0 COASTAL REGULATION ZONE NOTIFICATION - REVISITED

3.1 Background

As per Allocation of Business Rules framed by the work allotted to the Ministry of Environment and Forests includes "Environment and Ecology, including Environment in Coastal Waters, in mangroves and coral reefs but excluding marine environment on the high seas". The Ministry of Environment and Forests is responsible for framing legislations and implementing measures for protecting and conserving the environment of the country including the marine environment upto EEZ. For the purpose of protecting and conserving the environment the Environment (Protection) Act 1986, (EPA) umbrella legislation has been enacted.

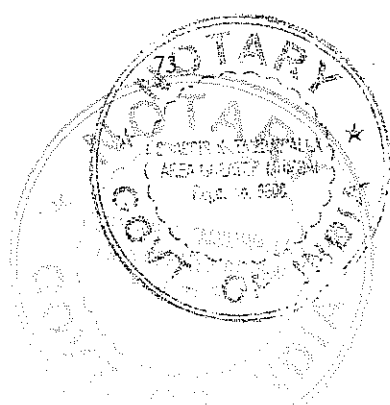
Under EPA, Ministry of Environment & Forests has issued various Notifications for control of pollution and conservation of environmentally sensitive areas. Keeping in view, the fact that multifarious activities in coastal zone has resulted in over exploitation of marine and coastal resources and marked degradation of the quality of coastal habitats and environments, the Coastal Regulation Zone Notification has been issued on 19th February, 1991 under the provisions of the Environment (Protection) Act, 1986.

Origin of Coastal Regulation Zone Notification

In 1981, the then Prime Minister wrote to the Chief Ministers of all the coastal States directing them to keep clear of all activities upto 500 metres from the water at the maximum high tide along the coast. In the wake of this direction, the then Department of Environment set up a Working Group on "Environmental Guidelines for Development of Beaches." This Working Group was to address issues relating to land/marine interact eco-system and to prepare guidelines for environmental management of beaches. It comprised experts in Pollution Control, Town and Country Planning, Tourism, Oceanography, Ecology and Human Settlement. The report of the Working Group submitted in June, 1983 was prepared after a scientific study taking into account the coastal and marine environment, natural hazards, socio-economic problems and developmental activities.

These guidelines were prepared in consultation with the coastal States and Union Territories. These guidelines also suggested that construction along the coast, irrespective of their location, i.e., even beyond 500 metres of the high tide mark, should be subjected to environmental impact assessment studies. These guidelines were circulated to all coastal States and Union Territories in March, 1984. However, at that time, none of the States or Union Territories prepared Environmental Management Plans for coastal areas as suggested by the Department of Environment.

As neither the Prime Minister's directive nor the guidelines issued by the then Department of Environment were followed by the State Governments, the Ministry of Environment and Forests issued a notification under the Environment (Protection) Act, 1986 regulating developmental activities in the coastal area.



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Issue of Coastal Regulation Zone (CRZ) Notification, 1991

Keeping in view the degradation of the coastal environment and rampant construction activities along the coastal areas, MoEF issued a draft CRZ Notification twice inviting suggestions and objections from the public on June 27, 1990 and 18th December, 1990. Based on the suggestions and objections received, the Ministry issued the CRZ Notification declaring coastal stretches as Coastal Regulation Zone (CRZ) and regulating activities in the CRZ. As per this, the CRZ area is defined as coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters which are influenced by tidal action (in the landward side). As per the notification 500 metres on the landward side from the High Tide Line (HTL) and the land area between the Low Tide Line (LTL) and HTL including 500 metres along the tidal influenced water bodies subject to a minimum of 100 m on the width of the water body, whichever is less is declared as CRZ area. Based on the ecological sensitivity, geomorphological feature and demographic distribution, the CRZ area is classified into four categories namely, CRZ-I (sensitive and inter tidal), CRZ- II (urban or developed), CRZ-III (rural or undeveloped), CRZ-IV (Andaman & Nicobar and Lakshadweep Islands).

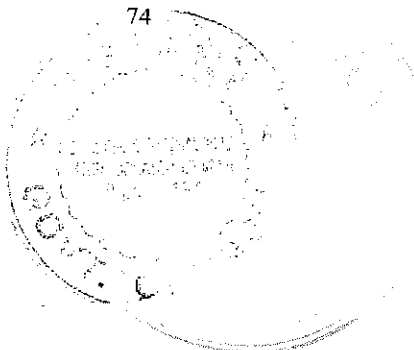
3.1.1 Prohibited and Permissible Activity

The Notification regulates developmental activities in the CRZ area by prohibiting certain activities and permitting the essential activities. The prohibited activities include setting up of new industries and expansion of existing industries, manufacture or handling or storage and handling of hazardous substances (except specified petroleum products in port areas), fish processing units, disposal of wastes and effluents, mining of sands, rocks and other rare minerals and mechanized drawal of ground water. The permissible activities include those activities that require water front and foreshore facilities such as construction activities related to defence requirements for which foreshore facilities are essential (e.g. slipways, jetties, etc.), operational constructions for ports and harbours and construction of hotels and resorts in specified areas.

3.1.2 Amendments to the CRZ Notification

The Ministry of Environment and Forests has been receiving proposals from the coastal States/Central Ministries, industry associations, local communities and NGOs requesting for amendment to CRZ notification on certain specific issues. The Ministry after examining the proposals had constituted Committees to examine the specific issues. Based on the recommendations of the Committee/request made by the various agencies the Ministry had amended the CRZ Notification, 1991 as per the provisions laid down in the Environment (Protection) Act, 1986. Some of the amendments constituted to look into specific issues are:

- S.O.595(E), dated 18th Augst, 1994 – Relaxed Coastal Regulation Zone area to 50 mts along the tidal influenced water bodies. This was based on B. B. Vohra Committees report. However, the Supreme Court in the Writ Petition 664 of 1993 quashed the above amendment.
- S.O.73(E), dated 31st January, 1997 – Permitted mining of sand and drawal of groundwater in the Coastal Regulation Zone area in Andaman and Nicobar.
- S.O.494(E), dated 9th July, 1997 – Permitted reclamation within port limits, constructions for operation expansion and modernization of ports. Development of public utilities within Sunderbans areas and storage of 13 POL products within port limits.



- S.O.730(E), dated 4th August, 2000 – Permitted storage of LNG in the inter-tidal area and exploration and extraction of oil and gas in Coastal Regulation Zone areas
- S.O.329(E), dated 12th April, 2001 – Permitting setting up of projects and Department of Atomic Energy, Pipelines and conveying systems in Coastal Regulation Zone areas.
- S.O.550 (E), dated 21st May, 2002 – Permitted non polluting industries in the field of IT and other service industries in the Coastal Regulation Zone area of special economic zones. Housing schemes of State Urban development Authorities initiated prior to 19.2.1991 was also permitted.
- S.O.110(E), dated 19th October, 2002 – Permitted non conventional energy facilities, desalination plans, air strips in Coastal Regulation Zone of A&N and Lakshadweep. Storage of non-hazardous cargo such as edible oil, fertilizer and food grain was also permitted.
- S.O.460(E), dated 22nd April, 2003 – Project costing more than 5 crores requires clearance from Ministry of Environment and Forests.
- S.O.636(E), dated 30th May, 2003 – Permitted construction of embarkation facilities for Lakshadweep in Coastal Regulation Zone –I areas.
- S.O.725(E), dated 24th June, 2003 – Permitted construction of trans-harbour sea links passing through Coastal Regulation Zone –I areas.
- S.O.838(E), dated 24th July, 2003 – Relaxed No Development Zone to 50 mts from 200 mts from HTL in A&N and Lakshadweep for promoting tourism based on Integrated Coastal Zone Management study.

Based on the reports of the above committees and the requests made by Central Ministries, State Governments and NGOs, the Ministry had from time to time carried out amendments to the CRZ Notification.

3.2.0 Working of the CRZ Notification

3.2.1 Efforts by the Ministry and the Courts

Neither the Ministry nor the State Governments had taken serious note of the CRZ Notification. A Writ Petition was filed in the Supreme Court in 1993 by Enviro Legal Action Group Vs. Union of India regarding non-implementation of CRZ Notification, 1991. The Supreme Court in its order in April, 1996 directed the State Governments of coastal States and UT Administration to prepare the Coastal Zone Management Plans (CZMPs) and get them approved from the Ministry within 3 months. The CZMPs submitted by the State Governments/UTs were accorded approval by the Ministry of Environment and Forests on 27th September, 1996, subject to the incorporation of some general conditions and other conditions specific to each coastal State/Union Territory. Each of the coastal States/UTs were required to prepare the revised CZMPs incorporating the suggestions and modifications which are still pending.

For preparing the CZMPs, demarcation of the HTL/LTL is required to be carried out in the Coastal Regulation Zone area. For this purpose, the Ministry has authorized seven institutes for demarcating. Guidelines have also been issued for demarcating HTL and LTL.



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Those projects, which are permissible as per the provisions of the CRZ Notification are examined and environmental clearance procedure similar to that under EIA Notification is followed for approval of such projects.

3.2.2 Enforcement and monitoring of Coastal Regulation Zone Notification

The Coastal Zone Management Authorities (CZMAs) are responsible for enforcement and monitoring of the CRZ notification and the CZMPs. For taking punitive action against the violations Section 5 of Environment (Protection) Act, 1986, powers have also been delegated to the Authorities.

3.2.3 Positive aspects of the CRZ Notification, 1991

The CRZ Notification has created awareness among the decision makers and the people regarding the importance of the coastal environment. The Notification has been responsible in maintaining *status quo* by not permitting major developmental activities along the coast. It has established the traditional rights of fishing community. It emphasized the need for planned development of the coast. By disallowing polluting industries and controlling effluent/sewage disposal, the stage has been set for the control of pollution of the coastal areas. Protection of life and property from natural hazards such as erosion, flooding, sea level rise etc., has been largely ensured. All these measures will have positive impact on fisheries, which will ensure the economic development, fisherman community in particular and the coastal areas in general. The protected coastal environment has envisaged in the CRZ is expected to enhance the tourism potential of the coast.

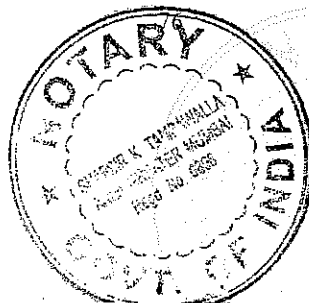
3.2.4 Violations of the Notification

The violations of the CRZ area include destruction of CRZ-I areas such as mangroves, coral reefs, breeding sites of endangered species, etc., Illegal constructions coming up in No Development Zones of CRZ-III, construction in CRZ-II areas without adhering to the norms laid down in the Notification and constructions within CRZ-I areas are some of the major violations of the Notification. The State Governments have insufficient infrastructures facilities to take action against such violations. Further there is lack of will of the concerned and inadequate enforcement machinery. This is one of the reasons for the high number of Cases pending in various Courts in the States and Supreme Court.

3.2.5 Constraints/Problems

The precautionary principle approach of the Notification, which lays down uniform regulations for the diverse coastal environment, is one of the major constraint areas for implementation of the notification. This is the reason why the Ministry has been, time and again constituting expert committees with eminent scientist to address some of the problem areas and carrying out amendments based on the recommendations of the reports. Some of the constraints faced by the implementing agencies include ambiguities and lack of clarity of terminologies existing in the Notification. Further, the Notification is badly structured. A common man cannot easily understand the Notification hence he is put into great difficulties even for undertaking a small dwelling unit.

There had been lack of agreement on satisfactory definition of the coastal zone. It has been criticized that the CRZ lacks a scientific approach. The State Governments and



development agencies complaint that the notification is too restrictive in nature and lacks statements on the objectives expected to be achieved. Though, there is enormous private investment in coastal area the notification treats it as a common property resource. The Notification does not provide information sufficient for take decisions and there is no motivation for conservation of the ecosystems. Lack of awareness, lack of enforcement, lack of funding and attitudinal problems are enlisted as some of the reasons for the difficulties in implementing the CRZ notification.

3.3.0 Issues raised by Governments with regard to Coastal Regulation Zone Notification

3.3.1 General issues

Due to various constraints faced by the implementing agencies, which include the State Governments and the State Coastal Zone Management Authorities, the Ministry has been providing clarifications and amendments to the Notification from time to time. However, there are several areas, which have not been addressed adequately by the Central Government even after a decade of issuing the CRZ Notification, 1991. The critical issues include the demarcation of High Tide Line, permission for constructions of dwelling units for local communities, etc. Most of the States have expressed their inability to implement the Notification, since they lack adequate infrastructure including funding mechanism. Lack of maps indicating CRZ-I, II, III and IV areas in the implementing scales, which is 1:4,000 is also attributed for not implementing the Notification. Some of the States where there is tremendous pressure due to increasing urbanization faces rampant violations of the Notification.

3.3.2 Mechanism and Funding

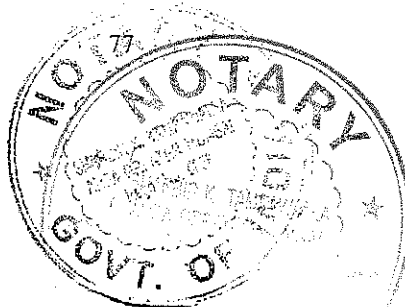
As per the Supreme Court's Order in W.P. No.664 of 1993, the Ministry has constituted the NCZMA and State CZMA for enforcement and monitoring of the CRZ Notification. These Authorities have been delegated powers under Section 5 of the Environment (Protection) Act, 1986 for taking punitive action against the violations. Further, the State Environment Departments, which also are responsible for enforcing the Notification.

No funding mechanism is available under the Notification for undertaking proactive role by the State Governments in preservation and conservation of the coastal area. In most of the cases, the State Governments have to depend upon the internal finance available, which is highly inadequate. It is seen that in some States scrutiny fee is being levied while assessing the development project. However, there is no information available with regard to utilization of such funds.

3.4.0 Issues pertaining to Economic Development

3.4.1 General

The developing country like India is experiencing increased economic activity due to changing economic policies. The economic activities, which include infrastructure development such as port and harbours, road networks, special economic zones etc., are

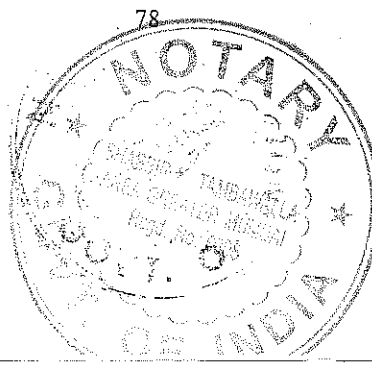


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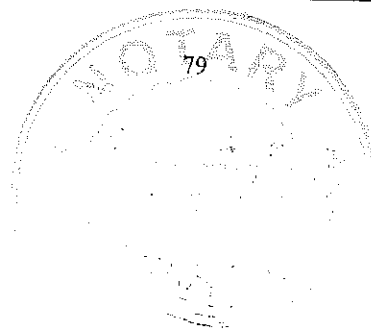
located along the coastal stretches since the port and harbours are corridors for economic activity.

Many of the economic activities are site specific such as mining of rare earth minerals, setting up of coastal tourism facilities, ports and harbours, fishing activities, etc. Most of the developmental activities in the mainland directly or indirectly depend upon the infrastructure available along the coastal areas. Due to the stringent provisions of the CRZ notification several economic activities are affected. Under the CRZ Notification about 67 activities are listed. These developmental activities can be carried out based on the norms provided in the CRZ notification and the Coastal Zone Management Plans of the concerned States/UTs. The table below summarizes the various activities that can be taken up in the Coastal Regulation Zone area and the locations where they can be set up based on the category of the Coastal Regulation Zone is given below.

Sl. No.	Activities	CRZ-I (i)	CRZ-I (ii)	CRZ-II	CRZ-III (HTL-200)	CRZ-III (200-500)	CRZ-IV
1.	Agriculture	X	✓	✓	✓	✓	✓
2.	Airstrips	X	X	X	X	X	✓ (Lak)
3.	Ash from TPS	X	X	X	X	X	X
4.	Blasting Underwater	X	X	X	X	X	X
5.	Bridges	X	✓	✓	✓	✓	✓
6.	Complex commercial	X	X	✓	X	X	X
7.	Control erosion	X	✓	✓	✓	✓	✓
8.	Conveying systems	✓	✓	✓	✓	✓	✓
9.	Demolition/reconstruction of archaeological, heritage, public structures	X	X	✓	X	X	X
10.	Dispensaries	✓ (SB)	X	✓	✓	X	X
11.	Drainage	X	X	✓	✓	✓	✓
12.	Drains storm water	X	X	✓	✓	✓	✓
13.	Drawal groundwater	X	X	✓	X	✓	✓
14.	Drying fish	X	X	✓	✓	✓	✓
15.	Edible oils storage of	X	✓	✓	✓	✓	✓
16.	Effluents treated	X	X	✓	✓	✓	✓
17.	Energy non-conventional	X	X	X	✓	✓	✓
18.	Energy projects atomic	✓	✓	✓	✓	✓	✓
19.	Facility embarkation	X	X	X	X	X	X (Lak)
20.	Fertilizers storage of	X	✓	✓	✓	✓	✓
21.	Fields play	X	X	✓	✓	✓	✓
22.	Fisheries (aquaculture)	X	X	X	X	✓	✓
23.	Food grains storage of	X	✓	✓	✓	✓	✓
24.	Forestry	X	X	✓	✓	✓	✓
25.	Hatchery	X	X	✓	✓	X	X



26.	Horticulture	X	✓	✓	✓	✓	✓
27.	Industries expansion	X	X	X	X	X	X
28.	Industries new	X	X	X	X	X	X
29.	Information technology	X	X	X	✓ (SEZ)	✓ (SEZ)	X
30.	Jetty	X	✓	✓	✓	✓	✓
31.	Landfill	X	X	X	X	X	X
32.	Lines transmission	✓	✓	✓	✓	✓	✓
33.	LNG	✓	✓	✓	✓	✓	✓
34.	Minerals rare	X	X	✓	✓	✓	✓
35.	Mining coral	X	X	X	X	X	X
36.	Oil and gas exploration	✓	✓	✓	✓	✓	✓
37.	Parks	X	X	✓	✓	✓	✓
38.	Pipelines	✓	✓	✓	✓	✓	✓
39.	Plants desalination	X	X	✓	✓	✓	✓
40.	Plants thermal power	X	X	X	X	X	X
41.	Ports/harbours expansion of	X	✓	✓	✓	✓	✓
42.	Prevention of salinity ingress	X	✓	✓	✓	✓	✓
43.	Processing fish	X	X	X	X	X	X
44.	Products POL	X	X	X	✓	✓	✓
45.	Projects defense	X	✓	✓	✓	✓	✓
46.	Projects SEZ	X	X	X	✓ (SEZ)	✓ (SEZ)	X
47.	Quays	X	✓	✓	✓	✓	✓
48.	Radars weather	✓	✓	✓	✓	✓	✓
49.	Rain shelters public	✓ (SB)	X	✓	✓	X	X
50.	Reclamation of land	X	✓ (P&H)	✓ (P&H)	✓ (P&H)	✓ (P&H)	✓ (P&H)
51.	Regulators tidal	X	✓	✓	✓	✓	✓
52.	Resorts beach	X	X	✓	X	✓	✓
53.	Roads	X	X	✓	✓	✓	X
54.	Saltpan	X	✓	✓	✓	✓	✓
55.	Sand dunes altering	X	X	X	X	X	X
56.	Sand/rock mining	X	X	X	X	X	X
57.	Schemes housing	X	X	✓	X	X	X
58.	Schools	✓ (SB)	X	✓	✓	X	X
59.	Sea-links	✓	✓	✓	✓	✓	✓
60.	Sewerage	X	X	✓	✓	✓	✓
61.	Shipways	X	✓	✓	✓	✓	✓
62.	Structures reconstruction of	X	X	✓	✓	✓	✓
63.	Supply water	X	✓	✓	✓	✓	✓
64.	Toilets community	✓ (SB)	X	✓	✓	X	X
65.	Units dwelling	X	X	✓	X	✓	✓



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66.	Waste municipal	X	X	X	X	X	X
67.	Wharves	X	✓	✓	✓	✓	✓

Legend

CRZ-I (i) – Ecologically sensitive areas

CRZ-I (ii) – Inter-tidal areas

CRZ-II – Built up areas

CRZ-III – Rural areas

CRZ-III (HTL to 200 metres) – No Development Zone within rural areas

CRZ-IV – Andaman & Nicobar Islands and Lakshadweep Islands

Lak - Lakshadweep

P&H – Port & Harbours

SB - Sunderbans

SEZ – Special Economic Zone

3.4.2 Dwelling Units of Local Communities

Most of the fishermen associations are satisfied with the present CRZ regime as it safeguards the coastal and marine ecosystems with the areas protected and no large developmental activities being permitted in the CRZ area. The No Development Zone of 200 mts in the rural areas, i.e., in the CRZ III areas have helped the fishermen to berth their boats, drying fish, mend nets, etc., thereby protecting their fishing rights. The CRZ notification permits construction of such dwelling units in the CRZ area other than the CRZ-I and the NDZ area of CRZ-III. These restrictions affect the construction of dwelling units of local communities especially living along the backwaters of Kerala. The situation in Kerala have to be considered separately as the State has the highest population of 2176 persons per Sq Km living along the coastal and backwater areas of Kerala. The restrictions of the CRZ Notification have affected the constructions of public amenities and housing in the CRZ area.

As can be seen from a table most of the developmental activities are not permitted in the CRZ-I(i) and (ii) areas except foreshore requiring facilities such as port and harbours, jetties etc., in the inter tidal area. The large inter tidal mangrove area in case of Sunderbans is also a place where more than 3 lakh population are living. The Ministry has amended the notification for providing certain basic amenities such as schools, dispensaries etc for the local population. However, for the welfare and upliftment of communities living in eco-sensitive areas such as Sunderbans, Chilka, Pulikat, etc., special provision in the notification have to be provided and which have to be integrated within the integrated area management plan.

Keeping in view the impact of Tsunami it is necessary to protect mangroves and take up shelterbed plantations along the habitations, prevent reclamations of sand dunes, mudflats, lagoons, etc. to locate dwelling units behind appropriate set back zone. This set back zone should be demarcated on the basis of the vulnerability of the coast to natural hazards. The Government may consider ICZM approach for locating the dwelling units of the communities.

3.4.3 Ports and Harbours and other Foreshore Activities

Ports and harbours are one of the major gateways for economic development of the country. At present there are 14 major ports and several minor ports. These ports are experiencing increasing economic activities. Further, there are proposals from the Central Governments and State Governments for setting up of new ports and harbours including upgradation and expansion of the ports and linkages between the ports. The CRZ notification provides for setting up of expansion of ports and harbours except in areas classified as eco-sensitive areas. Capital dredging and maintenance dredging are some of the serious environmental concerns. These aspects of port development are not covered under the notification, since the jurisdiction of the CRZ ends at Low Tide Line and does not include the water part. Hence, the Committee is of the opinion that the marine part should be included within the jurisdiction of the new coastal regulation regime whereby dredging, maintenance dredging, deepening, dumping of the dredged material can be adequately regulated.

3.4.4 Setting up and Expansion of Industrial Units

As per para 2(i) of Coastal Regulation Zone Notification setting up of new industries and expansion of existing industries except for project of atomic energy, non-polluting industries such as Information Technology etc., to be located in SEZ areas are prohibited activity. This prohibition has affected setting up of certain important non-polluting industries activities such as cement, fertilizer, pharmaceutical, chemical, gas handling, packaging/bottling units even within the port area. The Committee is of the opinion that while prohibiting the polluting industries care may be taken that some of the non-polluting industries may be permitted along the identified stretch of the coastline after taking adequate environmental safeguard as per EIA.

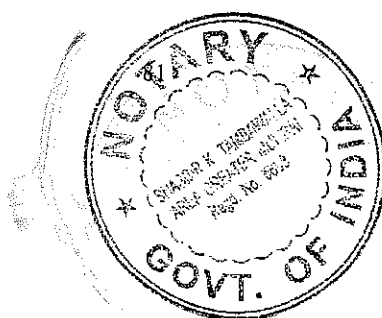
3.4.5 Mining Activities

Para 2(ix) of the Coastal Regulation Zone Notification permits mining of rare minerals, oil and gas in the Coastal Regulation Zone area and prohibits mining of all other materials. The word 'rare-mineral' has not been explained which has led to confusion among the State Governments and the mine operators. The word 'rare minerals' can be replaced with 'placer minerals' and shall be permitted to be mined in the coastal areas since these minerals are not found elsewhere.

With regard to other minerals found in the coastal and off-shore areas, mining can be permitted subject to Environmental Impact Assessment (EIA) studies. However, mining of sand, clay, rocks, pebbles, shells and corals shall not be permitted to be mined.

3.4.6 Non Conventional Energy

The Coastal Regulation Zone Notification permits setting up of non-conventional energy equipments such as solar panels etc. however, the notification silent about wind mills, OTECs, wave energy etc. In view of increasing energy sources the Committee is of the opinion that such non-conventional energy resources should be promoted in a big way all along the coastal areas of the country since, as these energy will benefit the local communities. But it may be ensured that EIA is carried out before implementation of such programmes.



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3.4.7 Fishery and Allied Activities

The notification permits construction of fishing jetties and harbours in the Coastal Regulation Zone area other than the eco-sensitive areas. However, the allied facilities for a fishing harbours such as storage halls, ice factories, ice crushing units, fish processing units, workshops, storage units, fish ware housing are not permissible. The fish and shell fish being highly perishable commodity the port harvest technology are very important for improving the shelf life of fish for purpose of marketing and processing. Therefore, the Committee is of the opinion that an integrated fishing unit should be setup after adequate environmental safety measures are incorporated in the project.

3.4.8 Structures to prevent Erosion and Salinity Ingression

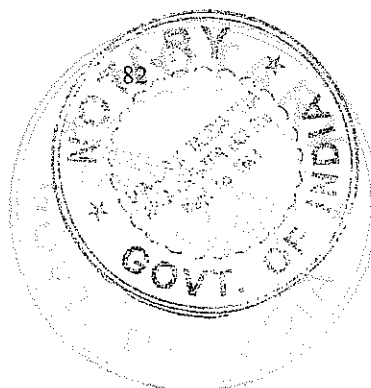
The notification [para 2(viii)] provides for taking measures against erosion and salinity ingress. However, the notification is silent about the type of erosion measures to be taken in the various stretches of the coastal areas. Some of the erosion measures such as seawalls and their hard structures can be detrimental to a mangrove or coral ecosystem. Hence, adequate care needs to be taken with regard to the type of erosion measures and its location. World wide there has been change in the erosion control measures. Some of the developed countries are using soft measures such as beach nourishment, shelter bed plantation, geo-textile measures etc. these methods have to be carefully studied before implementation.

3.4.9 Extraction of Oil and Gas

The notification [para 2(ix)] provides for exploration and extraction of oil and natural gas. However, the exploration in the ocean part i.e. below the Low Tide Line is not covered under the notification. Keeping in view, the importance of this sector the Committee is of the opinion that exploration and exploitation of oil and gas should be permissible in the coastal and marine areas after incorporating adequate environmental safety measures. Proper monitoring mechanism should be inbuilt and should be assigned to the Coast Guards for monitoring and enforcing the regulations since the Coast Guards are equipped with necessary infrastructure including oil spill combating. The Ministry has to draw up guidelines to speed up the clearance procedure for this sector since delay would cause huge economic loss to the public.

3.4.10 Extraction of Groundwater

The notification provides for drawal of groundwater by only manual method in the Coastal Regulation Zone area beyond 200 mts on the landward side. Keeping in view, the facts and figures provided by Central Ground Water Boards, the groundwater situation along the country is highly distressing. The Ministry should come out with a comprehensive plan to map areas of ground water depletion, the drawal of groundwater and take up recharging of the aquifers. Desalination, water recycling, rainwater harvesting should be some of the methods which should be encouraged in coastal areas.



3.4.11 Land Reclamation

The Notification [para 2(viii)] prohibits land reclamation in the coastal area except for expansion of port and harbours. The Committee is of the opinion that this prohibition is necessary since reclamation causes ecological and geomorphological changes, which can have adverse impact on other areas. Reclamation can be permitted only in places such as within special economic zones, port and harbours, defence units, for construction of bridges, sea links after detailed EIA studies.

3.4.12 Storage of Chemicals and Petroleum Products

The notification [para 2(ii)] permits storage of 14 petroleum products and food grains, edible oil etc. The notification is silent about several other materials and chemicals, which are handled all over the world such as iron ore, coal, sulphur including variety of chemicals and products. The Committee is of the opinion that within a port and harbours all handling and storage facilities should be governed by the Ports Act. The Ministry may draw up specific guidelines for handling and storing of the chemicals and other commodities within such port and harbours area including EIA procedures.

3.4.13 Discharge of Effluents

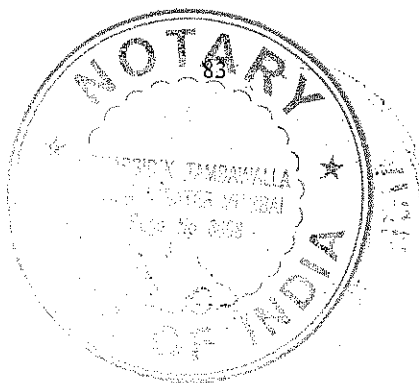
The notification [para 2(v) and (vi) and (viii)] prohibits discharge of untreated effluents from industries and cities, dumping of solid waste including fly ash. As per the information provided by Central Pollution Control Board (CPCB) it is observed that most of the cities/settlements are letting out their sewage without any treatment into the coastal waters. The upstream rivers are also bringing along large quantities of effluents from the settlements and industrial units into the estuary and then to the coastal waters. The Ministry had done very little to overcome this problem. In view of this, the Ministry should take adequate measures to regulate such pollution in a time bound manner.

3.4.14 Transportation Systems

The notification prohibits construction of roads those not approved in the Coastal Zone Management Plans, airstrips, railway lines etc., in the Coastal Regulation Zone area. Airstrips have been permitted only in Lakshadweep and Andamans. This provision needs to be reconsidered in view of the growing economic activity of the ports, which need connectivity to the major cities. The Committee is of the opinion that the roads and airstrips may not be laid in eco-sensitive areas. Roads along the coastal stretches for the purpose of decongestion of cities, industrial towns etc. may be approved after proper EIA studies are carried out.

3.4.15 Agriculture Activities

Agriculture, horticulture activities etc., are permissible under the notification except in eco-sensitive areas. The Committee agrees with this provision. The Committee is also of the opinion that the Ministry should map such agriculture and horticulture areas and prevent change of land use of such areas for the purpose of safeguarding the livelihood security of the local communities.



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3.4.16 Defence Projects

The notification provides for locating defence units along the coastal areas, but are subject to scrutiny by a separate Committee constituted in the Ministry. Since, there are no major criticism about the procedure the Committee has no view on the subject.

3.4.17 Transmission Projects

The notification provides for laying of transmission and conveying systems including eco-sensitive areas. The Committee has no comments on this item.

3.4.18 Public Amenities

As per the notification public amenities such as dispensaries, schools, rain shelter, community toilet, bridges, roads, water supply, drainage, sewerage are permissible in the rural areas including in Sunderbans. However, as per the notification toilets, drinking water facility, rain shelter, medical care centers, telecom booths cannot be set up on the beaches for the tourist where tourism facilities are located. This not only causes inconvenience to the tourist but also spoils the beaches. Therefore, the Committee is of the opinion that certain public amenities which are of essential nature should not be prohibited in the coastal areas.

3.4.19 Salt Pans

The saltpan activities are permissible in the inter tidal areas other than eco-sensitive areas. The Committee agrees with this provision.

3.4.20 Recreational and tourism

The notification provides for setting up of hotels and tourism projects beyond 200 mts on the landward side from the High Tide Line. The tourism associations have indicated that this provision is too stringent and has been detrimental to the tourism projects. While the NGOs are of the opinion that this provision should not be relaxed, the Committee keeping in view the potential for the beach tourism development in the country, is of the opinion that the concerned Ministry may identify tourism potential areas along the country and draw up integrated tourism management plans for promoting this industry. All developments in the identified tourism areas shall be taken up based on the ICZMP.

3.4.21 Housing and Settlements

The notification provides for construction of houses behind authorized structure on the landward side in municipal areas in CRZ II areas. It also permits construction of dwelling units for local communities beyond 200mts from the High Tide Line on the landward side in rural areas i.e CRZ III. For the purpose of undertaking constructions, Floor Space Index and Floor Area Ratio have been frozen as on 19.2.1991. On account of this provision, several housing schemes such as slum redevelopment and rehabilitation schemes, rehabilitation of old structures have been affected. The Committee is of the view that developments within municipal limits and other populated areas may be taken up based on ICZMP taking into consideration the vulnerability of the area, to coastal hazards.



3.4.22 Projects of Department of Atomic power

As per para 6(2) (a) sub-heading CRZ-I of Coastal Regulation Zone Notification, 1991 projects relating to Department of Atomic Energy has been included vide the amendment dated May, 2002. Keeping in view the impact of tsunami on the Kalpakam Atomic Power Plant, it would be advisable if such nuclear power plants are located a little away from the coast rather than very near the coast.

3.4.23 Categorization of the CRZ Areas

The CRZ Notification, 1991 [para 6(i) and 6(ii)] categorizes the CRZ areas into CRZ-I, II, III and IV. The para 6(ii) lists specific activities that can be taken in each of these categories. The categorization of the CRZ area is based on the eco-sensitivity of the coastal zone and the extent of development. But it is seen from the list under CRZ-I it includes several of the eco-sensitive areas and areas, which are very subjective and cannot be defined for example, areas of outstanding natural beauty, areas rich in genetic diversity. Such subjective and broad base terminologies have led to problems in demarcating CRZ-I areas by the State Governments in their CZMP maps. The Committee is of the opinion that there needs to be a clearly defined terminology alongwith a boundary for the purpose of Administration of such identified areas. Similarly, under CRZ-II and III the terminologies used are highly vague and subjective such as 'developed area, substantially built up, relatively undisturbed areas, legally designated urban areas etc'. For the purpose of implementation and enforcing the CRZ policy the Committee is of the view that there needs to be a clearly defined terminologies along with the administrative boundaries. In the absence of such clarity, there will be confusion within the enforcing machinery, which will lead to hardship for the local communities and also for taking up developmental activities.

3.4.24 Demarcation of High Tide Line, Low Tide Line and CRZ Boundaries

As per para 1(i), of the notification High Tide Line needs to be demarcated uniformly by an authorized demarcating agency. For this purpose the Ministry has issued guidelines and also identified 7 Central and State Government agencies for demarcating the HTL and LTL. The Committee has noted that the definition given for High Tide Line demarcation has led to confusion among various authorized agencies. The guidelines issued are also being interpreted differently by the different agencies. Since, each of the authorized agency employ different methodologies for demarcation there is significant variation between the High Tide Lines drawn by one agency to that of the other for the same area. Further, there is no clarity with regard to the scale at which the demarcations have to be carried out. Most of the High Tide Line maps are classified hence cannot be accessible by common man. This has put the local communities into great difficulties even to construct small dwelling units, schools, village roads etc. Further the expense towards High Tide Line demarcation cannot be afforded by small entrepreneurs.

In view of the above difficulties and the complications involved in the entire process, the Committee is of the opinion that this procedure of High Tide Line demarcation should be simplified or done away with. The Ministry may think of the other methods such as considering permanent structures (safe for the period of last 20 years along the sea front as a line of setback) in the metropolitan cities and towns. In case of eco-sensitive areas the administrative boundary or the biological boundaries drawn by some of the scientific



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institutions or available in the State plans/revenue map shall be taken into consideration. In case of the rural areas the demarcation of such High Tide Line may not be necessary. The development in rural areas can be taken up as per the revenue maps after leaving adequate buffer from the shoreline indicated in the revenue maps.

3.4.25 Preparation of Coastal Zone Management Plans

In compliance with the Supreme Court Orders vide Writ Petition No.664 of 1993 the State Governments had prepared the Coastal Zone Management Plan maps within period of 3 years. Such a hurried exercise undertaken by the State Government for the fulfilling the Court direction contains lots of mistakes and factual errors. The Ministry also, in order to comply with the Court directions, approved these Coastal Zone Management Plans on 27th September, 1996 with certain conditions and modification and directed the State Governments to submit the revised management plans within a period of 3 months. However, till date no State Government has submitted the revised CZMPs for the entire states as per the procedure laid down in the CRZ notification. In the absence of such approved revised CZMPs is very difficult for a developer to undertake developmental activities in the coastal area. Further, lack of clarification in the notification with regard to the categorization, High Tide Line demarcation, scale of the maps have led to further confusion.

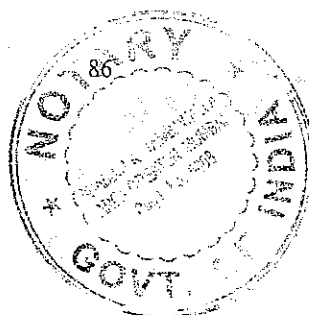
The Committee is of the opinion that Ministry should revise the procedure and bring out a simplified Coastal Zone Management preparation guideline, which will be easy for a common man to understand.

3.4.26 Clearance Procedure for Developmental Projects under CRZ Notification

Para 3(i) and 3(ii) of the notification lays down clearance procedures for permissible projects in CRZ area. It is not clear which of these activities require clearance from the Central or State level agencies. The method and documents required for obtaining clearance under the notification is also not laid down. The entire procedure is very vague. It is left to the Ministry and the State Governments to request for information/details from the entrepreneurs. Such discretionary powers are hurdle to developmental project. It is also observed that even a small project less than Rs.1 lakh worth tourist resort project needs to come to the Ministry for clearance for which the project proponent has to come to Delhi for making a presentation before the Expert Committee for Infrastructure Development and Miscellaneous Projects.

Further, as per the same notification a major project such as a maintenance dredging or ship breaking unit can get away from the notification since, they are located below the Low Tide Line. It is also observed that the monitoring and enforcement of such cleared projects are lacking.

The Committee is of the opinion that the Ministry should lay down a clear procedure, documents required, list out activities that require central clearance, state clearance or clearance from local bodies in the guidelines. The Ministry should also maintain database with regard to the baseline information for the purpose of preparing EIA for the marine sector since it is difficult and expensive to obtain information with regard to flora and fauna in the marine areas. The monitoring programmes for the cleared project should be undertaken at regular periods.



3.5.0 Enforcement and monitoring of Coastal Regulation Zone Notification, 1991

In compliance to the same orders of the Supreme Court in Writ Petition No.664 of 1993 the Ministry has constituted National Coastal Zone Management at the Central level and 13 State and Union Territory level Coastal Zone Management Authorities under the Environment (Protection) Act, 1986. These Authorities have about 8 members, of which 4 of them are bureaucrats from concerned Departments of the State Government and 4 experts in the field of coastal management. The scope of work of the Authority include enforcement and monitoring. For this purpose necessary provision of Environment (Protection) Act, 1986 has been delegated. The State and UT Authorities have also a technical role to play such as preparation of Integrated Coastal Zone Management Plans, awareness creation etc. But till date no major technical activities have been taken up by the Authorities.

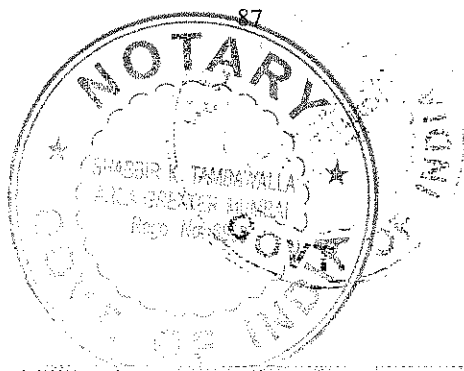
During the meetings of the Committee and the interactions with the NGOs it was brought to the notice that these Authorities have not taken up proactive role in the Coastal Zone Management programmes initiated by the Ministry. None of the Authorities have prepared the Coastal Zone Management Plans for the entire State. Very few violations have been booked by the State Coastal Zone Management Authorities. The reasons for such weak enforcement by the Authorities are mainly due to lack of infrastructure, funds and training to the officials. The Ministry should help these Authorities to strengthen their capacities and provide adequate infrastructure to these State and Union Territory Authorities. Appropriate representation of NGOs involved in coastal management should be made.

3.6.0 NGOs perceptions

Due to lack of sufficient motivation from the concerned State Governments, lack of adequate financial mechanisms, weak enforcements, the NGOs have been playing a critical role in identifying the violations and bringing them to the notice of the concerned governments. In several cases, the NGOs have taken up the matter to the Courts. The NGOs have been playing a very proactive role in protecting the coastal environment. However it is seen that most of the activities of the NGOs are confined to areas such as Mumbai, Goa and Kerala.

3.6.1 Suggestions made by the NGOs

Most of the NGOs are of the opinion that the CRZ Notification has been relaxed time and again. The NGOs have raised the issue with the Ministry stating that the CRZ Notification has been amended about 17 times and in each amendment relaxations have been made for taking up developmental activities which are contrary to the principle of Environment (Protection) Act, 1986 and the objective of the CRZ Notification. The NGOs have indicated that stringent enforcement mechanism should be put in place for implementing the notification. The CZMPs should be prepared and put on the website and other public domain for transparency in implementing the notification. They also suggested that the livelihood security of the communities should be adequately addressed and the notification should be further strengthened by protecting the rights of the fishermen communities and other communities, who are dependent upon the coastal resources. For this purpose, the NGOs have indicated that the ocean part should be brought under the CRZ notification. They are also of the opinion that the Coastal Zone Management Authorities have been highly ineffective in enforcing the Notification hence; the NGOs should be included in the Authority.



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3.6.2 R&D Sector

The CRZ Notification and the efforts to implement had created an awakening among the research community on the challenges in the management of coastal resources. The scientific community also came forward with both appreciation and criticism on the various provisions of the regulatory regime. It has also created opportunities for the application of the latest tools such as IT, GIS, GPS and remote sensing, of which the latter was extensively used and became particularly handy both in high speed mapping and monitoring. The high rate of degradation of the coastal ecosystems/violation of the CRZ came to the limelight in this process. There had been substantial contribution from rational, state and private institutions and played an important role in exposing the criticality of the ecosystems.

In spite of the increased vigour in scientific research, the community had not been able to address several vital issues related to CRZ and come out with well-studied suggestions. Some of these include the impact of sea level rise, the impact of settlements on the coastal waters, the delicacy of groundwater aquifer, the limit upto which activities to be regulated in the inland tidal water bodies, etc. However, there had been positive inputs on the type, extend of regulation for the coastal geomorphic units, management of mangroves, ICZM, etc. Even then studies are yet to reach their logical conclusions.

Considering the increased importance on one side and the greater vulnerability due to developmental demands on the other in the coastal areas the strengthening of R & D sector has become more important. There is R&D agencies that have been working in the areas of coastal environment include the Central, State and private. Coastal Systems Research (CSR) which takes into account both sea and land surfaces in an integrated manner needs to be fostered. CSR will help to promote the sustainable and equitable use of coastal bioresources.

3.7.0 Summary of current CZM

3.7.1 Weak Implementation by State Governments

The Committee has observed that there have been very few initiatives taken by the concerned State Governments and Union Territories for preparing the Coastal Zone Management Plans. The Ministry had directed the State Governments to prepare the revised CZMPs in September, 1996 within a period of one year. However, till date no State Government has come up with a detailed CZMP for the entire State. This has led to non-development in some areas and delay in project implementation. The State Governments have not earmarked sufficient funds and created infrastructure for the implementation of the Notification. As on today only the state like Kerala and Tamil Nadu have scientific institutions to advise the State Governments with regard to the implementation of the notification. In the absence of such scientific institutions the implementation programme was grossly inadequate. The weak implementation by the State Governments are one of the reasons for increasing number of court cases which are pending in the Supreme Court and various High Courts.

3.7.2 Initiatives by the Centre

The Ministry time and again has been amending the Notification based on the recommendations of the various Expert Committee and in-house exercise. However, there



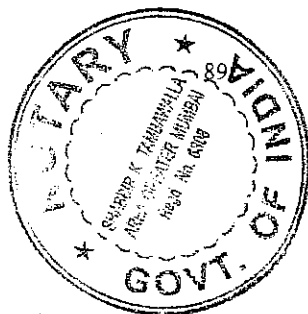
has been no concrete effort in addressing some of the major issues such as degradation of the eco-systems due to anthropogenic activities, pollution of coastal areas and coastal waters due to effluents, sewage and solid waste. There has also been no effort by the Ministry for strengthening the enforcement mechanism by the State Governments. The Committee takes a serious note of the lack of manpower and infrastructure existing within the Ministry itself, which is entrusted with protecting and conserving the vast coastal and marine resources. There has been a vast change in the management approach of the coastal and marine area worldwide. The Ministry has done very little work to initiate the programmes in an integrated way. There has been no initiative in strengthening or setting up of scientific institutions dealing with coastal management. Training programmes to the officials have been carried out very few times and there is no continuity in the programmes. All these factors have accounted for failure of the notification to a large extent. The Committee also observed that the Ministry has no special norms for the EIA procedure to be undertaken in coastal and marine areas. The EIA procedure followed for a breakwater project is similar to the EIA procedure for a road project. Lack of database is another area of major concern. The Ministry should take initiatives in identifying specialized institutions such as ZSI, BSI, Universities and other R&D institutions to address this issue and provide authorisation for preparing a database of various resources of coastal and marine areas and for conducting specialized studies for the coastal resources managements and ICZM.

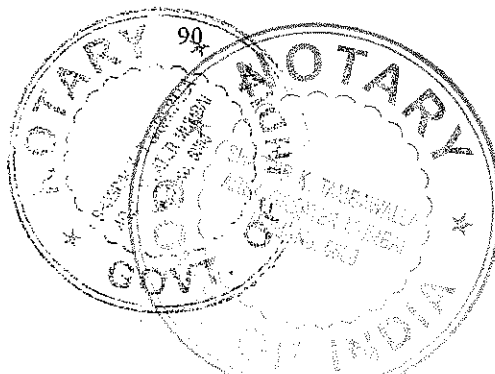
3.7.3 Awareness Programmes

The Ministry inspite of having a separate division called as environmental education and information division has done very little in creating awareness. Till date no brochures, information material, guidelines etc., have been published by the Ministry. The developers, industry associations, central Ministries, NGOs and other stakeholders have no information with regard to various norms and procedures prevailing under the notification for obtaining environmental clearance. Several of the procedures have not been brought into the public domain. This has lead to delay in project implementation, though, it may be permissible under the notification.

3.7.4 Conflict Resolution

The Ministry has not been active on addressing the conflict issues between the stakeholders except in resolving certain specific cases. This is evident from the increase in number of court cases. The conflict resolution is one of the major areas, which the Ministry has to address while according clearance to the projects. It is observed that there is no public hearing mandatory for the projects falling in CRZ. In the absence of involvement of the public in decision making there is bound to be conflicts occurring during the implementation and operation of the project.





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Panchayati Raj institutions in coastal areas should be fully involved in the educational and social mobilization programmes.

- (4) The protection and sustainable development of the marine and coastal environment and its resources should be in conformity with international law, as laid down in 1982 UNCLOS, as well as with the suggestions contained in Chapter 17 of Agenda 21. The Draft National Environment Policy of India also contains useful guidelines. Every effort should be made towards ensuring an Integrated Marine and Coastal Area Management (IMCAM) as prescribed in the 1995 Jakarta Mandate under the 1992 Convention on Biological Diversity.
- (5) Coastal regulation needs to be based on sound, scientific and ecological principles and should safeguard both natural and cultural heritage. Heritage sites need particular care and should be conserved in their pristine purity. These include buildings, artifacts, precincts of spiritual, historical, aesthetic, architectural or areas of environmental significance such as richness of biodiversity and scenic beauty. Bird sanctuaries and parks and breeding grounds of migratory birds should be protected.
- (6) The precautionary approach should be used where there are potential threats of serious or irreversible damage to ecologically fragile critical coastal systems and to living aquatic resources. Scientific uncertainty should not be used as an excuse for the unsustainable exploitation of coastal resources – both living and non-living as well as to prevent environmental degradation, injustice and harm.
- (7) Significant or irreversible risks and harm to human health and life, critical coastal systems and resources including cultural and architectural heritage would be considered unacceptable. Ecological economics should underpin economic activities, so that present day interests and future prospects are not antagonistic. Significant biological, cultural and natural assets should be considered incomparable, invaluable and irreplaceable and should receive overriding priority in the allocation of resources for coastal area protection and conservation.
- (8) Coastal policy and regulations should be guided by the principles of gender and social equity as well as intra-generational and inter-generational equity, (i.e., the interests of future generations). They should be based on Mahatma Gandhi's dictum, "Nature provides for everyone's needs, but not for everyone's greed." All stakeholders should be involved in decision-making. Precious biological wealth, coming under Marine Biosphere Reserves, should be managed in a Trusteeship mode, with all the stakeholders protecting the unique natural wealth of biosphere reserves as Trustees and not as owners. A case study should be made on how the Gulf of Mannar Biosphere Trust is functioning, so that the Trusteeship pattern of sustainable management by the principal stakeholders can be replicated.
- (9) Coastal protection and bio-resources conservation policies should be guided by techno economic efficiency, the precautionary approach, 'polluter-pays' principle(s) and 'public trust' doctrine. There should be strict liability on the part of those engaged in hazardous or inherently dangerous coastal activities, including the liability to compensate the victims of all human made hazards such as marine pollution and fish contamination. They should also bear the cost of restoring the



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coastal environmental degradation. The onus of proof in such cases should be on the developer/industrialist for demonstrating that their "development" activities are environmentally benign.

- (10) The principles contained in the Biodiversity Act (2002), should be applied to coastal bio-resources management. This will involve concurrent attention to conservation, sustainable use and equitable sharing of benefits. To address the issue of pressures on marine and coastal ecosystems, as defined in the Johannesburg Plan of Implementation (Part IV) adopted at the 2002 World Summit on Sustainable Development, every effort should be made to promote sustainable fisheries, prevent loss of biological diversity, prevent all forms of marine pollution and ensure that coastal area development and urbanization are eco-friendly.
- (11) The regeneration of mangrove wetlands, coral reefs and sea grass beds as well as the promotion of coastal forestry and agro-forestry will confer both short and long term ecological and livelihood benefits. Carbon sequestration through coastal bio-shields will make an important contribution to promoting a balance between carbon emission and absorption, in addition to offering protection during coastal storms and calamities like Tsunami. An important lesson taught by the tsunami disaster is that the rehabilitation of degraded mangrove forests and the raising of coastal plantations of salicornia, casuarina and appropriate species of halophytes will represent a "win-win" situation both for nature and coastal human habitations. No further time should be lost in initiating a national coastal bio-shield movement along the coasts of the mainland of India as well as islands. This can be a priority task under the National Rural Employment Guarantee and Food for Work Programmes.
- (12) The severe loss of life and livelihoods as well as property caused by Tsunami in Andaman & Nicobar Islands and in the coastal regions of Tamil Nadu, Kerala, Andhra Pradesh and Pondicherry teaches us that short term commercial interests should not be allowed to undermine the ecological security of our coastal areas. Human memory tends to be short and neglecting the lessons of Tsunami will be equivalent to writing off the future of coastal communities.

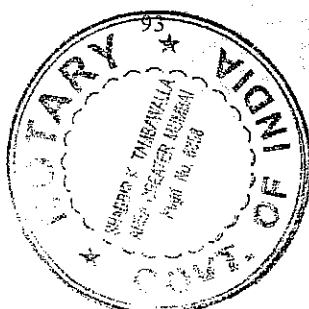
Thus, Coastal Zone Management requires cohesive, multi-disciplinary approaches as well as multi-dimensional vision. Sustainable human security in all its dimensions - ecological, economic, ethical, cultural and human well-being, in terms of the health and happiness both man and nature, should be the goals of an enlightened Coastal Zone Management policy. The implementation of such a policy will require appropriate regulations supported by effective monitoring systems as well as education, public and political understanding of risks and benefits of development activities and above all, social mobilization through Panchayati Raj institutions.

It is on the basis of the above 12 guiding principles that we have formulated our recommendations. We appeal that our recommendations may be considered in toto and not in a fragmented manner and that both the letter and the spirit of the recommendations be respected.

4.1 Recommendations with regard to Terms of Reference

4.1.1 ToR-(I) To review the reports of various Committees appointed by the Ministry of Environment & Forests on coastal zone management, international practices and suggest the scientific principles for an integrated coastal zone management best suited for the country;

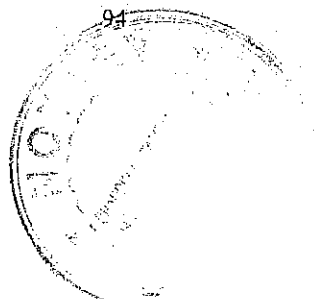
- (i) The Coastal Regulation Zone Notification, 1991 has been framed with an objective to protect the coastal environment. In the process, the notification has laid rigid regulatory measures for undertaking developmental activities including those activities, which are essential for coastal fishing communities such as dwelling units. The Ministry of Environment and Forests has been receiving several representations and requests from various stakeholders in the coastal areas, which include central Ministries, coastal State Governments and Union Territories, developmental associations and civil society organisations. Keeping in view these representations the Ministry has been appointing Expert Committees from time to time to examine the issues raised by the stakeholders and suggest measures for addressing these issues. The reports submitted by these Committees were examined in detail by this Committee. After examination of the recommendations of the various Committees and the action taken by the Ministry with regard to each of the recommendations, this Committee is of the opinion that the recommendations of the earlier Committees contained in their reports are quite comprehensive and address the specific issues in detail. However, the Ministry has selectively chosen specific recommendations and have amended the Coastal Regulation Zone notification. Such a selective approach has been described by the NGOs and conservationists as dilution of the notification. Had the Ministry taken note of all the recommendations of each of the Committees constituted so far, the Coastal Regulation Zone notification would not only have been strengthened but also brought clarity for implementation.
- (ii) The Committee is of the view that for addressing the coastal problems in a holistic manner, the water part i.e., the ocean, tidal water bodies should be included.
- (iii) The Committee examined various international practices of Coastal Zone Management adopted by both developed countries and developing countries. The Committee found that the practices followed by these countries are not confined to regulatory systems. The practices provide greater emphasis on the management approach rather than merely on regulation. Further it also reveals that the developed countries have adopted a more pragmatic approach in their coastal zone management programme, while giving due attention to protection and conservation of ecological systems, geomorphic features, water bodies and the vulnerability of the coastal areas to natural hazards.
- (iv) An integrated, multidisciplinary and multi-sectoral coastal land and sea area management system is an urgent need. The regulatory framework should aim at integrated and sustainable coastal zone management.
- (v) It is necessary to encourage collective and democratic initiatives at the level of the local communities for preparation and implementation of Integrated Coastal Zone Management. This will encourage using, caring for and managing the coastal



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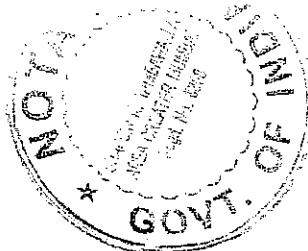
environment and resources on the principle of common property resources, and not private ownership.

- (vi) It is necessary to ensure that area and region-specific plans are prepared and a regulatory framework is put into place. The Coastal Regulation Zone framework has been used to protect principles of maintenance of ecological diversity and social justice. The principles of the notification can be strengthened by well-thought out, sensitive and firm policy mechanism to prevent any further degradation of coastal zones from irreversible consequences.
- (vii) An Integrated Coastal Area Management (ICAM) approach will address problems in coastal areas in an integrated and inter-sectoral manner so as to achieve environmentally and socially sustainable development. It seeks to identify the links between environmental problems in coastal areas with activities that take place outside it, in inland areas or in the deep seas. It seeks to bring together users of coastal resources, together with government agencies active in the coastal zone, to evolve a plan for eco-development of coastal resources. A major objective should be to coordinate, manage and reduce conflicts between the activities of various sectors in coastal areas for a long-term sustainability of coastal resources. It is suggested that various resource users be brought together in the planning process. Coordinating the activities of various government departments with jurisdiction in the coastal zone is crucial.
- (viii) Stakeholders participation and decentralization of decision-making processes and management are desirable objectives in their own right. For example, if the classified categories are retained, suggestions must be invited from the public and stakeholders regarding the new classification of areas being proposed as 'ecologically sensitive areas', 'areas of particular concern' and 'other open areas', "islands of Andaman & Nicobar and Lakshadweep". It is also difficult for the government to watch every part of the coastal zone. Powers must be devolved to the local self-governing bodies in accordance with the letter and spirit of the 73rd and 74th Constitutional Amendments. Grassroot democratic institutions need to be harnessed by the new Coastal Regulation Zone Management system. The MoEF should consider any projects proposed within the coastal zone for clearance only after fair, transparent and due public hearing. Institutions of the local self-government must be given adequate authority and resources and a clear role in community development as well as in conserving and enhancing biodiversity. Local-level institutions need to be supported by, and should work in co-operation with, appropriate decision-making bodies at the state/provincial and national levels. Management needs to be oriented towards actually controlling and guiding the development process in a manner which benefits coastal communities in an environmentally sustainable manner. There is a need to recognize the advantages of allocating appropriate responsibilities at different levels. In projects where public hearings are mandatory, a public awareness programme should precede so that the local citizens can be well informed about the purpose and rationale. The right to information must be respected.
- (ix) It is also necessary that Central and State Governments ensure that different Departments are unambiguous on the allocation of responsibility and accountability. While many characteristics and needs of local communities



dependent on coastal resources such as fisheries are unique, there are several aspects which need to be integrated into a broader approach to coastal area management. In particular, there is a need to harmonize policy objectives between different natural resource users, and to establish mechanisms for conflict resolution. All aquaculture projects should be strictly reviewed so as to ensure that these projects do not destroy the natural bio-shields such as mangroves, corals and are not detrimental to the coastal ecological security.

- (x) Environmental as well as social impact assessments should be a compulsory part of the procedures in the approval process for potential developmental activity. Provisions for a public review process should be made mandatory. In the present Environment Protection Act (1986), compulsory public hearing is applicable only to projects subjected to EIA. 'Social Assessment' refers to analyzing, monitoring and managing social dimensions or consequences of a development process or of planned interventions such as policies, programmes, plans and projects. These consequences may be intended or unintended. The primary orientation of social assessment is to bring about a more sustainable and equitable biophysical and human environment. The direction for ICZM will come from a detailed mapping of ecological and social/community dimensions which must constitute the base-line information of all decision making for proposed development projects. Further, environmental impact assessments (EIAs) of new developmental projects must be prepared in the context of existing activity in the area and their burden on the ecosystem. EIAs need to take traditional as well as 'modern' scientific knowledge into consideration. Wherever the information base is poor, or the likely adverse impact can not be predicted with adequate certainty, the 'precautionary approach' must be applied, and developmental activities should not be undertaken. All EIAs should account for the social and economic costs which environmental degradation causes to local communities. There must also be ways and means for accounting for the costs to be borne by future generations whose rights may be jeopardized by current developments. We recommend that MoEF may help to strengthen national capacity in the area of assessing the economics of inter-generational equity. Our capacity in this area is very meager at present. Once such costs are internalized, a purely economic rationale to pursue many 'development' policies or projects must cease to exist. There are clearly many areas where harmonious development is possible, and these areas need to be identified and prioritized.
- (xi) Defense related projects though necessary for national security, should also be subjected to assessment process in order to avoid possible negative social and ecological outcomes. Such environmental and social assessment processes can help to reduce the resistance of local populations to the defense projects by helping to address the concerns and also to mitigate possible hazardous environmental impacts. All projects including defense projects should go through a well-defined process of identifying impacts so that efforts can be made in mitigating them while clearing important projects.
- (xii) It is essential that balance must be maintained between development and conservation, i.e. while it is essential to promote socio-economic development, it is equally essential to maintain the unique scientific and cultural values of the sites. Coastal Zone Managers, well versed in the principles of ecology, economics



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and social and gender equity, will have to be trained in suitable institutions. Capacity building in the science and art of environmentally and ethically sustainable development is an urgent need.

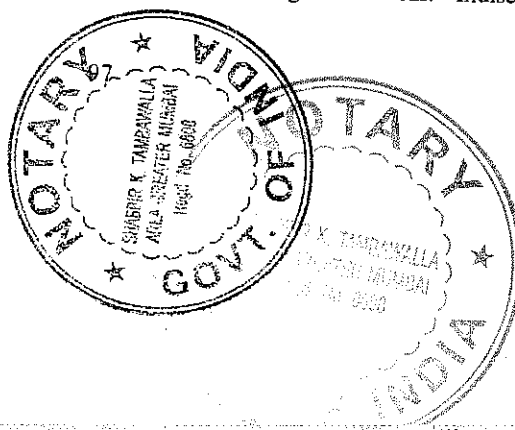
4.1.2 ToR-(II) To define and enlist various coastal and marine resources and recommend the methodology for their identification and the extent of safeguards required for conservation and protection;

- (i) The coastal resources and issues have to be viewed in an integrated and inter sectoral manner. It is necessary to identify the links between environmental problems in coastal areas with activities that take place outside in inland areas and in the deep seas. Therefore, it is necessary to bring together impacts of all developments on the coastal zone and all the concerned agencies, to evolve a plan for the sustainable utilization of coastal resources. The Committee examined the different living or non-living resources of the coastal zones and the threats and safeguards involved in their utilization particularly, in the context of their finite nature. It is necessary to prepare a biodiversity index for the coastal and marine areas, which is to be integrated into ICZMP. There is a need to distinguish clearly between the genuine needs of local communities and those of commercial interests.
- (ii) The Committee, after discussing in detail various coastal and marine resources, came to a conclusion that it may not be possible to conserve and protect each of the entities. Already much has been lost, as for example in the Krusodi island in the Gulf of Mannar which was formerly described in Zoological literature as a "paradise for crustaceans." The resources which need priority attention are mangroves, coral reefs, sand dunes, inland tidal water bodies such as estuaries, lagoons, lakes, creeks, straits, mudflats, marine parks and sanctuaries, coastal forest and wildlife, coastal freshwater lakes, salt marshes, turtle nesting sites, horse shoe crab habitats, sea grass beds, sea weeds and breeding grounds for migratory birds. These ecosystems/features should be demarcated as ecological sensitive areas and an Integrated Coastal Zone Management plan should be prepared for the protection and conservation of these resources.
- (iii) The well recognized protection role of sand dunes, beaches, sand bars, coastal cliffs and such other geomorphologic features on one side and the ecosystems such as mangroves, coastal forests, corals, bio-shields, etc., on other side against coastal and marine natural hazards shall be respected and integrated into the coastal area management schemes.
- (iv) There is need for initiating a coastal 'bio-shield' movement by raising mangroves, plantations of casuarinas, salicornia, leucaena, atriplex, palms, bamboo and other tree species and halophytes that can grow near the sea. These will serve as speed breakers in the event of coastal hazards like cyclones, storm surges, tsunami, and monsoonal and high wave activity. Community nurseries can be raised for this purpose. There is a need for people's participation in the conservation and enhancement of mangroves, other wetlands, reefs, coastal/marine biodiversity and coastal geomorphology. It is necessary to prepare a comprehensive biodiversity index for the coastal and marine areas, which can be integrated into ICZMP. The National Institute of Disaster Management has prepared a state wise vulnerability atlas for the entire country. This needs to be integrated in the ICZMP. In the ecologically sensitive areas while adopting restoration mechanisms, necessary precautions have to be taken to avoid entry of exotic and invasive alien species



and it is necessary to ensure propagation of indigenous species. The conservation, preservation and development of the areas of ecological sensitive nature and particular concern shall be on the basis of the Integrated Coastal Zone Management Plan prepared based on the guidelines issued by the Central Government.

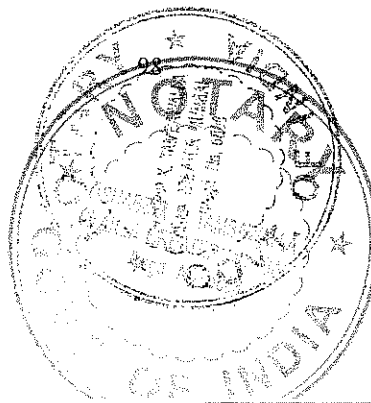
- (v) The Committee is of the view that there are several issues and resources such as heritage sites of unmeasurable value, ecological security, livelihood security, traditional rights, national security, cultural heritage, bio-diversity and food security which are non negotiable. Site specific taxes in public domain, lease rights and ecological cess especially for mining, chemical industries and other hazardous industries need to be introduced to account for socio-economic and environment cost. Ecological mining principles should be fully enforced.
- (vi) Closely interrelated with natural resources are cultural resources, and along the Indian coastline are regions and sites of great cultural and spiritual significance encompassing a precious and vulnerable range of heritage both tangible and intangible. The total number protected by the Centre and States constitute a very small percentage of the total wealth distributed over the country, and apart from these, few are, indeed, even listed. Thus only a fraction of the total wealth of India's built heritage is actually known. The Archaeological Survey of India, jointly with the State Departments of Archaeology and the Ministry of Environment and Forests, would need to identify such heritage sites within and relevant to the coast, prepare a comprehensive inventory pertaining to their components and demarcate their respective regulatory zones. Structures for their management and conservation would need to be in evidence in order to integrating the sites into the overall framework of the CRZ. Special attention must be given to declare World Heritage Sites and potential World Heritage Sites. In the coastal zone management plans prepared by the concerned States, a majority of heritage sites have not been delineated, and where they have been, the States and Union Territories are yet to formulate their approach and plans for conservation management and future development. It must be noted that there are various kinds of built heritage and heritage sites related to the Indian coast (living heritage areas such as historic/*Adivasi* settlements, monuments of worship, imperial centers, ports, colonial heritage, traditional settlements, forts, urban landscapes, cultural landscapes; walls, pillars, towers, water-structures and systems; archaeological parks, underwater/underground heritage, and natural landscapes, sanctuaries and particular physical and biological formations). These may exist singly as apparently isolated forms, natural formations, structures or remains; in groups or clusters; within/a part of/around living settlements; or a site may cover several square kilometers. There is an urgent need to identify, define, and protect a large number of these sites that are currently neglected.
- (vii) The Committee recommends that the burden of proof should be on the developers (including government agencies) to show that their activities will not cause harm to the coastal environment or the coastal communities. In cases of coastal areas of 'incomparable value', the developers shall have strict and absolute liability. Moreover, consultation and involvement of the local communities or representatives of the affected communities, including women and members of disadvantaged groups, in all phases of planning and implementation must be made obligatory.
- (viii) **Ground water in coastal areas must be declared as a social resource.** Limit for exploitation need to be placed while prioritizing drinking water needs. Indiscriminate



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extraction, especially near the coast can prove disastrous. Along the coast of Gujarat, limestone mining has extended towards the coast. Exploitation of ground water, if not regulated, results in salinity ingress into fresh water aquifers near the coast. Monitoring and enforcement structures remain weak. A clear regulatory framework on ICZM must include the dimension of the sustainable management of the aquifer.

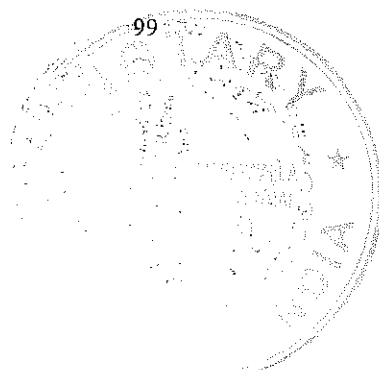
- (ix) Significant or irreversible risk and harm to human health and life as well as critical coastal systems and resources including cultural and heritage sites, resulting in serious and large-scale detrimental impact, would be considered 'incomparable' and unacceptable. As such, they will not be measured in terms of monetary or conventional goods and services. Being irreplaceable and invaluable, they shall be given special and overriding priority for allocation of resources for coastal protection and conservation. Coastal policy and regulations shall be guided by the principle of 'equity', both in entitlements to and participation of the relevant public in processes of fair, just and transparent environmental decision-making especially as regards critical coastal systems and resources including those of cultural and heritage value.
- (x) A comprehensive policy with respect to heritage sites specific to coastal zones needs to be arrived at, detailed and integrated with the CRZ regulations. Based on this, a workable control and monitoring mechanism should be determined and made operational. The Ministry of Culture should accomplish this process as soon as possible.
- (xi) Addressing the issue of pressures on marine and coastal ecosystems, as defined in the Johannesburg Plan of Implementation (Part IV) adopted at the 2002 World Summit on Sustainable Development (WSSD), every effort shall be made to promote sustainable fisheries, prevent biological diversity loss and pollution from various sources including land-based sources of marine pollution, ship-generated marine pollution, oil spills, hazardous waste dumping, contaminated ships brought for breaking purposes, etc., and minimize/nullify impacts of coastal development and urbanization.
- (xii) Every effort shall be made towards ensuring 'integrated marine and coastal area management (IMCAM)', as prescribed in the Jakarta Mandate (1995) and its Programme of Action (1998) under the 1992 Convention on Biological Diversity, as the best tool for the conservation and sustainable use of marine and coastal biodiversity.
- (xiii) As required under the 1992 UN Framework Convention on Climate Change, climate-related impacts would require response options that could also address issues such as sustainable coastal development and the protection of mangroves and other ecosystems. Coastal bio-shields will help to enhance carbon sequestration.
- (xiv) Coastal village communities and school children should be encouraged and enabled to prepare local level biodiversity and cultural heritage registers, as is now being done with reference to community bio-diversity registers. This will also be helpful in implementing the provisions relating to prior informed consent and benefit sharing enshrined in the Biodiversity Act (2002).
- (xv) Coastal bioresources conservation needs the understanding and support of all those who are currently using both the living and non-living aquatic resources in the ocean. For example, modern fishing trawlers have destroyed sea grass beds and this in turn has led to the destruction of the habitat of dugongs. Unfortunately, there is no mechanism for a



proactive action-reaction analysis before this so called "modernization" of coastal commercial activities including fishing is undertaken. There is need to build the capacity of local Panchayats, educational institutions and civil society organizations, as well as of relevant government departments in conducting environmental and biodiversity audits. This will enable greater public understanding and participation in the conservation and enhancement of coastal bio-resources, both on the landward and seaward sides of the coast. Many precious halophytes occur on the coast and these are now endangered with the threat of extinction. The Botanical and Zoological Surveys of India should undertake a massive programme of coastal bioresources inventorisation and conservation together with the National Bioresources Board, the National Medicinal Plants Board and the National Bureau of Plant, Animal and Fish Genetic Resources.

4.1.3 ToR-(III) To revisit the CRZ, Notification, 1991 in the light of above and recommend necessary amendments to make the regulatory framework consistent with recommendations on (a) and (b) above and the Environment (Protection) Act, 1986.

- (i) On the basis of various presentations made before the Committee, representations made by different stakeholders, deliberations among the members of the Committee, as well as based upon the 12 basic principles, the different issues relating to Coastal Regulation Zone Notification were addressed. The Committee is of the opinion that there needs to be a comprehensive, holistic and transparent approach towards management of the coastal zone, which is lacking in the present Coastal Regulation Zone Notification, 1991.
- (ii) The range of amendments presents a trend that has allowed commercial and industrial expansion in coastal areas. Many of these activities have proved to be extremely harmful to the ecological and livelihood security of the coastal areas. The Committee is of the view that CRZ notification needs to be strengthened and made more scientific in its overall approach, keeping in mind both the needs of the coastal communities (including fishing, agricultural) and the conservation of the coast.
- (iii) The several amendments brought into the original notification have to some extent distracted from the original objectives and the spirit of the Coastal Regulation Zone Notification, 1991.
- (iv) As already stressed, coastal policy and regulation for protection and conservation of the coastline will be governed by principles of ecological economics and polluter pays. As such there shall be absolute liability for those who engage in hazardous or inherently dangerous coastal activity including the liability to compensate the victims of all man made hazards, including pollution as well as the cost of restoring the coastal environmental degradation. The 'onus of proof' in such cases shall be on the actor/developer to show that his/her action is environmentally benign.
- (v) Coastal policy and regulations overall approach shall be to protect fragile coastal zones of India, in view of the growing demographic and economic pressures, especially to protect and regenerate the mangroves and the coral reefs as well as other ecologically sensitive areas. In the wake of the serious loss of life, property



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and the destruction of precious habitats caused by unprecedented Tsunami that ravaged Andaman and Nicobar Islands and coastal states such as Tamil Nadu, Kerala, Andhra Pradesh and Pondicherry on 26th December, 2004, it should be ensured that short-term commercial interests do not undermine the ecological security of Indian coastal areas. The strategies for disaster preparedness shall comprise emphatic prohibition on construction of any permanent structures within the vulnerable areas, except for those required to protect the community such as disaster shelters, infrastructure for rescue and relief, sea walls, where essential, to prevent erosion and ingress of sea water, look-out posts, etc.

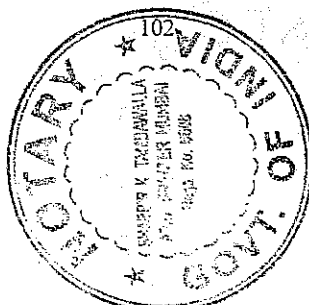
- (vi) That Coastal Zone Management requires multi-disciplinary approaches as no single field or sector adequately addresses all the complex issues of conservation, preservation, restoration and development of coastal resources and ecosystems including livelihood security and food security and the security of cultural and heritage sites.
- (vii) There are complex issues which were not addressed in the Coastal Regulation Zone notification adequately such as different property right regimes and the benefits generated by the coastal resources, living and non-living resources in term of marketable values, non-market benefits, immeasurable and intangible benefits. Many of the conflicts arise because of difficulty in resolving intra-generational and inter-generational equity and a mechanism should be put in place to resolve such conflicts in the policy and regulatory framework concerning the coastal areas. There shall be code of conduct for coastal management and ecological security including a package of rewards for initiatives in the areas of landward and seaward oriented buildings, energy efficient construction, use of non-conventional energy sources, rainwater harvesting, effluent treatment and use of biodegradable material. The coastal ecological security literacy programme should bring to the attention of builders the opportunities now available for mainstreaming ecology in building design and construction.
- (viii) Although there are several R&D institutions engaged in coastal zone conservation and management in the country, there is no well-planned and coordinated effort. We suggest that MoEF in cooperation with Department of Ocean Development sponsor an all India Coordinated Research Project for Sustainable and Integrated Coastal Zone Management. Such an All India Coordinated Project should bring together various institutions now functioning under Indian Council of Agriculture Research (ICAR), Council for Scientific and Industrial Research (CSIR), DoD, Department of Science & Technology (DST), Indian Space Research Organisation (ISRO), Department of Atomic Energy (DAE), Defence Research & Development Organisation (DRDO), Indian Institute of Technologies (IITs) and Universities, into a working partnership based on a sharply focused and prioritized agenda. This will also help to fill gaps in ongoing work, particularly in the areas of ecological economics and the economics of inter-generational equity. Coordinated efforts will help to maximize the benefits of the vast R&D infrastructure available in the country and will minimize avoidable duplication and transaction costs.
- (ix) There is need to identify and notify areas such as sensitive areas, hotspots, potential land based and sea based mariculture sites, etc. The mandated

institutions under the various Ministries may be approached to prepare the GIS based sitemaps, which should be notified and legalized by the MOEF for future developmental and conservational activities. The issue of demarcating the High Tide Marks perhaps could be done away with and a more distinct natural boundary may be adopted. Coastal people particularly fishermen and women are severely affected by some of the existing provisions of the CRZ regulations and are targeted by local authorities by denial of traditional and essential activities on the coasts.

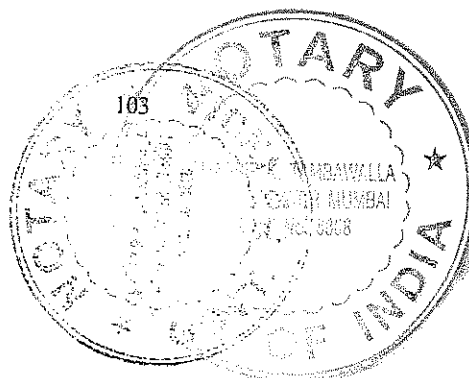
- (x) Sustainable livelihood strategy should be based on the principles of social inclusion and gender equity. It must cover fisher and land-based farming communities as well as landless labour families. Male fishers who are unemployed for about half of the year and the women who are under employed shall be brought under the sustainable livelihood strategy by introducing agrarian reforms, integrated capture and culture fisheries, seawater farming, coastal biovillages, a coastal grid of farm schools and demonstration centers, etc. A Network of Rural Knowledge Centres should be established all along the coast, as soon as possible, with good connectivity, a digital gateway and capacity building for care and management.
- (xi) Enforcement is the weakest dimension of most of the environmental legislation. Unless strict penal measures are instituted, policies will remain on paper. Fixing of responsibility on the bureaucrat /state official as well as elected representatives, as per the 'public trust doctrine', will be necessary to create a higher level of political will and commitment. The implementation of the provisions of notification should be rigorously enforced. Placing within the public domain full details of projects proposed within the Zone can generate the necessary public and media attention and involvement.
- (xii) At present, the extent of the coastal zone is defined in various ways and is managed by a multiple set of agencies. Various Government departments such as the Public Works Department, Port Department, Department of Mines and Geology, Forest Department, Fisheries Department, Department of Ocean Development, Coast Guard etc. control various features and activities on the coast. In the presentations made by the various Departments of the Government before this Committee, it was clear that there is an urgent need for greater inter-departmental interaction and cooperation when it comes to the conservation of the coastline. Data sharing as well as sharing of plans and procedures are important. Furthermore, it is critical that there is an awareness related to national security, biodiversity conservation, livelihood and related issues simultaneously in all these Departments.
- (xiii) All activities that are permissible within the coastal zone need to be allowed only after a comprehensive EIA and safety/disaster planning analysis that takes into account climate change implications and extreme events. All aquaculture projects should be reviewed so as to ensure that these projects are not destroying mangroves, corals, etc. or polluting the ground water. No new roads should be permitted within the CRZ unless EIAs are conducted and ICZM Plans are put in place, except for providing fisher communities access to the sea.

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- (xiv) The construction of sea walls has been proposed by some States as one of the solutions for preventing damage by tidal waves. However, the construction of sea walls alters long-shore currents and modifies coastal geomorphology. In many places it also causes loss and fragmentation of coastal habitats. As a result it also prevents the access to the beach and estuaries which marine organisms need for breeding and rearing their young. Estuaries, which serve as habitats of mangrove species will be affected. Structures for preventing coastal erosion should be located beyond the High Tide Line. Instead of building concrete seawalls, it will be advisable to initiate a programme of raising bio-shields and coastal green belts. Construction of concrete sea walls can be restricted to areas, which are very vulnerable to sea erosion.
- (xv) Sand mining is the foremost factor leading to erosion of beaches. There are studies to indicate that at least 21 beaches have been lost in the Nicobar to sand mining in a period of ten years. It is critical that alternate and environment friendly technologies for controlling erosion are employed. These include replanting sand dune vegetation and mangroves where they existed earlier. All natural barriers – such as coral reefs, mangroves and sand dunes must be protected at all costs. No activities that affect these natural assets should be permitted. Earthen bunds can also be encouraged wherever possible. These activities can be built into coastal zone management plans and can be monitored by the CZMAs. Any structure (hard measure) should be considered only if soft measures are not possible. The agency considering the hard measure particularly groins or breakwaters should be responsible for protecting the shoreline at least 500 mts on either side of the shoreline from erosion. In case of breakwaters for harbours, the stretch of the shoreline to be considered for protection should be at least 1.5 km on either side of the structure. The agency undertaking the construction of the said structures should be responsible for the monitoring of the shoreline for a minimum period of one year so as to cover the seasonal variation in the wave climate, which dictates its dynamics. Here again, the agency responsible for the construction of the said structures should be responsible for the monitoring of the shoreline for a minimum period of one year.
- (xvi) At locations, where, shoreline advances towards the ocean, due to shore defense measures undertaken by the Government, construction of huts and houses should be totally banned. The local Panchayat could monitor and report to the District Collector or enforcing department. The construction sequence as per the season is extremely important. This should be spelt out clearly in consultation with an expert in the field of specialization prior to obtaining the necessary clearance/sanction from the appropriate authority/body. The sizes of the stones usually adopted for the construction of seawalls, groins or breakwaters are arrived at using empirical formulae. If the weight of the individual stones used for construction is underestimated, this would result in the scattering of such stones all over the seafloor resulting in several other problems. (Typical examples are the seawalls along Royapuram in Tamilnadu, North of Paradeep port, a long stretch of the coast of Karnataka and a few other locations). Verification of the stability of the cover layer of these structures through physical modeling in Laboratories is absolutely essential prior to the commencement of such projects.



- (xvii) Vacant plots within municipal limits should be left open. They can be used for parks, gardens, playgrounds etc. All efforts should be made to discourage and reduce population densities and new activities in these areas. There is need to sensitise Panchayat Members on the population supporting capacity of fragile ecosystems. No construction activities, pipelines, cables, jetties, reclamation, should be permitted in ecologically sensitive areas. Only repairs of existing authorized structures should be permitted within open spaces. Reclamation for ports and harbours should be kept to the barest minimum.
- (xviii) Coastal tourism and recreational facilities may be promoted in identified tourism potential areas after taking into consideration the social issues of the area, vulnerability and resources. Ecological literacy programmes should be initiated for tourists, so that they do not dump non-biodegradable plastics and other wastes in the coastal areas. There should be pride in preserving areas of great scenic beauty.
- (xix) The notification permits construction of fishing jetties and harbours in the coastal zones other than the ecologically sensitive areas. However, the allied facilities for fishing harbours such as storage stalls, ice factories, ice-pressing units, processing units, workshops, storage units, fish warehousing are not permissible. The fish and shell fish being highly perishable commodities, the post-harvest technologies are very important for improving the self-life of fish for the purpose of marketing and processing. Therefore, the Committee is of the opinion that integrated fish processing units should be allowed after adequate environmental safety measures are incorporated in the decision making process. Land for such purposes should be made available on a priority basis by the district administration. Eventually, the maps of the town and country planning departments could be amended to make these allocations possible. Improved post-harvest technology is essential for ensuring the quality and nutritional safety of fish and to prevent *Salmonella* infection.
- (xx) The role of the Coastal Zone Management Authorities needs to be expanded from a mere a policing the coast for conservation purposes to one of sustainable and integrated management. National and State Coastal Zone Management Authorities have been constituted by the Central Government. However, in most cases their composition is imbalanced, having none or very few local community representation. These CZMAs if they are to be effective, both at national and state level need to be reconstituted such that they have representatives of local communities; community based organizations and non-governmental organizations. The CZMAs need to be constituted at district levels as well, perhaps in the form of district level authorities. At present, the state level CZMAs have too large an area to monitor efficiently. There needs to be an active participation of local communities in the planning and monitoring of activities on the coast. This also dovetails with the point that local community representatives need to be on CZMAs. At present this is missing at both national as well as state levels. It should be incorporated at any other level also where such monitoring is taking place. Unfortunately, because this aspect has not been explicitly stated in the notification, it is ignored in practice.



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4.2 For implementing the National Coastal Management Programme, the Central Government should strengthen the technical and human resource capacity. It may be useful to establish the following institutional structures for this purpose:

1. A separate Division in the Ministry of Environment and Forests to handle Coastal Zone Management in the country headed by an eminent technical expert. This Division may service the proposed All India Coordinated Research Project on Integrated and Sustainable Coastal Zone Management.
2. A National Board for Sustainable Coastal Zone Management may be set up on similar lines to that of the Wildlife Board of India. This Board may consist of about 21 members including representatives of all major stakeholders:

- i. Union Minister for Environment and Forests - Chairman,
- ii. Union Minister for Ocean Development - Co-Chair.
- iii. Technical experts from reputed national and State Government Institutes in the area of coastal and marine management/research.
- iv. Representative of the National Commission for Women.
- v. Representatives of electronics and print media.
- vi. Representatives from fisheries, aquaculture, tourism, hotel, industries, mining, shipping, sectors.
- vii. Legal experts (national and international law).
- viii. Representatives from selected coastal Panchayats.
- ix. Representatives from Andaman & Nicobar and Lakshadweep islands.
- x. Representatives from Non-Governmental Organisations involved in activities related to coastal zone management, fishermen welfare and conservation of bioresources and cultural heritage.
- xi. Early warning and Disaster Management experts.

- The Board may meet as often necessary.

3. National and State/UT level Coastal Zone Management Authorities:

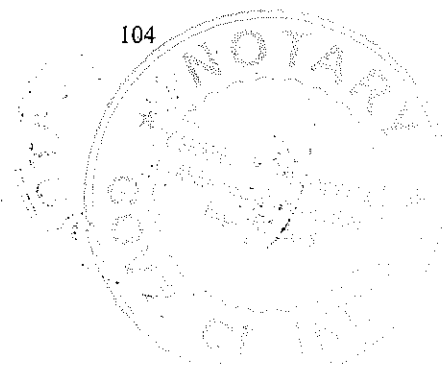
- (i) A National Coastal Zone Management Authority may be set up to monitor the state of environment in the coastal zone and to suggest implementation procedures for the decisions made by the National Board for Sustainable Coastal Zone Management. The Authority should be headed by an eminent expert in the area of Sustainable Coastal Zone Management.

4. National Institute for Sustainable Coastal Zone Management:

The proposed National Institute should be autonomous but may be located in an appropriate existing Institution/University.

- (i) Functions:

- a. This Institute shall be set up to address policy and legal issues of coastal zone management and to undertake conflict resolution studies.
- b. Awareness and education programmes in the areas of coastal zone management and ecological literacy.



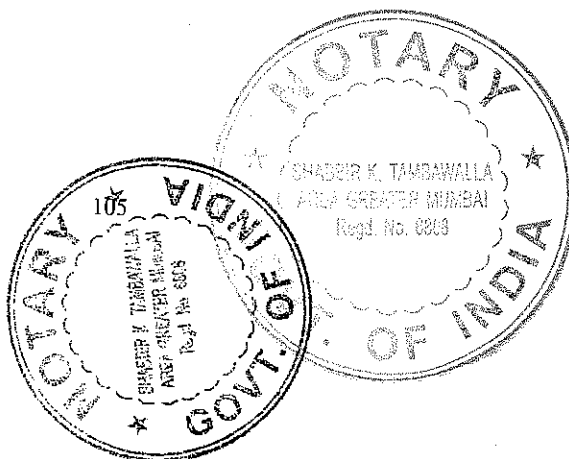
- c. Litigations, violations and other issues referred to by the National and State/Union Territory Coastal Zone Management Authorities.
- (ii) Under the National Institute, two regional centers may be set up to address the issues of:
- Andaman & Nicobar Islands.
 - Lakshadweep Island.
- (iii) A digital gateway for sustainable coastal zone management may be set up within the National Institute for Sustainable Coastal Zone Management. The gateway shall be responsible for providing upto date information on integrated sustainable coastal zone management.

Thus, we are proposing a 3 tier structure to strengthen our national capacity in the area of environmentally and socially sustainable integrated coastal zone management:

- 1) A National Board for Sustainable Coastal Zone Management for policy guidance.
- 2) A professionally led Sustainable Coastal Zone Authority for task implementation.
- 3) A National Institute supported by 2 island centers for serving as repositories of policy and legal decisions and guidelines, undertaking conflict resolution studies and for promoting ecological literacy as related to sustainable coastal zone management.

In addition, we have proposed the initiation of an Inter-organisational and inter-disciplinary All India Coordinated Research Project on Integrated and Sustainable Coastal Zone Management, in order to achieve convergence and synergy among numerous on-going R&D efforts and to fill gaps in critical areas such as social and gender audit, economics of inter-generational equity and technological empowerment of Panchayati Raj institutions.

An organogram indicating the Institutional Structure for Sustainable Coastal Zone Management is placed at item 6.5 at page 108.



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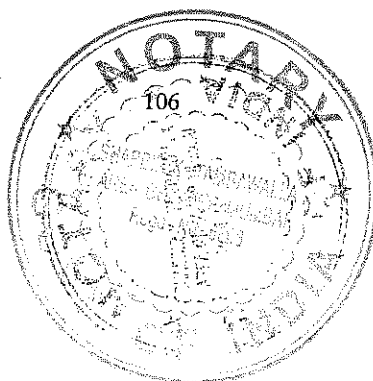
CHAPTER-5

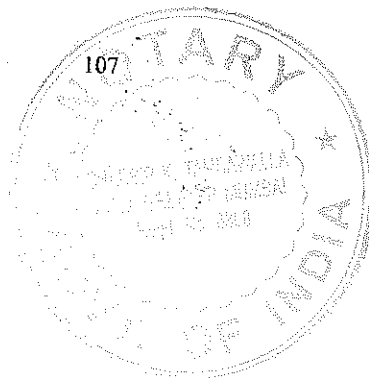
5.0 Conclusion of the Committee

We should build on the strengths of existing regulations and institutional structures, eliminate weaknesses in regulatory procedures and fill gaps in core areas, such as ecological economics and social and gender audit, where our national competence is inadequate.

Our goal should not be just conservation but also enhancement of the living and non-living resources of the coastal zone. This is our duty to the generations yet to be born. For example, we should rehabilitate all damaged mangrove wetlands and involve local youth in preserving coral reefs and promoting the creation of artificial coral reefs. The coastal ecological literacy movement should place emphasis on both conservation and natural resources enhancement.

Above all, we should create structures for generating coordinated and cooperative action among the different Central and State Government agencies. The absence of inter-departmental and Centre-State coordination is the biggest obstacle to fostering a Sustainable Coastal Zone Management Strategy. We hope that the proposed National Board will help to fill this void.





through scientific institutions which will be implemented by the concerned States/Union Territory and monitored by the Coastal Zone Management Authority of State/Union Territory. Necessary funding will be earmarked and provided by MoEF.

- (ii) **Coastal Management Zone -II** – Integrated Management Plans (IMP) prepared by the local bodies /concerned agencies following the guidelines which will include vulnerability status (demarcated as per the guidelines in Annexure-I). Necessary funding for the preparation of Integrated Management Plans (IMPs) will be provided by the Ministry of Environment. The guidelines for the preparation of IMPs are given in Annexure IV.
- (iii) **Coastal Management Zone -III** - The activities to be permitted or prohibited on the seaward side of the vulnerability line and the agencies responsible are enlisted in the Annexure-V.
- (iv) **Coastal Management Zone -IV** - The management of the Andaman and Nicobar and Lakshadweep islands will be based on the Integrated Coastal Zone Management plan prepared by the MOEF.

6.2 Funding

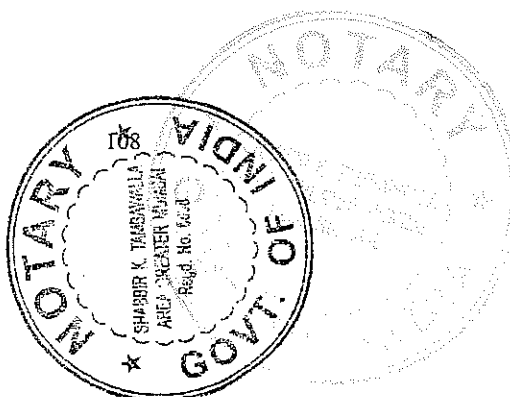
The MoEF shall have funding mechanism for preparation of ICZMP for ESAs, IMP for APCs monitoring and enforcement, capacity building, awareness programme, bio-shields afforestation, women empowerment, participatory planning and development, warning systems and shelters against natural hazards and all other programmes necessary for the integrated coastal area management in the country etc.

6.3 Legislative mechanism

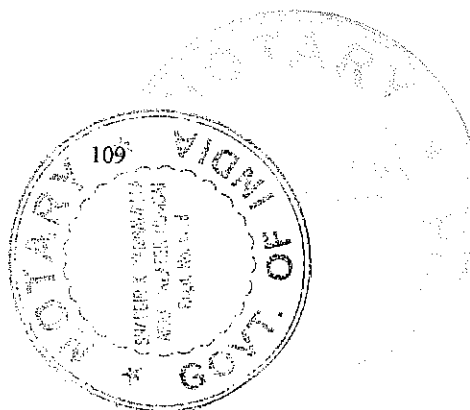
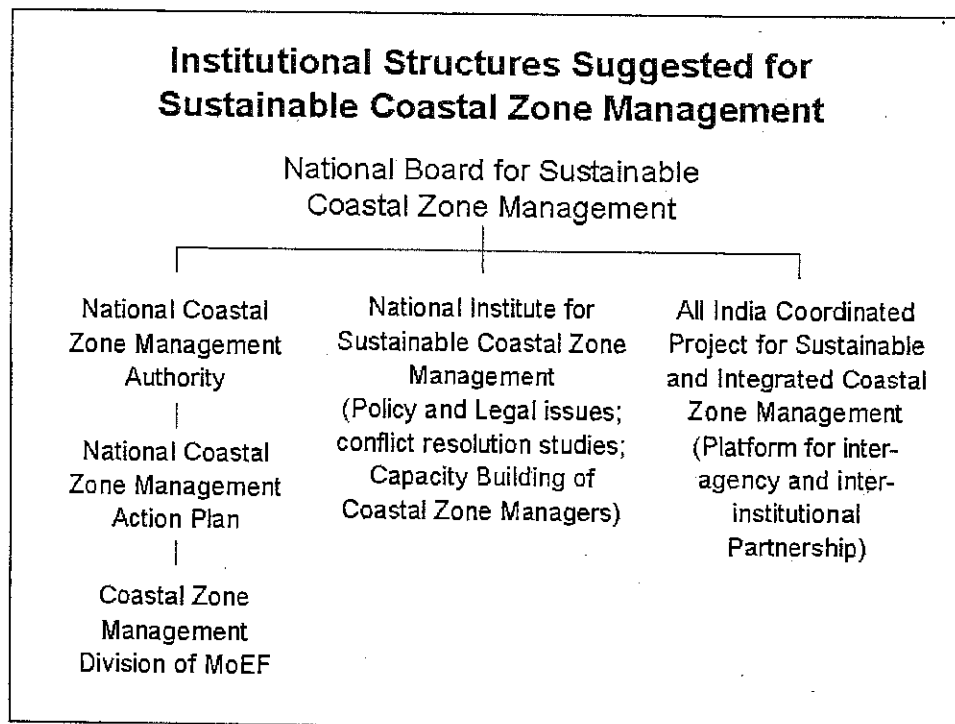
For the successful implementation of Integrated Coastal Zone Management a coastal policy and rules on the lines recommended by this Committee shall be issued notification under Environment (Protection) Act, 1986.

6.4 Policy and Implementation Oversight

The proposed National Board for Sustainable Coastal Zone Management may review periodically the implementation of the National Coastal Zone Management Action Plan, to initiate timely mid-corrections, where needed.



6.5 ORGANOGRAM INDICATING THE INSTITUTIONAL STRUCTURE
SUGGESTED FOR SUSTAINABLE COASTAL ZONE MANAGEMENT



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Annexure I

VULNERABILITY MAPPING

The setback lines in the zones categorized as CMZ -II and III will be based on vulnerability of the coast to natural and manmade hazards. This procedure is followed in many countries including USA where the coast has been mapped for vulnerability to coastal hazards.

For the purpose of mapping the vulnerability of the coast seven parameters are taken into account: elevation, geology, geomorphology, sea level trends, horizontal shoreline displacement (erosion/accretion), tidal ranges and wave heights. A brief on each of the parameter which can be considered for drawing up the vulnerability line are given below:

- (i) **Elevation:** - The elevation data shall be obtained from the available coastal toposheets satellite data surveys.
- (ii) **Geology:** - The geology identifies the rock types for all coastal segments.
- (iii) **Geomorphology:-** the land forms will be identified on the maps based on the available toposheet and remote sensing data. Bathymetry to be derived from naval Hydrographic Charts on location specific surveys
- (iv) **Sea level trends:** - The sea level trend data shall be obtained from the data available in the Ministry prepared based on primary data published by Survey of India.
- (v) **Horizontal shoreline displacement** - The erosion/accretion data used for horizontal shoreline displacement shall be obtained from long term information derived from Survey of India Topographic maps (1967) and the latest satellite data.
- (vi) **Tidal ranges:** - Tide table published by the Survey of India.
- (vii) **Wave heights:** - Wave heights obtained from ship observations published by National Institute of Oceanography or other locally available measured data.

Based on the above data a relative risk factor chart will be drawn up indicating vulnerability of the coast.

The vulnerability lines will be demarcated based on the above parameters using the guidelines for the entire country on cadastral scale (1:4000) by the NISCM proposed by Ministry of Environment & Forests.

Early warning systems are available for few of the hazards like cyclones, storm surges and Tsunamis (being put in place). Earthquakes however cannot be predicted. For protecting the population from these hazards appropriate resistant buildings units, disaster shelters and other necessary infrastructure facilities need to be provided.



Annexure -II

CMZ-I: INDICATIVE LIST OF ECOLOGICALLY SENSITIVE AREAS (ESA)

- (i) Mangroves
- (ii) Coral reefs
- (iii) Sand Dunes
- (iv) Inland tide/ water bodies such as estuaries, lakes, lagoons, creeks & straits
- (v) Mudflats
- (vi) Marine parks and sanctuaries
- (vii) Coastal forests & wildlife
- (viii) Coastal fresh water lakes
- (ix) Salt Marshes
- (x) Turtle nesting grounds
- (xi) Horse shoe crabs habitats
- (xii) Seagrass beds
- (xiii) Sea weed beds
- (xiv) Nesting grounds of migratory birds.

Guidelines for preparation of ICZMP of CMZ-I

- The above ecologically sensitive areas will be mapped and notified by the Ministry of Environment & Forests.
- The NISCM under Ministry of Environment & Forests will prepare the ICZMP to protect the notified areas.

Activities, which are essential shall be permitted in the area based on the ICZMP and after public hearing.

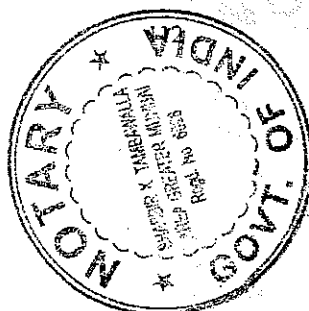
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Annexure-III

CMZ- II : AREAS OF PARTICULAR CONCERN (CMZ II)

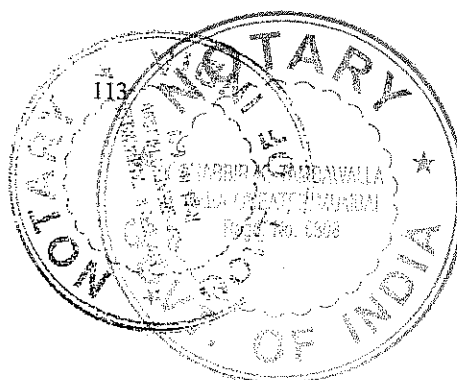
- (i) Coastal Municipalities/Corporations
- (ii) Coastal Panchayats with population density more than 400/sqkm.
- (iii) Ports & harbours
- (iv) Declared Tourism Areas
- (v) Mining sites
- (vi) Approved Industrial Estates
- (vii) SEZ
- (viii) Heritage areas.
- (ix) Archaeological sites
- (x) Defence areas/installations
- (xi) Atomic/thermal/other power plants

The guidelines for the preparation of the integrated management plans for these notified area are given in Annexure IV.



**GUIDELINES FOR PREPARATION OF INTEGRATED MANAGEMENT PLAN
FOR CMZ II AREAS**

- The entire notified Corporation, Municipality, Panchayat, revenue area, shall be the outer boundary of the APC.
- IMPs will be prepared for these areas indicating all present and future developments, conservation and preservation schemes.
- Integrated Management will address vulnerability to human life and property based on vulnerability lines prepared by Ministry of Environment & Forests.
- No constructions shall be permitted on the seaward side of any existing (as on 2004) approved building or a tarred or surfaced road in the area.
- All the existing roads including the internal roads shall be strengthened, as these roads will serve for the purpose of livelihood, communication, relief and evacuation measures.
- Adequate cyclone shelters shall be constructed taking into account the population of the area.
- The new schools, market areas and other public facilities where large number of public congregate shall be located beyond the vulnerable area.
- Along the seaward side sufficient bio shield with local vegetation, trees including mangroves shall be planted
- The beaches shall be left free of any development.
- Appropriate coastal protection structures be constructed where ever required on a scientific basis
- New houses and settlements be planned landward of the vulnerability line.
- Sand dunes being natural speed breakers in the event of hazards shall be maintained or regenerated by planting shrubs or through appropriate measures.
- All the areas notified by the Ministry of Environment & Forests as CMZ I be clearly demarcated in the plan and for their conservation by the Ministry of Environment & Forests.
- The IMPs will be approved by the proposed NISCM of the Ministry.
- The enforcement and monitoring will be the responsibility of the concerned state/Union Territory Coastal Zone Management Authorities.



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- ♦ Agriculture and horticulture.
- ♦ Public toilets and rain /cyclone shelters.
- ♦ Repair of existing buildings including reconstructions.

(ii) **Activities to be permitted with the approval of State/UT Authority**

- Temporary construction for tourism facilities.
- Construction of boat jetties and fishing harbours to be approved with EIA.
- Coastal Protection-the approach shall be to avoid hard engineering; soft engineering options shall be preferred.
- Bunding for the purpose of preventing coastal erosion, salinity ingress, maintenance of waterways.
- Salt pans-making salt by solar evaporation of seawater.
- Water sports and recreation facilities.
- Discharge of treated effluents shall be permitted as per the State/UT pollution Control Boards norms.
- Forest related activities.
- Boat building and repair.
- Boat re-fuelling facilities

(iii) **Activities that can be permitted with EIA and EMP to be approved by MoEF.**

- ♦ Integrated port, harbour, jetties and moored facilities.
- ♦ Dredging and disposal of dredged materials.
- ♦ Reclamation within port limits and for coastal protection.
- ♦ Bridges and sea links and approaches and reclamation therefor.
- ♦ Hydrocarbon exploration and extraction.
- ♦ Mining of placer minerals and offshore mining.
- ♦ Constructions of communication, power supply, lighthouses and water supply.
- ♦ Pipelines for transfer of petroleum /chemicals, storage facilities for storage of petroleum/chemical products and regasification facilities.
- ♦ Defence related projects.
- ♦ Shipbuilding yards.
- ♦ Ship-breaking in existing locations.
- ♦ Non conventional energy
- ♦ Any other activity which requires foreshore facilities.

(ii) **Mangrove, corals and other bio shields afforestation activities in CMZ-III will be supported by Ministry of Environment & Forests**

(v) **All other activities are prohibited.**



Annexure - VII**ABBREVIATIONS USED IN THE REPORT**

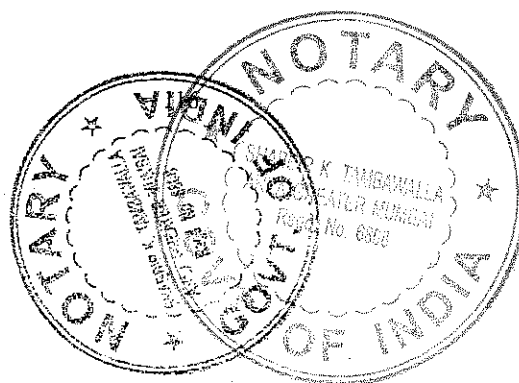
APC - Areas of Particular Concern
CRZ - Coastal Regulation Zone
CWC - Centre Water Commission
CZM - Coastal Zone Management
ESA - Ecologically Sensitive Areas
EIA - Environmental Impact Assessment
EMP - Environmental Management Plan
HHTL - Highest High Tide Line
IRS - Indian Remote Sensing Satellite
MoEF - Ministry of Environment and Forests
NCZMA - National Coastal Zone Management Authority
SBL - Setback Line
SCZMA - State Coastal Zone Management Authority
SOI - Survey of India
PWD - Public Works Department
UT - Union Territory
UTCZMA - Union Territory Coastal Zone Management Authority
NISCM - National Institute for Sustainable Coastal Management
IMP - Integrated Management Plan
ICZMP - Integrated Coastal Zone Management Plan
ICT - Information Communication Technology



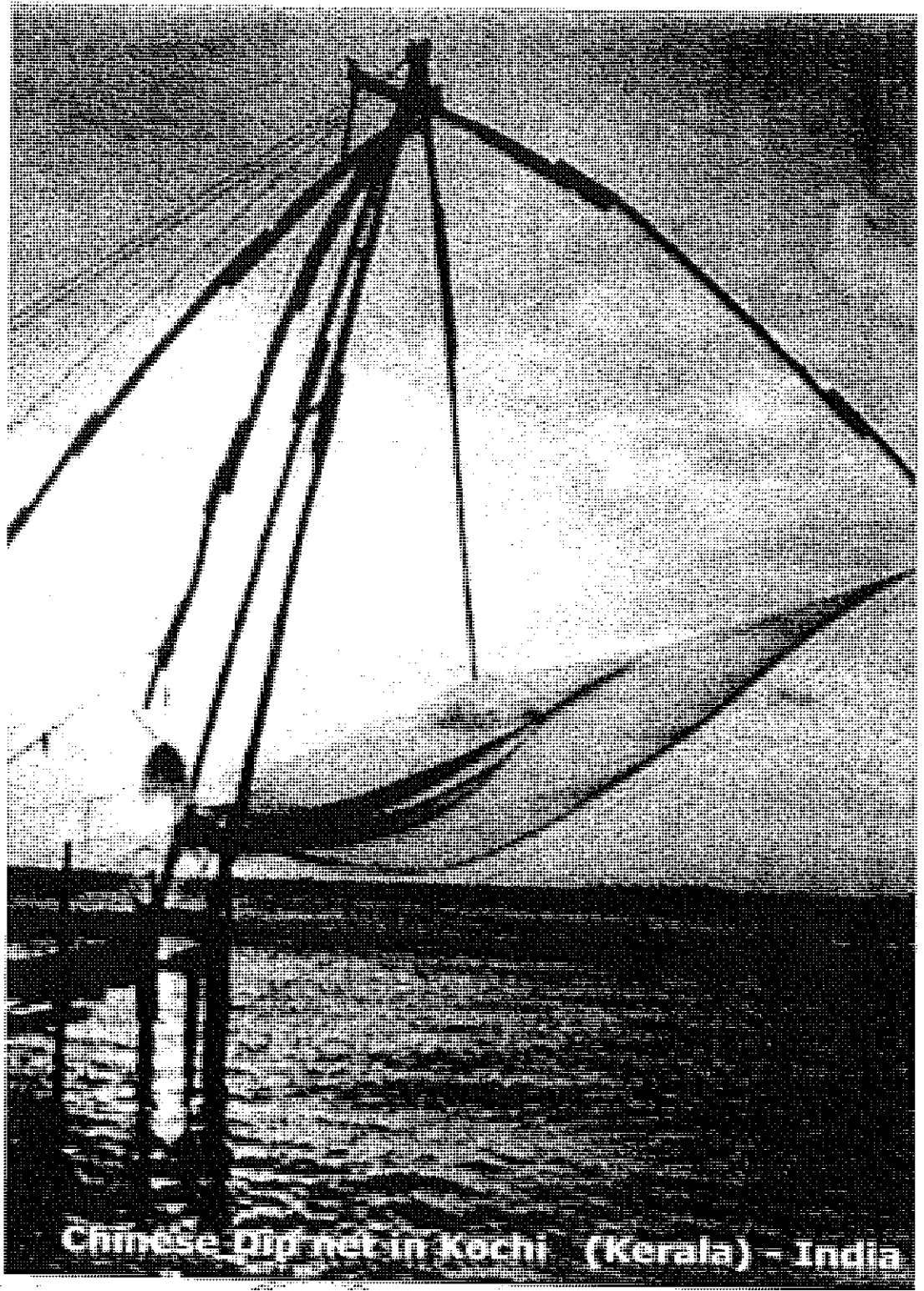
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Legend to the photographs on the cover page from top left to right

1. Traditional fishers.
2. Women participation in the Integrated Coastal Zone Management process.
3. Mangroves.
4. Remote Sensing image showing flooding of villages in Nagapattinam by tsunami waves in the area where the plantations have been removed.
5. Huge tsunami wave striking the coast of Kanyakumari.
6. Agriculture along Kerala coast.
7. The tsunami waves submerging the Marina beach at Chennai.
8. Coral biodiversity in Lakshadweep waters.

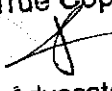


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Chinese dhow sail in Kochi (Kerala) - India



True Copy

Advocate

TRUE COPY

Zaman Ali
Advocate, High Court

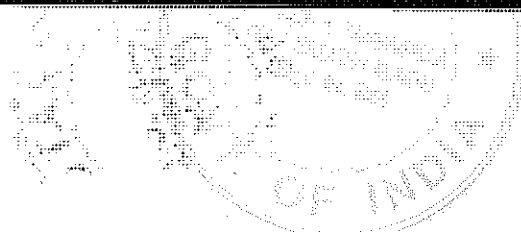
402 ANNEXURE A-6

FINAL FRONTIER

Agenda to protect the ecosystem and habitat
of India's coast for conservation and livelihood
security

Report of the Expert Committee on the draft Coastal
Management Zone (CMZ) Notification, submitted by the
Ministry of Environment and Forests, under the
Chairmanship of Prof M. S. Swaminathan

July 16, 2009



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July 16, 2009

Dear Shri Jairam Ramesh,

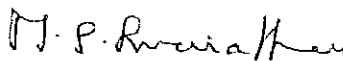
We are grateful for the opportunity given to us to examine the comments received on the draft Coastal Management Zone Notification, 2008. We have studied the views expressed by a wide range of stakeholders both in writing and orally at the 35 consultations held all over the country by the Centre for Environment Education, Ahmedabad. Based on further discussions with Central and state government and Mumbai Metropolitan Representatives and also with the representatives of fishermen and women, we have formulated the recommendations contained in the enclosed Report.

We urge that the Coastal Management Zone Notification of 2008 may be allowed to lapse. Keeping the CRZ Notification, 1991 as the basic framework, suitable additions/amendments may be made taking into account the new challenges likely to arise from climate change-induced sea level rise, and the growing pressure of population on coastal resources and biodiversity. The lives and livelihoods of nearly 25 per cent of our population living within 50 km of the shoreline, as well of the nearly 10 million fisherfolk, will depend upon the decisions we take now to develop enforceable regulations for integrated attention to both ecological and livelihood security. In addition to regulations, education and social mobilization through Panchayats, Nagar Palikas and other local bodies will be vital for ensuring that the unique benefits coastal ecosystems confer are preserved in perpetuity for present and future use.

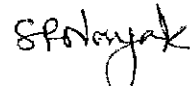
Once again, we thank you and the officials of the Ministry for the support extended to us to complete this task within a month.

With our regards,

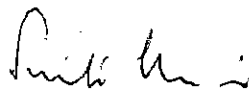
Yours sincerely,



Prof M S Swaminathan
(Chairman)
Chairman, MSSRF



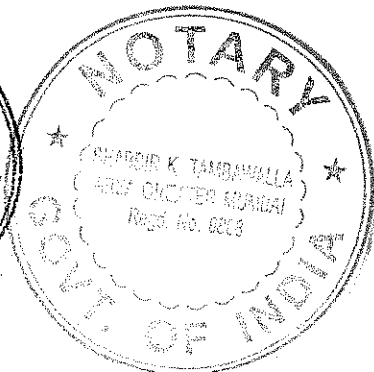
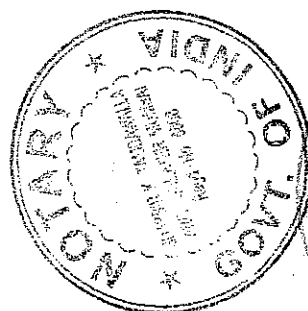
Dr Shailesh Nayak
(Member)
Secretary, Ministry of Earth Sciences



Ms Sunita Narain
(Member)
Director,
Centre for Science and Environment



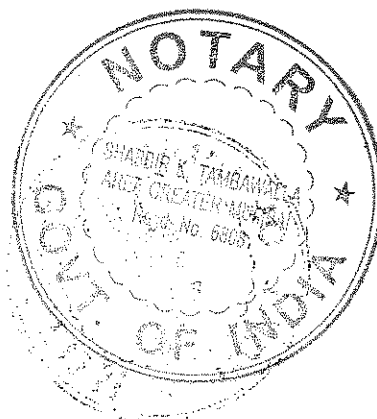
Mr J M Mauskar
(Member)
Additional Secretary,
Ministry of Environment and Forests



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Introduction: Events leading to CMZ Notification, 2008	6
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TOR 2: Advise on the policy and legal framework for integrated coastal zone management	14
Agenda for the future	15
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Executive summary

On June 15, 2009, the Ministry of Environment and Forests (MoEF) constituted a four-member Committee under the Chairmanship of Prof M S Swaminathan to recommend future steps on the draft Coastal Management Zone (CMZ) Notification, 2008. The other members of the Committee were Dr Shailesh Nayak, Secretary, Ministry of Earth Sciences; Mr J M Mauskar, Additional Secretary, Ministry of Environment and Forests; and Ms Sunita Narain, Director, Centre for Science and Environment. The Committee was given the following Terms of Reference (TOR):

- To examine the comments received by the Ministry on the draft Coastal Management Zone Notification, 2008
- To advise on the policy and legal framework for Integrated Coastal Zone Management

The Committee has found in its deliberations that there are a number of areas of concern in coastal areas that need to be addressed. Due to the limited time at its disposal, the Committee has outlined these issues in its report, so that necessary follow-up actions can be taken. The Committee suggests that the government should initiate consultations and amend the Coastal Regulation Zone (CRZ) Notification, 1991 based on the outcome.

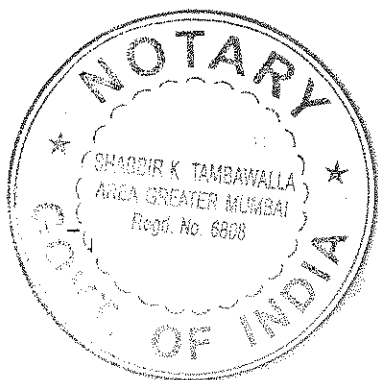
A summary of the Committee's recommendations is as follows:

The Committee is clear that the Indian coast is doubly vulnerable today. On one hand, it is facing unprecedented pressures because of industrial and urban development; on the other, it will be threatened by climate change-related devastation – from growing intensities of cyclonic storms to sea surges and eventual sea level rise. All this requires increased attention and vigilance for the protection of the coasts and the people who live there. It is also clear that coastal areas are the habitats of fishing communities. These communities are in double danger as well – ironically, from conservation on one hand and development on the other. Future policies for coastal area management must reverse these trends and find approaches to conserve and protect vulnerable ecosystems and secure the livelihoods and habitats of its people. This is the challenge.

Recommendation for TOR 1: Let the CMZ Notification, 2008 lapse and incorporate amendments as recommended in the existing CRZ Notification, 1991 for better coastal management.

Recommendations for TOR 2: An agenda for coastal areas

- Check violations to CRZ through improved space technology-enabled enforcement, strengthened institutions, and regulatory and legal reform.
- Enhance protection to fishing communities and families for habitat and livelihood security through amendments in the CRZ Notification.
- Resolve issues regarding the development and redevelopment of Mumbai, based on locale-specific amendments.
- Introduce regulations to manage the proliferation of ports along the coasts with possible impacts on the coastline by considering cumulative impacts of these developments.
- Introduce tighter standards for disposal of effluents into coastal waters so



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that these waters do not become cheaper alternatives to inland pollution management.

- Introduce new management regimes in the Andaman and Nicobar as well as Lakshadweep Islands after deliberation and discussion.
- Introduce any new protection regime – such as critically vulnerable coastal areas – after careful and deliberate understanding of the impact of conservation policies on local communities, particularly fisher families.
- Strengthen protection to mangroves based on clear definitions.
- Include the seaward side to ensure protection from current and future threats, but with safeguards to ensure there is no restriction to livelihoods of fishing communities.
- Introduce measures to greatly strengthen research and regulatory capacity at all levels.
- Introduce policies to cope with and adapt to the future dangers from sea level rise and increased vulnerability of the coasts.

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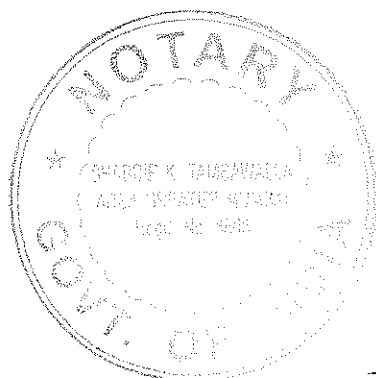
1. TOR of the committee and its work

The Ministry of Environment and Forests (MoEF) constituted a four-member Committee on June 15, 2009 under the Chairmanship of Prof M S Swaminathan to recommend future steps on the draft Coastal Management Zone (CMZ) Notification, 2008. The other members of the Committee were Dr Shailesh Nayak, Secretary, Ministry of Earth Sciences; Mr J M Mauskar, Additional Secretary, Ministry of Environment and Forests; and Ms Sunita Narain, Director, Centre for Science and Environment. The Committee was given the following Terms of Reference (TOR):

- To examine the comments received by the Ministry on the draft Coastal Management Zone Notification, 2008
- To advise on the policy and legal framework for Integrated Coastal Zone Management

The Committee has reviewed the comments received by the MoEF on the draft CMZ Notification, 2008. It also held five meetings, including meetings with representatives of different groups, who had sent comments on the draft CMZ Notification to the Ministry (see Annexure I for TOR):

- June 27, 2009 – to discuss issues relating to Coastal Regulation Zone (CRZ) and Coastal Management Zone (CMZ)
- July 7, 2009 – to meet representatives of Central and state governments
- July 8, 2009 – to meet representatives of Chambers of Commerce and Industry
- July 11, 2009 – to meet representatives of NGOs and fisherfolks' associations
- July 16, 2009 – to finalise the Report



2. Introduction: Events leading to CMZ Notification, 2008

The effort to protect the Indian coast began in the early 1980s at the initiative of the then Prime Minister Ms Indira Gandhi. In 1981, Ms Gandhi sent an advisory to coastal state governments to take adequate precautions while promoting development in the coastal areas. Subsequently, guidelines issued for the protection of beaches were found ineffective without statutory backing. In February 1991, the Ministry of Environment and Forests (MoEF) issued the Coastal Regulation Zone (CRZ) Notification under the Environment (Protection) Act, 1986 to regulate all developmental activities in coastal areas.

The CRZ Notification, 1991 prohibits and regulates certain activities within 500 metres from the High Tide Line (HTL) on the landward side and within 100 to 150 metres from the HTL on the landward side along water bodies influenced by tidal activities – such as creeks, estuaries, bays, etc. The land use is regulated by classifying the 500-metre regulated zone into four categories: CRZ-I (ecologically sensitive and inter-tidal areas), CRZ-II (urban or developed areas), CRZ-III (rural areas) and CRZ-IV (Andaman & Nicobar and Lakshadweep Islands).

In the last 18 years, the Ministry has amended the CRZ Notification 25 times. The issues concerning the implementation of CRZ have also been deliberated and decided upon by various courts of the country. Based on the directions of the Hon'ble Supreme Court on April 18, 1996, the Ministry set up 13 national and state-level Coastal Zone Management Authorities. These State/Union Territory Authorities, set up under the Environment (Protection) Act, 1986 (EP Act, 1986) are institutions mandated to enforce and monitor implementation of the CRZ Notification, 1991. But in this period, violations continued, as did the demands for review of the different provisions of the original Notification.

It was increasingly evident that the implementation of the CRZ Notification was not as successful as anticipated. It was in this context that the Ministry set up, in 2004, an Expert Committee under the Chairmanship of Prof M S Swaminathan to review the existing CRZ Notification and to suggest the agenda for coastal zones. In February 2005, the Committee submitted its Report to the MoEF. The Report contained specific recommendations designed to protect and safeguard the livelihoods of coastal communities and promote conservation (see Box: Coastal zone management: Guidelines recommended by the M S Swaminathan Report).

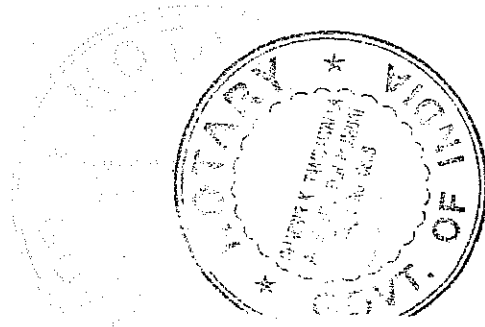
In May 2008, the Ministry issued the draft CMZ Notification, accompanied by an amendment providing for inclusion of green field airports in CMZ areas. In accordance with the Environment (Protection) Act, 1986, the draft was issued for public suggestions and objections within a period of 60 days from the date of issue of the Notification. Based on the requests made by the state governments of Tamil Nadu, Goa and the administration of Puducherry, the draft Notification was re-notified on July 22, 2008 to extend the time period for receipt of suggestions and objections.

Coastal zone management: Guidelines issued by the M S Swaminathan Report, 2005

- Safeguard the habitats and strengthen the livelihood security of fisher families, who depend upon living marine resources for their food and income. Also, pay attention to the potential threats to coastal farming communities.
- Conserve natural and cultural heritage sites along the coast, including Ramsar sites and Olive Ridley breeding grounds.
- Strengthen the ecological security of coastal areas through mangrove and non-mangrove bio-shields and biodiversity conservation.
- Strengthen the coping capacity of coastal communities to face the challenge of sea level rise caused by climate change, as well as the more frequent occurrence of tsunamis and cyclones.
- Prevent sea water pollution in order to ensure that the fish and other marine products sold in the home market or exported are free from pesticides and other toxic residues, thereby also ensuring the income security of small-scale fisher families.
- Initiate steps to protect the lives and livelihoods of nearly 25 crore people living near the coast, and initiate anticipatory steps to safeguard the future of megacities along the coast like Mumbai, Kolkata, Chennai, Kochi, Vishakapatnam, etc in an era of sea level rise.
- The above will require integrated attention to the landward and seaward sides of the coast.

The key differences between the CRZ Notification and the proposed CMZ Notification are as follows:

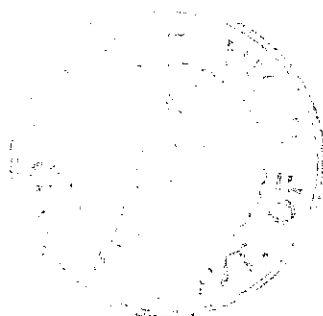
- The 1991 CRZ Notification is based on management through regulation, while the 2008 CMZ Notification focuses on management through planning. Furthermore, the CRZ regulates activities in inter-tidal areas (i.e., between Low Tide Line and High Tide Line) and 500 metres from the High Tide Line on the landward side. The aquatic area is not included in the regulations. The CMZ's jurisdiction extends to 12 nautical miles on the seaward side and till the landward administrative boundary of the municipality/panchayat or the ecological boundary, including the aquatic area of the tidal-influenced water bodies and the seabed falling within the coastal management zone jurisdiction.
- The CRZ regulates activities within 500 metres from the High Tide Line on the landward side across the entire coast of the country. This strip is uniform in width and does not take into account any specific area of vulnerability, which may require protection beyond 500 metres. The CMZ requires the area of regulatory control to be demarcated based on a setback line. The setback line would map the specific vulnerability of the stretch of the coast based on elevation, geomorphology, sea level trends and horizontal shoreline displacement (erosion and accretion). In other words, the CMZ area could be more or less than the 500-metre width, depending on vulnerability. The setback would be determined by agencies authorized by the Ministry within two years from the date of issue of the notification.
- In the CRZ, the regulated area is classified into four categories which determine the level of protection and prohibition. In the CMZ, though the categories remain more or less the same, the method of regulation changes. In both CRZ and CMZ, Zone-I consists of areas designated as ecologically



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sensitive. The critical difference is that under CRZ, the area defined as Category-I is a no-development zone, with minimal activities permitted in it: over the years, successive amendments have increased the scope of these activities. But this is not the case in CMZ, where in Zone-I, the range of activities permitted is left open to be defined through an integrated coastal zone management plan. In CRZ Category-II, the regulated zone – even within urban areas and municipal limits – is restricted to up to 500 metres. In CMZ, Zone-II denotes all urban and industrial areas as well as 'areas of particular concern'. Unlike CRZ, this Notification does not make a distinction between urban and rural settlements. Furthermore, the boundary of control in this case is not 500 metres as in CRZ, but the entire municipality or corporation. In CMZ, Zone-III consists of all other open areas, including coastal waters and tidal-influenced inland water bodies. In both CRZ and CMZ, Zone-IV is for Andaman and Nicobar and Lakshadweep Islands, but the difference is that in CRZ, only 500 metres is regulated, while in CMZ, the entire island's activities will be managed through an integrated plan.

- In the CRZ, there is a list of prohibited and permissible activities under Categories II and III, while limited development is allowed in areas under Category I (see Annexure II for list of permitted activities). In the CMZ, management is through the preparation of an Integrated Coastal Zone Management (ICZM) Plan in Zones I and II. The Plan, once prepared, would have to be cleared by the Central government. Most importantly, "development on the landward side of the setback line shall be as per the local town and country planning rules as existed on the day of the notification." In other words, the development rules will be 'frozen' and subsequent changes will require clearance from the Central government. Importantly, the zone of control is no longer 500 metres, but the entire municipal or corporation limit. In CMZ, the development activities permitted in Zone-III are listed in Appendix VI of the Notification. Appendix IV also details the agency which will give permission for the different levels of activities. So, for instance, while fisheries including traditional fish processing, ice plants and crushing facilities require permission only from local authorities, the construction of jetties and fishing harbours would need clearance from the state-level coastal zone management authority. Similarly, an integrated port, harbour, jetty or mooring facility would need to be cleared by the MoEF based on an environmental impact assessment report.



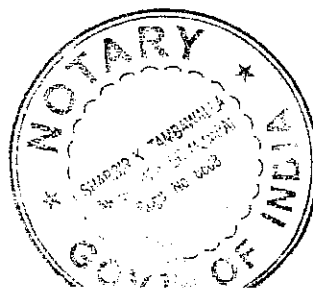
3. Comments on the draft CMZ Notification

After the Notification was issued, the Ministry of Environment and Forests received large numbers of suggestions and objections from a cross-section of stakeholders – ranging from state governments to fisherfolks' organisations. To facilitate public consultation, the Ministry commissioned the Ahmedabad-based Centre for Environment Education (CEE) the task of holding meetings across the country. The CEE conducted 35 consultations with representatives of local communities and non-governmental organizations and submitted a report to the Ministry in September 2008. The key findings of the report were summarized in a presentation made by the CEE Director at the Committee's first meeting on June 27, 2009 (see Box: Summary of consultations held by CEE).

In 2008, the Parliamentary Committee on Science and Technology, Environment and Forests also examined the draft Notification. After consultations, the Parliamentary Committee concluded that the Ministry "should not make haste in implementing the CMZ Notification without addressing the conflict of interests between the stakeholders – mainly the

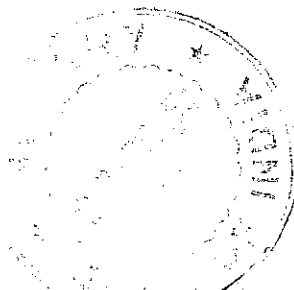
Summary of consultations held by the Centre for Environment Education

- The Coastal Regulation Zone needs to be retained and improvements incorporated in it; furthermore, clarity has to be brought in with regard to setback line, ecologically sensitive areas, Integrated Coastal Zone Management and the methodologies of management, etc.
- The existing CRZ Notification, 1991 has enough scope to manage coastal zones efficiently if implemented effectively, with some improvements and existing violations penalized.
- Representatives from various stakeholder groups, particularly from local communities, should be involved in the entire process of formulation and drafting of the CMZ Notification, 2008 framework.
- The CMZ Notification, 2008 introduces new management methodologies which are open to subjective interpretation and can be used to promote and legalize corporate activities.
- The CMZ notification, 2008 will promote Special Economic Zones (SEZ), thus opening up the coastal space and resources to the industrial sector without considering the basic rights of local communities.
- The roles of the local authorities and state governments are not adequately addressed in the proposed CMZ Notification, 2008 management methodology and structure. The basic rights of and opportunities for local communities and their representatives (Panchayat Members) to participate in and plan the activities in their local environment and settlement areas appear to have been curtailed in the proposed Integrated Coastal Zone Management Plan process.
- Looking at several amendments and impacts of the CRZ Notification, 1991 that have led to a dilution of its original objectives, there are apprehensions about the amendments in the case of the CMZ Notification, 2008 as well, and their impacts, especially on fisherfolk.
- A legislation or an Act on coastal management is needed, which will ensure protection of the coastal ecology and the basic rights of traditional coastal communities. Elected members of the Legislative Assembly should discuss the coastal policies to initiate such an Act. Till the time a comprehensive legislation on the management of coastal zones is enacted, the CRZ Notification, 1991, without amendments, needs to be effectively implemented and violators punished.



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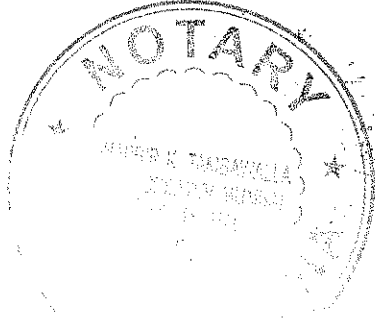
fisherfolk and coastal communities." It recommended that the "CMZ Notification be kept pending/in abeyance till mechanisms/instruments – executive and legislative – are put in place for inclusion and integration of coastal communities through participative, decision-making and control instruments."



4. TOR 1: Examine the comments received by the Ministry on the draft Coastal Management Zone Notification, 2008

The Committee has reviewed written submissions received in response to the draft CMZ Notification. In addition, in the short time at its disposal, it has discussed the matter with various representatives of Central government agencies, state governments, public sector units, private sector companies, fishers and environmental groups (see Annexure III for summary of comments received and Annexure IV for minutes of the meetings). Based on its review and deliberations, the following is noted:

- There is widespread opposition to the draft CMZ Notification. All eight state governments, which have submitted written comments, have recommended that CMZ 2008 should be withdrawn. The draft Notification has also been rejected by fisherfolks' organizations as well as environmental NGOs. Even real-estate developers and the private sector have expressed serious reservations regarding the CMZ 2008.
- There is a widespread concern that the scientific management regime proposed in the draft Notification is open to misinterpretation and abuse. There is some ambiguity about the scientific terminology used and most importantly, a basic uncertainty about the demarcation of the setback line. There is near unanimity among all groups that the demarcation of the setback line is fraught with scientific and data problems and would lead to delays in implementation. Without a clear setback line, even private developers who prefer the management regime of CMZ, are not clear how they will be impacted. It has also been pointed out that the draft Notification includes inconsistencies and also terms and proposals not clarified adequately, which could lead to selective interpretation and high transaction costs. All this could prove to be detrimental to the protection of the coast. It is evident from discussions that however 'unscientific' the present demarcation based on 500 metres is, it is preferred because it is time-tested and clearly understood.
- It is apprehended that the interim period – between the time that the setback line is demarcated and the Integrated Coastal Zone Management Plan is formulated and cleared by the Central government – will be a period of tremendous activity by some interested parties, who might be expecting that these violations would get legalised when the Plan is approved. The Ministry of Agriculture, the nodal agency for fisheries in the country, has requested that the setback line demarcation should be done prior to the Notification. It also says that the definition of setback is ambiguous and could be easily misinterpreted.
- Another overwhelming concern is regarding the change in the prohibitory regime, which may lead to widespread commercial activities and urbanization on the coast. The Karnataka and Kerala governments have expressed their fear that CMZ would legalise all violations made so far under CRZ. Even the Goa government, which is battling for legalisation of the current violations, concurs with this view in its written comments. The Maharashtra government says that CMZ would open up the coast for



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commercial activities; the Orissa government points out that the draft Notification allows various activities even in designated sensitive ecosystems. It is needless to say that environmental groups have strongly opposed CMZ on this very ground.

- It has also been suggested that the livelihood rights of fisherfolk have been ignored in the draft Notification. The National Fishworkers Forum says the CMZ curtails accessibility of local communities, but will serve the interests of corporate and large investors in different sectors. Governments and non-governmental groups have all expressed this concern. The Kerala government is categorical: "The coast belongs to the fisher community by tradition and they must not be alienated from their homeland."
- Even though an effort was made through the consultations held by CEE to publish and distribute material in local languages, it was observed that as the Notification was not widely available, it could not be discussed across the coastal villages. It is feared that the proposed changes are not understood or accepted by large numbers of people who live on the coast. The submissions demand that their participation is necessary before the Notification is finalised.
- A number of agencies have asked that their representatives should be included in the National Board for Sustainable Coastal Zone Management, which is currently proposed to have 32 members.
- While groups have raised issues regarding the draft Notification, most have also pointed to problems in the current CRZ regime and have called for amendments to the CRZ Notification. It has been pointed out that the current system of enforcement is weak and violations are common.

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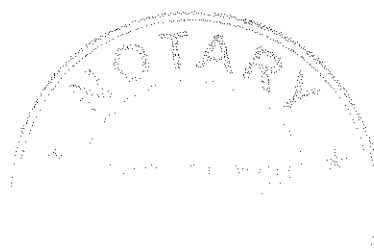
5. TOR 1: Recommendation of the Committee

The Committee deliberated on the following four options:

- To continue with the existing CRZ Notification, 1991;
- To incorporate suggestions and objections and to issue a revised CMZ Notification, 2008;
- To let the CMZ Notification, 2008 lapse and to incorporate certain suggested improvements in the existing CRZ Notification, 1991 for better coastal management; or,
- To let the CMZ Notification, 2008 lapse but issue an altogether new notification integrating the key features of CRZ 1991 and CMZ 2008.

After detailed deliberations on the various options and the nature of comments and objections received, the Committee was unanimous in its first meeting held on June 27, 2009 in choosing option 3.

Recommendation for TOR 1: Let the CMZ Notification, 2008 lapse and incorporate amendments as recommended in the existing CRZ Notification, 1991 for better coastal management.

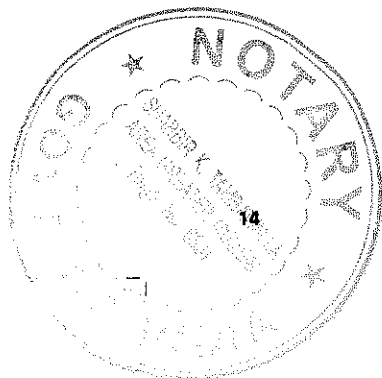


6. TOR 2: Advise on the policy and legal framework for integrated coastal zone management

The Committee is clear that the Indian coast is doubly vulnerable today. On one hand, it is facing unprecedented pressures because of industrial and urban development. On the other, it will be threatened by climate change-related devastations – from growing intensities of cyclonic storms to sea surges and eventual sea level rise. All this requires increased attention and vigilance for the protection of the coast and the people who live there.

It is also clear that coastal areas are the habitats of fishing communities. These communities are in double danger as well – ironically, from conservation and from development. On one hand, these communities are marginalized and even alienated from their lands because of the need for conservation in marine parks or forested islands. And on the other, they are in jeopardy because of large development projects which displace them and take over their lands and livelihoods. Their land is today prized for tourism and high-end housing projects. Future policies for coastal area management must reverse these trends and find approaches to conserve and protect vulnerable ecosystems and secure livelihoods and habitats of its people. This is the challenge.

The Committee has found in its deliberations that there are a number of areas of concern in coastal areas that need to be addressed. Due to the limited time at its disposal, the Committee proposes to outline these issues in its report, so that necessary follow-up actions can be taken. The Committee suggests that the government may initiate consultations and amend the CRZ Notification, 1991 based on the outcome.



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7. Agenda for the future

The Committee is outlining below the specific areas that need to be addressed in future.

7.1 Check violations to CRZ through improved space technology-enabled enforcement, strengthened institutions, and regulatory and legal reform.

CRZ 1991 did not provide in detail the mechanism for ensuring compliance. The Notification reads: "The Ministry of Environment and Forests and the state or Union territory government and such other authorities at the state or Union territory level, as may be designated for this purpose, shall be responsible for monitoring and enforcement of the provisions of this Notification."

In 1993, the Indian Council for Enviro-Legal Action filed a writ petition in the Hon'ble Supreme Court on coastal zone management. In 1996, the Hon'ble Court directed the government to set up Coastal Zone Management Authorities under the Environment (Protection) Act, 1986. Subsequently, the National Coastal Zone Management Authority, based in Delhi and headed by the Secretary, MoEF and 13 State/Union Territory Coastal Zone Management Authorities (CZMAs) were constituted.

These Authorities have been delegated powers under the Environment (Protection) Act, 1986 to take punitive action against violations. They are delegated with Sections 5, 19 and 10 of the EP Act, 1986 which give them the powers to inquire into violations, file complaints, verify facts and also take punitive action to temporarily close down polluting or violating units. Over the years, while these powers have indeed been used to check violations, there is a need for reform for more stringent enforcement.

Currently, projects falling within CRZ are sent to the state authority for scrutiny and clearance (projects below an investment of Rs 5 crore are cleared at the state level), while the others go to the MoEF. The MoEF takes decisions based on the recommendations of the state authorities. In addition, proponents for major projects like ports and harbours, which require environmental clearance, also apply under both CRZ and EIA for clearance from the Central government. These processes need to be strengthened.

The Committee would recommend the following actions to be taken:

7.1.1 Use satellite and information technology to map the coast and to monitor real-time violations that are taking place. This mechanism has been used in the case of State of Goa where, based on a decision of the Hon'ble High Court of Bombay, the government undertook mapping of the entire coast to identify violations (see Box on page 16: Goa: Violations to book). The Committee recommends that the MoEF should institute a national-level programme to map the coast and to develop technology that can inform authorities of changes/violations as and when they occur.

7.1.2 It is essential to streamline the clearance process under the different



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Goa: Violations to book

In 1998, the Goa Foundation, an environmental NGO based in the state, filed a writ petition (No 422 of 1998 with No.99/1999) regarding violations of the CRZ Notification, 1991 in the state. The matter concerned the construction activities being undertaken in the CRZ-III – restricted for residential and livelihood use by rural communities residing close to the sea.

The petitioners contended that the government was clearing projects in violation of the CRZ Notification. As per the CRZ 1991, construction or reconstruction of existing dwelling units between 200 and 500 metres from HTL in CRZ III areas is permitted, so long as it is within the ambit of traditional rights and customary uses. It also stipulates that the total number of dwelling units should not be more than twice the number of existing units, and the Floor Area Ratio (FAR) should not exceed 33 per cent of the plot size with height 9 metres and 2+1 floors.

The petitioner claimed that the authorities had granted approval to dwelling units in violation of the CRZ and “two villages were virtually sought to be converted into concrete jungle which paradoxically, the CRZ had designed to prevent”. It also claimed that in the name of residential units, people had been allowed to construct shops, hotel rooms, beach resorts, etc.

The Hon'ble Bombay High Court, in its order dated October 13, 2006, directed the state government to identify the violations within one year and the Central government to take action against the violations. To comply with the directives of the Hon'ble Court, the Goa state government assigned M/s Remote Sensing Instruments, a Hyderabad-based company, the task of undertaking temporal analysis based on 1991-2005 satellite data. The computed data indicated an increase of structures from 1991 up to 2005. Furthermore, a detailed survey through DGPS was carried out in the villages of Calangute, Candolim and Baga.

Based on these surveys, the Goa government has identified 4,553 structures that have come up in violation of the CRZ post-1991 in the 200-500 metres zone and another 2,272 structures that have been built post-1991 in the restricted zone of 100 metres along rivers with tidal influence. The Hon'ble High Court has asked for strict action to be taken against these violations. In June 2009, the state government has approached the MoEF, seeking an amendment to the CRZ Notification to provide a one-time exemption to these structures. Clearly, if agreed upon, this would be tantamount to legalizing violations and creating a precedence for further negation of CRZ regulations. The MoEF, in the view of the Committee, must take a highly cautious view of the matter, given its implications as a precedence for the rest of the coast and for future violations.

Source: MoEF

regulations; however, greater diligence and rigour is a must to ensure environmental integrity. Currently, it is observed that state authorities, headed in most cases by the Secretary, Environment are involved primarily with deliberations concerning the clearance of projects. As a result, these authorities have little time to enforce regulations for which they were primarily constituted under the order of the Hon'ble Supreme Court. It would be desirable to change the functioning at the state level so that clearance of projects under CRZ and EIA is done by the State Environmental Appraisal Committees or the Departments of Environment. The role of the state CRZ authorities should be mainly directed towards monitoring and enforcement. This separation of roles will lead to better decision-making and implementation. This will also require that the State Environmental Appraisal Committees have the necessary expertise to review CRZ projects.

- 7.1.3 Build the capacity of State Coastal Zone Management Authorities; in particular, build information sources for better decision-making. The key



problem of coastal regulations is the lack of scientific data and information to enable decision-making. There is a serious lack of scientific institutional capacity at the state and Central levels. This needs urgent attention.

7.1.4 Use web-enabled systems to publish all clearances related to CRZ and its links with EIA clearances. Currently, while the MoEF has put all projects which require EIA and CRZ clearances on its website, all the state authorities have not done so. The Committee has noted that the MoEF has written letters recently to the various state authorities asking for all clearance-related data to be published in the public domain. The Committee would strongly reiterate this directive and recommend that this action should be taken urgently.

7.1.5 Bring changes in the EP Act, 1986 to ensure better compliance. Currently, violations under the provisions of the EP Act (Sections 21 and 22) are non-cognizable and bailable, which delays and impedes successful enforcement. The financial penalties provided under the Act – a maximum of only Rs 1 lakh – are also insufficient as deterrents. The Committee recommends that these provisions should be reviewed and changes made to improve enforcement.

7.2 Enhance protection to fisher families for habitat and livelihood security through amendments in CRZ.

7.2.1 Recommendations concerning fisherfolk dwelling units in CRZ-III:

As per the CRZ Notification, 1991, the area defined as CRZ-III is where rural communities (including fisherfolk) reside. In this zone, the area between the HTL till 200 metres is a 'No-development Zone'. No constructions are permitted within this zone except for repairs of existing authorized structures not exceeding the existing Floor Space Index (FSI), existing plinth area and existing density (frozen as per 1991). Activities like agriculture, horticulture, gardens, pastures, parks, playfields and forestry are permissible within this no-development zone. Furthermore, construction/reconstruction of dwelling units between 200-500 metres from the HTL is permitted so long as it is within the ambit of traditional rights and customary uses such as existing fishing villages and *gaothans*. The construction and reconstruction is subject to restrictions. In this zone, infrastructure for local communities such as public rain shelters, community toilets, water supply, schools, dispensaries, etc are permitted.

The issue of restricted development of the dwelling units, based on FSI of 1991 (restricted to one floor plus two floors, subject to 9 metres height) has been raised by some fisherfolk organizations. They prefer a higher FSI to cater to growing family needs. This seems justifiable; however, any change must also bear in mind the need to ensure continued ownership and use by fisherfolk of these prized properties. The Committee would recommend that government should discuss this matter and take a considered decision on the raising of FSI in Zone-III, subject to ownership and usage restrictions.

7.2.2 Recommendation concerning inclusion of livelihood-related activities

The livelihood needs of fisherfolk – activities concerning their occupation, namely fishing – are seen as left ambiguous in the 1991 CRZ Notification. As a result, on several occasions, fisherfolk communities



have raised demands that their genuine needs have been ignored. In the CMZ Notification, 2008, an effort was made to correct this ambiguity by including the provision that there would be "no restriction in fishing and fisheries related activities of local communities living in the area". Currently, in CRZ 1991, there is no explicit mention of activities which relate to the 'profession' of traditional fisherfolk – fish drying, auction halls, net-mending areas, etc. This is a serious anomaly which impinges on the lives of fisherfolk.

The Committee recommends that the CRZ Notification, 1991 should review the list of such activities and suggest their inclusion in the permissible list in Zones II and III. The list will have to be carefully evaluated to ensure that it does not lead to misuse. For instance, there is a case to be made for inclusion of 'fish processing units' in the permissible activities. However, it is also clear that such units could potentially be large, polluting and owned by non-fishers.

In the no-development zone of CRZ-III (0-200 metres), while dwelling units are allowed for fisherfolk, economic activities like tourism are not permitted. There is a growing demand for inclusion of such activities in this zone, under the ownership of fisherfolk. This demand, however legitimate, can lead to a proliferation of tourism units in this zone and will be difficult to regulate in terms of size, impact or ownership. The Committee is of the view that this modification, if considered, must be handled with extreme caution.

7.2.3 Recommendations concerning legislation for the rights of fisherfolk

The Committee heard testimonies of fisherfolk regarding how development projects had displaced their livelihoods and homes. For instance, in Versova in Mumbai, Machlipattnam on the Andhra Pradesh coast and Mundra in Gujarat, large developmental activities – from housing to ports – have encroached upon the habitats of fisherfolk and affected their livelihoods. The fishers recounted how their struggles against large corporations and building contractors have been long and difficult.

The Committee endorses the recommendation made by Prof M S Swaminathan to the Parliamentary Committee reviewing CMZ on the need for consideration of a separate legislation, along the lines of the Traditional Forest Dwellers Act, 2006 for securing traditional fisher families' rights by the relevant Union ministry.

7.3 Resolve issues regarding the development and redevelopment of Mumbai based on locale-specific amendments.

In CRZ-II, construction of buildings on the landward side of an existing road or existing building structure is permitted. The definition of an authorized existing building is that such a building must have existed prior to February 19, 1991. This provision, important to regulate development in the 500-metres zone, is open to different interpretations, and has proven to be difficult to implement. It has led to large numbers of litigation, many of which are still pending. This issue has reached a flashpoint in the city of Mumbai, with its high-priced land and large slum population.

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The Committee had discussions with builders' associations, NGOs and state government officials with regard to rehabilitation of slums as well as rehabilitation of the dilapidated structures in the municipal area of Mumbai. It was explained that the existing dwellings are located on the landward side, within 500 metres and close to the sea. It is contended that as development and redevelopment on the 500-metre zone is restricted through the FSI - CRZ says that the FSI should be as it existed on February 2, 1991 - it is leading to a situation where builders do not have the FSI incentive to rebuild. An NGO specifically brought out the issues regarding pre-1940 chawls and housing, which are in very bad condition and are a health hazard to their tenants.

The Committee was informed that the issue of FSI has been discussed in the Hon'ble High Court of Bombay. In writ petition number 1019, of 1999, filed by a city builder, the Hon'ble High Court upheld the Ministry's clarification which states that the word 'existing Floor Space Index' shall mean 'FSI as existed from the date of issue of the Notification, i.e. February 19, 1991'. As per this clarification, the existing FSI was 1.00 in rural areas and 1.33 in urban areas of Mumbai.

The Committee was also informed that the Ministry had set up a committee in May 2000 to examine the matter precisely related to the Mumbai slums and other dilapidated structures in the CRZ zone of the city. This committee, under the chairmanship of D M Sukthankar, former Union Urban Development Secretary, concluded that a higher FSI should be permitted. This committee recommended that FSI in Mumbai CRZ areas should be as per the development control regulations - existing FSI in non-CRZ areas. The Ministry did not accept the recommendations of the Sukthankar report, in view of the directives of the Hon'ble High Court of Bombay.

The Committee also asked developers and city administrators about the change in FSI that they would require. Most builders argued that they needed a very high - even unlimited - FSI to make the projects financially viable. Their argument was that to provide free housing for existing dwellers who live in cramped conditions, they needed to construct more within the same area. And to make this housing viable, they needed to build more to sell and to recover their costs.

On the other hand, the Committee also heard from fisherfolks' representatives that they did not benefit from the slum redevelopment schemes. They explained that in the name of slum rehabilitation or reconstruction of dilapidated structures, the houses of local communities were given the least priority. The prime land, especially the sea-facing properties, belonging to these communities were sold at exorbitant costs by the developers, while the redeveloped area earmarked for fisherfolk was small and on marginal lands. They requested the Committee to debar all projects of slum redevelopment in these lands, arguing that only projects which secured their ownership should be permitted.

The Committee recognizes the special case of Mumbai and its need for redevelopment of existing properties. However, it is not clear how this redevelopment, specific to certain areas of the city, can be allowed without jeopardizing the regulatory control, so essential for coastal areas,



in other CRZ-II areas. The Committee recommends that the government should take a careful view of this issue, perhaps restricting permitted construction to redevelopment of specified buildings in some specific areas.

It is also imperative that state governments must review their policies for private-developer based building projects in CRZ areas. The government must consider public finance for housing so that this development can be used for meeting the needs of existing households, without compromising on ecological safety.

7.4 Introduce regulations to manage the proliferation of ports along the coasts, with possible impacts on the coastline, by considering cumulative impacts of these developments.

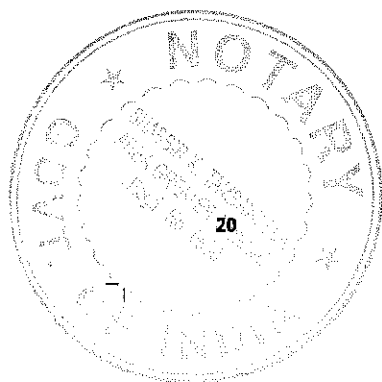
The Committee noted that currently, the shoreline of the country is undergoing a major change because of a large number of port and harbour projects. These projects involve large quantities of dredging, shore protection works, breakwaters and reclamation. The problem is that there is little information of the cumulative impacts of these projects on the coastline. Officials of the Union Ministry of Shipping explained that it was difficult to track all projects, because permissions are given based on their scale and ownership. The Union Ministry of Shipping is involved in 'major public sector ports, while state governments give clearance to minor ports as well as upgraded ports being proposed by private developers'. Experts are unanimous that each structure would impact the shoreline – particularly the beach formation. Already, many of these infrastructure projects have caused significant shoreline changes, as in Ennore, Puducherry, Alibag, Digha and Dahej.

It is also observed that the shoreline is being impacted adversely by mining projects and by interventions like the building of shore-protection structures like groynes (see Box: Blocking the sea).

Under the existing CRZ and EIA notifications, various port projects are indeed regulated. Under the EIA Notification, the ports which attract cargo-handling capacity need clearance. In other words, the ports which may only involve dredging or disposal of dredged material or shore-protection projects, will not be included. The EIA Notification also categorises the clearance required based on the handling capacity of the port – ports with a handling capacity higher than 5 million tonnes per annum require clearance from the MoEF, while the rest can get clearances from State Environmental Appraisal Authorities. In CRZ 1991, all port projects require clearance from the Central government, but only for components which fall within the land area of CRZ; this is because CRZ 1991 has no jurisdiction in the water area.

The Committee was of the view that these developments have all led to serious threats to the coast, as especially beaches face severe erosion and shorelines are visibly changing. Given that the Central and state governments propose to construct several ports and harbours all along the shore in the coming years, these projects could have irreversible adverse impacts on the coast. The Committee recommends the following:

7.4.1 The government must immediately study the cumulative impacts of the



Blocking the sea

Coastal erosion is a serious problem in Puducherry. But the beaches did not disappear overnight. Activists say the problem began in 1989, when a harbour was built at the southern tip of the Union territory. Two breakwaters were constructed as a part of the harbour which stopped the littoral drift, the natural south to north movement of sand.

The country's eastern coast has a high littoral drift with an estimated 6 million cubic metres of sand moving south to north along the coast. The breakwaters in southern Puducherry meant that sand from the beaches of the state moved north, but there was no sand to replenish it. So the area north of the breakwater lost all its beaches.

Consulting Engineer Services, a New Delhi-based organization which designed the harbour, had anticipated this problem. It had incorporated a sand bypass system in the harbour's design to obviate sea erosion: silt from the harbour would be dredged and artificially pumped to the other side, restoring the movement of sediments along the coast. Says M D Kudale, chief research officer of Central Water and Power Research Station (CWPRS), "A sand bypass system was put in place but seldom used except for a brief period between 2000 and 2001, when small stretches of beach began to reappear. But the system was discarded in 2002, and the beaches disappeared once again."

SAND LOSS

By 2002, northern Puducherry had lost all its sand. Structures along the coast began to crumble as sea water intruded into their foundations. In 2002-03, the state government decided to build a seven-km long seawall consisting of boulders along the coast; Rs 40 crore was spent on the construction. While Puducherry was saved temporarily, the problem of erosion was transferred to villages in Tamil Nadu in the north.

By 2006-end, areas in the state north of Puducherry had lost 200 metres of beach and the sea waves destroyed a few houses and killed a child. The Tamil Nadu government had to fortify these villages with a seawall. Meanwhile, in 2002, experts from the Indian Institute of Technology, Chennai and the National Institute of Ocean Technology (NIOT) suggested that groynes be erected on a trial basis in Puducherry. Civil society groups like the Indian National Trust for Art and Cultural Heritage and Citizens Forum for Puducherry opposed the move, contending that groynes would only transfer the problem of erosion towards the north of the structures — much like the breakwaters. The issue was raised in the Union territory's Legislative Assembly in 2002. The government then assured that it would seek a second opinion on the subject. In January 2008, Pondycan along with another NGO, Coastal Action Network, filed a public interest litigation in the Hon'ble Chennai High Court, seeking a stop on the construction work. A month later, the Court directed that the Public Works Department should get environmental clearances for the project. The Department applied for CRZ clearance in February 2008. Meanwhile, in January this year, the Tamil Nadu government initiated an enquiry on erosion in Kottakuppam block in Villupuram district. The report of the enquiry noted: "All villages in Kottakuppam block and other areas of Vannur taluk of Villupuram north of Puducherry, are at the risk of sea erosion because sea walls/groynes had blocked the natural transport of sand up and down the coast." It further added that if construction proceeds further in Puducherry, it would "aggravate the erosion on Tamil Nadu coast especially in Villupuram district". The proposal from the Puducherry administration seeking clearance from the MoEF for constructing the groynes is under consideration, while no proposal has been received from the government of Tamil Nadu.

Source: Down To Earth

individual projects on the coastline, pending which there should be a moratorium on expansion of existing ports and initiation of new projects.

- 7.4.2 The CRZ 1991 should be modified to include the seaward side so that port projects are regulated in terms of their impacts on the sea and its land

interface. In the CMZ 2008, an effort was made to regulate all activities related to the development of a port – including ancillary and road and transport-related activities – through an integrated port management plan. The CRZ 1991 should be amended to include this provision.

- 7.4.3 The amendments proposed in the EIA Notification of January 9, 2009 would require that modernisation or expansion proposals without any increase in pollution load and/or without any additional water and/or land requirement will be exempted from environmental clearance. This could lead to major impacts on the coast, as existing minor and major projects could increase in size and impact without any scrutiny or regulation. The Committee recommends that the Ministry should examine this amendment in the EIA notification in the light of its recommendations above.

- 7.5 Introduce tighter standards for disposal of effluents into coastal waters so that these waters do not become cheaper alternatives to inland pollution management.

The Committee is of the view that pollution of the coast is a serious threat. The Committee heard from representations of fisherfolk that fish resources have depleted over a period of time in many places because of effluent discharges into coastal waters. Taking advantage of lax effluent discharge standards, some industries are basing their operations in coastal areas. There is also a growing trend towards building pipelines for disposal from common effluent treatment plants into the sea. The problem is that it is impossible to monitor whether effluents are indeed being treated before disposal or if they are simply being dumped into the sea. Similarly, most cities and municipalities located in coastal areas discharge untreated sewage into the surrounding sea. The sea and the coast are also being used as a convenient dumping ground for solid wastes.

Under CRZ 1991, it is provided that "discharge of untreated waste and effluents from industries, cities or towns and other human settlements is a prohibited activity. Schemes shall be implemented by the concerned authorities for phasing out the existing practice, if any, within a reasonable time period, not exceeding three years, from the date of this notification." This provision has been completely ignored in the past and in fact, cities are discharging their effluents with impunity. There is also a growing trend to lay underwater pipelines for discharge of effluents. These practices will be highly detrimental to marine life.

The Committee strongly recommends that action must be taken to mitigate pollution in the sea. It recommends that standards for effluent disposal should be revised; that there should be a strong monitoring programme with public data access on the quality of sea water; and that underwater effluent pipelines should be disallowed with amendments to CRZ 1991.

- 7.6 Introduce new management regimes in Andaman and Nicobar as well as Lakshadweep Islands after deliberation and discussion.

The Committee observed that the CRZ Notification, 1991 stipulates an



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uniform 500-metres regulation along the islands of Andaman and Nicobar and Lakshadweep. This provision creates different problems for differently sized and located islands. In cases where the islands are small, the entire landmass of the island could be notified under CRZ, which in the absence of management plans, could lead to problems for the island-dwellers. On the other hand, in large islands, many regions which are ecologically fragile are not included in the 500-metres regulation. There is also a growing concern about the special vulnerability of the islands because of sea level rise.

These issues require a review into the CRZ Notification, 1991. The CMZ Notification, 2008 had advocated that the islands should base their development on an Integrated Coastal Zone Management Plan, which would require clearance from the MoEF. The Committee noted that these management plans have already been prepared for selected islands and approved by the respective administrations.

The Committee recommends that a separate island protection zone notification could be issued for the integrated management of the islands. This notification should keep in view the ecology, socio-economic issues, especially of fisherfolk, sea level rise and sustainable development as well as the impacts of the tsunami of December 26, 2004. The island protection zone notification should be finalized after deliberations with the island administration and its people.

Jambudwip: Conservation without people

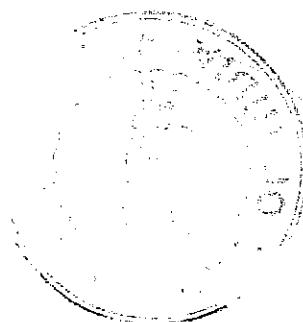
Jambudwip Island is a tiny dot in the Bay of Bengal. A few years ago, it hit the headlines when wildlife activists dragged fisherfolk who used the landmass to dry their fish, to the Hon'ble Supreme Court. A case was filed regarding 'encroachment' of this island, partly covered by mangroves. The Apex Court's Central Empowered Committee (CEC), which advises it in all forest matters, in its report to the Court contended that fish drying was a non-forest activity, and therefore disallowed under the Forest Conservation Act, 1980.

The fisherfolk appealed. They had to go out into the open sea for days, putting life on hold and everything they had at risk. Jambudwip was a convenient transit camp; they used this nearest landmass, with a natural harbour, only to dry fish. They had no refrigeration facilities; this was the only way they could preserve fish for sale in the mainland. Their practices were sustainable – fishing nets were handcrafted to catch only the adult fish, leaving the small to the sea. They used the sun to dry fish. They took from nature only what they needed.

The fishers also explained that their use was not destructive to the ecology of the island, and, in fact, it was in their best interest to protect the mangroves as a buffer to the harsh sea. The permits and payments made to the forest department showed the island was in use from 1950. Destruction to the mangroves was marginal – satellite imagery confirmed the island had, over these long years of use, lost only 200 hectares of forest, out of its 2,000 hectares. The fisherfolk also put forward a plan – use the money we pay for permits to the forest department to plant mangroves; create a sustainable management plan for the island; restrict boat numbers.

But these pleas were unheard. The fishers were disallowed from using the island in the future and livelihoods of over 10,000 people engaged in fishing, drying, transporting and selling fish ended. Conservation in this case made enemies, not friends.

Source: Down To Earth



7.7 Introduce any new protection regime – such as critically vulnerable coastal areas – after careful and deliberate understanding of the impacts of conservation policies on local communities, particularly fisher families.

The CRZ Notification, 1991 declares areas like national parks/marine parks, sanctuaries, reserve forests, wildlife habitats, mangroves, corals/coral reefs, areas close to breeding and spawning grounds of fish and other marine life, areas of outstanding natural beauty/historically/heritage areas, areas rich in genetic diversity, areas likely to be inundated due to rise in sea level consequent upon global warming and such other areas as may be declared by the Central government or concerned authorities at the state/Union territory level from time to time, and the area between the Low Tide Line and the High Tide Line in CRZ-I as ecologically sensitive. Over the years, this open-ended definition has led to ambiguity and subjective interpretation.

In CMZ Notification, 2008, an effort was made to clarify the areas that should be considered as ecologically sensitive. A list of 12 such areas – ranging from mangroves to nesting grounds of birds – has been provided in Appendix II of the Notification.

Furthermore, the Committee is also aware that there are large marine parks, sanctuaries and national parks along the coastline of the country – Chilka, Pulikat, Pichawaram, Gulf of Mannar, Vembanad, Coringa, Gulf of Kachchh etc – which are also inhabited by fishers. These large biospheres require special attention, since they provide livelihoods to local communities and are also affected by developmental activities. It was proposed to the Committee that these regions could be provided with further protection by declaring them as Critically Vulnerable Coastal Areas (CVCA).

The Committee noted that in some cases, conservation has led to the impoverishment of fisherfolk. It noted instances from Orissa, where there have been cases reportedly of suicides by desperate families of fishers, dispossessed because of the creation of Bitharkanika National Park. Similarly, at Jambudwip, a small island off the coast of Bay of Bengal, fishers have been thrown off the island they were traditionally using for drying fish, because of intervention by some conservationists (**see Box: Jambudwip: Conservation without people**). These past experiences must not be repeated and efforts must be made to enjoin the interests of fishers with that of conservation.

The Committee recommends that the Ministry may take a view on the creation of Critically Vulnerable Coastal Areas based on the above factors.

7.8 Strengthen protection to mangroves based on clear definitions.

The CRZ Notification, 1991 provides for the protection of mangroves irrespective of their density. However, it is noted that often, state governments take the view that mangroves above 1 hectare in density and 1 metre height should be recognized as 'mangroves' for protection. The Hon'ble High Court of Bombay (writ petition 3246 of 2004) has directed the Maharashtra state government to map the mangrove area and declare all such areas as 'forests' for protection. However, it is understood that

this work to map mangroves and its declaration is still incomplete. As the definition is unclear, it is possible to impact large mangrove sites because of certain development projects. The committee recommends that the protection of mangroves is critical, particularly as these provide bioshields and nurseries for fish breeding in the coast – protecting against disasters like tsunamis or cyclones and providing livelihoods to fishers. It is also important to recognize that mangroves are difficult to regenerate. Once these mangrove areas are destroyed, new mangrove plantations do not come up easily.

The Committee recommends that the Ministry should conduct a nation-wide mapping of existing and potential mangrove areas. It must provide a definition of mangrove areas that need to be protected and include these and other suitable areas into its afforestation projects, like the Green India project. It should also include the concept of restoration – of degraded areas, mangroves or coastal, sandy beaches – into the plan. All mangrove areas should be strictly protected as bioshields and sea-productivity zones.

- 7.9 Include the seaward side to ensure protection from current and future threats, but with safeguards to ensure there is no restriction to livelihoods of fishing communities.

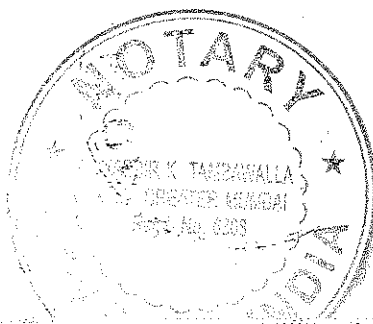
The coastal environment depends upon the hydrodynamics of the waters of the sea. We cannot plan or manage the land, without planning for the seawater. Furthermore, what is done on land could have major impacts on the sea – from pollution to construction. The Committee has informed about how in some cases, promoters of port and jetty projects were filling up the land in the sea – reclamation to use for other purposes – without any permissions. In CRZ 1991, the seaward side had been included and so its regulation was not possible. CMZ 2008 included the area up to territorial water limits (12 nautical miles measured from the appropriate baseline). It also included the seabed in its regulatory ambit.

Fishing communities have raised objection to this inclusion of the seaward side in CMZ 2008. They contend that the classification of the sea area under the Notification would have implications for the livelihoods of the fishing community. It would restrict their access and instead, would open out the sea for industrial development. Clearly, this should not be the aim of the regulation.

The Committee recommends that the seaward side should be included in the CRZ 1991. But the amendment must take into account the concerns raised by fishing communities and ensure strong and effective safeguards.

- 7.10 Introduce measures to greatly strengthen research and regulatory capacity at all levels.

It is clear that coastal areas face enormous challenges. But if these are to be managed, then we will need institutions for coastal research. Currently, there is a huge gap in data collection and information and more importantly, on using the knowledge for changing policy and practice. It is also clear that we need to strengthen the current regulatory institutions at the Centre and at the state for better decision-making, including the setting up of a new institute for coastal zone management. This will



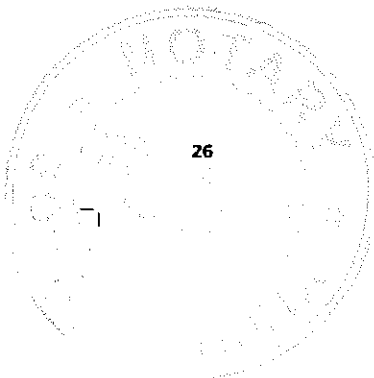
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require enhancing the capacity of current institutions and building new ones dedicated to coastal research. It will also require involving people – fishers and environmentalists – in this research so that their knowledge can be used to learn the practice of the future. Further, the National Board for Sustainable Coastal Management may be set up to assist the Ministry and the state governments and to address the policy and legal issues, including undertaking conflict resolution studies.

The Committee would recommend that urgent steps are taken to build institutional capacity for the coasts.

7.11 Introduce policies to cope and adapt to future dangers from sea level rise and increased vulnerability of the coasts.

The Committee is of the opinion that the coastal areas of the country face a danger due to sea level rise in future and the projected increase in frequency of storms and tidal surges. These developments would not only endanger inhabitants of coastal areas, but also have an adverse impact on the coastal ecosystem which provides livelihood support to millions. It is imperative that the Ministry undertakes a project to demarcate the vulnerability and hazard line along the coast. This will take into account present and future risks because of projected sea level rise and other threats. Once done, the demarcated vulnerability and hazard line must be incorporated into the CRZ 1991. This will initiate steps to improve protection of critical infrastructure and thickly populated areas. The study will also provide policy directions for adaptation strategies in our coastal areas. It is clear that the coast will need more protection measures and investment in adaptation to cope with the coming devastations.



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Annexure I

No.11-83/2005-IA-III(Pt.)
Government of India
Ministry of Environment and Forests
(IA-III Division)

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi - 110003.

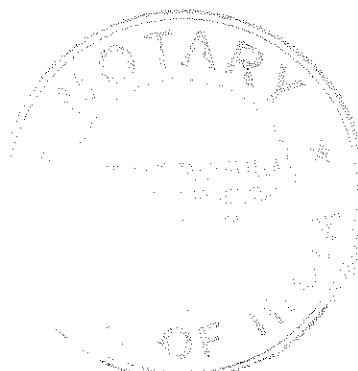
Dated, the 15th June, 2009

ORDER

Sub: Constitution of an Expert Committee for finalization of the Coastal Management Zone Notification - regarding.

1. Ministry of Environment and Forests has issued a draft Coastal Management Zone Notification, vide S.O No.1070(E), dated 1.5.2008, and an Amendment to this Notification was issued vide S.O.No.1120(E), dated 9.5.2008 inviting public suggestions and objections in accordance with the Environment (Protection) Act, 1986 within a period of 60 days from the date of issue of the notification. Further, based on the requests made by the State Government the draft Notification had been reissued on 22.7.2008.
2. The Ministry has received a large number of comments on the above draft Coastal Management Zone Notification. To examine these comments the Ministry has decided to constitute an Expert Committee under the Chairmanship of Prof. M. S. Swaminathan. The composition of the Committee is as follows:-
 - (i) Prof. M. S. Swaminathan, Chairman, M S Swaminathan Research Foundation MSSRF, 3rd Cross Street, - Institutional Area, Taramani, Chennai - Chairman
 - (ii) Dr. Shailesh Nayak, Secretary, Department of Ocean Development, New Delhi
 - (iii) Ms. Sunita Narain, Centre for Science and Environment, 41, Tughlakabad Institutional Area, New Delhi-110062.
 - (iv) Shri J. M. Mauskar, Additional Secretary, Ministry of Environment and Forests, New Delhi
3. The Committee shall:-
 - (i) examine the comments received by the Ministry on the draft Coastal Management Zone Notification, 2008
 - (ii) advise on the policy and legal framework for the Integrated Coastal Zone Management.
4. The Committee may co-opt additional Members, if required and shall submit its report by 15.7.2009.
5. The Committee may convene its meeting(s) anywhere in the country. TA/DA and sitting fee for non-official members will be paid as per norms.
6. This issues with the concurrence of the IFD vide IFD Dy. No.418/DS/IFD, dated 11.6.2009.

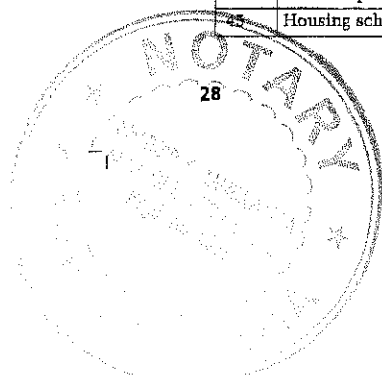
(Dr. A. Senthil Vel)
Additional Director
Telefax: 24360694
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Annexure II: List of permissible activities in CRZ

Sl. No.	Activites	CRZ-I(i)	CRZ-I(ii)	CRZ-II	CRZ-III (HTL-200m)	CRZ-III (200-500m)	CRZ-IV
1	New industries	X	X	X	X	X	X
2	Expansion of industries	X	X	X	X	X	X
3	Atomic energy projects	√	√	√	√	√	√
4	IT	X	X	X	√ (SEZ)	√ (SEZ)	X
5	SEZ Projects	X	X	√ (SEZ)	√ (SEZ)	√ (SEZ)	X
6	Non conventional energy	X	X	√	√	√	√
7	Desalination	X	X	√	√	√	√
8	Air strips	X	X	√ (LAK)	√ (LAK)	X	√
9	POL products	X	X	√	√	√	√
10	L&G	X	√	√	√	√	X
11	Fish processing	X	X	X	X	X	X
12	Hatchery	X	X	X	X	X	X
13	Fish drying	X	X	X	√	√	√
14	Treated effluents	X	X	√	√	√	X
15	Storm water drains	X	X	√	√	√	X
16	Municipal waste	X	X	X	X	X	X
17	Landfill	X	X	X	X	X	X
18	Ash from TPS	X	X	X	X	X	X
19	Land reclamation	X	√ (P&H)	√ (P&H)	√ (P&H)	√ (P&H)	√ (P&H)
20	Expansion of Ports/Harbours	X	√	√	√	√	√
21	Jetty	X	√	√	√	√	√
22	Wharves	X	√	√	√	√	√
23	Quays	X	√	√	√	√	√
24	Slipways	X	√	√	√	√	√
25	Bridges	X	√	√	√	√	√
26	Sea-links	√	√	√	√	√	√
27	Erosion control	X	√	√	√	√	√
28	Tidal regulators	X	√	√	√	√	√
29	Prevention of salinity ingress	X	√	√	√	√	√
30	Commercial Complex	X	X	√	X	X	X
31	Mining of Sand/Rock	X	X	X	X	X	X
32	Rare mineral	X	X	√	√	√	√
33	of Oil and Gas	√	√	√	√	√	√
34	Groundwater drawl	X	X	√	X	√	√
35	Horticulture	X	X	√	√	√	√
36	Agriculture	X	X	√	√	√	√
37	Fisheries (Aquaculture)	X	X	X	X	√	√
38	Pipelines	√	√	√	√	√	√
39	Altering sand dunes	X	X	X	X	X	X
40	Defense Projects	X	√	√	√	√	√
41	Conveying systems	√	√	√	√	√	√
42	Transmission lines	√	√	√	√	√	√
43	Embarkation facility	√ (LAK)	X	X	X	X	√
44	Thermal power plant	X	X	X	X	X	X
45	Housing schemes	X	X	√	X	X	X

Cont...



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EXPERT COMMITTEE ON COASTAL ZONE JULY 2009

Cont...

Sl. No.	Activities	CRZ-I(i)	CRZ-I(ii)	CRZ-II	CRZ-III (HTL-200m)	CRZ-III (200-500m)	CRZ-IV
46	Weather radars	✓	✓	✓	✓	✓	✓
47	Demolishing/Reconstruction of Archeological, heritage public structures.	X	X	✓	X	X	X
48	Dispensaries	✓ (SB)	X	✓	✓	✓	X
49	Schools	✓ (SB)	X	✓	✓	✓	X
50	Public rain shelters	✓ (SB)	X	✓	✓	✓	X
51	Community toilets	✓ (SB)	X	✓	✓	✓	X
52	Roads	X	X	✓	✓	✓	✓
53	Water supply	X	✓	✓	✓	✓	✓
54	Drainage	X	X	✓	✓	✓	✓
55	Sewerage	X	✓	✓	✓	✓	✓
56	Saltpan	X	✓	✓	✓	✓	✓
57	Storage of food grains	X	✓	✓	✓	✓	✓
58	Storage of fertilizers	X	✓	✓	✓	✓	✓
59	Storage edible oil	X	✓	✓	✓	✓	✓
60	Parks	X	✓	✓	✓	✓	✓
61	Play fields	X	X	✓	✓	✓	✓
62	Forestry	X	X	✓	✓	✓	✓
63	Beach resorts	X	X	✓	X	✓	✓
64	Coral mining	X	X	X	X	X	X
65	Underwater blasting	X	X	X	X	X	X
66	Dwelling units	X	X	✓	X	✓	✓
67	Reconstruction of structures	X	X	✓	✓	✓	✓

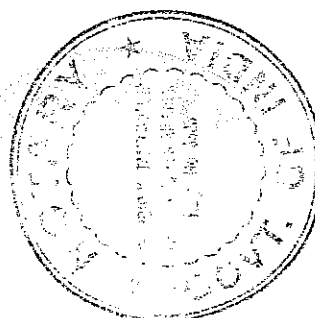
P&H - Port and Harbours

SEZ - Special Economic Zones

SB - Sundarbans

LAK - Lakshdweep

Note: The above details are subject to approved CZMP of respective States/UTs, Court judgments, interpretations with respect to local regulations and the provision of CRZ notification in specific para. Activities less than Rs.5 crores are approved by the concerned State Government. Activities more than Rs.5 crores to be cleared by MoEF.



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Annexure III: The details of observations / recommendations by the Coastal States on CMZ Notification , 2008

Sl. No.	Name of the State	Comments		
		Suggestions for incorporation	Concern on CMZ	Recommendation
1	Gujarat	CRZ Notification 1991 should be enforced. The coastal policy and legislation to be tailor made for different States for different coastal environments. It is unclear how activities will be handled amongst various government departments concerned with implementation of CZM Notification, 2008.	Zonation not demarcated clearly in CMZ. Livelihoods rights of the fishermen ignored. Role of the local communities in ICZMP is not mentioned.	CMZ Notification, 2008 to be withdrawn.
2	Maharashtra	During the last 17 years of CRZ existence, High Tide Line (HTL), Low Tide Line (LTL) has not been demarcated as yet. The role of village Panchayat and other Public Authorities in implementing CMZ is not clear.	Rights and livelihood of the fishing and other local communities including coastal ecology are not protected. CMZ would open up the coast for commercial activities. The management activities of CMZ are ambiguous.	Not favouring/ supporting CMZ. CRZ Notification 1991 should be strengthened and enforced with active participation of local communities.
3	Goa	CRZ Notification, 1991 should be strengthened by drawing some good features of CMZ such as Setback Line and develop ICZMP for practical implementation, effectively.	The drafting process of the CMZ notification 2008 is controversial. If CMZ comes into force, there is fear that all the violations of CRZ would be regularized.	CMZ Notification 2008 should be withdrawn
4	Karnataka	CMZ lead to denial of the rights of fishermen communities, who live near the coast for their livelihood. CMZ must protect the coastal ecosystem. Since the local bodies on the coast with more than 400 persons per square kilometer, come under "Areas of Particular Concern" and hence in CMZ II, most of the coastal fishing villages in Karnataka coast will come under CMZ II, opening up the coast to the external stakeholders.	The "Setback line" which is yet to be demarcated will be a "Lakshman Rekha" for construction of community dwelling units and related activities. Rapid urbanization on the coast through CMZ will be disastrous for the eco-system and environment. CMZ will lead to regularization of illegal structures that came up since 1991, violating the current CRZ -II areas	CMZ notification should be withdrawn. Recommended to implement the Original CRZ Notification 1991, and ensure its strict enforcement. Violators should be punished.
5	Kerala	Each coastal State requires a different Management Plan for its development and protection. In the case of Kerala, a state characterized by backwaters and more than 40 rivers, most of the inland water bodies which will be affected by high tide, will come under CMZ III. Hence, while CRZ affects only the sea coast, CMZ will affect the inland water bodies also. The setback line is not very clear to anybody.	Violations of CRZ Notification, 1991 are likely to be regularized by CMZ. The law is likely to be diluted to suit the interests of industry, tourism, mining and real estate lobbies The coast belongs to the fisher community by tradition - do not alienate this community from their homeland.	CMZ should be scrapped and CRZ should be implemented without diluting it with the amendments made. CMZ favours large investment sectors like tourism, industry,

Cont...

Sl. No.	Name of the State	Comments		
		Suggestions for incorporation	Concern on CMZ	Recommendation
				refineries, mining, besides SEZs.
6	Andhra Pradesh	The activities that might happen in the 12 nautical miles (territorial waters) need to be listed out and no activity, which threatens the livelihoods of fishermen should be allowed. A comprehensive legislation is the need of the hour to protect the marine resources, fishermen rights and to protect the ecology- Traditional rights of fishermen should be clearly stated. Consultations should cover substantial representation of fisher communities and Panchayats and decision should be taken only after considering their opinion. Clear guidelines for categorization of island villages should be given and protection of the same should be ensured in the wake of global warming.	While CRZ Notification, 1991 has a mandate for protection of the coastal environment, CMZ Notification, 2008 appears to be more 'development' or industry driven. While 500 meters demarcation as in CRZ Notification, 1991 should remain, setback line concept of CMZ can be integrated into CRZ.	CMZ Notification, 2008 severely affects the livelihood of the local communities and their traditional lifestyle.
7	Orissa	CRZ, 1991 protects the rights of traditional fisher folk, their livelihood needs and coastal ecology. A comprehensive Act needs to be in place for coastal management. The permission for fishing within 12 nautical miles should be controlled by the State Government only. Foreign vessels should not be allowed to fish in coastal zone waters. The local community representatives must have the right to plan developmental activities in their immediate surroundings especially in case of external industrial projects coming up in coastal areas.	The violations in CRZ are being regularized in the name of CMZ. No consultation was done with the local communities who are the primary stakeholders. CMZ Notification allows various activities in these sensitive ecosystems. The CMZ notification allows a number of new stakeholders ignoring the local fishermen, who traditionally linked to the sea and real owners and protectors of the coast.	Since its formulation CRZ 1991, is not implemented effectively. CMZ to be withdrawn as there is no Zonation has been demarcated clearly for management.
8	West Bengal	Zonation criteria in CMZ and the management methodology to be clearly defined. The Draft Notification uses the words "sustainable development", "sustainable coastal zone management practices" and The definition of 'green field airports' "sound scientific principles" which are not clearly defined.	CMZ notification has not at all considered the strengths of CRZ notification on the other hand will legalize all the violations that have taken place under CRZ so far. which is added as amendment is not given in the notification.	CMZ notification 2008, is not beneficial to the local communities.

Comments of Fishermen' Forum

Name of the State	Comments		
	Suggestions for incorporation	Concern on CMZ	Recommendation
National Fish Workers' Forum (NFF), Kolkata	Protection of coastal ecology and recognition of basic rights and livelihood of the local communities over the sea and the coast should be at the heart of any coastal zone planning. Coastal management plan should be framed by taking coastal fishermen /local communities into confidence. Bottom-up public participation approach is preferred rather than top-down- decisions made by Government. Demands elaborate consultation with fishing community as recommended by Parliamentary Standing Committee before drafting any legislation. Notification on coastal issues.	CMZ legalizes all violation made so far as per CRZ Notification. Curtail accessibility of local community to the shore and sea resources and serve the economic interests of the corporate sector/ large sector / large investors like tourism industry, refinery, mining, etc. A High Power Committee, along the lines of the P. Morari Committee should be formed to lead this process of consultation. NFF rejects formation of another committee again chaired by Prof. Swaminathan to recommend a new draft Notification for the coastal zone. High level delegation of NFF would meet HMoEF, Other Ministers and Hon'ble PM. In first week of July, 2009. State level dharna proposed on 30.06.2009 declaring it as National Day of Action. (HMoEF given time for discussion on 02.07.2009 at 3.00 p.m.)	

Central Government

Sl. No.	Name of the Ministry / Department	Comments		
		Suggestions for incorporation	Concern on CMZ	Recommendation
1	M/o. Agriculture	Sandy beaches, sand dunes, mudflats, coastal freshwater bodies to be removed from the list of Ecologically Sensitive Areas (ESA); The definition of Setback Line is ambiguous and therefore could easily be misinterpreted. Moreover the Setback Line is to be demarcated in 2 years time after the passing of the CMZ act. The Setback Line demarcation should be done prior to passing of the CMZ Act. The Notification to be provided in local languages	Appendix-VI (i) (c) should read 'Mariculture including hatcheries and Coastal Aquaculture as regulated by Coastal Aquaculture Authority Act, 2005'. This is required because traditional Aquaculture is not the only method approved by Coastal Aquaculture Authority. Further as per CCA 2005 aquaculture is already a permitted activity in the CRZ.	
2	M/o. Urban Development	The parameters of the setback line to be reviewed keeping in view the climate change seismic activity and natural hazard. The institutional setup procedures for mapping etc to be spelt out.	ESA need to be demarcated and protected keeping in view the local requirements and prevailing amendment. In the National Board representative of tribal leader of A&N to be included	

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Sl. No.	Name of the Ministry / Department	Comments		
		Suggestions for incorporation	Concern on CMZ	Recommendation
3	M/o. Urban Development	Setback line parameters to be reviewed keeping in view the dynamics of the ocean; ESA to be demarcated; The provisions of proposed CMZ regulations need to be in harmony with the Allocation of Business Rules, 1961 without bringing in conflicting provisions in CMZ areas for town and country planning, powers of local Municipal Corporations and Municipalities, and for providing water supply, sewerage, drainage and sanitation.		
4	M/o Civil Aviation	Appendix-VI with respect to activities that can be permitted in CMZ-III with Environmental Impact Assessment and Environmental Management Plan to be approved by Ministry of Environment & Forests should also include expansion & upgradation activities for development of existing Airports/Heliports or development of Greenfield Airports in CMZ-I as well in view of essential requirement to provide reliable connectivity & economic development of remote coral islands of Lakshadweep and Andaman & Nicobar Islands.		
	Comments expressed by CIDCO	Time frame should be prescribed for preparation of ICZMP on part of local authority, and approval of same on part of the Central Govt. The role of National Coastal Zone Management Authority and that of State Coastal Zone Management Authorities need to be defined. Mangroves etc. which grow in manmade water bodies (like holding ponds, flood control channels, etc.) should not be given status of CMZ I. Activities requiring water front such as ports, water transports terminals, water sports marina etc should be allowed in CMZ-I, CMZ-II and CMZ-III.	Once the Setback Line is delineated, development should be allowed as per the approvals obtained from the local authority. The condition of approval from ICZMP should be deleted.	
5	M/o Commerce & Industry			No comments
6	M/o Petroleum & Natural Gas	Many facilities for Paradip Refinery project (PDRP) like crude oil pipelines & product pipelines corridor from refinery to south Jetty and facilities within the refinery boundary wall have been constructed and planned as per the Coastal Regulation Zone Notification, 1991. Considering such cases of huge investment, the new notification should be	The creek having mixed water from a river body and sea should be kept under CMZ-III with Set-back Line of 100m. Such creek of PDRP of IOCL is Santra Creek, which is a nalla of 40 sq. km. Catchment area as per Oct' 98 report of the Govt. of Orissa, Department. of Water Resources and Setback Line of	

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Sl. No.	Name of the Ministry / Department	Comments		
		Suggestions for incorporation	Concern on CMZ	Recommendation
		made applicable only for new projects with prospective effect.	100m as per the Forest & Environment Department, Govt of Orissa. The refinery layout has been firmed up considering Set-back Line of 100m as per CRZ notification, 1991.	
7	D/o Atomic Energy (DAE)	As per CRZ-1991 notification, 'projects of DAE' were placed under permissible activities. Similarly, mining of those rare minerals containing monazite not available outside CRZ areas was also permitted activity. It is therefore suggested that provision similar to CRZ-1991 notification may be made in the proposed CMZ-2008 notification with respect to the Projects of the Department of Atomic Energy incorporate the following- "Projects of the Department of Atomic Energy including expansion and modernization of existing projects, and mining of placer minerals containing monazite in coastal areas" as permissible activities in CMZ areas.		
8(a)	D/o Space, National Remote Sensing Agency, Hyderabad	In the draft notification, the CMZ Act/Rule covers the entire coast as a system including seaward boundary (12 nautical miles) rather than shoreline as in CRZ. This is in principle with scientific approach for sustainable coastal protection and environmental conservation. The term Integrated Coastal Zone Management Plan (ICZMP) is perceived as land utilization/usage and development plan for ICZM implementation. This helps futuristic and long-term protection of coast. The Set-back Line forms the basis for CMZ and ICZMP and replaces the erstwhile HTL and 500 meter boundary. The time frame for determining the Set-back Line is not specified.	The Setback Line (as per definition given in the draft notification) implies an arbitrary line depending on the vulnerability, which is location dependent, subjective of natural process and influence of tidal periodicity in time and space. Fixing of such a line requires analysis of historical data and modern techniques like remote sensing and GIS. The concept of Integrated Coastal Zone Management (ICZM) in this notification ensures scope for decision-making on protection of coastal population and infrastructure. This provides conservation and sustainable development of coastal resources.	
8(b)	D/o Space, Space Applications Centre, Ahmedabad	Sr. No. (vi): Coastal freshwater bodies such as creeks, lakes etc. Creeks are not coastal freshwater bodies. Instead of writing coastal fresh water bodies, it should be written as Inland/tide water bodies such as estuaries, lakes, lagoons, creeks (refer Annexure-II of the M.S. Swaminathan Committee Report) Creeks, lagoons are also purely tidal in a number of places on the Indian coast. All the coral reef lagoons are purely tidal. The creeks in the mangrove areas in most of the mangrove habitats of Gujarat, etc., are purely tidal in nature.		

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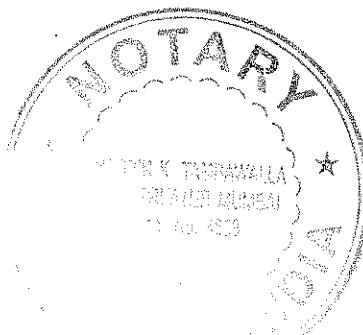
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EXPERT COMMITTEE ON COASTAL ZONE JULY 2009

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Sl. No.	Name of the Ministry / Department	Comments		
		Suggestions for incorporation	Concern on CMZ	Recommendation
9	M/o Earth Sciences (INCOIS)	The definition of ICZM should include protection and conservation of coastal and marine ecosystems and resources. There is no justification of classifying backwater islands in CMZ IV (b). These islands cannot be and should not be equated with the Lakshadweep and Andaman and Nicobar Islands. The main reason for making this suggestion is non-availability of elevation, geomorphology, sea level trends and horizontal shoreline displacement data at the cadastral scale, at present.	Notification of the Setback Line: Though the Setback Line needs to be drawn on cadastral scale; however this will be a huge task for the Central Government to take up. It may be a good idea to prepare maps on a smaller scale, say, 1:25,000 or so by the Central Government. The preparation of maps at cadastral scale may be left to concerned parties / local bodies / State Governments.	
10	Ministry of Shipping, Road Transport & Highways and Major Port Authorities	Department of Shipping should be given a permanent representation in the proposed National Board for Sustainable Coastal Zone Management (NBSCZM). The same criteria as applicable to airports should be made applicable for expansion and modernisation of Ship building Yards and existing sea ports. The type of industries to be permitted in the proposed SEZ's may specifically be incorporated in the CMZ notification to facilitate the environmental clearance of SEZ's to be established in the Coastal Zones. In the definition of coastal zone, area from the territorial waters limit (12 nautical miles measured from the appropriate baseline) not clear in Draft CMZ 2008, requires some more in-depth definition/clarifications. Most of the land available with KPT is tidal affected and covers with Mangroves, Mudflats etc. Therefore, while framing the Integrated Coastal Zone Management Plans for CMZ-1 area it is also required to consider the future development of the Port Projects with necessary EIA and EMP. A provision under Para 6(iii) Coastal Management Zone-II, should be introduced as below: "With regard to economically important areas of Ports & harbours, the Deptt. of Shipping in the Ministry of Shipping, road transport & Highways would prepare an Integrated Coastal Zone Management Plan and submit it	Major ports should be treated as separate entities for the purpose of preparation of Integrated Coastal Zone Management Plan (ICZMP) under CMZ notification 2008. The development activities of the Ports, both seaward and landward side of the Set-back Line may be regulated based on the ICZMP of the Ports for which one time CMZ clearance be accorded, and thereafter there should be no further need to obtain clearances of individual projects so long as the projects conform to the ICZMP. Natural Gas, so as to read as below: "Pipelines for transfer of petroleum or chemicals or liquefied natural gas, storage facilities for storage of petroleum or chemical products or liquefied natural gas and re-gasification facilities". Development of facilities in the existing ports may be permitted with the approval of State or Union Territory Coastal Zone Management Authority. It is felt that a separate Port Zone under CMZ notification along with permissible and prohibited activities within this zone would be more appropriate. This will provide uniform guidelines to all the Major Port and non-major ports in the country.	

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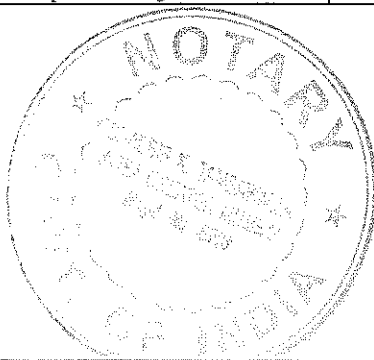
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Sl. No.	Name of the Ministry / Department	Comments		
		Suggestions for incorporation	Concern on CMZ	Recommendation
		to MoEF. Such plans would be accorded clearance by a special committee constituted by the Central Government." In Appendix-VI (iii), item (x) shall be modified for including the item of Liquefied As per the notification, any development of Ports and harbours in green field site will be falling under CMZ III. For development of any new Port the Indian Ports Act as well as Major Port Trusts Act empowers the Central/State Government to Notify the Port limits. It is not clear whether such notification can be issued only after getting the clearance of area identified from the Ministry of Environment & Forests.	The notification also specifies under item no. (iv) in Appendix V-Guidelines for preparation of integrated management plan for CMZ II areas, that "No construction shall be permitted on the seaward side of any existing (as on 2006) approved building or tarred or surfaced road in the area". This clause is detrimental to the ports as it prohibits further development in the port on seaward side.	
11	M/o Textiles			No comments
12	M/o Panchayati Raj	Chodan - Mandal Village Panchayat, Tiswadi, Goa has passed a resolution stating that the move to replace existing Coastal Regulation Zone with Coastal Management Zone will effect fishing activities besides this there would be no easy access on Coastal sides as the construction coming up with the help of Coastal Management Zone would then completely block the public visiting the beaches/coastal areas and hence it is unanimously resolved and decided to oppose the move to replace existing Coastal Regulation Zone rules with Coastal Management Zone.	It was resolved by Gram Sabha members that we are not in favour of Coastal Management Zone (CMZ) as proposed in the 2008 notification and demand that the same be scrapped forthwith and further resolved that existing CRZ notification of 1991 be maintained and strengthened to be more effective.	
13	M/o Defence	Chief Hydrographer to the Government of India, who heads the National Hydrography Office (NHO), should also be included in the list of experts.	Appendix - V of the draft Notification (Guidelines for preparation of Integrated Management Plan for CMZ II areas) may suitably incorporate necessary provisions to address the security concerns regarding strategically important areas, such as ports/harbours and defence installations.	
14	M/o Mines,			'No objection'
15	Planning Commission	Constitution of an Authority under the Environment (Protection) Act, 1986 would provide for not only the statutory backing required but also financial support for functioning of wetlands. Appendix - III of the notification lists areas of concern in CMZ II and does not include hotels and residential areas near the coast line and these also do not figure in Appendix-VI-CMZ III of permissible development activities. The inclusion / Exclusion require detailing.	The demarcation between the Setback line and the water body including the backwaters is not clearly discernible and permission of boating activity in lakes which are contiguous with the sea front needs reconsideration. Boating as part of tourism could be permitted with the approval of the State or Union Territory Coastal Zone Management Authorities	

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EXPERT COMMITTEE ON COASTAL ZONE JULY 2009 ■

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Sl. No.	Name of the Ministry / Department	Comments		
		Suggestions for incorporation	Concern on CMZ	Recommendation
16	Office of The Salt Commissioner, Govt. of India, Jaipur	The Salt Commissioner to Govt. of India should also be included as a member on National and State/UT Coastal Zone Management Authorities.		
17	The Union Territory of Andaman & Nicobar Islands	CMZ-IV is also required to be included under SETBACK LINE in the Appendix-I, otherwise the primary objective may be lost sight of in the Integrated Coastal Zone Management Plan, since the Union Territory of Andaman and Nicobar Islands is no less vulnerable to natural and manmade hazards, protection from which is the main objective of the CMZ, Notification. As CMZ-IV will be managed entirely on the basis of Integrated Coastal Zone Management Plan, a detailed guideline is required to be added to the Notification for CMZ-IV. There is no designated authority to take cognisance of CMZ violations and also a defined procedure for filing the complaints before the appropriate Court of Law. Provision for the same may be provided for in the notification.		
18	The Administration of Union Territory of Lakshadweep Islands			Endorsed
19	The Union Territory of Puducherry		Coastal Regulation Zone Notification, 1991 should be implemented in its original form without any amendments.	Opposed
20	The Administration of Union Territory of Daman & DIU			



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Annexure IV

Resume of the first meeting of the Expert Committee for finalization of the Coastal Management Zone (CMZ) Notification held under the Chairmanship of Prof. M. S. Swaminathan on 27th June, 2009 in Room No.402, 4th Floor, Ministry of Environment and Forests, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi

1. The meeting of the Expert Committee for finalizing of the CMZ Notification was held on 27.6.2009 in Ministry of Environment and Forests under the Chairmanship of Prof. M.S. Swaminathan. List of participants who attended the meeting is Annexed.
2. Chairman welcomed the Expert Members and briefly mentioned the steps to be taken for fulfilling the two Terms of Reference given by Ministry of Environment and Forests namely (a) analysis of comments referred and (b) advise on policy and legal framework.
3. The Chairman in his introductory remarks emphasized the need for any Notification to have the following principles as the bottom line:-
 - a. Safeguarding and strengthening the livelihood security of fisher and other coastal communities.
 - b. Strengthening the ecological security of coastal areas through bioshields and biodiversity conservation.
 - c. Conservation of cultural and natural heritage sites including Ramsar sites and Olive Ridley breeding grounds.
 - d. Strengthening the coping capacity of coastal communities to face the challenge of sea level rise caused by global warming as well as the more frequent occurrence of severe cyclonic storms and tsunamis.
4. After these opening remarks the Chairman requested Shri Jairam Ramesh, Hon'ble Minister for Environment and Forests to brief the Committee. The Minister welcomed the Members of the Committee and he emphasized that the new Coastal Zone Regulation/Management should lay strong foundations for the welfare of the fishing communities and other local communities living on the coast as indicated in the opening remarks of the Chairmen. With these brief remarks the Minister thanked the Members of the Committee and left the meeting along with Shri Vijai Sharma, Secretary (E&F).
5. The Chairman requested Dr. A. Senthil Vel, Additional Director to make a brief presentation. Dr. A. Senthil Vel in his presentation explained the issues related to Coastal Regulation Zone (CRZ) Notification, CMZ Notification and dealt in detail the suggestions and objections received on the draft CMZ Notification. The compilation of the comments, letters received from the National Fishworkers' Forum dated 27.6.2009, letter from Minister for Fisheries and Registration, Government of Kerala dated 9.6.2009, Chief Minister Goa, letter dated 10.6.2009 were circulated during the meeting to the Members alongwith a draft notification on management of Andaman & Nicobar and Lakshadweep Islands.
6. After the presentation, Chairman invited comments from Shri Kartikeya V. Sarabhai, Director, Centre for Environmental Education (CEE), who was a Special Invitee to the Expert Committee because CEE was assigned the work of consulting the local communities regarding the draft CMZ Notification, 2008 and submit a report to Ministry of Environment and Forests. Shri Sarabhai informed the Committee regarding the major issues that were raised during his consultation with the local communities on the draft CMZ Notification, 2008. Shri Sarabhai explained in detail various suggestions and objections. Some of the major comments were,-
 - a. Coastal Regulation Zone to be retained and improvements incorporated. Further, clarity to be brought in with regard to setback line, ecological sensitive areas, Integrated Coastal Zone Management and methodologies of management etc.
 - b. Existing CRZ Notification, 1991 has enough scope to manage coastal zones efficiently if implemented effectively with some improvements and existing violations penalized.
 - c. Involve representatives from various stakeholder groups, particularly from local communities in the entire process of formulation and drafting of CMZ Notification, 2008 framework.
 - d. CMZ Notification, 2008 introduces new management methodologies which are open to

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- subjective interpretation and can be used to promote and legalize corporate activities.
- e. CMZ notification, 2008 will promote Special Economic Zones (SEZ) thus opening up the coastal space and resources to industrial sector without considering basic right of the local communities shall be addressed.
 - f. The roles of the local authorities and State Government which are not adequately addressed in the proposed CMZ Notification, 2008 management methodology and structure. The basic right and opportunity for the local communities for their representatives (Panchayat Members) to participate and plan the activities in their local environment and settlement areas appear curtailed in the proposed Integrated Coastal Zone Management Plan process.
 - g. Looking at several amendments and impacts of CRZ Notification, 1991 leading to the dilution of its original objectives, there are apprehensions about the amendments in the case of CMZ Notification, 2008 too and their impacts, especially on the fishers.
 - h. Legislation or an Act on coastal management is needed wherein the coastal ecology and basic rights of the traditional coastal communities are protected. Elected members of the legislative assembly should discuss on the coastal policies to initiate such an act. Till the time a comprehensive legislation on the management of coastal zones is enacted, the CRZ Notification, 1991 without amendments needs to be effectively implemented and violators punished.
 - i. He also emphasized that the new Coastal Management Zone Notification should incorporate education, social mobilization, regulation and community participation.
7. Shri Sarabhai concluded stating that the fisherman on the whole were in the favour of the CRZ Notification, 1991 since, it provided 500 mts of regulated area. Hence, they could visually see 500 mts and accordingly, take necessary steps and he requested permission of Ministry of Environment and Forests for putting the report in public domain.
 8. The Committee also dealt in detail the observations made by the Parliamentary Committee on Science and Technology, Environment & Forests and noted the recommendation which are as follows:-
 - a. Bottom up rather than top down and people's participation in policy formulation.
 - b. Common management plan for the entire coastal area of the country is not a workable proposition. It feels that it should rather be specifically designed for different States keeping in mind the diverse nature of the people and culture. Further, State Governments should have enough participation in ICZM Plan preparation.
 - c. NGOs, fishermen to be included in the National Board for Sustainable Coastal Zone Management.
 - d. Concerns of the poor and marginalized sections of the coastal communities must be reflected and addressed in the Policy.
 - e. Should not make haste in implementing the CMZ notification without addressing the conflict of interests between the stakeholders – mainly the fisher folk/coastal communities.
 - f. *CMZ notification be kept pending/in abeyance till mechanisms/instruments-executive and legislative are put in place for inclusion and integration of coastal communities through participative, decision making and control instruments.*
 9. Ms. Sunita Narain, Director, Centre for Science and Environment while expressing her concern regarding the implementation of CMZ Notification informed the Committee that it would be difficult for the Ministry to regulate the entire municipal area. Hence, she was also of the opinion that the CRZ Notification of 500 mts could be continued with some amendments to incorporate key issues of concern.
 10. Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences welcomed the Ministry's steps for incorporating the aquatic part within the regulations, since the aquatic dynamics plays an important role in determining the coastal environment.
 11. Shri J. M. Mauskar, Additional Secretary said that the CRZ Notification has been well understood by the coastal communities by and large and improvements in the CRZ Notification may be better rather than bringing in a new concept which is still at the experimental stage.
 12. Dr. V. Selvam, Director, Coastal Systems Research, MSSRF, indicated that the fishermen were of the view that, the CMZ Notification would regularize the violation of CRZ Notification, promote development in the coastal areas and the fishermen and their dwelling units would be relocated behind the vulnerability line on the landward side.
 13. After elaborate discussions the following were the important decisions/issues considered by

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the Committee:-

- (i) The CMZ Notification has not been understood by the local communities and many of its scientific terminologies are unclear and may be open to misuse and selective interpretation.
 - (ii) The main thrust of the CMZ Notification is on the vulnerability line which is demarcated based in the four parameters, namely, (i) Tides, (ii) Waves, (iii) Sea level rise due to existing natural factors and the climate change and (iv) Horizontal displacement of shoreline. Based on these parameters the vulnerability line could differ from area to area. Hence, it will be difficult for the communities and the stakeholders to abide by the CMZ regulation until unless the vulnerability line is demarcated on the ground. In the period before the vulnerability line is demarcated there could be a sudden increase in violations and trigger large scale development.
 - (iii) It was agreed that seaward side — the water area up to territorial limit and the tidal influenced water body — need be included in coastal management. As such, regulation may be needed for conserving and protecting the ecologically sensitive areas even in the aquatic zone similar to that of the regulations on the landward side.
 - (iv) Special considerations can be given to Sunderbans as the area is not only ecologically sensitive but is prone for sea level rise and has been extensively damaged during the recent Aila cyclone. The local communities living in Sunderbans have also experienced damage to property and loss of life.
 - (v) The ecologically sensitive areas such as Chilka, Pulikat, Pichawaram, Gulf of Mannar, Vembanad, Coringa, Gulf of Kachchh could also need attention for ensuring better conservation. The Committee agreed to consider in its deliberations the need to declare these areas as Critically Vulnerable Coastal Areas so that management plans could be prepared for conservation and protection.
 - (vi) The work assigned by Ministry to Centre for Environment and Development (CED) for the purpose of management of ecologically sensitive areas and demarcation of their biological boundaries was discussed. The Committee sought for the Report from CED at the earliest.
 - (vii) It was agreed that the coast especially the beaches are facing severe erosion and the shorelines are changing. These could be due to natural or manmade activities such as construction of ports, harbours, groynes, shore protection measures etc. It was also indicated that the Central Government/State Governments propose to construct several ports and harbours all along the shore in the coming years. These could have irreversible adverse impact on the coast if such infrastructures are constructed without scientific studies. It was also discussed that there is a need to study the cumulative impact of the individual projects on the entire coastline. Keeping in view the seriousness of the matter the Committee suggested that the Ministry should study the impacts of such projects and also make policy changes to ensure the damage to the beaches and coastline is mitigated.
 - (viii) For the purpose of protecting the islands of Andaman & Nicobar and Lakshadweep it was thought that a possible approach could be to separate these from the rest of the coastal areas. In this case, a special dispensation de-linking the islands from the CRZ Notification could be considered. This "Island Protection Zone (IPZ)" Notification could be based on the principles mentioned by the Chairman in his opening remarks and put for further discussions. The Committee agreed to discuss this approach in the further meetings.
14. The Committee desired that a chart may be prepared indicating the provision of the CMZ Notification and corresponding provision or changes made in the CMZ Notification, comments received from stakeholders regarding the said provision and how it is proposed to incorporate the comment into the new Coastal Zone Management approach.
 15. The Committee desired that the gist of the Report of CEE who had undertaken consultations with the local communities and NGOs with regard to the CMZ Notification may be put on the Ministry's website.
 - 16.1 Dr. Nalini Bhat, Adviser informed the Committee that there is an Order of Central Information Commission stating that the Ministry shall seek opinion of the public before issue of the draft Notification itself.
 - 16.2 The Committee was of the view that the local communities and the NGOs need be heard. Hence, it was decided that all the fisherman or NGOs who have provided their suggestions

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and objections to the draft CMZ may be invited to the Ministry and the Committee would hear them. For this purpose it was decided to hold the meeting of the fishermen and the NGOs on 11th July, 2009 in the Ministry for full day.

16.3 It was also decided to hold discussions with the Central and State Governments. The Committee agreed to hear the Central and State Government on the afternoon of 7th July, 2009 in Ministry of Environment and Forests.

16.4 Further, the Committee will also hear the Chamber of Commerce, Industry Association etc., on the afternoon of 8th July, 2009 in Ministry of Environment and Forests.

The meeting ended with thanking the Chair.

List of the participants

1. Prof. M. S. Swaminathan, Chairman, M S Swaminathan Research Foundation (MSSRF), 3rd Cross Street, Institutional Area, Taramani, Chennai.
2. Dr. Shailesh Nayak, Secretary, Department of Ocean Development, Mahasagar Bhawan, Block-12, C.G.O. Complex, Lodhi Road, New Delhi-110003.
3. Ms. Sunita Narain, Centre for Science and Environment, 41, Tughlakabad Institutional Area, New Delhi-110062.
4. Shri J. M. Mauskar, Additional Secretary, Ministry of Environment and Forests, New Delhi.
5. Dr. Nalini Bhat, Adviser, Ministry of Environment and Forests, New Delhi
6. Shri Kartikeya Sarabhai, CEE, Ahmedabad.
7. Dr. V. Selvam, Director, Coastal Systems Research, M S Swaminathan Research Foundation (MSSRF), 3rd Cross Street, Taramani Institutional Area, Chennai
8. Shri P. Madeswaran, Director, Department of Ocean Development, Mahasagar Bhawan, Block-12, C.G.O. Complex, Lodhi Road, New Delhi-110003.
9. Dr. A. Senthil Vel, Additional Director, Ministry of Environment and Forests, New Delhi.



Resume of the second meeting of the Expert Committee for finalization of the Coastal Management Zone (CMZ) Notification held under the Chairmanship of Prof. M. S. Swaminathan on 7th July, 2009 in Room No.403, 4th Floor, Ministry of Environment and Forests, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi

1. The second meeting of the Expert Committee for finalizing of the CMZ Notification was held on 7.7.2009 in Ministry of Environment and Forests under the Chairmanship of Prof. M.S. Swaminathan. The second meeting of the Committee was called for to hear the suggestions and objections made by Central and State Governments/agencies to the draft Coastal Management Zone Notification, 2008. List of participants who attended the meeting is Annexed. The compiled version of the comments which were already received from the Central and State Governments were circulated to the Members.
2. The resume of the first meeting was considered and the Members suggested certain changes which were taken note of.
3. The Chairman welcomed the officials of Central Ministries and State Governments/agencies and invited their comments on the draft Coastal Management Zone Notification, 2008.
4. Officials from Nuclear Power Corporation India Limited (NPCIL) indicated that specific provision needs to be made in the Coastal Management Zone Notification providing for all facilities relating to nuclear power generation, atomic mineral mining both in onshore and offshore. It was mentioned that thorium deposits were available on the beaches which needs to be mined mostly by manual method should be permitted in all coastal areas. It was also brought to the notice of the Committee that once the nuclear facilities are installed on the coast, there is no restriction of fishing activities in the coastal waters near the nuclear installations. Further, there is no record of destruction of fisheries due to the discharge of cooling water from the nuclear plant. NPCIL requested that the Department of Atomic Energy (DAE) projects may be treated on par with the defence projects mentioned in the notification. The Integrated Coastal Zone Management Plans of DAE project shall be prepared by DAE and one time approval obtained from Ministry of Environment and Forests.
5. The officials from Ministry of Shipping mentioned to the Committee that ports and harbours to be permitted on par with the green field airports who have been permitted in the CRZ-I areas. It was indicated that the Ministry of Shipping would undertake the Integrated Coastal Zone Management Plan preparation for the port area and seek one time approval of the Plan. The individual projects would be cleared by Ministry of Environment and Forests only if it attracted Environment Impact Assessment Notification, 2006. During discussions, it was mentioned that the ports are not consulted by other project proponents who propose to set up ports and harbours within the close vicinity of the existing port. The Committee observed that such lack of consultation/coordination of the port authorities is serious keeping in view the impact on the coastal areas due to such mega constructions which can cause serious erosion/accretion, loss of habitats, adverse impact on coastal communities etc. In view of the above the Committee reiterated the need for undertaking a comprehensive study along the coastline to assess the impact of such development along the coastal areas.
6. The officials from Town and Country Planning Office, Ministry of Urban Development indicated that the setback line should be done in a time bound manner and the parameters shall include the sea level rise and the local characteristics of the area. He also suggested that a National Board for Sustainable Coastal Zone Management shall include tribal leaders of Andaman & Nicobar Islands and fishermen communities.
7. Officials from Ministry of Agriculture mentioned that the mariculture and aquaculture activities shall be regulated as per the Coastal Aquaculture Act. Further, the National Board for Sustainable Coastal Zone Management shall also include Members from Aquaculture Authority. He also pointed out certain discrepancy in the notification with regard to dredging and construction of fishing harbours and requested for corrections to be carried out.
8. Shri Lalu Bhai Patel, Member of Parliament, Lok Sabha who appeared on behalf of Administration of Daman and Diu indicated that the Daman and Diu has a very small coastal stretch which has sea on one side and several riverlets and creeks in the land areas. The CRZ regulations has affected development in Daman and Diu. He requested the Ministry to consider declaring Daman and Diu as CRZ-II except for the portions declared as CRZ-I, where there are forest areas. He requested for permitting cremation grounds in CRZ areas.
9. Shri Nanda from Government of Gujarat indicated that the setback line demarcation would

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take a long time until such time the vulnerability line is drawn the CMZ Notification cannot be imposed. Hence, there would be a vacuum in the regulations which will lead to violations. He appreciated the move to link the seaward side in the coastal management. He also suggested that the mangroves of all kinds should not be disturbed and peoples involvement should be built-in for promoting conservation of mangroves. He pointed out the discrepancies in the port related activities which are mentioned in Coastal Management Zone-II and also in Coastal Management Zone-III. Further, dredging activity is mentioned in Coastal Management Zone-III, separately which needs to be corrected. He indicated that for the purpose of clearance of project in coastal areas about four clearances from various agencies are required, which is extremely time consuming. He requested for a single window streamlined process for clearance.

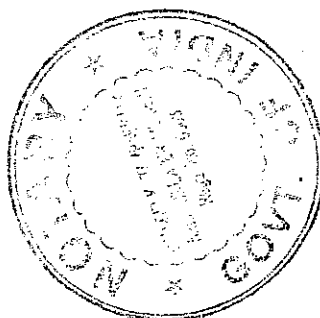
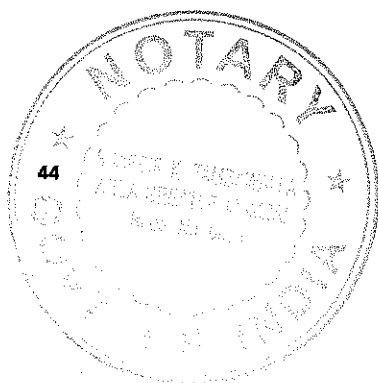
10. The official from Karnataka also indicated his apprehension towards demarcation of the vulnerability line in a specific time. He requested for including Members of Maritime States in the National Board and to give more powers to the Coastal Zone Management Authorities for according clearance to plans and coastal projects. With regard to the population density criteria for determining the areas as Coastal Management Zone-II, he suggested that the recent census of 2000 may be considered. With regard to the clearance process he suggested a single window mechanism for clearance.
 11. Shri Anna Malai from Government of Tamil Nadu mentioned that the Chief Minister, Tamil Nadu has written a letter seeking further extension of time for obtaining suggestions and objections from the people on the notification and also to provide Tamil version of the notification to the Government. He suggested that the freezing of development on the landward side of the vulnerability line will have an adverse impact on cities development. Further, he also suggested that the forest related activities, not to be subjected to clearance.
 12. Shri G. S. Gill from CIDCO suggested that Metropolitan cities like Mumbai should be provided a special status and developmental regulations in such metropolitan cities should be left to local town planning authorities. Any freezing of development would have adverse impact on the development of such cities as there is no means to control the rural migration of people to cities. The mangroves in the holding ponds should be permitted to be removed by dredging in order to maintain a suitable holding capacity during flooding conditions. Shri Gill dealt in detail the issues relating to housing in Mumbai and indicated that large population lives in slums and dilapidated houses. In order to provide them a secured decent living condition as per National Policy for Housing and Settlement a Floor Space Index, which is economically viable should be provided. There shall not be any freezing of Floor Space Index on the seaward or landward of the vulnerability line and shall be as per DCR Rules. He also suggested that there should be clear guideline for demarcating the vulnerability line and a single agency to be assigned for the work so that there are no disputes at a later stage. The data pertaining to vulnerability line shall be provided in the digital form or on a large scale map by Ministry of Environment and Forests.
 13. The Chairman after hearing the officials assured them that the comments provided by the officials would be duly considered.
- The meeting ended with thanking the Chair.



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List of participants (7.7.2009)

1. Prof. M. S. Swaminathan, Chairman, M S Swaminathan Research Foundation MSSRF, 3rd Cross Street, Institutional Area, Taramani, Chennai.
2. Dr. Shailesh Nayak, Secretary, Department of Ocean Development, Mahasagar Bhawan, Block-12, C.G.O. Complex, Lodhi Road, New Delhi-110003.
3. Ms. Sunita Narain, Centre for Science and Environment, 41, Tughlakabad Institutional Area, New Delhi-110062.
4. Shri J. M. Mauskar, Additional Secretary, Ministry of Environment and Forests, New Delhi.
5. Dr. Naini Bhat, Adviser, Ministry of Environment and Forests, New Delhi.
6. Dr. A. Senthil Vel, Additional Director, Ministry of Environment and Forests, New Delhi.
7. Dr. Jitendra Singh, NPCIL, Mumbai.
8. Shri A. B. Awati, Scientific Officer-G, Deptt. Of Atomic Energy, Strategic Planning Group, Anushakti Bhavan, C.S.M. Marg, Mumbai-400001.
9. Shri C. B. Jain, Project Director (JNPB), Nuclear Power Corporation of India Limited, 2, ENT Block, Nub, Anushakti Nagar, Mumbai.
10. Capt. Subash Kumar, Chairman, Chennai Port Trust, Chennai. Tamil Nadu.
11. Ms. Geetu Joshi, Deputy Secretary (Port Development), Ministry of Shipping.
12. Shri G. P. Raj, Manager-I (PPD), Jawaharlal Nehru Port Trust, Admn Bldg, Sheva, Tal. Uran, Navi Mumbai-400 707.
13. Shri Udit Ratna, Town & Country Planner, Town and Country Planning Organisation, E-Block, Vikas Bhawan, IP Estate, New Delhi-2.
14. Shri Satheesh Kumar P.M., Senior Engineer, Civil, Cochin Port Trust.
15. Shri P. Madeshwaran, Scientist-F, Ministry of Earth Sciences, New Delhi.
16. Shri Shanker L., Deputy Commissioner (Fishing Harbour), Ministry of Agriculture, Department of Animal Husbandry, Dairying & Fisheries, Krishi Bhavan, New Delhi.
17. Dr. R. Annamalai, Director, Environment Department, Panagal Buildings, Saidapet, Chennai, Tamil Nadu.
18. Shri Kanwer Pal, Secretary (Ecology and Environment), Government of Karnataka, Bangalore.
19. Ms. Uma Adusumilli, Chief, Planning Division, MMRDA, Mumbai.
20. Shri S. K. Nanda, Principal Secretary, Gujarat.
21. Shri Lalu Bhai Patel, Daman and Diu, Member of Parliament, Lok Sabha.
22. Shri G. S. Gill, Vice CMD, CIDCO, Nariman Point, Mumbai.



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Resume of the third meeting of the Expert Committee for finalization of the Coastal Management Zone (CMZ) Notification held under the Chairmanship of Prof. M. S. Swaminathan on 8th July, 2009 in Room No.402, 4th Floor, Ministry of Environment and Forests, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi

1. The third meeting of the Expert Committee for finalizing of the CMZ Notification was held on 8.7.2009 in Ministry of Environment and Forests under the Chairmanship of Prof. M.S. Swaminathan. For the third meeting the Chamber of Commerce, Industry Association etc., were invited. List of participants who attended the meeting is Annexed.
 2. The resume of the first meeting held on 27.6.2009 was circulated alongwith the draft notification on Island Protection Zone (IPZ).
 3. The Chairman welcomed the Members of the Association and invited their comments on the draft Coastal Management Zone Notification, 2008 one by one.
 4. The Member from CREDAI, Tamil Nadu suggested that the demarcation of the vulnerability line should be left to the local body. Further, in the Coastal Management Zone Notification there is no explicit mention of housing. Hence, the same should be incorporated. He sought clarity with regard to the criteria of 400 persons per square km for declaring as Coastal Management Zone-II.
 5. The Member from Kerala Builder Association mentioned that the backwater areas in Kerala should be treated separately, since, the area along the backwaters are more than the seashore in Kerala and such backwaters areas are thickly populated. He requested the Ministry to suggest the guidelines for demarcating the setback line and leave it to the local bodies for implementing.
 6. The Members from CREDAI, Mumbai indicated that in Mumbai more than 60% of people live in slums and about 16,000 old buildings are located in the CRZ area. These old buildings are crumbling and several deaths have occurred over a period of time. In order to provide a decent housing for the slum dwellers and for the people in the old buildings a higher Floor Space Index is required to make it viable. Hence, they requested the Ministry to consider providing higher FSI as provided in the DCR Rules.
 7. The Member from Remaking of Mumbai reiterated the same issues as mentioned by CREDAI, Mumbai. While, highlighting the housing conditions of Mumbai, he requested the Ministry to permit higher FSI in all developed areas and subject to the condition that the environmental issues are taken into consideration in the byelaws.
 8. The Member from ACE Links also suggested the same as above and appreciated the Coastal Management Zone Notification as it provides for zonal planning.
 9. The Members for Alkani Manufactures Association and Tata Chemicals indicated that the existing units of caustic soda, salt manufacturing units and other products which use seawater as raw material shall not be disturbed. They also requested for permitting expansion and modernization of such units in the CRZ area. The Member from Tata Chemicals suggested that the Coastal Management Zone Notification is a way forward for integrating the social and livelihood issues in the zonal plan. The Ministry could stipulate conditions on the units operating in the area to have social responsibility as a part of their project.
 10. The Member from Ganesh Benzoplast suggested that storage of all products should be permitted in the coastal areas to be stored and handled.
 11. The Chairman after hearing the officials assured them that the comments provided by the officials would be duly considered and action taken.
- The meeting ended with thanking the Chair.



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List of Participants (8.7.2009)

1. Prof. M. S. Swaminathan, Chairman, M S Swaminathan Research Foundation MSSRF, 3rd Cross Street, Institutional Area, Taramani, Chennai.
2. Dr. Shailesh Nayak, Secretary, Department of Ocean Development, Mahasagar Bhawan, Block-12, C.G.O. Complex, Lodhi Road, New Delhi-110003.
3. Ms. Sunita Narain, Centre for Science and Environment, 41, Tughlakabad Institutional Area, New Delhi-110062.
4. Shri J. M. Mauskar, Additional Secretary, Ministry of Environment and Forests, New Delhi.
5. Dr. Naini Bhat, Adviser, Ministry of Environment and Forests, New Delhi
6. Shri P. Madeswarn, Director, Department of Ocean Development, Ministry of Earth Sciences, New Delhi.
7. Dr. A. Senthil Vel, Additional Director, Ministry of Environment and Forests, New Delhi.
8. M/s Ace Links, 1401, Continental Tower, Sherry Rajan Road, Rizvi Complex, Bandra (W), Mumbai-400050.
9. Shri Amit Ranjan, Mahindra Holidays, 873/4, Neetaji Subhas Place, Pitampura, New Delhi.
10. Dr. Y. R. Singh, Executive Director, AMAI.
11. Dr. Arup Basu, Tata Chemicals Limited, Andheri - Kurla road, Andheri-(E), Mumbai-400059.
12. Shri Ramesh Pilani Rodriguez, M/s Ganesh Benzo Plast, Marine Limes, Mumbai.
13. Shri Thankachan Thomas, Kerala Builders Forum, Kochin.
14. Shri Prakash Challa, Vice President, CREDAI, Chennai.
15. Shri G. P. Savlani, Resident Director CREDAI, 105, Ansal Bahwan, 16, K. G. Marg, New Delhi-1.
16. The General Manager (Real Estates), Avarsekar & Sons Pvt. Ltd., 1252, Pushpanjail Apts., First Floor, Old Prabhadevi Road, Prabhadevi, Mumbai - 400 025.
17. The Chairman & Managing Director, Unity Reality and Developers Ltd., K.K. Tower, Ground Floor, Parel Tank Road, Off. G. D. Ambedkar Marg., Parel, Mumbai - 400 012.
18. The Chairman & Managing Director, Lok Housing and Constructions Ltd., Lok Bhevan, Ground Floor, Lok Bharti Complex, Marol Maroshi Road, Marol, Andheri (E), Mumbai - 400 059.
19. Federation of Association of Maharashtra, Mumbai.
20. Remaking of Mumbai Federation, 18, Moti Building.
21. Shri D. D. Lavenia, Unity Infras Projects Limited, Mandoli Prison Complex, Harshvihar Delhi-93.
22. Shri K. K. Sharma, Mangalore Chemicals & Fertilizers Limited, 1002, Bhikaji Cama Bhawan, New Delhi-66.
23. Ms. Nidhi Ladha, CII, Thapar House, 2nd Floor, 124, Janpath, New Delhi-1.

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Resume of the fourth meeting of the Expert Committee for finalization of the Coastal Management Zone (CMZ) Notification held under the Chairmanship of Prof. M. S. Swaminathan on 11th July, 2009 in Room No.403, 4th Floor, Ministry of Environment and Forests, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi

1. The fourth meeting of the Expert Committee for finalizing of the CMZ Notification was held on 11.7.2009 in Ministry of Environment and Forests under the Chairmanship of Prof. M.S. Swaminathan. For the fourth meeting the fishermen and fishermen associations were invited. List of participants who attended the meeting is Annexed.
2. The Chairman welcomed the Members of the Association and invited their comments on the draft Coastal Management Zone Notification, 2008 one by one.
3. Ms. K. Hemalata, General Secretary, All India Fishers & Fisheries Workers' Federation mentioned that if the CMZ Notification is finalized thousands of fishers would be displaced and their livelihood affected. Large industrial development, thermal powers, ports etc., would be constructed in the coastal areas which will affect the fishermen. She emphasize that the CRZ Notification prohibits activities and imposes regulation on development, while, the Coastal Management Zone Notification allow setting up of industries, resorts, green filed airports etc. The Federation has requested for a detailed and wide spread consultations before finalizing any notification. She also mentioned that developmental activity in the coastal areas should be permitted only after the approval of the Gram Sabhas and the elected local bodies. Trade union representing fishers should be included in the National Board.
4. Shri Mahesh Pandya, Paryavaran Mitra, Ahmedabad agreed to the comments of Ms. K. Hemalata and brought to the notice of the Committee regarding the violations in Gujarat especially at Muodra. He informed the Committee that large scale destruction of mangroves are taking place in the Mundra Region for developing SEZ. Inspite of several representations, the Authorities have not taken any action so far and the SEZ is in progress.
5. Mr. Mangera, Chairman, Juhu Narayan, Juhu Muragaon, Mumbai brought to the notice of the Committee the hardship faced by the fishing communities living in the Mumbai area. He informed that in the name of slum redevelopment State Government gives away the land of the fishermen community to the builders with a assurance that the fishermen community would get a decent dwelling unit, but this has not happened. The fishermen communities who occupy the prime land in Mumbai are displaced and their land sold at premium price to the developers. They also showed pictures of illegally constructed building in the fishing, village in Versova against which they are fighting a legal battle for several years. They requested the Committee to address the issues of the fishing community and to provide them the rights and ensure that their livelihood is not affected. They also informed that if permitted they would construct their own houses but would require a higher Floor Space Index to meet for the growing family needs.
6. Shri Ravindra D. Bhosele, Pune informed that he was unable to attend the meeting on 8.7.2009 which was ment for hearing the developers. He requested the Committee to permit tourism projects which are located on the elevated areas of coast.
7. Shri T. S. Pewar, President, MHADA, Mumbai inform the Committee that about 10,000 people from economically weaker section which have been allotted land in Mumbai are unable to undertake construction since, these plots fall in the bnffer area of the mangroves. He requested the Committee to coosider their views and amend the notification accordingly.
8. The Representative from the Green Peace agreed with the comments made by the above Representatives.

The meeting ended with thanking the Chair.

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■ EXPERT COMMITTEE ON COASTAL ZONE JULY 2009

List of the participants (11.7.2009)

1. Prof. M. S. Swaminathan, Chairman, M S Swaminathan Research Foundation MSSRF, 3rd Cross Street, Institutional Area, Taramani, Chennai.
2. Dr. Shailesh Nayak, Secretary, Department of Ocean Development, Mahasagar Bhawan, Block-12, C.G.O. Complex, Lodhi Road, New Delhi-110003.
3. Ms. Snnita Narain, Centre for Science and Environment, 41, Tughlakabad Institutional Area, New Delhi-110062.
4. Shri J. M. Mauskar, Additional Secretary, Ministry of Environment and Forests, New Delhi.
5. Dr. Naini Bhat, Adviser, Ministry of Environment and Forests, New Delhi
6. Dr. V. Selvam, Director, Coastal Systems Research, M S Swaminathan Research Foundation (MSSRF), 3rd Cross Street, Taramani Institutional Area, Chennai
7. Shri P. Madeswari, Director, Department of Ocean Development, Ministry of Earth Sciences, New Delhi.
8. Dr. A. Senthil Vel, Additional Director, Ministry of Environment and Forests, New Delhi.
9. Advocate Laxman Narayan, Bedetar, R No.B107^{1/2}, Shastrinagar, Pratiksha Nagar, Sion (E), Mumbai. Mobile:09221004093. [(a) Friends of Society – NGO (b) National Association of Fishermen and (c) Koli Makasangh, Mumbai].
10. Ms. K. Hemalata, General Secretary, All India Fishers & Fisheries Workers' Federation, BT Ranadive Bhawan, 13-A, Rouse Avenue, New Delhi. Mobile:9868280410.
11. Shri Mahesh Pandya, Paryavaran Mitra, 502, Raj Avenue, Thaltej, Ahmedabad-380059. Ph:079-26851801 / 26851321. e-mail: paryavaranmitra@yahoo.com
12. Mr. Mangera, Chairman, Juhu Narayan, Juhu Moragaon, R.R.M. road, Juhu, Mumbai-400049. Mobile:09869019325 / 09892461567.
13. Shri Sanjiv Gopal, 60, Richmond, Lawn, Bangalore-25.
14. Shri Rahul N. Pardesh, 71B Ratnasat Society, New D. N. Nagar, Link Road, Andheri (W), Mumbai-53, Mobile: 09869039310 / 09221237869.
15. Shri Ravindra D. Bhosale, "Shruti Vill", Yamuna Nagar Higadi, S. No.21, Plot No.100, Pradhikam, Pune-411044. Mobile:9881636558.
16. Shri T. S. Pawar, President, MHADA, Bhukhand, Mumbai. 09892782408.

TRUE COPY
Zaman Ali
Advocate, High Court



True Copy
Advocate

ANNEXURE A-7 451

BY SPEED POST

F. No. 20-33/2015-IA.III
Government of India
Ministry of Environment, Forest and Climate Change
(IA.III Section)

Indira Paryavaran Bhawan, Jor Bagh Road, Aliganj
New Delhi-110 003
Telefax: 011-2469 5324

Date: - 15th June, 2016

To,

Ms. Kanchi Kohli,
Centre for Policy Research
Dharma Marg, Chanakya Puri
New Delhi - 1100 21

Subject: Information sought under the RTI Act, 2005-Application No.
MOENF/R/2015/61183 dated 09.11.2015-reg.

Madam,

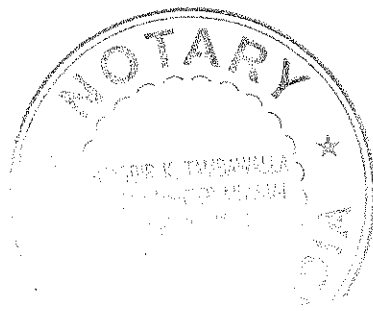
This has reference to order dated 13th May, 2016 of Central Information of Commission passed in Appeal No. CIC/SA/A/2016/000209.

2. In compliance to the above direction of Hon'ble CIC, the information comprising of a copy of report of the Committee headed by Shri Shailesh Nayak, copies of file noting, correspondences, etc. (300 pages) are provided free of cost. In respect of latest action taken on the report, it is informed that no decision on the report has been taken by the Ministry till date.

Yours faithfully,

Encls: - As above (300 pages)

(Shard)
CPIO (IA-CRZ)



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File No.18-1/2014-SICOM

Society of Integrated Coastal Management
(Ministry of Environment & Forest)

Sub: Constitution of Committee to review the issues relating to the Coastal Regulation Zone Notification, 2011- reg.

Discussed with PPS &
Sgt. Earth Science office today.
Jury is reviewing on
25/6/14 to Govt.
Shankar has accepted with the
letter.

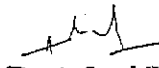
FR is the Office Memorandum constituting the six-member Committee to examine the Coastal Regulation Zone issues in Maharashtra, Karnataka and Kerala. The matter was discussed with Secretary, Ministry of Earth Sciences who is the Chairman of the Committee on 1st July, 2014 after his return from abroad. He suggested that the first meeting could be held on 8th July, 2014 in Mumbai. Accordingly, the undersigned spoke to Shri Rajiv, Principal Secretary, Environment Department, Government of Maharashtra, who agreed to organize the meeting and also provide accommodation and transport to the Members. Accordingly, a letter is being issued to the Members and Government of Maharashtra.

2. IFD's approval is sought for travel and sitting fee as follows:-

- (i) Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences : Delhi - Mumbai - Delhi
- (ii) Shri Sashi Shekhar, Additional Secretary : Delhi - Mumbai - Delhi
- (iii) Prof. R. Ramesh, Director, National Centre for Sustainable Coastal Management : Chennai - Mumbai - Chennai
- (iv) Dr. M. Baba, Former Executive Director, Former Member, NCZMA : Trivendrum - Mumbai - Trivendrum (with sitting fee as per norms as he is a non-official member)
- (v) Shri Hardik Shah, Member Secretary, Gujarat Coastal Zone Management Authority : Ahmedabad - Mumbai - Ahmedabad
- (vi) Dr. A. Senthil Vel, Additional Project Director, Society of Integrated Coastal Management : Delhi - Bombay - Delhi

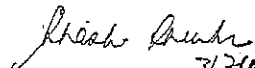
3. Shri Amardeep Raju, Joint Director, IA-III Division may assist the Committee and coordinate with IFD. If approved, Shri Amardeep Raju may travel with the Committee and his travel programme Delhi- Mumbai - Delhi may be approved.

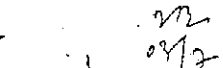
Submitted for consideration and approval please.


(Dr. A. Senthil Vel)
Additional Project Director
2.7.2014

AS (SS)

May kindly see for approval.

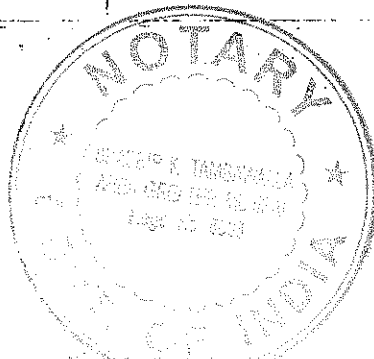

3/7/14


4/7/14

ADD SICOM

Office of Secretary (E&F)
Dy. No. 98
Date 3/7/14

Informing
P. A. Senthil Vel
25/6/14
PPS, MEFCE



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:2:

In page

May kindly see notes at pre-page regarding the Committee to review the Coastal Regulation Zone issues of Maharashtra, Karnataka and Kerala. The first meeting was held in Mumbai on 8th July, 2014 (draft minute of the first meeting is at F/A). As per the e-mail from the Chairman (F/X), the second and third meeting is proposed to be held on 21st and 22nd August, 2014 in Bangalore and Thiruvananthapuram, respectively. The travel programme of the Members is as follows:-

- (i) Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences : Delhi - Bangalore - Trivendrum - Delhi
- (ii) Shri Shashi Shekhar, Additional Secretary : Delhi (20.8.2014) - Bangalore (22.8.2014) [AI-263] - Trivendrum (23.8.2014) - Delhi
- (iii) Prof. R. Ramesh, Director, National Centre for Sustainable Coastal Management : Chennai - Bangalore - Trivendrum - Chennai
- (iv) Dr. M. Baba, Former Executive Director, Former Member, NCZMA : Trivendrum - Bangalore - Trivendrum (with sitting fee as per norms as he is a non-official member)
- (v) Shri Hardik Shah, Member Secretary, Gujarat Coastal Zone Management Authority : Ahmedabad - Bangalore - Trivendrum - Ahmedabad
- (vi) Dr. A. Senthil Vel, Additional Project Director, Society of Integrated Coastal Management : Delhi (20.8.2014) - Bangalore (22.8.2014) [AI-263] - Trivendrum (23.8.2014) - Delhi
- (vii) Dr. Amardeep Raju, Joint Director, Ministry of Environment and Forests : Delhi (20.8.2014) - Bangalore (22.8.2014) [AI-263] - Trivendrum (23.8.2014) - Delhi

2. Accordingly, letters are being issued to Government of Karnataka and Government of Kerala (F/B & F/C).

3. Approval of Secretary (E&F) and IFD is sought for travel programme of para 1(ii) to (vii).

Submitted please.

(Dr. A. Senthil Vel)
Additional Project Director, SICOM
28.7.2014

AS(SST)

A.B. may kindly be approved

Shash Shekhar
28/7

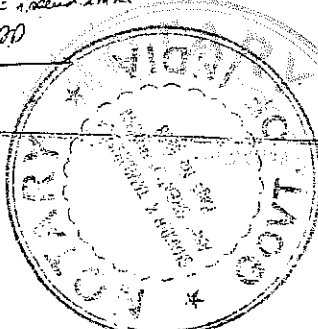
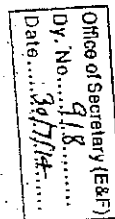
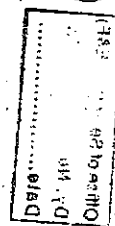
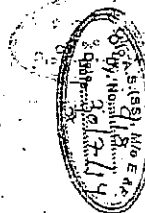
AS(SST)

28/7
11/8

B.T. AD

Pl. obtain IPO's approval and get the air travel book for Mr. Baba.
Pl. get the bill issued soon.
Dr. Raja RD

(2)

306/Adm/14
11/8/141282/ASD/ASD/14
28/7/2014
1/8288/Adm/14
1/8/2014

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Notes on pre-page refer:

This is with reference to OM dated June 17, 2014 regarding 'Constitution of Committee to review the issues relating to Coastal Regulation Zone Notification, 2011. Copy of the OM is placed at F/X

2.0 Earlier, Secretary (E&F) had approved the Travel plan for all the members of the Committee to Mumbai and sitting fee for Dr. M. Baba, Former Executive Director, Former Member, NCZMA (1/N)

3.0 It may be mentioned that the second and the third meeting of the review Committee is proposed to be held on 21st and 22nd August, 2014 in Bangalore and Thiruvananthapuram respectively.

Secretary (E&F) has already approved the travel plan for all the members of the Committee to Bangalore and Thiruvananthapuram and sitting fee for Dr. M. Baba, Former Executive Director, Former Member, NCZMA (2/N)

4.0 In view of the forgoing we may send the file to IFD for the post-facto approval for the travel plan for all the members of the Committee to Mumbai and reimbursement of sitting fee for Dr. M. Baba (Rs. 3000/-) (as per 1/N) for the 1st Meeting held on 8th July, 2014. We may also request IFD to approve the travel plan for proposed second meeting scheduled to be held on 21st and 22nd August, 2014 for all the members of the Committee to Bangalore and Thiruvananthapuram and reimbursement of sitting fee for Dr. M. Baba as scheduled on 2/N

Submitted please

(Amardeep Raju)
Deputy Director
August 4, 2014

Dir(SV)

4/8/14

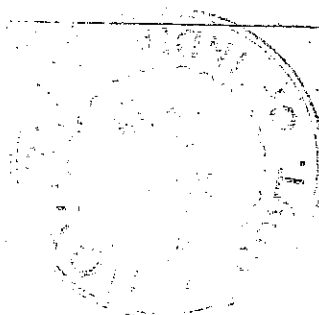
Dir(IFD)

4/8/14

SOCIAL

315/Adm/113
04/08/14

Office of Dir. (IFD)
Dy. No. 418/14
Date 4/8/14



8

455

(5)



4
IFD

Ref. notes on pre-page

2. This is regarding PD seeking ex-post-facto approval for the travel plan of the members of the Committee constituted to review the issues relating to the Coastal Regulation Zone Notification, 2011 for the visit under taken in connection with the meeting held on 8th July, 2014 at Mumbai and travel plan for the 2nd meeting scheduled to be held on 21st and 22nd August, 2014 in respect of all the members of the Committee to Bangalore and Thiruvananthapuram and also sought the concurrence for the payment of sitting fee of Rs.3000/- to Dr. M. Baba, a non-official member of the Committee.

3. In this regard, IFD's initial observations are as under:

- i) It is not known whether the IFD's concurrence was obtained before constitution of the Committee and submitted the necessary checklist in the prescribed proforma for fixing the quantum of sitting fee to non-official members. If so, a copy of concurrence of IFD may please be placed on file.
- ii) The relevant OM dt. 17th June, 2014 regarding constitution of the Committee is silent about the payment of sitting fee to non-official members of the Committee.
- iii) PD has not mentioned the amount, at least tentative amount for which the concurrence of IFD is required for the payment of TA/DA to non-official members of the Committee in respect of meeting already held on 8th July, 2014 and also for the proposed meeting to be held on 21st & 22nd August, 2014.

4. Submitted please.

DIR(IFD)

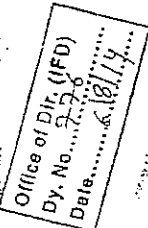
6/8/14

Dir (SV)

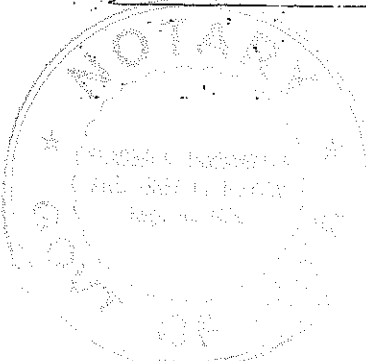
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May kindly see notes at page 1/N onwards regarding the constitution of the six-member committee to review issues relating to Coastal Regulation Zone (CRZ) Notification, 2011 under the chairmanship of Dr. Shailesh Nayak, Secretary, MoES. The tenure of the above Committee was upto 17th September, 2014. The Committee has had three meetings in Mumbai, Bangalore and Thiruvananthapuram and had deliberations with the concerned State Governments with regard to the CRZ Notification, 2011. In the meantime, representations have also been received from Government of Gujarat, certain fishermen associations, industry association, etc., seeking hearing by the Committee. The Committee may desire to look into these issues and also visit certain other States as well.

2. In view of the above, the tenure of the Committee may be extended for another two months i.e., from 17th September, 2014 to 17th November, 2014. All other conditions laid down in the Office Order shall remain unchanged.

Submitted for consideration and approval please.

(Dr. A. Senthil Vel)
Member Secretary, CRZ Committee &
Additional Project Director
30.9.2014

AS(SS) & NPD

A may kindly be approved

Dr. A. Senthil Vel
30/9/14

Minister
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2/10

AS(SS) *h*
7/10

ADD

533/Adm/14

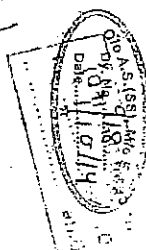
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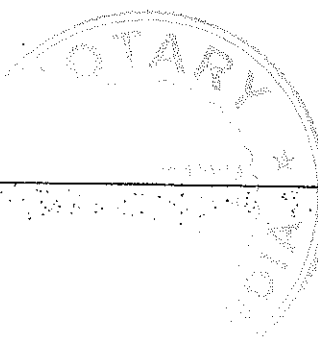
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May kindly see approval of Hon'ble MEF with regard to the extension of the tenure of the Committee on Coastal Regulation Zone upto 17th November, 2014. Accordingly, an Office Order may be issued from IA-III Division after obtaining IFD's approval. Since, Shri Amardeep Raju, Joint Director has been transferred, Shri E. Thirunavukkarasu, Joint Director (IA-III Division) may assist the Committee. Page 1/N may be seen in this regard.

557/Adm-14
08/10/14

Submitted please.

[Signature]
(Dr. A. Senthil Vel)
Additional Project Director
8.10.2014

557/Adm-14
08/10/2014

Director (A.K)

JD (ET) *[Signature]*
9/10

557/Adm-14
10/10/14

This relates to extension of tenure of the Expert Committee constituted vide Lr. no. 19-112/13-IA-III dt 12/06/14; from 17th Sep. 2014 to 17th Nov, 2014. MEFBCC has approved the same. Submitted for IFD concurrence please.

557/Adm-14
17/10/14

Office of Dir. (IFD)
Dy. No. 1568
Date 13/10/14

Dir (IFD) *[Signature]*
13/10/14

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13/10/14
JD IA-III
R.D. 409
Agmt.

Secy (IA) IFD.

Ref. notes above.

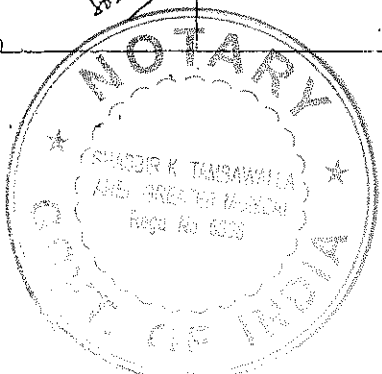
PD may be requested to link the file in which the IFD's initial Concurrence was obtained while constituting the Committee.

Submitted pl.

[Signature]
17/10/2014

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Dir (IFD) *[Signature]*
17/10/14
JD (ET)



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In power -

7:

May kindly see notes at pre-page regarding the constitution of the Committee to look into the issue relating to Coastal Regulation Zone (CRZ) Notification, 2011. The Hon'ble MEF has approved the extension of the Committee upto 17th November, 2014.

File created for
BOP & survey
extension 2
(31/10/14)

2. The presentation on the CRZ matter was made to Hon'ble MEF on 5th November, 2014 in which SS(SS) was also present. All issues relating to CRZ was discussed in detail. It was informed to the Hon'ble Minister that some of the issues of various States such as housing fishing, and most important conservation and protection of Ecological Sensitive Areas are being examined in detail by the Committee.

676/Adm/14
13/11/14
17/11/14

3. In this context, it was requested that some more time would be required for completion of the report. It was agreed in the meeting that the extension of the Committee would be 20th December, 2014. As agreed earlier all expenditures towards the Committee shall be borne by the SICOM under the ICZM Project.

1996/APD(BSD)/14
13/11/2014

Submitted for consideration and approval please.

(Dr. A. Senthil Ven)
Additional Project Director
13.11.2014

JS(SS)

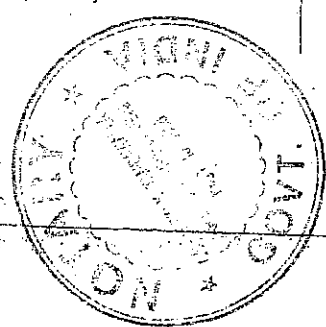
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AD/ASU

Report issued after study IFOG approved

AD/Thiruv

13/11/14



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Government of India
Ministry of Environment, Forests & Climate Change
(IA-III Section)

This relates to extension of the committee constituted to review the issues relating to the Coastal Regulation Zone Notifications, 2011.

The tenure of the committee was earlier extended till 20th December, 2014 vide pg. 7/N. It is learnt that report of the committee will be submitted in a week time, therefore, the tenure of the committee may be extended till 25th January, 2015.

Submitted for consideration and approval please.

35/34(E)
16/1/15

C. DIRECTOR
14/2/15

MOS (IC) EF & CC
File Dy. No. 1009
Date 19 JAN 2015

C. J. S. (BS)
Dy. No. 95
Date 16/1/15

C. J. S. (BS)
Dy. No. 95
Date 17/1/15

(E. Thirunavukkarasu)
(Joint Director)

Dir (MH)

JS (BS)

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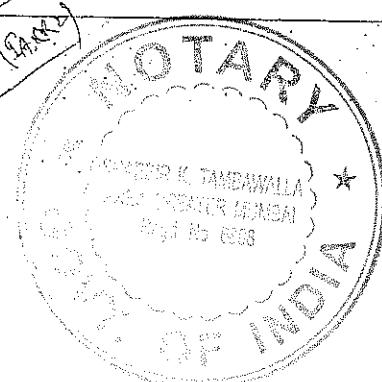
PS to Minister

Office of Secretary (E&F)
Oy. No. 151
Date 27/2/2015

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Sub: Report of the Committee constituted to review the issues relating to CRZ Notification, 2011

MoEF (now re-designated as MoEFCC) vide office order No. 19-112/2013-IA-III dated 17 June 2014 constituted a Six Member Committee to examine the issues of coastal States / UT Governments relating to CRZ Notification, 2011, and to examine the errors or inconsistencies; and suggest procedural simplification in the said Notification. The Committee comprised Dr. Shailesh Nayak, Secretary, Ministry of Earth Science – Chairman; Shri Shashi Shekhar, Additional Secretary, MoEF&CC; Prof. R. Ramesh, Director, NCSCM; Dr. M. Baba, Former Director, CESS; Shri Hardik Shah, Member Secretary, Gujarat CZMA; and Dr. A. Senthil Vel, Additional Project Director, SICOM.

II. The prescribed Terms of Reference (ToR) of the Committee included:

- a) examination of issues raised by various coastal State Governments which inter-alia included Maharashtra vide State Government letters dated 27.08.2013 and 23.12.2013; Karnataka vide State Government letters dated 16.08.2013, 28.02.2014 and 18.02.2014; Kerala vide State Government letter dated 10.02.2014;
- b) examination of errors/inconsistencies in the CRZ Notification, 2011 and procedural simplification; and
- c) examination of any other issues raised by the State Government(s) during their interaction with the Committee.

The Committee was empowered to interact with the State/ UT Governments, if deemed necessary.

The Committee interacted with State Governments of Maharashtra, Karnataka, Kerala in respective State Capitals; and an interactive session with other coastal States / UTs including West Bengal, Odisha, Tamilnadu, Goa, Gujarat, Andhra Pradesh, Puducherry and Daman & Diu was held in Delhi.

III. The Committee submitted the Report on 19/01/2015

Six basic principles have been considered and adopted by the Committee in formulation of the Report. These include conservation of ecologically sensitive areas such as coastal geo-morphology & archaeological and heritage sites; integration of development needs in coastline preservation; delineation and demarcation of authority vested with local bodies vis-a-vis coastal conservation rules; application of space technology for management of coastal and marine environment; issues related to capacity building in coastal zone management and issues related to Climate Change. These basic principles have underpinned the formulation of Report and have been elaborately addressed by the Committee after having examined and analyzed the view points of State and UT Governments. The Committee has noted the ever growing demand for addressing human issues in terms of housing necessities in coastal urban areas including that of slum rehabilitation, redevelopment of

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- 4 -

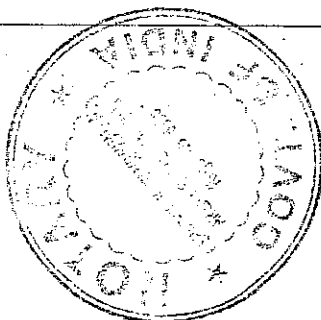
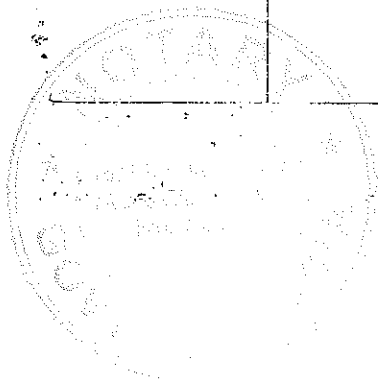
dilapidated buildings, housing for fishermen folk; haphazard growth along coastlines coupled with serious marine discharge of solid and liquid wastes; near absence of planned infrastructure; conflicting and overlapping provisions of CRZ Notification, 2011 with overriding effect on lawful authority of local Governments to frame town and country planning regulations; ambiguous and dilatory demarcation of CRZ limits; lack of professional management in coastal zone regulations and others. In having noted these concerns, the Committee has explicitly emphasised for delineated focus of coastal zone management towards protection and conservation of ecologically sensitive areas which are extremely important for bio-diversity conservation – marine and terrestrial, and maintenance of wholeness of functional integrity of the coast in the larger perspective of reduction of vulnerability of coastal communities to natural disasters and that of maritime livelihood, trade and tourism with overall coast functioning as carbon sink. The policy recommendations accordingly aim at Government emphasizing consolidation for mechanism, infrastructure and institution building to conserve coastal eco system. The mainstreaming of traditional fishermen communities into modern development structure has been recommended by the Committee through enabling mechanism to be prescribed for expanded economic infrastructure along the coastline including that of tourism and others.

IV. Urbanization on coast has been noted as a natural phenomenon by the Committee as it offers connectivity and hinterland for trade and industry including that for trans-boundary movement. Major Indian coastal cities have dilapidated urban infrastructure in terms of housing and city civic amenities. Unassuming and overriding provisions of CRZ Regulations, as per the findings of the Committee have contributed to the pathetic state of affairs by way of intrusion into the powers of local municipal authorities. The consequential haphazard growth on the coastline has ramifications in terms of astronomical pollution through industrial, institutional and residential waste and sewerage disposal in the marine environment. That coastal urbanization would grow further along with the country's development march, right alignment of CRZ Regulation is called for to allow city-specific pollution management tools in the direction of environmentally sound pollution mitigation measures for solid and liquid waste. Simultaneously, the Committee has noted the anthropogenic activities in shoreline changes which is outcome of growing size of economy but there is a noted necessity for putting in place remedial measures as well.

V. The Committee in having considered the views of the State/ UT Governments; and in the perspective of emerging scientific technologies in the field of coastal and marine management, has recommended that the MoEF&CC should embark upon new initiatives for protecting and conserving the coastal and marine areas, which are endowed with rich but fragile ecosystems. While taking up conservation and management of ecosystems, the Government should identify/ assess development of technologies/ infrastructure having minimum impact on the coastal and marine environment to the economic aspirations of the growing population of the country. The Committee in having examined the gamut of the issues raised by the coastal States/ UTs and in line with the above elaborative scientific analysis has proposed a revised CRZ Notification to be superseded replacing the existing CRZ Notification, 2011.

VI. Specific issues indicated by the State/UT Governments

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(a) Maharashtra

- (i) Loss of buildable land due to demarcation of the HTL based on CRZ Notification, 2011- This is a specific problem in Navi Mumbai where because of ingress of creek water into land area subsequent to destruction of bunds, the HTL has shifted landward side. Simultaneously, there is expansion of mangroves in these parcels of land. CIDCO has acquired most of these lands. HC, Mumbai has restrained on destruction of mangroves.
- (ii) Issues relating to slum redevelopment by SRA and redevelopment of dilapidated, cessed and unsafe building - The problem pertains to existing provision of CRZ Notification which stipulates joint venture for rehabilitation projects at a specific stakeholding discouraging private sector industry. Further, FSI is also a problem.
- (iii) Municipal Corporation of Greater Mumbai on CRZ issues relating to redevelopment of dilapidated, cessed and unsafe building - The identification of such buildings has been frozen on a date whereas this is a continuous process.
- (iv) Issues relating to Koliwad and Goathans of Maharashtra - A classification of such urban settlement units in CRZ-III restricts redevelopment.
- (v) Issues relating to the development of coastal road project by MCGM - Restriction on typology of and method of construction of certain activities on reclaimed land prohibits development of coastal road on the surface reclaimed land.

(b) Karnataka

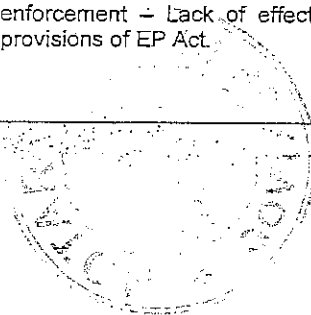
- (i) Fishermen issues in Karnataka - NDZ up to 200 meters restricts housing infrastructure creation of fishermen fold and local inhabitants.
- (ii) Issues relating to tourism sector - NDZ is highly restrictive for thin strip of coastal stretch which has potential for tourism development.

(c) Kerala

- (i) Issues relating to fishermen - CRZ-III and NDZ posses restriction for construction / expansion / additional housing and other infrastructure for local population.
- (ii) Tourism issues - Restrictions on account of CRZ-III for tourist resorts construction and infrastructure facilities.
- (iii) Conservation of backwaters - Problems on account of different provisions of rules under Wetland Rules, 2010 and CRZ Notification, 2011

(d) Other States

- (i) HTL demarcation and CZMP preparation - Lack of clarity, ground verification necessity, State level delegation for preparation of maps and impractical criteria of salinity for determination of tidally influenced water bodies.
- (ii) Monitoring and enforcement - Lack of effectiveness on account of weak provisions of EP Act.

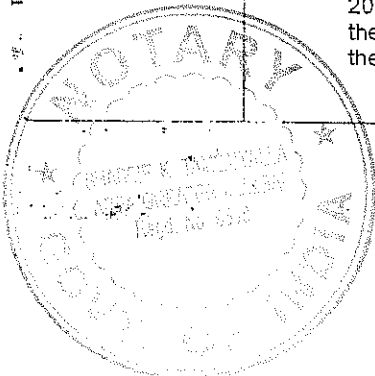


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- (iii) Disaster management and hazard line mapping
- (iv) Fishery related issues including fish processing – All fishery related infrastructure including repair yard etc. to be made permissible; salt cultivation to be removed out of the purview of CRZ restrictions; permissibility sought for infrastructure including building for fish-based small scale cottage industries including shops and flour mill in CRZ.
- (v) Protection of ESAs categorized as CRZ-I – The ground mapping of ESAs should be made available including that for mangrove; clarity in regulation for management of estuaries.
- (vi) Tourism – Relaxation in CRZ areas for beach resort development for tourism and temporary structures on such beaches.
- (vii) Clearance of projects – Project clearance mechanism should be simplified and more delegation should be given to State Government.
- (viii) Capacity building and institutional mechanism – Technical and financial assistance to coastal States should be provided.
- (ix) Regularization of the dwelling units constructed in violation of the CRZ Notification – In public interest dwelling units constructed by traditional coastal communities in violation of CRZ Rules should be regularized.
- (x) Mining of minerals – Relaxation in CRZ Notification for mining of minerals and sands on the coastline outside ESAs.
- (xi) CRZ-II and III related issues pertaining to Town and Country Planning norms – Problems of housing including slum rehabilitation, redevelopment of dilapidated buildings, delegation to State Government for reconstruction of public use structures and civic infrastructure like sewerage disposal, pipelines, bridges, roads.
- (xii) Foreshore requiring facilities – All the ports, minor and major to be allowed to undertake construction / development of allied infrastructure on waterfront as well as in the hinterland; State Governments should be delegated powers for port development and redevelopment.

VII. In consideration of the issues flagged by State Governments / UTs with regard to difficulties and impediments in the implementation of the CRZ Notification, 2011, the Committee has analyzed the subject matter exhaustively and recorded their view as under:

1. The Committee examined the issue of Development Issues in CRZ-II with regard to the applicability of Development Plan (DP) and Development Control Rules (DCR). Growing urbanization necessitates a holistic and pragmatic policy tool to address the city amenities in line with the local resources available. The subordination of local Town and Country Planning Regulations to CRZ Notification, 2011 has created disparity in the regulations, governing constructions in the CRZ area which is hindering development and causing hardship to the local communities. The restrictions imposed have actually led to land

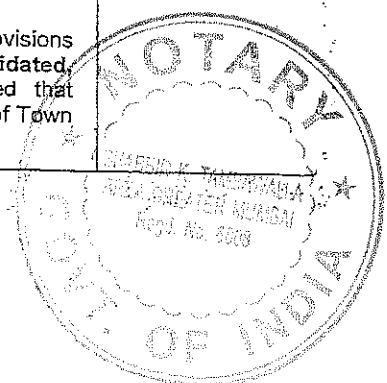


encroachment and development of illegal slums particularly along the beaches of Mumbai.

2. The Committee finds that the thickly populated slums in Mumbai proliferating in unhygienic and inhuman conditions with no proper basic infrastructure are prone to risks of flooding, cyclone lacking a network of roads or passage to evacuate the people during calamities. It is the responsibility of the State Government to provide basic facility to the people. The Committee is of the opinion that the CRZ Notification, since its implementation from 1991, has not addressed the issues appropriately. Accordingly the Committee is of the opinion that in view of the serious environmental and social issues arising due to proliferation of slums the matter should be left to the State Governments to implement the slum rehabilitation schemes as per the concerned State Government norms issued from time to time; and rehabilitation of the slum areas is an urgent matter to be addressed in most of the cities of the country particularly in the coastal areas as they are vulnerable to hazard from the sea. However, the Committee has recommended that while undertaking such housing for slum rehabilitation in the CRZ-II areas, the following should be strictly adhered to:

- a. All construction activities to be undertaken in these coastal municipalities on the landward side of the road included in the approved developmental plan or authorized structure(s).
- b. All developmental activities to be undertaken (in these municipal areas) as per the prevailing local Town and Country Planning Regulations subject to the following conditions:
 - (i) no discharge of untreated sewage/effluents;
 - (ii) no activities to be undertaken causing shoreline change including disturbing the sediment balance in the coastal waters;
 - (iii) adequate provisions/facilities to be built for quick and timely rescue, relief and rehabilitation measures in case of natural calamities;
 - (iv) adequate open space to be provided to meet the emergencies during natural disasters, to maintain aesthetics including adequate ground cover for fresh water recharge;
 - (v) all residential constructions to be provided with groundwater recharge facilities;
 - (vi) all residential or commercial buildings to be provided with water recycling systems for non-contact purposes such as gardening, washing and flushing (through dual pipeline system);
 - (vii) no dumping of solid waste. The solid waste shall be managed as per the MSW Rules;
 - (viii) no conversion of land earmarked for parks, gardens, schools, hospitals and dispensaries, defense establishments, disaster management and other public utility purposes;
 - (ix) necessary provisions to be put in place to ensure that the ambient air quality within the municipality is as per norms. All construction activities, transport, industrial activities and others to follow strict air quality norms so as to provide congenial quality of air for people.

3. The Committee in having consideration to the restrictive provisions of CRZ Notification, 2011 in respect of redevelopment of dilapidated, cessed and unsafe buildings, the Committee recommended that redevelopment of such buildings should be as per the provisions of Town



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and Country Planning Regulations subject to specific safeguards as listed by the Committee in respect of slum redevelopment.

4. In the subject matter of redevelopment of Koliwadās, as restricted by CRZ Notification, 2011, the Committee recommended that such Koliwadās / Goathans / fishermen colony should be classified as units in CRZ-II in order to bring them on par with other developments in Mumbai to meet the economic aspirations of the fishermen communities. With the conditions as listed in slum redevelopment above.

5. The Committee recommended to keep the open space and parks intact into developable areas, except for toilets, wall, walkway and so on, required for non-commercial public use.

6. The Committee after detailed discussion is of the view that the rural areas may be divided based on the population density. The categorization of such populated rural areas shall be as thickly populated and other rural areas. The thickly populated rural areas shall be those which have a population density of more than 2161 people/km² which is as per class-III towns of 2001 census of India. Other rural areas would be those which are less than 2161 people/km². The Committee taking into consideration the hardships faced by the local communities and keeping in view the need for housing recommends that the NDZ may be reduced to (i) 50 m in the densely populated rural areas and (ii) 200 m NDZ along the other rural areas. The housing of the communities in densely populated areas could be taken up landward of the above NDZ subject to the following conditions:

(i) In densely populated CRZ-III areas, development can be taken up in accordance with the local prevailing norms including the height regulations. The local authorities shall ensure that:

- a. no activities shall be undertaken that would cause shoreline change including disturbing the sediment balance in the coastal waters;
- b. adequate provisions/facilities shall be built to provide for quick and timely rescue, relief and rehabilitation measures in case of natural calamities;
- c. adequate open space shall be provided (to maintain aesthetics including adequate ground cover for fresh water recharge) and also to meet the emergencies during natural disasters;
- d. all structures shall be provided with groundwater recharge facilities. Further, drawl of groundwater shall be regulated as per the norms laid down by the local ground water authority;
- e. no discharge of untreated sewage/effluents. All buildings shall be provided with water recycling systems and shall use the recycled water for non-contact purposes such as gardening, farming, washing and flushing;
- f. no dumping of solid waste;
- g. no conversion of land earmarked for parks, gardens, schools, hospitals and dispensaries, defense establishments, disaster management and other public utility areas including areas meant for fisheries.

(ii) Rural areas are those areas which are less populated. In such areas, development of new houses of local communities can be taken up beyond NDZ which is 200 m from the HTL. Expansion of existing houses in accordance

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with the prevailing local Town and Country Planning Regulations can be taken up subject to overall height of the construction not exceeding 9 m with ground plus one floor. For development of these rural areas, all provisions listed in a. to h. above shall be adhered to.

7. In the NDZ of CRZ-III areas, all traditional activities including fisheries, public amenities, recreational facilities and foreshore requiring facilities can be taken up in larger public interest as per the relevant provisions contained in the State and Central legislations and those contained in this notification. Repairs and reconstruction of existing authorized structure in the NDZ shall be taken up as per the local Town and Country Planning Regulations.

8. The Committee after detailed discussion on the issue is of the opinion that the dwelling units of the coastal communities in CRZ-III areas which have been constructed in violation of the CRZ Notification shall be regularized by the concerned States/UTs Government following the local town and country construction norms. If any of these violations are pending before the Court, the State Government may take up the matter, and with the approval of the Court such violations could be regularized.

9. The Committee is of the opinion that the modernization of the fish-processing units is necessary in order to improve the quality of processing and to maintain the norms stipulated for standards. Further, facilities for effluent treatment should be in place for the existing fish-processing units to ensure zero liquid discharge. Since the setting up of fish-processing units fall under the purview of the State/UT Governments, issues relating to modernization may also be dealt by the respective coastal State/UT Governments.

10. The Committee after examining each of the issues raised by Karnataka, Kerala and other States regarding difficulties in the implementation of the tourism-related projects and taking into consideration the potential for tourism, which could help regional economic development including the local communities, suggests the following:

- (i) In the NDZ and in the intertidal area, temporary tourism facilities such as, cyclone shelter, toilets, wash rooms, change rooms, drinking water facility and temporary shack(s) can be taken up with the permission of the concerned local authorities. It shall be ensured by the local authorities that such facilities indicated above shall occupy only 33% of the area. Further, it shall be the responsibility of the authorities that the solid wastes are handled as per MSW Rules and no untreated effluents are discharged in the coast or in the waters. All disaster management mechanisms shall be put in place by the authorities for rescue and relief.

- (ii) Wherever there is a national or a state highway passing through the NDZ, the tourism facilities indicated at (i) above can be taken up on the seaward side of the road. On the landward side of such road or NDZ, the following tourism activities can be permitted:

- a. Eco-friendly resorts, hotels and other such facilities for tourism not exceeding 9 m in height with ground plus one floor with slope and tiled roof.

Biodegradable
digesters for
public toilets
or any other
technology that
minimizes the
discharge of
waste water
be used.

only

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* other permissible use

9. Undertake afforestation & greening activity of open spaces

- b. The total covered area of construction shall not exceed more than 33% of the total area. The open space in the site shall be utilized for greenery, non-paved parking, play fields, and so on. Green areas and open space shall be promoted so as to minimize the impact of storms and facilitate operation and rescue during natural hazards.
- c. Drawl of freshwater from the aquifers shall be with the approval of the state ground water authority. Adequate facilities for groundwater recharging shall be provided.
- d. No discharge of untreated sewage, no disposal of solid waste. The water shall be treated and reused within the project area for gardening, flushing and washing. *or any*
- e. No operation of any hazardous or harmful activities which are detrimental to the coast and marine environment.
- f. To provide for adequate space for operation of livelihood activities of local communities who depend upon the resources of coastal and marine environment.

11. The Committee recommends that local communities including fishermen who possess houses in CRZ-III areas can be permitted to undertake tourism through home stay without changing the plinth area/design or facade of the existing structure.

12. The Committee recommends that in addition to the CRZ categories and its jurisdiction, there shall be an HMZ, which is, the zone falling between the CRZ boundary and the Hazard Line on the landward side. The Hazard Line is being demarcated by the MoEF&CC through Sol and NCSCM. In this HMZ, the concerned State/UT Governments shall provide for necessary hazard management measures as per the HM Rules. The States/UTs shall prepare the hazard management plans for this zone and integrate it with the CZMP of their respective areas.

13. The Committee noted that the Ministry has assigned NCSCM to demarcate HTL and LTL based on the data/inputs provided by the Sol, NRSC and the coastal State/UT Governments. The above HTL/LTL is being demarcated by the NCSCM based on the advice of a Committee appointed by the Ministry. The HTL/LTL thus demarcated would be final and all the CZMP would be prepared based on the above HTL/LTL by the respective coastal States/UTs.

14. This issue of CZMP preparation has been considered by the Committee, and the initiatives taken by the MoEF&CC in this regard have been appreciated. The HTL demarcation by NCSCM is a key step towards the preparation of the CZMPs. The uniform HTL all along the country shall resolve most of the issues related to it.

15. CZMPs shall be prepared by the States/UTs indicating the HTL, LTL, CRZ-I, CRZ-II and CRZ-IV areas, any other prohibited area declared by the States/UTs and the disaster management facilities superimposed on the approved Development Plan in case of CRZ-II areas (municipalities). In the case of CRZ-III areas, the CZMPs demarcating the HTL, LTL, CRZ-I, CRZ-III and CRZ-IV areas, any other prohibited area declared by the States/UTs and keeping in view the provisions contained in this Notification shall be prepared at the local body level.

16. The States/UTs may also address some of the important coastal issues, including climate change, renewable energy and any other innovative schemes suitable or unique for their location and include in the CZMP. Then this CZMP has to be recommended by the State/UT CZMAs.



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and approved by the NCZMA. Thereafter, all the development activities in the CRZ will be governed by the local body as per the approved CZMPs.

17. The Committee discussed the issues relating to the water bodies connected to the sea such as estuaries, rivers, creeks, backwaters, lagoons, ponds and the like which are termed as "tidal-influenced water bodies".

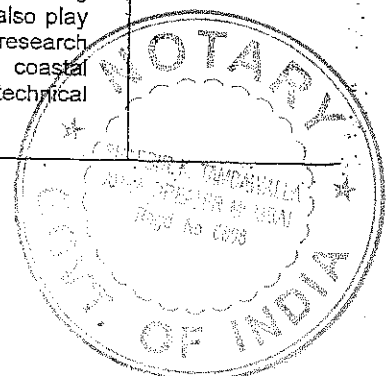
18. All activities proposed to be undertaken in the CRZ-II and CRZ-III areas other than those which attract EIA Notification, 2006 shall be governed by the concerned State/UT Government regulations subject to the conditions stipulated in the CRZ Notification and CZMPs approved by the NCZMA.

19. The Committee agrees to the request for speedy clearance of the projects. The Committee examined the process of clearance under CRZ Notification, 2011 including the various requirements/information sought at Annexure-IV of the Notification dealing with the application for clearances. It was felt that the information sought is required for all category of projects listed in the Notification which includes small houses of local communities, ice plants, fishing-related activities, agriculture, roads, rain shelters, community toilets and so on. Such information sought under Annexure-IV of the Notification may not be available with the agencies proposing to undertake the activities. Further, such detailed information may also not be required for small projects. With a view of simplifying the procedures for obtaining clearance under the CRZ Notification and to make it transparent and people friendly, each of the State Governments shall formulate the criteria for seeking clearance under the CRZ Notification along with an application form. The application form, details of the procedures, the agencies/local bodies that would clear the project, time limit for the clearance and so on shall be appended to the CZMP of the respective coastal States/UTs.

20. The Committee is of the opinion that all Acts, Notifications, governing the environmental issues shall operate independently and shall not be interdependent until unless specified. However, the project authority shall ensure that the projects are taken up for implementation only after receiving all statutory clearances.

21. The Committee examined the role of the CZMAs and the notification constituting the CZMAs. The Committee was of the opinion that the CZMAs should focus mainly on conservation and protection of the coastal areas especially the coastal ecosystem and geomorphological features which are so unique and fragile. The CZMAs rather than carrying out such scientific activity at the ground level are mainly involved in according clearance and examining developmental projects particularly in the CRZ-II and III areas. This activity is a duplication of the Authorities and Agencies created under EIA Notification, 2006.

22. Hence, the Committee is of the opinion that all such activities and clearances with regard to developmental projects in CRZ should be considered and examined by the respective Authorities created under EIA Notification, 2006. The CZMAs including NCZMA should be responsible mainly for monitoring, enforcement and examining the implementation of the CRZ Notification, particularly, the status of ESAs and approval of CZMPs. The CZMAs should coordinate with NCSCM and SICOM with regard to protection and conservation of ecosystem including monitoring of pollution, erosion, accretion, and so on. The CZMAs should also play an important role in developing a State level capacity in various research and development including awareness in the area of coastal management. The MoEF&CC may provide necessary technical



assistance and financial assistance under the ICZM Project to the coastal States/UTs for developing such expertise.

23. The Committee examined several issues in the present CRZ Notification where the terminologies are not explained or defined. This has led to ambiguities, litigations, violations and difficulty to the people. Hence, the Committee is of the view that the Ministry shall clearly indicate the definition, jurisdiction, the process of clearance, timelines and so on, so that the people are not put to difficulty. Further, the transparency mechanism shall be built in the new regulations to ensure speedy clearance process.

24. It will be the responsibility of the concerned State Government to address issues relating to complaint and redressal mechanism. The Environment Division of the State and the PCBs are delegated with necessary provisions of EPA 1986 to take action against the violations. Further, the Committee under Shri T. S. R. Subramaniam has also addressed this issue which may be taken into consideration.

25. The Committee is of the opinion that the State/UT Environment Departments which have a dedicated website for CRZ matters shall be updated regularly. The CZMPs shall be uploaded in the website after obtaining necessary approvals from Competent Authority. The notified areas under this Notification and decisions taken at the local level shall also be hosted on the dedicated website of the States/UTs.

26. Ministry will put in place a monitoring mechanism which will consist of State/UT CZMAs. The Ministry through specialized agencies shall strengthen the monitoring agencies and encourage monitoring through space and IT based technology. The Ministry will also put in place a third party monitoring system who will undertake periodic monitoring and evaluation of the coastal environment.

27. MoEF&CC through SICOM shall undertake strengthening of the existing institutions and periodic training and capacity building of the CZMAs and other stakeholders working in the area of coastal management. Further, the concerned State/UT Governments shall provide adequate infrastructure facilities keeping in view the international scenario and emerging technologies in the area of coastal management.

28. The Committee after examination of the provisions of the CRZ Notification, 2011 it is observed that there is no adequate provision for management of ESAs which are categorized as CRZ-I including the geomorphological and archaeological features. It was brought to the notice of the Committee that the mangroves are present in the Government as well as in the private lands. While the protection is provided in the Government land by the concerned State Government agencies, the owners of private land, who have planted the mangroves and face difficulties as the mangrove land is declared as 'no development area. This provision of imposing no development on a private mangrove land is a disincentive to such land owners. While the Committee appreciates the efforts and initiatives taken by the private owners in developing mangroves, it is found that there are no incentives to such initiatives. Further, the Committee feels that the private land owners should also be enabled to undertake development as per the local Town and Country Planning Regulations.

29. It was mentioned that the mangroves in case of more than 1000 m² are required to provide 50 m buffer. However, unfortunately, the buffer zone of 50 m has led to encroachment, illegal dumping, construction activity and slum redevelopment. Hence, to prevent such unauthorized

and illegal activities which are harmful to mangroves, a walkway on stilts along the boundary may be permitted. The 50 m buffer could also be developed as a green belt under social forestry or gardens. Further, the Committee is of the view that marine interpretation centres and research facilities are a requirement to spread awareness about the mangroves and its flora and fauna associated with it. Such awareness about the mangroves and the associated flora and fauna by the public would bring out better conservation and protection of the mangroves. This would be a positive approach which may be encouraged. The walkways, promenades and social forestry could be promoted all along the mangrove buffer zone that would prevent illegal felling of mangroves and also prevent dumping of waste in the mangrove area. In order to promote the conservation of mangroves, the Committee is of the opinion that the approval mechanism should be made simpler and faster and the State Government should be delegated the power to recommend and clear such proposals.

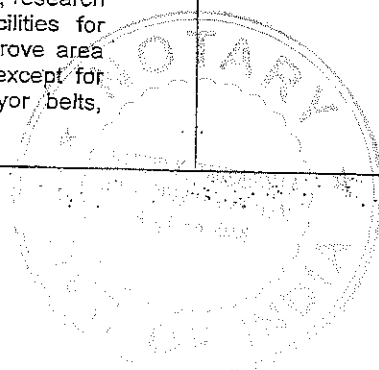
30. The Committee examined the issue of mapping the ESAs and preparation of the management plan in detail. It was brought to the notice of the Committee by NCSCM that the mapping activity of ESAs including the preparation of management plans for the conservation and protection of these ESAs are undertaken by the NCSCM.

31. The Committee taking into consideration the various aspects of mangrove conservation and the request made by the State Government to undertake certain development in larger public interest recommends as follows:

32. Mangroves in the coastal areas act as breeding, spawning and rearing grounds of several aquatic fauna that are important for biodiversity. Several species of finfish and shellfish live in mangrove areas on which the local communities depend for their livelihood. Further, the mangroves help in minimizing the impact of storms, floods, erosion and so on and are also carbon sinks. Keeping in view the importance of mangroves, the concerned State/UT Governments shall earmark adequate funds and identify suitable land for promoting, conserving and afforestation of mangroves in the respective areas. This activity shall be undertaken by the concerned State Governments/UTs.

33. The mangrove vegetation in the coastal areas are categorized as follows:

- (i) Mangroves declared as forest under Forest Conservation Act, 1980 – Notwithstanding anything contained in this notification, such mangroves declared by the concerned State Governments/UT Administrations/Central Government as forest land under the F(C)A, 1980 shall attract the provisions of the F(C)A, 1980 only.
- (ii) Mangroves in (a) Government land not declared under Forest Conservation Act, 1980; (b) private land.
- 1(a) Mangroves in Government land shall be protected based on a detailed plan prepared by the concerned State/UT Governments. In case the mangrove area is more than 1000 m², a buffer of 50 m along the periphery of mangrove area shall be provided. This buffer zone of 50 m shall be utilized for constructing walkways, interpretation centers, promenades public facilities for developing parks, research facilities related to mangrove biodiversity, facilities for conservation and the like. Further, in the mangrove area and in the buffer, all activities are prohibited except for laying of pipelines, transmission lines, conveyor belts,



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construction of road on stilts and other conveying mechanisms that are required for public use. Defence establishments such as watch tower could be taken up in the mangrove area. In such cases where removal of mangroves is inevitable in public interest after examining all the alternatives, a minimum of ten times the area of mangroves shall be re-planted and protected within the coastal zone of respective States or UTs. Mangrove removal for the above purposes shall be undertaken only on the recommendation by CZMAs and on the approval of the concerned States/UTs.

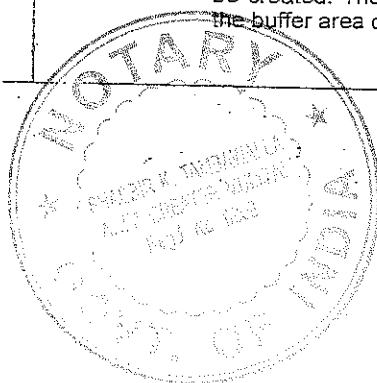
- 2(a) Government land designated for agriculture, fishing, infrastructure meant for local communities, fresh water storage, aquatic bodies, public bodies and associated infrastructure facilities for public use in the development plan which was approved prior to approval of CZMP of 26 September 1996 under the CRZ Notification 1991 may be taken up.

In case of such designated areas where mangroves have grown due to abandonment of agriculture, fishery related activities or lack of infrastructure to prevent ingress of salinity into land/fresh water bodies, in such areas development can be taken up as per the development plan approved prior to 27 September 1996 subject to the condition that such development in the mangrove land are considered by a committee headed by the Chief Secretary of the States/UTs. For any mangrove area destroyed while undertaking developments as indicated above, compensatory mangrove afforestation should be taken up 20 times in lieu of the mangrove destroyed, in an area identified by NCSCM.

- (b) For mangroves in private land, incentives shall be provided by the concerned State/ UT Forest Departments for promoting mangrove conservation/ afforestation in private land, for which there will be no requirement of a buffer zone. The developmental activities in the private mangrove land can be taken up.

34. The Committee taking into account the provisions of the CRZ Notification in this regard agreed that the proposed notification should provide for the following:

- i. To clearly indicate that destruction of mangroves other than for the permissible activities under the notification is a prohibited activity.
- ii. The mangroves shall be mapped by the NCSCM who have already been assigned the work of mapping ESAs. Detailed management plan for protection and conservation of mangroves shall be taken up by the concerned Department in the State Government. 50m buffer shall be provided along the mangrove area wherever the mangrove area is more than 1000 m².
- iii. For the purpose of conservation, protection and to create awareness, certain basic public infrastructure such as walk ways, rain shelters, interpretation centres, research facilities, parks, forestry and promenades, field research facilities related to coastal ecosystems and marine interpretation centres, can be created. The walkway on stilts could be constructed along the buffer area of such mangrove patch. All such developments



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shall be for public purposes only. For any mangroves destroyed for such construction, compensatory mangrove plantation of ten times shall be taken up within the States/UTs. It shall be ensured that no benefit for construction shall accrue on the landward side of such constructions.

35. The Committee discussed in detail the issue relating to coastal road in the CRZ-IV which is the water area. Government of Maharashtra has proposed such roads not only to ease the traffic congestion but also due to lack of land available in the mainland for this purpose. The justification provided is that such road would provide for faster means of transportation and can be taken up with no rehabilitation/relocation. Although the project is being taken up in larger public interest, the environmental issues especially from the coastal environment need to be addressed in detail for taking up such projects. Large-scale reclamation may transform the coastline. The project may cause erosion and other associated impacts such as destruction of mangroves, loss of beaches and loss to fisheries affecting the fishing community. In this regard, the State Government may have to carry out a detailed study along with a feasibility report. If found feasible from both economic and environmental angles; the coastal road project could be incorporated in the CZMP for which a separate approval may be sought from the MoEF&CC after following due procedures. The MoEF&CC shall examine the project under CRZ as the project falls within CRZ-IV category.

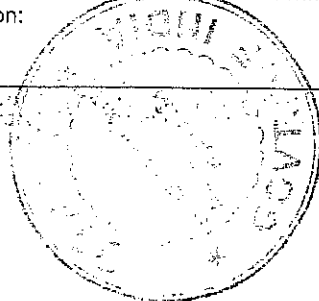
36. The Committee discussed in detail with regard to the new airport proposed by Maharashtra in an island in Thane creek. It was the view of the Committee that the GoM may reconsider the proposal since climate change and subsequent SLR is a serious issue. Further, in view of the increasing frequency of cyclones, storm surges, currents and so on, the feasibility from technical angle needs to be examined critically by the GoM. Though in several countries offshore airports are operating, this issue needs to be examined from both economic and environmental angles.

37. The request regarding the usage of old industrial buildings in CRZ area for developmental activities which are non-polluting in nature including tourism and other service sector activities was considered by the Committee. The Committee agrees with the proposal, however, the plinth area of such structures shall not be altered.

38. The Committee after taking into account the request of GoG seeking relaxation in mining of limestone in CRZ area was of the opinion that the limestone reserves are valuable and should be utilized for developmental purposes. The limestone reserves of Gulf of Kachchh and Saurashtra need to be examined and studied in detail by reputed scientific national institutes such as CSIR - Central Mining Research Institute, Dhanbad, National Cement and Building Material Institute, Faridabad and NCSCM. Based on the recommendations of these Institutes, selective mining with appropriate safeguards related to ground water, coastal erosion and others could be carried out. The mining of such minerals could be indicated in the CZMP of the State/UT which shall be prepared based on the above studies.

39. The Committee recommends that all other projects of national importance declared by the Central Government shall be undertaken in CRZ on a case-to-case basis based on EIA as provided in the EPA 1986.

40. In line with the above consideration, the Committee has made the following recommendation:



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- (i) The coastal areas have fragile ecosystems which are sensitive to various parameters such as salinity, temperature, turbidity, pollution and disturbance to the substrata. Even small changes in these parameters lead to partial or total destruction of these ecosystems, which in most cases are irreversible; hence, they should be preserved and conserved. From the data made available, it is observed that these ecosystems have undergone destruction over a period of time. Such irreversible damages cause serious impact to the livelihood to the local communities as these ecosystems sustain the productivity of the coastal areas. Further, these ecosystems such as mangroves, coral reefs, sea grass beds and coastal forests act as barriers to cyclones, flooding and erosion and also act as major carbon sinks. In view of the immense importance of the ESAs, the MoEF&CC may formulate concrete proposals and initiate activities for the conservation and protection of these ecosystems.
- (ii) The ecosystems while rendering immensely useful goods and services to the environment and coastal communities can also attract tourism if properly managed. Hence, it is important that the Government takes major initiatives in identifying, conserving and drawing up concrete framework based on certain successful models worldwide including that of IUCN for the conservation, protection and promotion of eco-tourism in such areas. These would provide alternative livelihood to local communities, thereby, reducing pressure on the fish and fisheries.
- (iii) *How many ?
a where* The Committee strongly opined that ESAs mapped under CRZ-I should be identified based on scientific assessment, each of which shall be notified. The States/ UTs through reputed scientific authorized agencies shall undertake conservation, protection measures as per the management plan based on the guidelines prepared by MoEF&CC.
- (iv) The coastal areas also are places where several historical, archaeological and heritage value structures and areas are present. These features need to be protected and conserved from the historical point of view. The MoEF&CC in cooperation with the Ministry of Culture should undertake identification, mapping and conservation programmes of such areas.
- (v) The sea bed and the bed of the tidally influenced water bodies are the breeding, spawning and rearing grounds of several coastal/marine species on which the local communities depend upon. Several activities such as indiscriminate mining and dredging have destroyed the benthic flora and fauna. Such activities have affected the coastal processes leading to accretion, deposition and change in hydrodynamics and morphodynamics. Hence, there is a need to protect and regulate the activities that are detrimental to the integrity of the water bodies and their bed.
- (vi) The marine waters and the coastal areas have been sites for disposal of sewage, effluents and solid waste. This indiscriminate dumping and disposal over a period of time has made the coastal waters and several of the coastal stretches toxic. It is a fact that the coastal cities are growing but there is inadequate solid waste management or sewage treatment facilities to address the pollution-related problems. If left unattended, the implications would be serious and could be irreversible. Hence, the Government, at local, State and Central level, should take serious note of this issue and address the problem at the earliest. The

State Pollution Control Boards should be entrusted to take up the Government's initiative of "Swachchh Bharat Abhiyaan" in the coastal and marine waters as well.

- (vii) It is observed that the CRZ Notification has tried to address some of the issues related to Town and Country planning in it. The Committee was informed by all the coastal States and UTs that they have well-laid Town and Country Planning Regulations. The regulations of the CRZ Notification in category II and III areas, especially with regard to construction, have affected the housing, slum redevelopment, redevelopment of dilapidated structures and other dangerous buildings. It is strongly felt that the concerned State Governments should be left to address the housing needs of the communities as per the State/UT Government norms. Providing decent housing to all communities is of prime importance and is a fundamental requirement of the people.
- (viii) The States and UTs also brought to the notice of the Committee the need for safe, hygienic and decent housing with basic infrastructure facilities for large sections of the coastal fisher and other population who since several decades have been living in unhygienic, disaster-prone slums and unsafe buildings. The Committee is convinced that the CRZ Notifications have not addressed this human issue comprehensively. Although the Committee agrees that the construction of housing infrastructure would lead to congestion in the coastal areas, there is no alternative with the Governments as there are no mechanisms in place to prevent migration of population to coastal areas or to decongest the existing populated areas. In the absence of such mechanisms, it is imperative that housing with basic infrastructure facilities is provided to these communities in the national interest.
- (ix) It has been brought out to the Committee by all the States/UTs that the CRZ Notifications have been made very complex and its interpretation and implementation is difficult. It was also observed that certain terminologies used in the CRZ Notification such as the word "existing" "HTL" etc were not defined in right time. Some of the issues being scientific, appropriate guidelines were not issued by the Government to the public. Hence, lot of ambiguity exists even today and several court cases and disputes have arisen due to such complexities. The HTL/LTL demarcation, boundaries of CRZ-I, CRZ-II and CRZ-III and so on, are complicated. It is recommended that the Ministry addresses each of the issues in detail and brings out guidelines, criteria and so on.
- (x) The other major issue that has come before the Committee is the conflicting and overlapping jurisdictions and provisions in the CRZ and other laws. The CRZ Notification, 2011 provisions especially in the CRZ-II and CRZ-III areas override the Town and Country Planning Regulations of the coastal States/UTs in the CRZ area. This disparity between the CRZ and non-CRZ had led to several issues. Most State Governments have sought for uniform regulations in the State for smooth implementation. This suggestion of the State Governments is found justified since currently there are a lot of ambiguities with regard to HTL/LTL mapping, CRZ boundary demarcation and so on, which are prerequisites for CZMP, the preparation of which is considerably delayed. It is also observed that the Environment Departments of States/UTs are extremely under-staffed to meet the challengers of CZM. The existing staff in the States/UTs is mostly involved in addressing approvals and issues relating to CRZ-II and CRZ-III.

There have been very few instances where States/UTs have taken proactive steps in CRZ-I and CRZ-IV areas, the conservation of the ecosystems in it, combating pollution and improving the general environmental quality of the coast. Hence, the Committee is of the opinion that the Environment Departments of the States/UTs and the MoEF&CC should be sensitized to mainly address CRZ-I and CRZ-IV issues and in turn allow the concerned Departments in the States/UTs to address the issues relating to CRZ-II and CRZ-III themselves as they relate mostly to town and country planning arena.

- (xi) The Committee is also of the opinion that new opportunities and initiatives need to be taken to address the economic and social development of coastal communities. Most of the traditional coastal communities, who live on the resources from the coastal areas, especially fishing, need to be provided with adequate opportunity for economic development. In this regard, the Committee is of the opinion that while the ecosystems are being conserved and protected by the Governments, the local communities should also play an important role in conservations and protection of the ecosystems. The local communities should be provided with an opportunity to take up tourism, artisanal fisheries such as traditional aquaculture and ornamental fish culture, in such ecosystem areas for their economic improvement. The Governments should work in this area which will address both conservation and economic development of the communities thereby, reducing pressure on the already depleting fisheries.
- (xii) Another matter of concern which the Committee has noted is the change in the shoreline. The shoreline change is accelerated by anthropogenic activities. In this context, certain initiatives have been taken by the MoEF&CC through the NCSCM wherein the shoreline changes are being mapped and studied. The above-mentioned studies need to be taken into consideration while undertaking foreshore developmental activities. Also, the studies need to be carried further to ascertain exact reasons of shoreline change.
- (xiii) The Committee appreciates the initiatives taken by the Ministry in setting up exclusive Centres for coastal management such as NCSCM, SICOM and State level Project Management Units including strengthening of the consortium institutions in each of the coastal States/UTs. These agencies could be further developed for undertaking research and development in the area of coastal management and also to address the social needs of the communities in the States/UTs.
- (xiv) The Committee after detailed examination of all issues raised by the States/UTs Government and taking into consideration the international scenario in the area of CZM including the emerging scientific technologies in the area of coastal and marine management is of the clear view that the MoEF&CC should embark upon new initiatives for protecting and conserving the coastal and marine areas which have such precious and fragile ecosystems.

41. Comments on the recommendations of the Committee:

- (i) Demarcations of High Tide Line (HTL) and Low Tide Line (LTL) have been recommended to be carried out by National Centre for

Sustainable Coastal Management (NCSCM) based upon 2011-12 satellite data generated by Survey of India. These lines would become the basis for preparation of Coastal Zone Management Plans. However, there is no method recommended for carrying out regular revisions and/or rectification in the Map once finalized.

Suggestion: A system of ground verification should be introduced before finalizing the satellite imagery as the basis for CZMP. Further, a mechanism has to be provided for revision and review of the map based on changes in survey records.

- (ii) Hazard Line has been recommended to be drawn. The presence of Hazard Line in CRZ Notification will bring in another instrument of regulation. The Committee's recommendation is silent on any regulation of activities within Hazard Line, neither specific purpose and responsibility has been suggested. There is no direct role of Ministry in Disaster Management save, having the responsibility for handling environmentally sound coastal management in general and taking appropriate actions for livelihood and life security of the people dwelling in coastal areas and who are likely to be affected by rise in sea water level. Further, existence of two lines will bring major administrative problems in conservation methods and permissible development activities on coast lines may be put to halt on account of likely ecological and conservationists movements. In addition, the Ministry may be called upon to defend itself in various judicial and quasi-judicial forums for failure to provide operational structure on hazards.

Suggestion: The subject matter of Hazard Line demarcation should be dropped from CRZ Notification. If required, another independent rule under E(P) Act may be notified for Hazard Line and Management of Areas falling within Hazard Line.

- (iii) Tidally influenced water bodies have been defined as those influenced by tidal effects of seas such as estuaries, creeks, backwaters, lagoons and the like connected to the sea. The ambiguity in definition by bringing in "the like connected to sea" should be substituted as "any other water body connected to sea". Moreover, there are many water bodies connected to sea and having influence of tidal effect but the effect of tide does not spread to the entire water body. The present CRZ Notification restricts the coverage of the rule up to 5 ppm of dry salinity period. This method is also faulty on account of the varied climatic factors along with the impact of anthropogenic factors. Although preservation of such water bodies is very critical for eco service, the restrictions to be imposed in such land adjoining / abutting the water bodies should not restrict the development of activities of traditional communities, traditional activities and other development activities which are ecologically sustainable in such areas.

Suggestion: The tidal influence in a water body connected to sea should be measured on the basis of modulations in the tide on a given date through satellite imagery and the distance inward should be superimposed in Coastal Management Plan as a fixed delineation. The modulation in the tides inside such water bodies should be considered at a level having the effect of HTL.

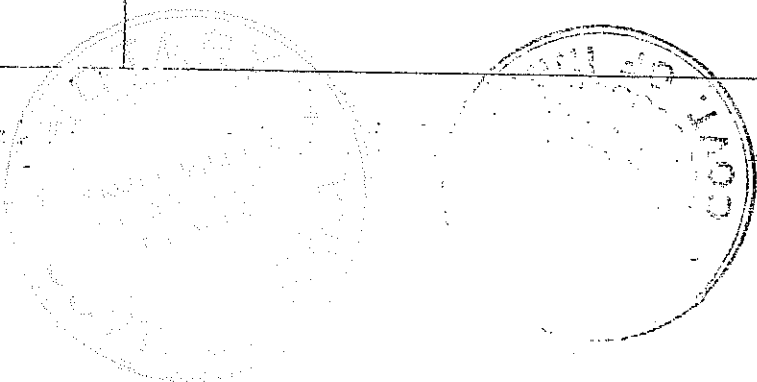
- (iv) Jurisdiction of the proposed Notification by amendment in respect of tidally influenced water body has been suggested as 100 metres or width of the water body whichever is less. This is the

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present provision as well. There are many tidally influenced water bodies on the side of which development has taken place in terms of physical infrastructure. Many such water bodies fall in Municipal and urban areas. There are many water bodies which are 100 metres in width itself. Further to this, tourism is flourishing in such areas as well and has huge potentials.

Suggestion: The distance should be reduced to 50 metres or width of the water bodies whichever is less.

- (v) The recommended coverage of CRZ to all mainland islands located in tidally influenced water bodies should not be accepted and there should not be a separate clause for administration of such islands.
- (vi) The recommended authorized agencies to be identified by MoEFCC for preparing CZMPs should be only those having requisite expertise in capturing satellite imageries and including those agencies who have been carrying out the land data digitization in the country under the Department of Land Resources, Government of India.
- (vii) The recommendation on permissibility for modernization of fish processing units has been capped to utilize only 25% additional plinth area for equipments and pollution control measures but without utilizing any additional FSI norms. The purpose of this recommendation is self-defeating. It is suggested that fish processing unit modernization should be allowed on landward side for any extent of land to undertake all the components of modernization including expansion with pollution safeguards utilizing the dynamic FSI of local body.
- (viii) Reclaimed land has been recommended for specific use. The list does not include public infrastructure which is not commercial in nature. Neither does it include ecologically sustainable tourism activities. The roads have been recommended on stilts which has no scientific basis. It is recommended that public infrastructure which is not commercial in nature, ecologically sustainable tourism activities, infrastructure for non-conventional energy sources and roads on reclaimed land should be permitted.
- (ix) Ecologically sensitive areas have been defined to include corals, coral reefs and associated bio-diversity. It is recommended that associated bio-diversity which has no definite meaning for identification and regulation should be deleted.
- (x) The Committee has recommended to remove the conditions of frozen FAR / FSI and TCPs, and prescribed specific environmental safeguard. However, there is no mention about coastline conservation programs to be undertaken in fully developed urban areas as well as anywhere in CRZ-II or III. The development will continue. The coastlines will witness the growth of infrastructure and permissible buildings. It is high time that a coastline conservation program is initiated to be framed and supervised by State CZMAs. Such programs should aim at protecting and conserving 5-10 metres of the setbacks from the HTL and/or the edge of the tidally influenced bodies. The entire program should be financed from the building / infrastructure permission.



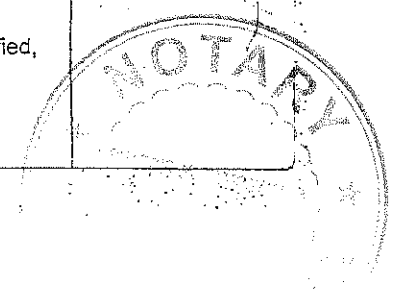
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- (xi) The definition of CRZ-III - two types of areas have been delineated based on density of population as per 2001 census. This has no meaning. CRZ-III is a vast area and adjoins all municipal and urban areas which is covered in CRZ-II. Urbanization is a continued dynamic process. The geographical growth if restricted by not allowing the FAR / FSI and TCPRs along with list of permissible activities in entire CRZ-III would entail further stressed urban housing and civic infrastructure. Accordingly it is recommended that the restrictions recommended on CRZ-III in terms of FSI / FAR based on distinction of population density should not be accepted.
- (xii) A specific mention on recommendation for CRZ-III (b) in terms of height, floor and covered area - 9 metre, 2 floors, sloping roof and ground coverage of 33% - should be rejected to be regulated under local building laws.
- (xiii) Local communities having houses in CRZ-III area have been recommended to have tourism activities through home stay without changing plinth area, design or façade. The entire thrust of tourism development is lost if design is not allowed to be changed. The local community must have its legal right in construction as per the local laws. Hence the recommendation may be rejected.
- (xiv) Role and Responsibilities - The regulation is more on granting permission for development/ construction, pollution control from waste disposal. Therefore, the responsibility of implementation should be with CZMA, Local Authorities, PCBs. Monitoring may be with State Environment Department. Ministry can only review over all compliance by the CZMA, PCB and Environment Department on their the policy.
- (xv) The list of prohibited activities provides for following exceptions:
 1. activities requiring foreshore facilities like port, harbor, ship building, ship repair,
 2. projects of DAE
 3. fish processing units
 4. facilities for generating nonconventional energy
 5. Mining other than rare minerals - Reclamation for the activities other than permissible.
 6. Repair works / reconstruction.

The item 6 may be deleted
- (xvi) Manufacture, storage of hazardous substances - Manufacture hazardous substances is covered under new Industry above may be modified as follows:

Storage of hazardous substance as specified in the notification of Ministry of Environment, Forests and Climate Change, No. S.O.594 (E), dated the 28th July 1989, S.O.No.966(E), dated the 27th November, 1989 and GSR 1037 (E), dated the 5th December, 1989, except POL which may be permitted other than CRZ-I area.
- (xvii) Fertilizer Storage - Fertilizer storage in CRZ area is not justified, hence should be deleted.

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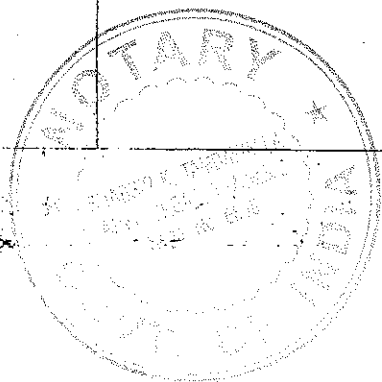


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- (xviii) Discharge of Waste - Discharge of untreated waste water is prohibited even in non-CRZ area and is covered under Water (Prevention and Control of Pollution) Act, 1974
- (xix) CRZ-I - Mangroves of considerable area up to 1000 sqm may be covered; archaeological sites-regulation is available under ASI, and there is no role of Ministry. Conservation and protection and regulation of permissible activities should continue to be as per relevant rules.
- (xx) CRZ-II - (i) - (iii) - is already covered under Water (Prevention and Control of Pollution) Act, 1974
- (xxi) CRZ -II - (iv) - (vi) -Open spaces conservation is a responsibility of Planning and Fire Department, and solid waste is the responsibility of Pollution Control Board. These should be continued to in existing framework of law.
- (xxii) CRZ-II, 3 - building permissions are dealt by Local Authorities, and hence there is no necessity in CRZ Notification.
- (xxiii) CRZ-IV - All infrastructure and permissible activities should be added.
- (xxiv) There should be specific focus in CRZ Regulations for Coastal Tourism Development. 1% of coastline i.e. 75 km should be permitted and declared as an eco-tourism zone. The identification of this length should be done by Ministry of Tourism in consultation with State Governments. In the beach - sandy and non-sandy - a setback of 100 mtr NDZ should be prescribed for construction of resorts and hotels with specified environmental safeguards on waste disposal and mandatory obligation for maintaining the ecological integrity of the beaches with the project developers. In the rocky and cliff coastal areas, a setback of 25 mtrs from HTL should be prescribed for development of such resorts. The temporary tourism sacks for any purpose except public amenities like drinking water and sanitation should not be allowed on beaches in the country within NDZ.
- (xxv) All other recommendations of the Committee may be accepted.

(Bishwanath Sinha)
Joint Secretary
04/04/2015

SS(SS)



(2)

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A Committee under Dr. Shailesh R. Nayak, Secretary, MoES was constituted to look into the issues raised by State Governments and also to suggest practical rationalisation of CRZ Notification, 1911 as the same was subject to a number of litigations. The Committee submitted its report on 19/1/2015. The Committee's Report is at F/A. The Committee adopted following principles in making the recommendations:

- (i) Protection, conservation and management of ecological sensitive areas along the coast and marine areas, given their role in protecting the coast from impact of natural hazards and acting as breeding grounds of fishes as the same was not been adequately addressed in the CRZ, 2011 Notification, thus defeating the very purpose of the Coastal Regulation. Protection and conservation of ESAs require maximum emphasis.
- (ii) The coastal hazard should be addressed comprehensively.
- (iii) The restriction/regulation in construction enforced under the existing notification shall not be in conflict with the norms issued by the local authorities from time to time.
- (iv) Appropriate mechanism for monitoring and predicting the changes in the coastal environment through satellite and other space technology shall be adopted apart from extensive capacity building of all the stake holders along with creating an enabling governing structure.

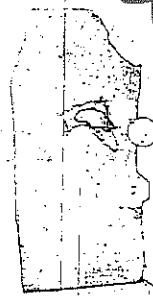
2. Notes of JS(BS) from page 3-22/N may kindly be seen. JS(BS) has critically examined the Report of the Committee constituted to review the issues relating to the Coastal Regulation Zone (CRZ) Notification, 2011. JS(BS) after examining the recommendations in the Report, has made certain suggestions and recommendations for acceptance of the Report. I am presenting my views on each and every recommendation of the Committee for their acceptance or otherwise and also views on JS(BS) recommendations, which are in variant with that of the Committee's report.

3. It would be desirable to see a comparative statement showing the proposed recommendations in Dr. Nayak Committee's Report and the CRZ Notification, 1991. They are as below:

3.1 CRZ Jurisdiction:

CRZ, 2011	Proposed regulations
500 meters landward from the HTL to 12 nautical miles.	No change.
100 metres from HTL on landward side along tidal influenced water bodies and upto 5 PPT on the landward side in the driest season.	100 metres from HTL on landward side to be demarcated by National Centre for Sustainable Coastal Management (NCSCM) based on orthomaps and/or satellite image.
Extending CRZ Regulation up to Hazard line which in number of places may extend even upto 7 kms landward side.	Hazard line mapping - -for disaster management preparedness. - Guidance for future decisions pertaining to location of ports, housing, industries, etc.
HTL and LTL to be demarcated based on complex methodology by any of the seven authorised agencies and corresponding CRZ line of 500 metres, 100 metres, etc.	In view of several litigations against the methodology adopted by these authorised agencies the Committee recommended a uniform methodology as approved by MoEF and to be demarcated by NCSCM, including ground verification.

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My Views – The proposed changes as proposed by the Committee is recommended to be accepted as it would avoid complexities and ambiguities in demarcation of HTL, which is the set off line. This will ensure uniformity and accountability for it to stand in the court of law.

3.2 CRZ-I: Ecological Sensitive Areas (ESAs):

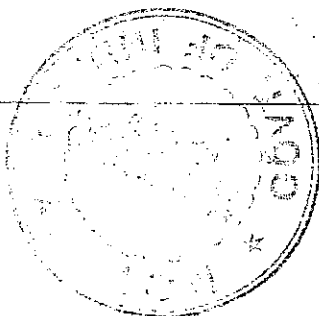
The CRZ-I area include mangroves, coral and coral reefs and associated biodiversity, sand dunes, mudflats, salt marshes, national parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas under the provision of Wildlife (Protection) Act, 1972, the Forest (Conservation) Act, 1980 or Environment (Protection) Act, 1986, including Biosphere Reserves, turtle nesting grounds, horseshoecrab habitats, sea grass beds, nesting grounds of birds, areas or structures of archaeological importance, heritage sites, etc. The comparative picture between provisions of CRZ Notification, 2011 and the proposed recommendations for conservation of ESAs is as follows:

CRZ, 2011	Proposed Regulations
- No emphasize on conservation and protection of ESAs despite their significant contribution to mankind.	Full emphasize on ESAs protection and conservation. Each ESAs to be mapped, delineated and to be notified under E(P) Act. Mandatory inclusion of ESAs in CZMPS with Government's commitment for their conservation.
- No provision to promote tourism using ESAs	Provision for eco tourism promotion like mangrove, walkway, tree resorts, etc. and use of archaeological and heritage sites. Including coastal forts for tourism
- No development permissible in mangrove area except for constructing bridges and roads on stilts	Development activities in mangrove areas permissible for the projects identified as public interest projects or in national interest. For such development in mangrove area shall be considered after ascertaining if mangroves existed prior to 1991. In such areas if development is to be taken up, then 10 times mangrove afforestation is to be taken up in and around the area. <i>→ Capd limit?</i> With regard to mangroves in Private Land, owner of the land to have discretion to undertake development as per the laid down norms in the Notification. <i>→ where</i>

My Views – ESAs play very vital role in protection of coastal areas and provide sustainability to the coastal people. They form fragile eco-system and must be preserved and conserved at all cost. Hence the recommendation may be accepted. Destruction of ESA for any development project could be only undertaken only if no other option exists.

3.3 CRZ-II – Urban Areas:

The Committee has recommended clubbing the provisions of CRZ-V and II under CRZ 2011 pertaining to Mumbai, with CRZ II as the issues relate to Town & Country Planning Regulations. Accordingly, the comparison between CRZ, 2011 provision and the recommendations made in the report are as follows:



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CRZ-II	Proposed Regulations
FSI/FAR as frozen on 19-2-1991 for private buildings.	FSI/FAR as per Town & Country Planning norms issued time to time (FSI dynamic) for different localities and projects. Process made simple, need to obtain necessary clearances from local bodies.
No requirement of "environment safeguards" prescribed.	Following conditions to be ensured: - Recycling and reuse of sewage water after treatment. No discharge to the coast/sea. - Adequate open space. - No conversion of reserved parks, gardens, etc by mandate. - 100% solid waste management as per MSW Rules and no littering or spoiling of beaches.
For Mumbai (CRZ-IV) For redevelopment of slums, dilapidated and cessed buildings the FSI frozen to January, 2011 but made dynamic by recent orders of Bombay High Court. However, the CRZ, 2011 provides for 51% stakes of State Government in such redevelopment schemes, RTI, C&AG and monitoring by high level committee.	51% ownership of State Government done away with. Need for RTI/C&AG monitoring by high level committee done away with. FSI/FAR as per local regulation for different locations. Mandatory "environmental safeguards" as mentioned above.
The Koliwada with in the CRZ II areas are declared as CRZ III where development is restricted to ground + one, 33% FAR as in CRZ III. This provision has restricted the development of the housing of the fishermen communities.	No separate classification for any Koliwadass and Gothans. The classification of the CRZ area will prevail.
With regard to backwater islands falling in CRZ-II, no special provisions prescribed. The CRZ boundary covers the entire island area making it NDZ, thereby no development possible.	These islands being located inland and also do not suffer flooding. Thus development beyond 10 metres in these islands is to be promoted following "environmental safeguards" and ecological conservation.

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My Views - The recommendations follow the principles adopted by the Committee. FSI/FAR norms are constitutionally within the jurisdiction of concerned local Government. MoEF&CC's role is to ensure protection of the environment and the fragile eco-system. Therefore, recommendations of the Committee may be accepted as the proposed change will ensure better living conditions particularly for local slum dwellers, dilapidated/cessed buildings and Koliwadass & Gauthan who are deprived on account of stringent conditions of CRZ, 2011. Location of Koliwadass &

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Gauthan will determine whether are regulated under CRZ II or CRZ III with "environment safeguard" as prescribed.

The small islands on backwaters generally privately owned, are excellent location for tourism promotions. Hence, recommendation of the Committee may be accepted.

3.4 CRZ-III:

The Committee after examining the coastal stretches of various States, especially Kerala, Karnataka, parts of Tamil Nadu, recommends classification of CRZ-III area into densely populated (population more than 2,161 persons/square km) and thinly populated rural areas (population less than 2,161 persons/square km) as it found areas having more than 10000 population density, are still classified as rural areas.

CRZ 2011	Proposed regulations
No Development Zone (NDZ) upto 200 metres from HTL. Even if road passes within 200 metres, NDZ continues till 200 metres on the landward side. No construction except repairs or reconstruction of existing houses but FSI and plinth area frozen as on 6.1.2011.	<u>Densely Populated rural areas</u> Development as per Town & Country Planning Regulations but with stringent "environmental safeguards" like treatment of sewage, recycling, reuse and no discharge in coast. Mandatory rainwater harvesting. Regulation of ground water extraction, adequate open space for parks, gardens, and solid waste to be managed as per MSW Rules. Local bodies to ensure no solid or liquid waste to be discharged/dumped on the coast/beach. <u>In thinly populated rural areas</u> - The existing provisions of CRZ, 2011 to continue.
<u>Backwater Islands</u> No provisions. Development not possible as 200 metres of NDZ regulations cover the entire area of such islands.	Development in these islands is permissible beyond 10 metres subject to stringent environmental safeguards, ecological conservation and use of local architecture with ground + one, sloping roof and 33% FAR.
<u>Tourism</u> - no provisions even for beach tourism except along beaches of Goa.	Provides for special provisions for beach tourism. Promotes tourism in archaeological and heritage areas, encourages water sports, cruise terminals, yachting, water aeroplanes etc. Home stays with bread and breakfast concept encouraged. Temporary structures, such as shacks are permissible in the beaches covering 10% of the beach area but with responsibility on the shop owners and local authority to ensure "environment safeguards" in order to keep the beaches clean. In case the National Highway or State Highway passing through the NDZ of 200 metres, on the seaward side beach tourism through temporary structures are permissible and on

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	the landward side of the road tourism facilities with Ground+one, slope roof and 33% ground cover permissible with stringent "environmental safeguards".

My Views - The recommendations of the Committee factor in the ground realities where violations and consequential harassment are rampant due to unreasonable conditions under CRZ Notification, 2011. In the densely populated rural areas aspirations of expanding family size, should be provided for but with stringent "environment safeguards" to ensure no pollution to the beaches/coast/marine area. The backwater islands, mostly privately owned and do not suffer flooding, are excellent places for tourism, provided all "environment safeguards" are adhered to. Indian coastal line offers tremendous opportunities for tourism development. Unreasonable restrictions under CRZ Notification hindered this sector. Coastal areas are beautiful, serene, virgin and highly diverse and must be exploited in ecologically sustainable manner for tourism development including architecture of buildings to gel with the ambience and thus regulations such as 9 meters height, sloped roof, 33% FAR etc assume importance. Considering the above, the recommendations of the Committee may be considered for acceptance.

3.5. Special Provisions:

The Committee after due consideration recommended incorporation of special provisions to address projects of high public and national interest such as coastal roads, offshore airports, etc. These projects can be taken up only after recommendations by the highest authority of the State/UT Government, recommendation of SCZMA and later NCZMA and approval by the Competent Authority. After approval, the project shall be incorporated in the CZMP.

4. Analysis of JS (BS)'s comments (on page 18/n at Sl. No.41) in variant with the Committee's recommendations:

- (i) With regard to HTL/LTL demarcation, no methodology recommended specially for ground verification.

My Views - Entire demarcation of HTL/LTL, ground verification and rectification has been assigned to be the responsibility of the NCSCM to rest ambiguities, resulting from multi-organisational demarcation as being followed presently. The HTL demarcated by NCSCM shall be sacrosanct as it is based on uniform methodology, approved by the MoEF&CC.

- (ii) Hazardline to be dropped if required to be notified under E(P)A.

My Views - The Hazard line will keep shifting with intensity of anthropogenic activities and impacts of climate change. It can be used as guidance for disaster management and developmental activities.

- (iii) With regard to Tidal influenced Water bodies the physical modulation of Tide based on satellite imagery to be demarcated and not the 5 PPT.

My Views: This comment can be agreed as NCSCM has been officially ordered to follow the same approach for demarcating the HTL using

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satellite imagery and orthomaps. Demarcation based on salt PPT and regulations thereon completely distorts the CRZ area.

- (iv) Instead of 100 metres or width of the water body, whichever is less, 50 metres or width of the water body whichever is less shall be maintained along tidal influenced waterbodies.

My Views: - This suggestion may be agreed as these tidal influenced water bodies do not generally get flooded beyond HTL. The cushion of 50 metres would be adequate. However, the local authorities must remove all encroachments, ensure no future encroachment and develop the 50 metre open space as green belt and "environmental safeguards" by mandate.

- (v) There should not be any separate clause for administration of mainland islands in tidal influenced waterbodies.

My Views: - My views at paras 3.3 and 3.4 above may kindly be seen. In fact for these small islands we may agree to a ring of 5 metres buffer instead of 10 metres but with stringent environmental safeguards, architectural regulations and height with FAR of 33% regulations.

- (vi) Expert agencies to prepare CZMPs.

My Views: - HTL/LTL, 500 metres and other CRZ boundaries including ESAs should be done only by NCSCM following the approved norms to avoid any ambiguities and resultant litigation.

- (vii) Restriction on expansion of fish processing units for pollution control activities.

My views: - The suggestion can be agreed to, provided adequate pollution control measures are put in place.

- (viii) Reclamation for non-commercial activities should not be permitted.

My Views: - Reclamation for port activities, which is already provided for in 2011 Notification. Special provisions have been incorporated for projects of national/specific public and strategic interest provided they follow the procedure as proposed in the report. Sea reclamation should not be permitted for any other purpose.

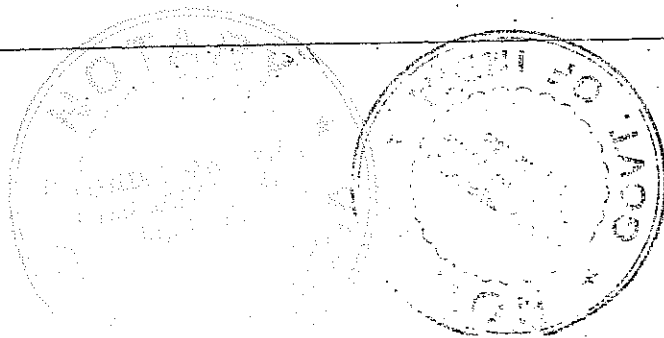
- (ix) Associated Biodiversity of corals not to be considered as CRZ-I.

My Views: - The coral biodiversity is extremely important for the very basis existence of corals as they live in symbiotic relation, hence coral biodiversity should be addressed comprehensively.

- (x) 5-10 metre setback line in CRZ-II and III should be maintained for conservation.

My Views: - Presently in CRZ-II areas construction can be taken up beyond the existing authorised structure or road on the landward side. In CRZ-III areas, adequate buffer of 200 metres NDZ is provided in the thinly populated rural areas, which is suggested in the report. Any further set back of 5-10 metres in such areas only will lead to encroachment of this

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additional buffer thus may spoil the beauty of the coast as it has been observed with the present notification.

- (xi) Distinction on population should not be a criterion for further classification and development regulation in CRZ-III.

My Views - My comments made at para 3.4 may be seen. Hence the above suggestion need not be agreed to.

- (xii) Height and FAR restrictions in thinly populated rural areas should be rejected.

My Views - My view of para 3.4 may kindly be seen. The above suggestions need not be agreed to.

- (xvi) With regard to fertilizer storage, the suggestion made can be agreed as in CRZ areas, fertilizer storage can be prohibited.

- (xvii) - (xxii) Can be agreed to.

- (xxiv) With regard to 1% of coastal line to be declared as ecotourism may not be the right approach as the tourism projects have to gel with the natural environment and ambiance of the coast. Hence tourism should be promoted wherever appropriate with such development which is sustainable and eco-friendly.

- (xxv) As suggested agreed.

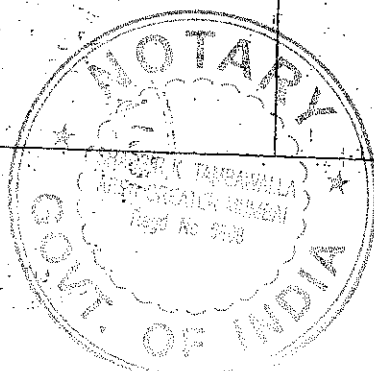
5. Further Comments:

- (i) Bays -The tidal influenced water bodies include estuaries, creeks, backwaters, lagoons, brackish water lakes, ponds, bay etc. which are connected to sea by a narrow opening. Certain water bodies by nomenclature has been defined as a lake, pond or a bay etc. but in realistic terms they are found to be not connected through a narrow mouth opening to the sea. Such water bodies are large with hydrological parameters such as currents, waves, tides are the same as that of a sea. Hence, such water bodies should not be regulated based on the nomenclature but should be based on the actual scientific parameters. For example Back Bay and Mahim Bay which are considered as Bay in CRZ, 2011 Notification, are actually not connected to the sea by a narrow mouth but are large open sea. They are Bay for naval hydrographic purposes but not for CRZ regulations.

- (ii) Water scarcity -In view of the various climatic conditions, water scarcity is going to be serious issue. This Ministry has identified several low lying areas during the elevation modelling for the hazard line marking. In such low lying areas, check dams, water storage systems etc. including rainwater harvesting should be promoted.

- (iii) Integrated Planning -Integrated Management Plan to be promoted in identified stretches, through consultative process in order to reduce stakeholder conflicts.

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(iv) transparency, monitoring and governance, including roles and responsibilities.

The Chapter 4, Subtitle 4.2 at para 8 of the Report details out the enforcement, monitoring and transparency mechanism. The report recommends a dedicated website, capacity building and making available the guidelines, dos and don'ts of the CRZ Notification in all the local languages and easily accessible to the communities. The monitoring and governance mechanisms as detailed in the report should be followed and emphasis should be provided on satellite data, information generated from aerial photography and other scientific instruments so as to minimise ambiguities and litigations.

With regard to roles and responsibilities at para 5 of chapter 4 lays down the responsibilities of each organisation such as NCZMA, CZMA, NCSCM, MOEF&CC, State Governments/UTs, including SICOM. These recommendations may be accepted and implemented.

6. I have given my views on each and every recommendations of the Committee and also on the comments of JS(BS). May like to consider them for acceptance. If the above is accepted, we shall attempt a revised draft CRZ notification.

Shashi Shekhar
(SHASHI SHEKHAR) 3/5/15-
3/5/2015

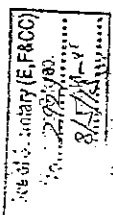
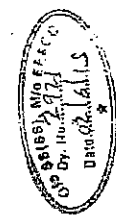
Secretary (E&CC)

Note from p 40 may kindly be seen. The recommendations of SC Committee Report have been analyzed and commented upon. JS & SS have given their view on the recommendations.

May kindly see. We may have a presentation where the recommendations and views on these may be discussed at length so that a decision may be taken on the proposed amendments in the CRZ notification.

Submitted.

Parase



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Shashi Shekhar
(SHASHI SHEKHAR) 3/5/15
3/5/2015

Secretary (EF&CC)

Note from P 2/4 may kindly be seen. The recommendations of SC Committee Report have been analyzed and commented upon. JS & SS have given their views on the recommendations.

May kindly see. We may have a presentation where the recommendations and views on these may be discussed at length so that a decision may be taken on the proposed amendments in the CRZ notification.

Submitted.

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Paradigms of climate change impacts on some major food sources of the world: A review on current knowledge and future prospects

Article in *Agriculture Ecosystems & Environment* · January 2016

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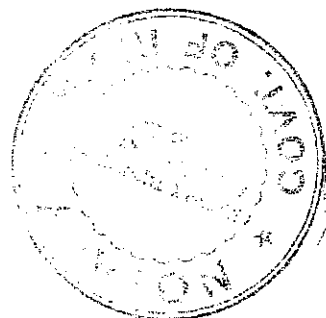
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Review

Paradigms of climate change impacts on some major food sources of the world: A review on current knowledge and future prospects



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ABSTRACT

Due to the adverse impacts of climate change on earth systems the research in this field has been profoundly taken a part in all scientific arenas since last few decades. The deleterious impacts of climate change on agricultural production are challenging the food security of the world in terms of quantity and quality both. Wheat, rice, maize, vegetables, fruits and fish-food provide food security for more than half of the world and are under immense pressure of changing climate. This review is an overview of the significant impacts associated with climate change on these food sources. In present synthesis, various phenological, physiological, biochemical and reproductive responses in major food crops have been summarized emphasizing the vulnerable growth and development stages. Winter and summer sensitivity responses, and morpho-biochemical acclimation patterns have also been summarized. Sustenance in wheat and rice production is evident but impacts of increasing temperatures are negating this on bio-physiological level impacts. Maize crops are experiencing more impacts on yield as compared to wheat and rice. Fruits and vegetable production is highly vulnerable to climate change at their reproductive stages and also due to more disease prevalence. Fisheries as a critical animal food source; is in extreme danger as apparent changes in their habitat and unmanageable environmental conditions are producing extreme losses. This review also provides an account of stress responses and useful adaptive measures. This synthesis may be helpful in understanding manifold dimensions and interactions of climate change impacts on selected major food sources of the world.

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1. Introduction

Climate variability has been and continues to be, the principal source of fluctuations in global food production in developing countries (Oseni and Masarirambi, 2011). The Earth's climate has warmed by approximately 0.6°C over the past 100 years with two main periods of warming, between 1910 and 1945 and from 1976 onwards and is greater than any other time during the last 1000 years (IPCC, 2014). Undoubtedly, agricultural production is going to be affected due to its consequences and the magnitude of which on crop yields will vary locally due to regional differences in both natural and anthropogenic factors that control plant responses (Rustad, 2008; Wei et al., 2014). Coupled with resource scarcity of land, water, energy, and nutrients, declining soil quality, increased greenhouse gas emissions and surface water eutrophication, climate change will affect crop production in a great deal (Fan et al., 2011; Tripathi et al., 2014). Changing temporal and spatial trends of hydro-climatic variables, rising sea levels and increasing incidence of extreme events pose new risks to future food insecurity in all parts of the globe (Chen et al., 2015; Zhao et al., 2015). Anomalies in temperature and climatic regime of our earth system have raised the concerns to think global climate change as a strongest stressor for the agriculture and world food production since plants are directly related and respond to environment CO₂ and temperature (Kersebaum and Nendel, 2014). Therefore, the potential impacts of climate change on food security must therefore be viewed within the larger framework of changing earth system dynamics and multiple socio-economic and environmental variables.

Various critical direct and indirect consequences of global climate change on crop production can be seen due to the rising CO₂ and temperature and unpredictable rainfall disturbing the food security aspects of the world (Poudel and Kotani, 2013). Consequently it becomes quite important to examine the changes happening at different stages of the crop growth and development and their impact on the production either in the form of quality or quantity. As this subject has gained enormous importance in recent times with growing numbers of specific studies of the impacts of climate change on various food items; multidisciplinary synthesis of the knowledge of climate impacts on major food sources of the world is needed.

1.1. Climate change and its current scenario

The 'climate' may be referred as the characteristic weather conditions (viz. air temperature, precipitations, atmospheric pressure, humidity, wind, sunshine and cloud cover) of the earth's lower surface atmosphere at a specific location. Any change compared to prior observations in an existing observation record of the systematic measurements of these phenomena at a specific location over several years may be ascertained as climate change. However, an internationally agreed definition of the term "climate change" is still desirable which on different international platforms is regarded as (i) only human-induced changes in the climate system (UNFCCC, 2006), or (ii) all changes in the climate system, including the drivers of change, the changes themselves and their effects (GCOS, 2012); or (iii) long-term changes in average weather conditions (WMO).

The world is now frequently experiencing many unprecedented changes in climate due to warming of the earth's system since last five decades. The assessment report of IPCC (2014, AR-V) identifies the changes as well as gives various projections in current climatic variables. Each of the last three decades has been successively warmer than any preceding decade since 1850 imparting warmest 30-year period (1983–2012) in the Northern Hemisphere, in last 1400 years (IPCC, 2014). The atmospheric concentration of CO₂ has increased to the level of 396.48 $\mu\text{mol mol}^{-1}$ in 2013 (ESRL-NOAA data, Fig. 1A) from its pre-industrial level of 280 ppm and is projected to reach 550 ppm by the middle of this century which may escalate up to 700 $\mu\text{mol mol}^{-1}$ by the end of this century

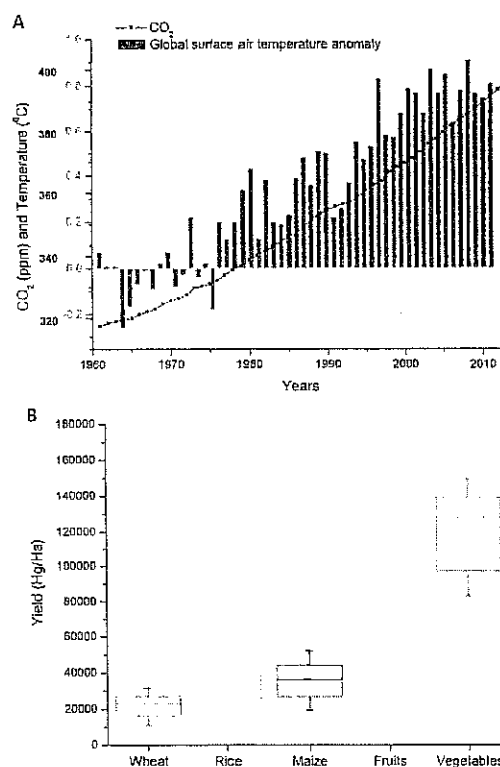


Fig. 1. (A) Annual mean of global surface air temperature anomaly (Base period: 1951–1980) and global CO₂ concentration since 1961–2013; shows equivalent increasing trends both in CO₂ concentration and temperature, indicating escalating warming of Earth systems (Data source: GISTEMP and ESRL, NOAA data). (B) The box chart shows variability in yield worldwide in selected food crops (excluding fisheries) since 1961–2012. Yield in selected food crops are showing departures from mean yield with respect to their minimum and maximum yield (Data source: FAO data). The boxes show first and third quartiles while whiskers show 5–95% intervals. The line in the boxes represents the median, and the small boxes, the mean value.

(Raupach et al., 2007). Evidently, the Earth's system shows a warming of 0.85 °C over the period 1880–2012 and the ocean warming is also increasing on a global scale and is largest near the surface; and the upper 75 m warmed by 0.11 °C per decade over the period 1971–2010 (IPCC, 2014). Further increase in GHGs will have a significant impact on global climate since in unmodified conditions of current energy uses; mean annual global surface air temperature will be raised by 1.5–4 °C (Wheeler and von Braun, 2013). This will have far reaching consequences on each type of ecosystems of the world including agro-ecosystems hence is dangerous for the food security of growing world's population.

1.2. Climate change and agriculture

Despite of the huge importance of the industrial production in the world, agriculture has an essential role in ensuring the food security and welfare of growing population (Rustad, 2008). Climate change associated impact on global food security is a threat with which the world will have to deal in the twenty-first century (Myers et al., 2014). Climate change will probably have direct impact on tropical and temperate regions where high temperature or inadequate rain often limits crop productivity (Wheeler and von Braun, 2013). Changed weather conditions will have serious impacts on food availability, accessibility, utilization and food system stability (Gu et al., 2010) and thus food security will be affected. As the growth and development of any plant depends on various environmental factors and their interaction (such as temperature, precipitation, moisture and pressure, etc.) (Cutforth et al., 2007); a plant will behave differently in different interactions and will show different impacts. The impacts will be either visual or changes will happen in its physiology and at the level of other biological processes (Cicchino et al., 2013). The quantitative and qualitative estimates of climate change impacts on crop yields are derived from various crop simulation models for almost all continents (Parry et al., 2004; Krishnan et al., 2007; Table 1). These simulations include higher temperatures, changes in precipitation and higher atmospheric CO₂ concentrations to make advance assessment of climate effects across a range of crops (Reidsma et al., 2010). However, some studies show that in current climatic scenario the increasing levels of the CO₂ may give some positive impacts on the crop production due to higher net photosynthetic rates and reduced transpiration but at the same time increase in the temperature negates this and different crops show variable impacts (Gu et al., 2010; Mishra et al., 2013; Table 1). On the other hand, increases in the level, timing and variability of precipitation may benefit semi-arid and other water-short areas by increasing soil moisture, but can aggravate problems in water excess regions (Schlenker and Lobell, 2010). Meanwhile a reduction in rainfall could have the opposite effect as well (Braun and Markus, 2012). Various specific crop and climate scenarios for the selected food sources in this assessment have been given here to understand the projected specific impacts of the changing climate on the particular food sources on different continents (Table 1).

Based on recent literatures and published data, this synthesis seeks to elucidate the potential impacts on different bio-physical processes of some important food sources of the world to understand the impact scales and their dimensions affecting the yield over the globe. Our primary goal here is to review observations of climate change impacts occurring on major food sources across the world and to find out evidences on crop responses to different kinds of stress produced due to changes in climatic factors. This deals with the various dimensions of climate change impacts on some major food grains (wheat, rice and maize), examines and points out the major changes happening at different level of vegetable and fruit crops and integrates the various

findings of published researches on the impact of climate change on fish-food which is also one of the major sectors fulfilling food demand across the world. It also tries to find out the winter and summer sensitivity differences in selected food sources, ways of stress responses and acclimation patterns to fight with the climate change induced stresses. Major climate change adaptive and mitigative strategies to cope up with the impacts have also been illustrated in brief.

2. Impact of climate change on major food sources of the world

2.1. Impacts on major food grains

The wheat, rice, and maize are among the six most widely grown crops in the world (Lobell et al., 2011). Production of these crops accounts for over 40% of global cropland area, 55% of non-meat calories and over 70% of animal feed (FAO, 2008). Historical climate and crop data have been used to indicate climatic impacts on yields of these grains in many countries of the world (Schlenker and Lobell, 2010). In the following sections three major crops of the world and their responses under the climate change has been illustrated by taking into account various literatures and reports available.

2.1.1. Impacts on wheat

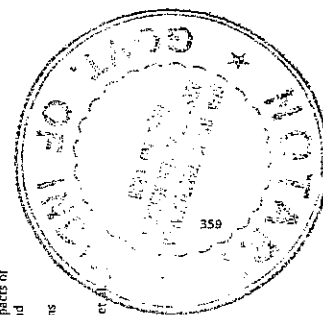
Various studies report the projections of impact of climate change on wheat (*Triticum aestivum* L.) production under different simulation models in different continents (Parry et al., 2004; Altenbach, 2012; Kersebaum and Nendel, 2014 Table 1). Under various climate change scenarios the major influencing factor is availability and management of soil water reserves of winter wheat, especially in frequently occurring extreme events such as heat waves and droughts with decrease in annual soil and groundwater recharge (Barnett et al., 2012; Elliott et al., 2014). However, it is expected that future climate change will affect wheat yields but is uncertain whether it will result in more positive impacts or negative ones. This is due to the opposing effects of temperature, precipitation and CO₂ concentration on physiological processes of wheat growth and development (Mishra et al., 2013; Kersebaum and Nendel, 2014). While CO₂ fertilization effects will induce more photosynthetic production whereas higher temperatures can reduce net carbon gain by increasing plant respiration more than photosynthesis (Högy and Faugmeier, 2008). The light-saturated photosynthesis rate of C₃ cereals such as wheat is highest for temperatures about 20–32 °C, while a steep nonlinear increase is noticed in total crop respiration for temperatures from 15 to 40 °C, followed by a rapid and nearly linear decline (Porter and Semenov, 2005). However, reduction in yields with higher temperature has been found worldwide (Lobell and Burke, 2008). In China, increase in temperature was correlated not only with lower but also with higher yields of wheat (Zhang and Huang, 2012). Lobell and Burke (2008) reported negative correlation between wheat yields and temperature but a positive correlation with precipitation reflecting that precipitation has a more positive impact on wheat yield than temperature.

Studies have also been carried out on the impact of climate variability on wheat production changes as functions of different environmental parameters (Reyenga et al., 2001; Alexandrov et al., 2002). Decrease in the production of wheat under the influence of changing climatic conditions have been reported from many agrological regions (Janjua et al., 2010). However, these trends in reduction may seem small when expressed as a percentage of current yields. The absolute losses in global wheat production due to warming trends since 1981 are substantial which would have been roughly 2–3% higher without climate trends since 1981 (Lobell and Field, 2007). There are various studies elucidating

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Table 1
Various significant impacts of climate change under different climate change/crop scenarios on different continents of the world.

Selected food sources	Continents	Continents					
		Africa	Antarctica	Asia	Australia	Europe	North America
Wheat	Crop-climate models	HADCM3, DSSAT, PEGASUS, IPSL-CM5A-LR	–	SRES A1B and A2, CropSyst, MAGNET, CWHIAT2	MR2, DOE-PCM, APSIM, Nwheat	CMIP3/5, EU-ENSEMBLES, RCP8.5, HERMES, EuroWheat	DIRTIL, HADCM3, SoilN, Wheat, CSM-CROPSIM-CERES, Wheat V4.5
	Specific impacts	Median response to climate change is a negative impact with major yield losses	–	Simulated yields show increases. An increased risk of flower sterility & reduction in yield	Increased average growing season temperatures in the main wheat growing regions. This can cause reductions in grain production of up to 50% (Liu et al., 2005); Auering et al. (2011)	Occurrence of adverse conditions might substantially increase by 2050, northward expansion of suitable cropping areas (Kasschaub and Nöcker, 2014; Tsubo et al., 2014)	Shifts in wheat production into environments once considered too arid, too variable, and too harsh to cultivate (Olnstead and Blumhede (2011); Li et al. (2013)
Maize	References	Krishnan et al. (2007); Llorens et al. (2013)	–	Wolfe et al. (2007); Nelson et al. (2014)	–	–	Baron et al. (2014); Nelson et al. (2014)
	Crop-climate models	PEGASUS, DSSAT, CERES-Maize	–	CERES, CropSyst, InGeoCrop, Hybrid-Maize Model	PEGASUS, APSIM, CMIP5, Agro-IBIS	EU-ENSEMBLES, HADCM2 & 3, AG-CCM	MaizeSim, CERES-maize, CropSyst
Rice	Specific impacts	At least 10% reduction in the potential maize growing areas	–	Projected mean change in production ranges from 10–15% as well as increase in some areas (Kang et al., 2012)	Weather extremes may cause ~10–80% variation in production	Yield stagnation and increased yield variability, reduction of the growing period (Blaasen et al., 2011)	Estimated overall reduction may range from 8 to 10% by 2055 (Jones and Thornton (2005); Morison et al., 2014)
	References	Krishnan et al. (2007); Charles, 2014	–	–	Anwar et al. (2015); Chaudhary et al. (2015)	–	–
Fruits and vegetables	Crop-climate models	ORYZA2000, PEGASUS, DSSAT, IPSL-CM5A-LR	–	MAGNET, SIMRIW, CERES-RICE, CCSM3	HADCM3, ECHAM5/LSG, CERES-Rice 4.0, APSIM	EU-ENSEMBLES, LUMIL, IWDDhydro	PEGAJUS, MAGNET, CERES-RICE
	Specific impacts	There will be large yield gaps between potential and actual yields	–	Temperature increase may decrease rice yield compared to normal condition scenario	Negative impact of climate change is mainly due to advances in crop phenology	Major losses in the form of fresh water limitations in some irrigated regions	Shift of rice to more favourable production zones due to reduced rainfall, increased temperature (Pacheco et al., 2006)
Fruits and vegetables	References	Krishnan et al. (2007); Dufresne et al. (2013)	–	Lee et al. (2013); Nelson et al. (2014)	Loos et al. (2005); Anwar et al. (2015)	Jones et al. (2003); Elliott et al. (2014)	–
	Crop-climate models	SRES B2, IMPACT, CTAP-W, HADCM3	–	CSIRO-Mk3.5, HadCM3, MIROC-APRCWHEAT2	CLIMEX, GENSECT, HADCM3, VineLogic	SRES A1B, FSSIM, DAE	SRES A1B, CLIMEX
Fruits and vegetables	Specific impacts	Varied impacts on rainfed and irrigated fruit and vegetable production, both positive as well as negative impacts, loss in winter chill	–	Delayed harvesting periods, impacts on postharvest quality causing tuber malformation, and changes in reducing sugars contents on potatoes (Maret et al., 2010); Bandiera and Gal (2014)	Disease outbreaks and changes in flowering-fruitlet time, chilling requirement not being met in future warmer climates	Climate change may enhance pathogen contamination risk on leafy green vegetable, changes in yields	Potential impacts generally vary by latitude, reduction in southern crop growing areas and enhanced yield in northern areas, winter kill of fruit trees (Baret (2005)
	References	Landis et al. (2012); Calceitilla et al. (2012)	–	–	Wobli et al. (2007)	Liu et al. (2013); Collier et al. (2014)	Major impacts of ENSO and Sudden Oscillations (Marengo et al., 2014)



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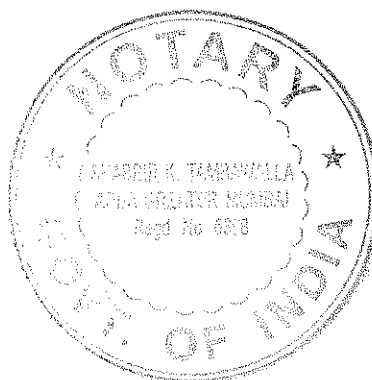
Table 1 (Continued)
Selected food sources

	Africa	Antarctica	Asia	Australia	Europe	North America	South America
Fish-food	GTAP-W, GFDL's CM2	BE models- PROOC, DISCRIM, CSIRO2, SPACC	AquaMaps, GFDL's CM2, CMIP2-E	MK3L-COAL, ERA-Interim	AORCM, GFDL's CM2, OBENs, TOPAZ	BBN, CANESM2M, SD-SAM, PCM	HADCM3, ERA-Interim, PCM
Crop-climate models	Predicted increased productivity at high latitudes, decreased productivity at low/mid latitudes, increased productive potential in West Africa	Habitat change and ocean acidification will affect fishing capacity and primary fish production	Decrease in productive potential in South and Southeast Asia, substantial reduction in marine fish production	Wild populations appear more vulnerable than aquaculture, changes in habitat quality	Species invasion, northern seas are expected to switch from polar to more temperate species, also the opening of new fishing opportunities	High water temperature is the leading driver of potential declines in fish community	More invasive species, range shifts on species level, changes in habitat quality and availability
Specific impacts							
References	Lam et al. (2012); Barange et al. (2014)	Milazzo et al. (2010); Chung et al. (2011)	Barange et al. (2014)	Plaginski et al. (2011); Richards et al. (2013)	Philippart et al. (2011); Cheung et al. (2013)	Olney et al. (2014); Paytan et al. (2014)	Hicke et al. (2007); Allison et al. (2008)

variables through which these impacts can be tested and observed and for which wheat crops are sensitive to a change and interactions among them (Amthor, 2001). For instance, long-term changes in the soil fertility and soil water storage capacity, accelerated hydrological cycle exaggerated by a change in evapotranspiration, precipitation, the run-off and by any change in the intensity and frequency of floods and droughts can significantly modify the climate change impact on wheat production (Dai, 2006; Sheffield and Wood, 2012). These are the most important limiting factors in wheat productivity in semi-arid agricultural areas (Lai, 2009).

It is important to understand that physiological responses of increasing atmospheric CO₂ concentration known as CO₂ fertilization effect can produce larger and more vigorous plants, higher total dry matter yields and often greater quantities of harvestable product (Lobell and Field, 2007). This is due to increased CO₂ concentrations which affect plant growth directly through stimulation of photosynthesis and reduction of transpiration resulting improved water use efficiency (Ortiz et al., 2008). Elevated CO₂ may also increase positive effect of soil nitrogen on water use efficiency of wheat (Leakey et al., 2009). Studies have also shown that growth of wheat plants is proportional with CO₂ under water limited conditions affecting energy exchange. This depends on soil water availability and positively impacts wheat production (Jablonski et al., 2007). However, these positive impacts may be compensated by many other physiological and biochemical impacts owing to heat and water stress conditions.

Overall decreases have been reported for most macro and micronutrients in wheat under high CO₂ (DaMatta et al., 2010). In wheat, reductions in N, Ca, Mg, and S were consistently reported whereas P and K responded differently to different CO₂ enrichment experiments (Högy and Fangmeier, 2008). These reductions under drier climate may be attributed to the accumulation of carbohydrates and other organic compounds, reduced uptake of N from the soil under varied transpiration rates resulting from decreased stomatal conductance and impaired nitrate assimilation associated with decreases in the photorespiration pathway (Luo et al., 2005; Bloom, 2006). It may also lead to decreased leaf protein concentration (Dupont et al., 2006; Altenbach, 2012). Evidently, the increase in temperature have a larger effect than elevated CO₂ on carbohydrate composition with increased sucrose and slightly decreased stachyose; while glucose, raffinose and fructose show less or no significant change (DaMatta et al., 2010). Changes in average granule size owing to induced water stress due to low humidity, strong winds and high light intensity have also been noticed which may have a greater impact on grain yield during certain growth stages than similar stress at other growth stages (Hurlman & Wood, 2011). Significant differences in water potential among different wheat genotypes under water stress have also been reported for wheat cultivars in different countries (Elliott et al., 2014). The resulting reduced turgor pressure in wheat plants will slow down leaf expansion, branching and tillering before stomata-controlled processes are reduced (Farooq et al., 2009). The increasing temperature also affect the structure and gelatinization process of wheat starch where small increase in temperature (2–4 °C) may affect grain quality more than twice the effect of CO₂ since starch content, starch grain size and number and gelatinization may be altered in complex ways with temperature (Hurlman and Wood, 2011). Elevated temperature also affects the concentration of oleic acid and linolenic acid, non-starch and starch lipid fractions, changes in acyl lipid, proportions of the membrane glycosylglycerides and phosphatidylcholine, gliadins and decreased glutenin content, (Tester and Somerville, 2003; Wieser et al., 2008). High temperatures may down-regulate waxy proteins, allergen-like proteins and elongation factor while heat shock proteins (HSPs), α-amylases, glyceraldehyde-3-phosphate



dehydrogenase (GADPH) and triosephosphate isomerase involved in glycolysis are up-regulated by high temperature (Luo et al., 2005; Altenbach, 2012).

Various reproductive changes in wheat crop are also seen due to high temperatures, which result in limiting plant growth and reducing grain yield. In some parts of the world, genetic progress in wheat breeds has been fairly counterbalanced by the unfavorable effects of climate change since the end of the 1980s (Oury et al., 2012). Short term exposure to extreme temperatures at any point before fertilization is much dangerous for many reproductive processes and consequently may decrease or prevent fertilization (Trnka et al., 2014). It has been observed that cell division stages of pollen and megaspore mother cell in wheat did not alter pollen germination, but guidance of pollen tube to the ovules may be prevented due to an increase in ovule abnormalities and a decrease in the proportion of functional ovules (Snider and Oosterhuis, 2011). This may have huge impact on wheat grain yield. Climatic impacts on post fertilization process result in pollen and anther sterility at the time of anthesis and thus restrict embryo development leading in reduction in grain numbers (Hedhly et al., 2009). After anthesis, high temperature stress affects the rate of grain filling leading to reductions in grain yield (Snider and Oosterhuis, 2011). Apart from these, effect of temperature on expression of genes encoding enzymes for starch biosynthesis in developing wheat endosperm were also reported indicating the effect of climate change on genetic levels as well (Hurkman and Wood, 2011).

Farmer's perceptions based studies in some parts of the world also point out the impacts of the shifting weather patterns affecting sowing and harvesting time and quality of wheat crops. Reduced fog, less winters and winter rains are some major variables which have been noticed by the farmers impacting the quality of wheat produce (Tripathi and Singh, 2013). Summarily it is quite complicated to discriminate whether climate change impacts on wheat are larger on negative side or positive but it is reasonably clear that changes in climate are playing crucial role in changing the various physiological and biochemical process of wheat growth and development which may have larger impacts on yield of wheat crops in recent future which is seeming quite sustainable at the moment.

2.1.2. Impacts on rice

Rice (*Oryza sativa* L.) is one of the main staple foods for over the half the world's population, providing 27% of dietary energy with 20% of dietary carbohydrate to the developing world (FAO, 2004). It is cultivated in at least 114, mostly developing, countries and is the primary source of income and employment for more than 100 million households in Asia and Africa (FAO, 2004). Droughts, floods, and typhoons are the major causes for fluctuation in production of rice as well as in its pricing worldwide (Pedersen et al., 2009; Sheffield and Wood, 2012). China and India account for more than half of the world's rice area, and, along with Indonesia, consume more than three-fourths of the global rice production (FAOSTAT, 2010). The changing climate has underscored the massive implications on rice; important for human nutrition, global food security, and alleviation of poverty (FAO, 2008). In general, an increase in CO₂ level was found to increase yields while increases in temperature reduced yields in some rice crop yield simulation models (Krishnan et al., 2007; Table 1). Some CO₂ sensitivity experiments of the rice indicated that an increase in CO₂ concentration leads to yield increase due to its fertilization effect and also enhances the water use efficiency of the paddy (Shimono et al., 2010). However, the temperature sensitivity experiments have shown that for a positive change in temperature up to 5 °C, there is a continuous decline in the yield (Endo et al., 2009). Increase in the rice yield has also been shown by some rainfall

sensitivity experiments when the observed values of rainfall are near exponential but decrease in rainfall results in yield loss at a constant rate (Poudel and Kotani, 2013). Reports indicate that rice yield is more vulnerable under maximum temperature as compared to the minimum temperature while collective effects of maximum and minimum temperature are more significant compared to their individual effect on rice production (Basak, 2009). Farmer's observation in many agricultural areas report variability in rice production; strongly influenced by rainfall patterns and gradual shift in the fruiting and flowering season of rice crops (Tripathi and Singh, 2013).

In phenological impacts, visual appearance of successive leaves and shortening of the flowering time due to CO₂ enrichment has been reported in rice (Streck et al., 2008). The elevated CO₂ effects were also observed in the morphology of leaves, changing the number, density and size of stomata (Pedersen et al., 2009). High air temperature can result in the increase of leaves surface temperature, affecting photosynthesis of crop and restraining the root growth, which is expected to negate the positive effects of CO₂ fertilization (Gu et al., 2010; Poudel and Kotani, 2013). Thermal effect of temperature and photoperiod consequently affect successive leaf appearance and the rate of leaf area expansion (Streck et al., 2008). Physiologically, high temperature also affects the accumulation of dry matter, carbon and nitrogen (Kim et al., 2013) in the Kernel Rice (Kobayashi et al., 2007). In rice, amylose which is unresponsive to elevated CO₂ in combination with gelatinization temperature largely determines the grain quality (Terao et al., 2005). Elevated temperatures have been found to cause lower amylose content, decreased hardness of the rice grains or amylose may also increase at warmer temperatures increasing stickiness of rice grains (Counce et al., 2005). Within gliadins, ω -5 gliadins and ω -1, 2 gliadins are more prone towards high temperature stress in rice (Wieser et al., 2008). Elevated CO₂ (540–958 $\mu\text{mol mol}^{-1}$) may cause lower protein concentrations in rice (Faub et al., 2008). Proteome change in rice is envisaged at higher temperature (30–35 °C) especially for the lignification-related proteins and proteins related to protection which are regulated by temperature (Han et al., 2009; Kosová et al., 2011). High night temperatures have also affected the milling quality, grain dimensions, and starch branching in rice (Counce et al., 2005). Climate change has been also predicted to affect rice productivity by altering disease occurrence and insect infestations (Rosenzweig et al., 2001; Table 2). Elevated CO₂ and temperature will have striking effects on irrigated rice production, through indirect effects inducing insect pest attacks, diseases, and weed competition in the rice ecosystem and could also affect the vulnerability of rice to the important disease like rice blast and sheath blight (Kobayashi et al., 2007; Gregory et al., 2009; Table 2). It was found that glucose concentrations significantly increase in the foliage of rice under increased CO₂; making more favorable condition for insects to attack (Shimono et al., 2010).

On reproductive structures, the elevated temperatures have marked impacts as it may decreased crop yield due to spikelet sterility and the same happens with combined effect with CO₂ (Kim et al., 2011; Rang et al., 2011). This also results in the lower quality of rice grains because of reduced growth duration (Peng et al., 2004). Reduce grain-filling duration and enhanced respiratory losses are also observed during fertilization process (Fitzgerald and Resurreccion, 2009; Kim et al., 2011). The increased humidity and wind velocity changes due to climate change have immense impacts on viability of pollination and length of basal dehiscence of the theca in rice (Matsui et al., 2005; Jablonski et al., 2007). Rice kernel development is less responsive to temperature extremes, but is more sensitive to low temperature (Kim et al., 2011). Rice is hypersensitive to high-temperature stress during panicle development and meiosis causing anomalous pollen

Table 2

Various diseases and ailments of selected food sources induced due to changes in different climatic variables.

Selected food sources	Disease and pathogen interacting with changing climatic variables	References
Rice	Rice blast (<i>Piricularia oryzae</i> , <i>Magnaporthe grisea</i> , <i>Magnaporthe oryzae</i>) Sheath blight (<i>Rhizoctonia solani</i>) Bacterial blight (<i>Xanthomonas oryzae</i>) Tissue infection (<i>Cryptosporidium corticale</i>) Brown spot (<i>Cochliobolus miyabeanus</i>)	Chakraborty et al. (2000); Rosenzweig et al. (2001); Gregory et al. (2009); Gautam et al. (2013)
Wheat	Common bunt (<i>Tilletia caries</i>) Karnal bunt (<i>Tilletia indica</i>) Leaf rust (<i>Puccinia recondita</i>) Head blight (<i>Fusarium</i> sp.) Needle blight (<i>Dothistroma septosporium</i> , <i>Phaeosphaeria nodorum</i> , <i>Mycosphaerella Graminicola</i>)	Garrett et al. (2006); Shaw et al. (2008); Gautam et al. (2013); Paterson et al. (2013)
Maize	Tar spot complex (<i>Phyllachora maydis</i> , <i>Monographella maydis</i>) Gray leaf spot (<i>Cercospora zeae-maydis</i> , <i>Cercospora Zeina</i>) Corn borer (<i>Ostrinia nubilalis</i>) Grayish black rot (<i>Helmithosporium maydis</i>)	Rosenzweig et al. (2001); Crous et al. (2006); Cairns et al. (2012); Beresford and McKay (2012)
Fruits and vegetables	Downy mildew on grapevine (<i>Plasmopara viticola</i>) Black sigatoka in banana (<i>Mycosphaerella fijiensis</i>) Potato late blight (<i>Phytophthora infestans</i>) Stem or white rot (<i>Sclerotinia sclerotiorum</i>) Banana wilt (<i>Xanthomonas</i> sp.) Kiwifruit Bacterial canker (<i>Pseudomonas syringae</i>) Apple black spot (<i>Venturia inaequalis</i>) Onion downy mildew (<i>Peronospora destructor</i>) Panama disease in banana (<i>Fusarium oxysporum</i>) Pineapple disease (<i>Fusarium subglutinans</i>) Potato leafhopper (<i>Empoasca fabae</i>)	Evans et al. (2006); Gautam et al. (2013); Beresford and McKay (2012); Paterson et al. (2013)
Fish-lood	Dermo disease (<i>Perkinsus marinus</i>) Ichthyophonus epizootics (<i>Ichthyophonus hoferi</i>) Vibrio illnesses (<i>Vibrio parahaemolyticus</i>) Fish pox (<i>Acroporid serratosus</i>) Grass carp haemorrhagic disease (Grass carp reovirus) Apicomplexa infections	Farrell (2002); Riegl (2002); Pikarsky et al. (2004); Burge et al. (2014)

maturity and absolute sterility (Endo et al., 2009). Thorough evaluation of the studies suggest that rice vulnerability to the changing climate is more towards physiological impacts and this crop seems much prone to warming conditions specially due to abrupt rainfall patterns during various growth stages.

2.1.3. Impacts on maize

Maize (*Zea mays* L.) is one of the prime starch resource and accounts for the majority (80%) of the global market share and is produced on nearly 100 million hectares mostly in the lower middle income developing countries (FAOSTAT, 2010). Demand for maize will double by 2050 and it is predicted to become the crop with the greatest production globally by 2025 (Rosegrant et al., 2001). A recent investigation of more than 20,000 historical maize trial yields in Africa showed that for every degree above 30 °C, the grain yield of maize was reduced by 1–1.7% under optimal rain fed and drought conditions (Lobell et al., 2011). It has been reported that the increasing temperatures combined with decreasing precipitation may have major implications for maize production negatively affecting all stages of maize growth and production, particularly the reproductive stage, is most sensitive to drought stress (Çakir, 2004; Wang et al., 2011; Cairns et al., 2012). Furthermore, different plant tissues of maize, organs and developmental stages are affected by heat stress in different ways, depending on the susceptibility of the dominant metabolic processes that are active at the time of stress (Monjardino et al., 2005). There are various abiotic and biotic effects of climate change on maize, such as effects on low soil fertility, pests and disease and drought affecting global maize production (Oseni and

Masarirambi, 2011). Acute high temperatures can also induce shortened life cycle, reduced light interception and increased sterility, reduced growing season and shortened grain-filling period (Wang et al., 2011). The growing temperature higher than 32 °C results in loss of grain yield especially in tropical and moderate zones and an increase of 2 °C can cause more than 10% yield loss in maize (Jones and Thornton, 2003; Cairns et al., 2012). While the yield is expected to decline in some parts of the world but it may increase in some other parts where maize is not currently grown as the main crop (Wang et al., 2011; Table 2). This indicates that changing temperatures may lead to the shifting of crop cultivation areas to new areas and consequently making more ecological struggle and adaptation responses for this crop.

Some sensitivity experiments illustrate the effects of shifts in sowing dates on maize yield under diverse climate-change conditions and report huge declination in the yield (Williams, 2006). Elevated temperature has also been found to negatively affect protein synthesis at the seedling and vegetative stages of maize crop (Cairns et al., 2012). The growth and senescence of phytomers and the role of the phyllochron and phytomer formation during developmental stage is drastically affected by temperature stress in maize (McMaster, 2005). Various other significant physiological changes have been reported such as, changes in carbon utilization and partitioning and decrease in maize leaf elongation rate, leaf area, shoot biomass and photosynthetic CO₂ assimilation rate (Monjardino et al., 2005; Potters et al., 2009).

Reproductive processes in maize are also on the verge of danger. High temperature results in an increase in the number of antipodal



cells in the maize embryo sac and causes asynchrony in the tasselling and silking of maize, whilst the growth and receptivity of the style is also inhibited (Ribaut et al., 2009). Effects of heat stress are severe as they decrease maize grain yield and change starch quality by decreasing starch granule size, amylose content and short branch-chains and increasing gelatinization temperature (Wang et al., 2011). It has been found that constant occurrence of high temperature during grain filling in maize reduces the granule size (Lindeboom et al., 2004). These kinds of susceptibilities of maize to high temperatures and drought stress are generally attributed to its separation of male and female flowers where female tissues are most susceptible (Jablonski et al., 2007). Increased flowering synchrony and delayed leaf senescence were also reported during high temperatures and drought conditions (Hedhly et al., 2009). Higher temperature induced heat stress may affect number of grains and weight and size of kernel and it decreases the number of fertilized ovules which develop into grain (Efeoglu et al., 2009). It reduces fertilization, viability and in vitro germination of pollen, pollen water potential, quantity of the pollen shed and pollen tube germination (Barnabas et al., 2008; Lu et al., 2014). Consequently, probability of pollen damage increases due to heat stress reducing sink capacity (Lu et al., 2014), affecting cell division, sugar metabolism and starch biosynthesis, (Cicchino et al., 2013).

It is noteworthy that the variety and receptiveness of agricultural pests and diseases in maize crop will vary under changing climates. Modified host physiology and resistance are the featured effects of climate change on maize and it has the potential to alter the stages of pathogen development (Rosenzweig et al., 2001). As various environmental conditions such as, rainfall, relative humidity, temperature and sunlight control disease development; any change in them is likely to have an effect on the diseases prevalence and emergence in maize (FAO, 2008). For example, *Cercospora zeae-maydis* and *Cercospora zeina* causing gray leaf spot (GLS) in maize and corn root worm (*Diabrotica*) are highly sensitive to environmental conditions (Crous et al., 2006; Table 2). The climate change driven expansion of maize production will make new areas susceptible to ingress, establishment and spread of diseases (FAO, 2008). Some characteristic diseases interrelated with climate change are given here for the food sources selected in this synthesis which gives an account of spreading danger of climate change triggered disease occurrence to these crops (Table 2).

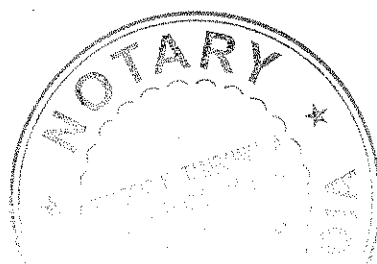
2.2. Impacts on fruit and vegetable crops

There are growing demands for the fresh fruits and vegetables all over the world and exports for which throughout the world has been increasing day by day (FAOSTAT, 2010). There are evidences of variations in climate, between years and regions which can have a strong effect on horticultural production worldwide. A warmer climate is supposed to be favorable for subtropical fruit production but at the same time can also be harmful for some temperate fruits (Luedeling, 2012; Kuden, 2013). Although, there is possibility of increase in yields of fruits and vegetables due to more carbon dioxide available for growth, but this may be limited by the less availability of water and nutrients (FAO, 2008). The increased risk of spring frost, new or more aggressive diseases and pests, hail and water shortage or more variable rainfall with longer droughts are some of the major factors highly detrimental for fruit crops (Chmielewski et al., 2004; Braun and Markus, 2012). The vast amount of research has been carried out on the reproductive stage effects of changing climate in fruits and vegetables and the flowering and its conversion into fruits is the major phenomena which is directly impacted by the climate change (Braun and Markus, 2012). Flowering and flower development are the major

physiological phenomenon in fruits where most of the studies are concentrated to understand the impacts of varying temperatures (Ruiz et al., 2007). Flower at a dissimilar time from their pollinator, developments of 'blind buds' failing to develop in spring, pollination problems due to sporadic flowering and poor leaf quality at flowering time will lead to poor fruit set in fruit crops worldwide (Yamane et al., 2006; Campoy et al., 2010). 'Initial flowering' or 'too early flowering' and 'full flowering' are the significant phenological stages which are known to be affected by changing climates over the years (Rodrigo and Herrero, 2002; Ashebir et al., 2010). Reports show the impact of climate change on decreasing firmness with increasing temperature and on mean number of flowers per winter bud (Legave et al., 2009). Dormancy and meristem inactivity are also induced in some unfavorable environmental conditions, such as chilling temperatures or short photoperiod; and effects of pre blossom temperatures have been reported on fruit set and flower development (Rodrigo and Herrero, 2002; Campoy et al., 2011). For example, blossoming of fruit trees in Germany have advanced by several days and general growing season in Europe and Germany has been extended by 10 days during the last decades (Chmielewski et al., 2004). Because of this, risk of late frost damages and the number of pest populations in orchards has risen (FAO, 2008). Earlier spring growth and longer-milder autumns will extend the growing season but, untimely and early flowering may be vulnerable to spring frosts (Seki et al., 2003). All these environmental stresses can affect developmental changes in the anthers, irregularities in the epidermis and endothesium, lack of opening of the stromium, and poor pollen formation leading to reduction in post harvest quality and quantity of fruits and vegetables (Moretti et al., 2010; Luedeling, 2012). Bud drop, irregular and atypical flower development, dehiscence and poor ovule viability, reduced carbohydrate availability and other reproductive abnormalities occurring due to high temperatures have also been reported (Hazra et al., 2007; Hedhly et al., 2009).

Physiological effects of climate change on photosynthesis, respiration, aqueous relations in cells and membrane stability during growth and development of fruit and vegetable crops have been documented (Collier et al., 2014). The elevated temperatures will also reduce or inhibit plant hormones, primary and secondary metabolites, and seed germination depending on the species and level of stress (Kuden, 2013). Coloring disorder, enhancement as well as reduction of fruit softening and spoiling acids have also been reported (Sugiura and Yokozawa, 2004). High temperature associated limited soil moistures are the key causes of low yields in vegetables in the tropics which will be aggravated day by day (de la Peña and Hughes, 2007). Increasing temperature will reduced the irrigation water availability, decrease soil fertility, increase soil erosion and flooding and salinity incursion; which are major restrictive factors in sustainable vegetable production (Wheeler and von Braun, 2013; Anwar et al., 2015). Salinity causes ion-specific stresses reflected in wilting, loss of turgor, leaf curling and epinasty, leaf abscission, decreased photosynthesis, respiratory changes, loss of cellular integrity and tissue necrosis which may prove fatal for the vegetable plants (Walker et al., 2003; Miller et al., 2010). Climatic change induced UV effects have shown production of anthocyanin and some genetic effects which are posing threats on genetic makeup of the vegetable crops meanwhile exact evidences of the impacts of climate change on gene levels of vegetable crops are very few (Yunxia and Michael, 2011).

The worldwide variability in yield of selected food crops since 1961–2012 (viz. wheat, rice, maize, fruits and vegetables) has been shown in Fig. 1(B) indicating departures from mean yield with respect to their minimum and maximum yield. Whereas, diagrammatic representation of some major impacts of increasing CO₂ and temperature on major food sources selected in this



synthesis has been represented in Fig. 2 depicting some major impacts of climate change on different parts of the crop plants and also represents an overview of heat stress response mechanism in these crops.

2.3. Impacts on fish-food (fishes and catch fisheries)

As a major food source; fisheries from the world's lakes, rivers and oceans offer key sustenance for many poor communities, in many parts of the world. It is not just a vital food option but also a very important source for work and money for millions of people around the globe (FAO, 2008; Allison et al., 2009). Hence, fish-food becomes an important and integral part of the climate change impact studies on the food security being one of the chief animal food sources in the world. The world's population is expanding and total supply and consumption of the fish food has been growing at a rate of 3.6% per year since 1961. The 13.8–16.5% animal protein demand of humans has been met by fishes, crustaceans and molluscs and the average apparent per capita fish food consumption has increased from 9 kg to 16 kg since 1961. The per capita availability of fish and fish products has nearly

doubled in last 40 years (FAO, 2008). Moreover, currently two-thirds of the total fish food supply is obtained from capture fisheries in marine and inland waters, while remaining one third is only derived from aquaculture. Since, the yields from the catch fisheries are now stagnant and somewhat decreasing due to many stresses; climate change is one of the strongest factors in them causing disturbances in growth and development conditions of fishes and fisheries (Jennings and Brander, 2010; Halbrook and Johnsan, 2014). Thus it becomes important to understand the climate change impacts on fish food also when we deal with the food security prospects of the world under climate change.

There are various potential effects of elevated temperature and distorted nutrient quality of resources on metabolic, foraging and stoichiometric characteristics in fresh water and marine fishes (Woodward et al., 2010; William et al., 2013). Various studies on the physiology, metabolism and reproductive biology of fishes suggest that changes in pH and CO₂ can have remarkable consequences on egg fertilization and survival of early developmental phases (Ishimatsu et al., 2005; Pörtner and Peck, 2010; Fig. 3). Increase in temperature has been found to effect estrogens

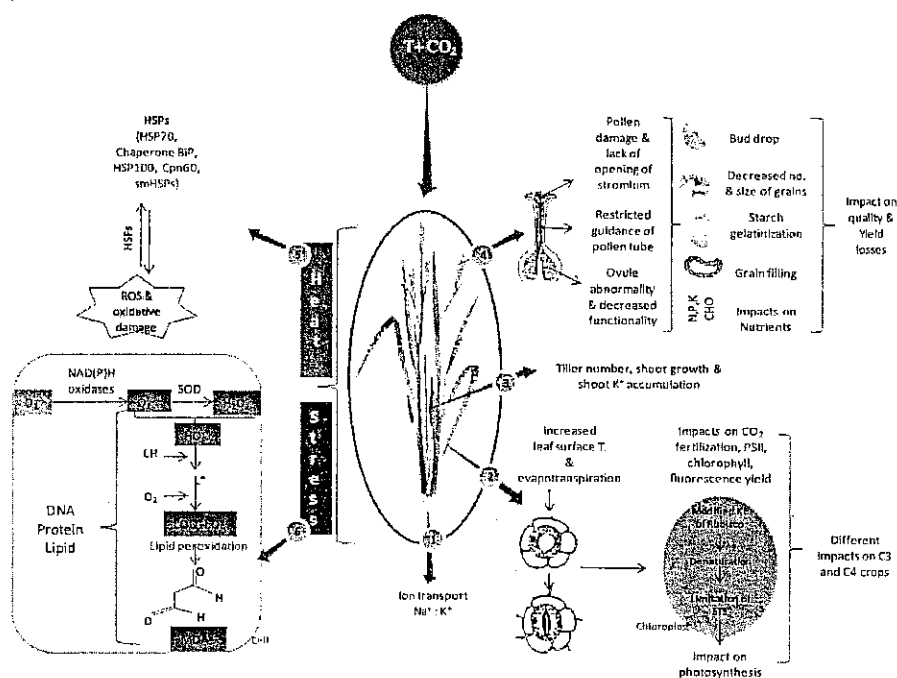


Fig. 2. Schematic of some major impacts of climate change on major food sources selected in this synthesis (excluding impacts on fisheries). Some characteristic responses of wheat, rice, maize, fruit and vegetable crops to changing climate are: (1) Some major impacts on root zone ion transport system from roots to the plants creating ion imbalance causing various physiological stress and effects. (2) Increased leaf surface temperature and related evapotranspiration leads to increased closure of leaf stomata and also cause various changes in photosynthesis and its related phenomenon in chloroplasts due to the impacts on Rubisco and ETS limitation. (3) Tilling may decrease and impacts on shoot growth may occur due to reduced shoot K⁺ accumulation. (4) Detrimental impacts on pre and post fertilization processes as they directly affect both yield quantity and quality by disturbing different stages of flowering and grain formation and inducing sterility. (5 and 6) Heat stress induced due to the climate warming triggers the production of HSPs and also produces oxidative damage through the production of ROS. Plant cells sense ROS via HSPs; which in turn activate HSPs expression for plant defense. ROS damage DNA, protein and lipids of plant cells and may prove lethal. Abbreviations: T, temperature; ROS, reactive oxygen species; SOD, super oxide dismutase; HSPs, heat shock proteins, HSPs, heat shock transcription factors; MDA, malonaldehyde.

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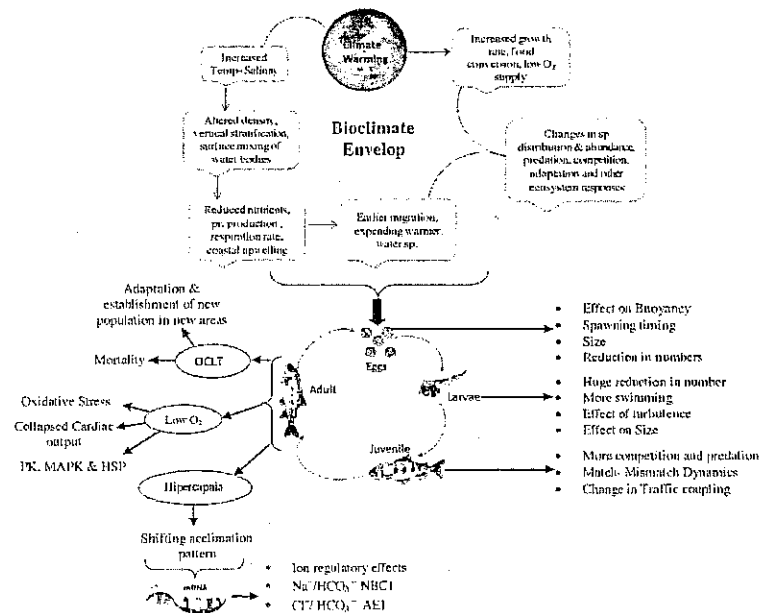


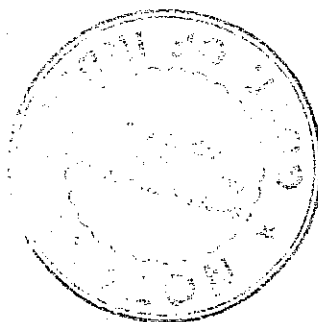
Fig. 3. Schematic of some major impacts of climate change on fishes and fisheries in the world. The climate warming causes a characteristic "Bioclimatic envelope" by impacting different levels of the habitat organization and ecosystem in water bodies which affects the whole life cycle of a fish. There are characteristic impacts on different stages of the fish life. Low dissolved O_2 in waters due to increased temperature and high CO_2 (hypercapnia) both have lethal effects on various bio-physicochemical processes of a fish which in turn may lead to extinction of valuable species.

Abbreviations: OCLT, oxygen and capacity limited thermal tolerance; PK, protein kinase; MAPK, mitogen-activated protein kinases; HSP, heat shock proteins; NBC1 & AE1 – RNA types.

in fishes (Brian et al., 2008). With increase in temperature metabolic demands will rise and per capita BMR will also increase and in such cases of individual metabolic rates rise, warming will decrease the total biomass of the fresh water fishes (Portner and Peck, 2010; Yvon-Durocher et al., 2010; Lefort et al., 2015). Warming induces ephemeral changes in body size affecting large and rare species occupying high niche in the food web are prone to lost first (Harborne, 2013). Furthermore, warming could arouse productivity, allowing food chains to grow longer and the size spectrum to broaden (Milner et al., 2009). Ethological or behavioral responses to environmental changes may induce many effects in fish stocks. For example, temperate fish stocks are likely to change due to the direct effects of exposure to increasing ocean temperature; affecting species indirectly through pole ward movement (Koehn et al., 2011; Kerosky et al., 2012; Cheung et al., 2013), habitat changes and increasing disease outbreaks (Portner and Peck, 2010). Strong evidences of climate-related impacts on species distributions and distributional shifts of fishes are related with the warming of the temperate oceans; consequently dominance of warm-water species is escalating (Last et al., 2011; Fig. 3). There are reports demonstrating the influence of elevated temperatures on the antiviral and antibacterial immune response in fishes which appears to decrease after prolonged exposures (Dang et al., 2012). Thermally susceptible species are narrowing to smaller ranges due to climatic changes affecting availability and distribution of some important fishes which affects fisheries and economies both (Perry et al., 2005).

Warming increases heart rate and velocity of cardiac contraction with depressed forces of contraction in fishes while some species show enormous physiological flexibility and can compensate the effects of temperature (Kirby et al., 2009; Franklin et al., 2013). Augmented stratification in lakes and rivers have been reported due to higher inland water temperatures reducing mixing of water, primary productivity and ultimately food supplies for fishes and thus food availability for larval and juvenile fishes causes additional damage to fisheries (Barange et al., 2014; Brander, 2015). Flooding episodes also introduce disease or predators into aquaculture facilities harming fisheries in a great deal (Allison et al., 2009; Table 2). As far as the effects on the phenological changes in fishes are concerned shifts in the seasonal timing of crucial events, such as spawning, have been analyzed and reported (Lefort et al., 2015). An increase in juvenile growth and temperature may result in a decrease in the length and age of fishes at first maturation, affecting the growth of adults (Edwards and Richardson, 2004). Changes in cap compositions of climate sensitive fishes, reduced catch rates, altered seasonality, reduced fishing days, altered recruitment patterns and recruitment success and earlier age maturity and mortality are some of the major impacts of changes in temperature and other climatic factors (Wilson et al., 2010).

Due to more frequent harmful algal blooms produced due to increase in sea surface temperature; the problems such as dissolved oxygen stress conditions, incidence of disease, parasites, competitors, predators and invasive species occur which harm fish



populations (Johann et al., 2013; Table 2). Changes in climate have also affected the timing and success of fish migrations, peak abundance, as well as sex ratios while rising sea level pose vigorous challenges to fisheries by loss of land and changes to the estuary systems (Attrill and Power, 2002). There are not only negative impacts of climatic changes on fisheries; as the retreat of glaciers can also create new habitats for some freshwater species (Milner et al., 2009). However, many other species will be unable to adapt these new habitats (Milner et al., 2009). Schematic of some major impacts of increasing CO₂ and temperature on fishes and fisheries in the world has been given in Fig. 3 showing characteristic impacts of climate change on different stages of the life cycle of the fishes.

In summary, the response of fish populations to climate change will vary between species. The variation is supposed to be interrelated with their adaptations to the shifting and changing environmental settings in their particular habitats. In response to these changes many fish species are expected to move back into deeper-cooler waters while species with spatially limited habitat requirements will be more sensitive to climate change than those without specific habitat requirements (Rijnsdorp et al., 2009).

3. Climate change induced stress responses

Temperature stress produces detrimental effects on plant and animal metabolism through disordered cellular homeostasis, and extricated physiology in plants (Seiler et al., 2011). Largely the induction of heat-shock protein (HSP) synthesis induces thermotolerance (Suzuki and Mittler, 2006). Stress-induced cellular changes bring enhanced buildup of toxic compounds such as reactive oxygen species (ROS; e.g. superoxide; (O₂⁻) produced by NADPH oxidases, O₂, H₂O₂, and HO[•]) which are toxic molecules able to cause oxidative damage to proteins, DNA, and lipids and generally produced in chloroplasts, mitochondria, and peroxisomes (Apel and Hirt, 2004; Fig. 2). The ROS may also exert stress-induced damage at the cellular level through peroxidation of lipid membranes in cereals (e.g. wheat) and may also induce oxidative stress in fishes by enhancing malondialdehyde (MDA) content (Király and Czövek, 2002; Savicka and Škute, 2010). It has been revealed that plant hormones such as salicylic acid (SA), abscisic acid (ABA) and ethylene play significant role in mediating ROS and temperature stress signals (Overmyer et al., 2003). Reducing the rate of ROS production in cells is imperative and may be achieved by adjustments to cellular metabolism or by controlling the accumulation of particular compounds with a high redox potential in the cells (Suzuki and Mittler, 2006). To completely understand how plants survive with the stresses produced by the climate change, future research should include the interrelated mechanisms involved in stress responses and the complex manners by which these mechanisms are synchronized with other physiological and biochemical mechanisms.

4. Summer and winter sensitivities of the crops and their acclimation patterns

Sensitivity of the crops towards short term climatic changes is an important parameter to be taken into account while dealing with the impact studies of climate change (Mondal et al., 2014). Any sudden change in normal growing temperatures in summer and winter growing crops may induce many bio-physical alterations (Table 3). Sudden high increase in temperature in summer crops and chilling, freezing and warm conditions during growth of winter crops affect growth and development by upsetting sensitivities of the temperature dependent physiological and biochemical processes (Wheeler et al., 2000; Young et al., 2004). Same crop may show different summer and winter sensitivities and it may also be cultivar specific (Connor et al., 2002). Sensitivity

is higher when freezing temperature increases in vulnerable stages of flowering to fruiting (Porter and Gawith, 1999; Tasgin et al., 2003) and when the unusual changes occur in night and day temperatures than normal (Peng et al., 2004). Low temperature (chilling and freezing) injury can occur in all types of crops, but the mechanisms and magnitude of damage vary considerably (Bergqvist et al., 2001; Lurie and Crisosto, 2005). Many fruit, vegetable and ornamental crops of tropical origin experience physiological damages when subjected to temperatures below about +12.5 °C, which is above freezing temperatures and this damage above 0 °C is chilling injury rather than freeze injury (Allen and Ort, 2001; Lurie and Crisosto, 2005). Freeze injury occurs in all plants due to ice formation in cells (Tasgin et al., 2003). Many tropical crop plants often experience severe frost damage when exposed to temperature slightly below zero, whereas colder climate crops habitually survive with little damage if the freeze episode is not too severe (Porter and Gawith, 1999).

Irregular short chilling episodes in many temperate regions are typical where thermophilic crops are grown such as maize in the Midwest USA. These short environmental episodes are much affective for these crops reducing their physiological activities (Badu-Apraku et al., 1983; Perdomo et al., 2014). Weather sensitivity of rice in some tropical/subtropical regions has been reported and is of immense use to understand the sensitivity area and factors (Yan et al., 2006; Okami et al., 2015). The altered climatic factors during these short events affect rice growth and yield, with their relative influence during various rice growth stages (Perdomo et al., 2014). These sensitivity analysis are useful to understand major vulnerable growth stage, and the crucial thresholds of these climatic factors during the most susceptible phases (Peng et al., 2004; Yan et al., 2006; Perdomo et al., 2014). In addition, the phenological calendar of a crop is an important factor being responsible for its sensitivity to climate. For example, frost sensitivity at flowering is usually higher than vegetative stage and can occur in annuals, multi-annuals and perennials crops including fruit trees (Verheul et al., 1996). Frost damage induces radical effect upon the entire plant or its part, reducing yield or affecting quality of the produce (Tasgin et al., 2003). Sunscald injuries, bark splitting, tip dieback, trunks freeze may occur during chilling and freezing conditions, killing xylem cells and filling vessels with gummy occlusions, rotting organisms on which the invade the injured trees and reduce productivity (Wheeler et al., 2000; Lurie and Crisosto, 2005).

Morphological and biochemical acclimatization responses in plants to tolerate these changes have been on the centre of many studies (Shen et al., 2000; Proveniers and van Zanten, 2013). Species or varieties exhibit different frost damage at the same temperature and phenological stage, depending on existed weather conditions, and they may response via "hardening" (Tasgin et al., 2003). Morphologically plants acclimatize via different leaf and surface changes (Aroca et al., 2003; Okami et al., 2015). At biochemical levels, different components of polyamines are largely involved in acclimation patterns by modulating many plant growth factors and processes related with enzymatic and hormonal regulation of plant growth and developments (Lee et al., 1997; Shen et al., 2000; Yang et al., 2007). Involvement of heat shock proteins in acclimation patterns in fishes has also been documented in studies (Dietz and Somero, 1992; Förtner and Knust, 2007). All these biochemical changes play an important role in modulating many bio-physiological control systems of the plants and fishes and induce summer or winter acclimation towards the micro/macrocliclimatic changes (Alcázar et al., 2011; Proveniers and van Zanten, 2013; Perdomo et al., 2014). In the present synthesis some important susceptible growth phases and processes have been identified for all selected food sources to differentiate and understand the weather related

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Table 3
Sensitivity responses (summer and winter) of the selected food sources and their morphological and biochemical acclimation patterns.

Food sources	Summer sensitivity	Winter sensitivity	Chilling	Freezing	Acclimation response	Morphological	Reference
Wheat		High temperature	Delayed vernalization, affects early initiation of spikelet primordia, pollen sterility at anthesis, increase in grain dry weight.	Modulation of the stable quinine receptor and non photochemical quenching in PSI. More accumulation of soluble carbohydrates suppresses photosynthesis by reducing PI cycling and depleting ATP levels in chloroplast.	Polyamines are largely involved, e.g.: putrescine, mediates abscisic acid's effects in acclimation. Cultivar specific acclimation: putrescine and free spermidine increases in winter wheat while putrescine decreases in spring wheat. Salicylic acid can increase freezing tolerance in winter wheat leaves by affecting apoplastic proteins.	Acclimation through increased leaf mass per unit area, biomass allocation and early vigor. Decrease in the evaporative surface of the leaves.	Porter and Gauth (1999); Wheeler et al. (2010); Ergin et al. (2011); Young et al. (2014); Ludwig and Aseneng (2014); Alcazar et al. (2011); Mondal et al. (2014); Predomo et al. (2014)
		Both temperature sensitivity and growth rates vary between cultivars during grain-filling.	Reduced numbers of developing grains in short period of hot temperature in winter cultivars				
Rice	Daytime (max) temperature induces shortening of growing periods and yield reduction.	Under increased night-time temperature associated with global warming.	Experimental chilling effects on stress phenotypes of milling leaves. Increased relative electrolyte leakage. Decreased net photosynthetic rate.	Temporal changes of total proteins.	Higher levels of putrescine, free spermidine, and spermine induce acclimation to water stress. Increased arginine decarboxylase during chilling acclimation.	Changes through aberrant cell morphology and depolymerized and dispersed microtubules. Increase in tiller and panicle number and size. Increased leaf area index.	Lee et al. (1997); Teng et al. (2004); Yan et al. (2009); Akkar et al. (2011); Okami et al. (2015)
Maize	Very high temperature decreases the duration of growth and grain yield.	Decreased rate of leaf appearance.	Disruption in thylakoid electron transport. Disrupted carbon reduction cycle and stomatal control. Decrease in the rate of leaf appearance and net assimilation rate.	Changes in leaf appearance rate, leaf area partitioning, and specific leaf area.	Involvement of abscisic acid in avoiding chilling effects and water stress. Increase in putrescine. Salicylic acid in the aerial portions due to activated glutathione reductase. Increase in 1-aminocyclopropane-1-carboxylic acid during acclimation.	Phenotypic plasticity, with increased leaf mass per unit area, and slower development. Various changes in leaf morphology.	Idrisi-Apudin et al. (1983); Verheul et al. (1996); Alon and Ott (2001); Arica et al. (2013); Akkar et al. (2011)
Maize	Higher night temperatures may result in an increased proportion of grain weight in kernel resulting from remobilization of stored dry matter.						
Fruits & vegetables	Impact on pollen germination and tube growth, increase in anthocyanin and total phenolic contents in fruits.	Reduction in micro and mega gametophyte fertility. Induces fruit abortion. Disrupted seed production during high temperature events.	Surface pitting, necrotic areas and external discoloration. Disruption in thylakoid electron transport. Chill induced water loss. Cultivar dependent responses of antioxidant activity. Increased total phenolic content and anthocyanin. Meadiness or woolliness. Internal browning or reddening of fruits, ion imbalance and leakage.	Intraextra-cellular freezing can mechanically disrupt the protonic structure and other cells. Changes in membrane lipid fluidity. Witherfall of buds and bark tissues. Flower style is more sensitive than the ovary to frost damage.	Free spermidine facilitate chilling tolerance in some vegetables through prevention of chilling-induced activation of MDPH oxidases in microsomes. Putrescine decreases cold induced electrolyte leakage. Spermine increases chilling tolerance of the photosynthetic apparatus. Increase in spermine is also related to freezing acclimation in some fruits.	Phytohormone interaction factor mediated morphological acclimation in flowering stages via auxin stimulation. Thicker leaves with greater no of palisade cell layers.	Lyons (1973); Bergquist et al. (2001); Shen et al. (2009); Connor et al. (2002); Lurie and Citovsky (2005); Akkar et al. (2011); Dumbao et al. (2012); Trueman and van Zanten (2013)

Table 3 (Continued)

Food sources	Winter sensitivity		Acclimation response		Reference
	Summer sensitivity	High temperature	Chilling	Freezing	
Fish food	Altered Match-Mismatch dynamics. Mismatch between demands for oxygen and oxygen supply capacity to tissues restrict tolerance to thermal extremes.	Continued shifts in distribution. Alterations in community interactions. Metabolic trade-offs and growth reductions.	Live-chilling significantly affects rigor mortis, pH and muscle glycogen. Super-chilling may result in higher liquid leakage.	Muscle metabolic changes. Increased myofibre breakages.	Dietz and Smirnov (1992); Heggseth et al. (1993); Sjøtvedt et al. (2001); Perry et al. (2005); Jørgensen and Knudsen (2007); Balshine et al. (2008); Bowden et al. (2014)

growth and development of the major food sources of the world (Table 3).

5. Combating climate change impacts: agricultural adaptation and mitigation strategies

There are varied risks of climate change and thus there is a strong need for successful adaptation and mitigation strategies across different scales and dimensions of impacts depending upon crops and region (Table 4). The important risks of increasing warming of globe are variable and untimely rainfall events, unstable winter seasons, more disease occurrences and crop failures (Adger et al., 2005). However, many research outputs indicate that prolonged short growth season collectively with higher growth temperatures can provide new opportunities for agriculture in many agrological zones (Uleberg et al., 2014). These climate change impacts on agricultural outputs in different continents are expected to differ and hence require customized adaptive strategies (Tschamtkke et al., 2012; Uleberg et al., 2014). These strategies should include those factors which affect agriculture in a great deal such as land use and soil properties, local climate, local and regional market forces, agriculture management strategies and agricultural tradition composed of coherent traditional wisdom and agricultural practices (Reidsma et al., 2010; Tripathi and Singh, 2013). To take some of the advantages of the current climate change, adaptation and mitigation strategies should consist of cautious crop and cultivar selection, proper selection of sowing and fertilization time corresponding to the selected food sources (Cairns et al., 2012). Judicious economic investments in the agricultural systems to cope with any uncertainty are also much important for adaptive capacity building of any country (Cartwright et al., 2013). Research programmes to find out genetically uniform, high yielding cultivars, higher production potential, particularly for annual plants and drought or water logging resistant varieties are also on the greater need (Civantos et al., 2012; Adger et al., 2005). There are many other important adaptive strategies which should be adopted in agricultural practices to cope up with adversities of climate change and these warrant extensive collaborative use of farmer's perception with regional climate-crop models to insure the necessity and sustainability of the adopted practices to avoid any mal-adaptation. Table 4 illustrates various important adaptive/mitigative strategies for sustaining agricultural production worldwide which should be implemented by improved sustainable agricultural policies of different countries.

6. Conclusion and future approaches

To summarize, it can be stated that world's food security is in immense pressure under climate change and much complex to understand due to interactions involved at every stages of the life cycle of a food source. Climate change; is unswervingly influencing the human survival through its agricultural impacts by higher temperatures, droughts, shifts in cropping areas, floods, soil erosion, and rainfall variations affecting the food security of the globe. Reduced quality and quantity of major food sources due to climate change are the basic effects through which world is confronting. In present assessment, investigating various scales and dimensions of the impacts of the climate change on major food sources of the world; we find that all selected major food sources of the world are facing huge impacts on various facets of their life cycle and are going through physiological, biochemical, phenological and genetic changes as well. Crop sensitivities differ in different seasons and are cultivar specific while acclimation responses have various morpho-biochemical patterns to understand. While wheat and rice crops are sustaining under elevated

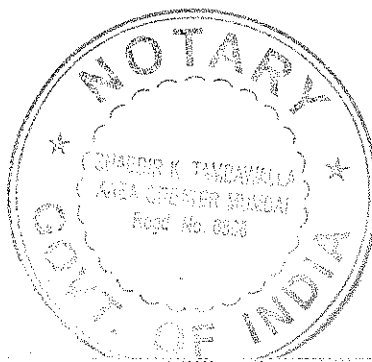


Table 4
Integration of different adaptation/mitigation strategies and their potential positive impacts to cope up with future and current climate change impacts to selected food sources.

S. No.	Adaptation/mitigation strategies	Possible positive impacts	References
1	Improved forecasting of weather and related phenomena and easy access of these to local farmers	This will induce adaptive capacities to change the sowing and harvesting timing of crops during reduced winters and untimely rainfall events over a long time assessment	Qiao et al. (2014)
2	Crop rotation and intercropping, and introducing legumes	This practice should employ as an efficient measure to maintain good soil properties thus adapting towards ill effects of increasing temperatures on soil bio-physical properties and to improve N-use efficiency of the soils	Adger et al. (2005)
3	Enhancing organic farming to reduce chemical intensive agricultural practices	Increased productivity due to higher temperatures may demand more use of fertilizers, hence not good for new areas. Thus new adaptation in the form of organic farming may enhance new possibilities of agricultural production and also enhance top soil carbon sequestration	Tuomisto et al. (2012)
4	Understanding people perception and responses and exchanging experience and knowledge among farmers and other agriculture dependent communities	This will serve as advisory inputs and will increase the adaptability to different challenges and opportunities in different regions. This may give far reaching inputs to include in sustainable agricultural policies and programmes	Tripathi and Singh (2012)
5	Shifting and adjusting the timing of different farm operations and cultivation practices	This seems little bit difficult but by adapting to changes in the onset of rainfall and temperature changes a continuous adjustment may take place over time along with the gradually changing climate.	Cairns et al. (2012)
6	To search and introduce significant ecological alternatives to the use of pesticides	This will prevent soil damage and thus will be a positive input against soil damaging properties of climate change	Civantos et al. (2012)
7	Increasing biodiversity in agro-ecological zones	Biodiversity has strong role to play for agricultural productions since more species-richness and rich biodiversity contribute to yield benefits by more pollination opportunities, weed suppression and persistency	Tschamtkke et al. (2012)
8	Involving plants protection techniques and tools	This will reduce the damage and yield losses of crops under any uncertain climatic events	Seki et al. (2003)
9	Improvement of drainage systems	To ameliorate the plausible impacts of high rainfall events during shorter growth periods, drainage system should be effectively made and maintained. In this way this adversity may be compensated by channelling the excess water in water deficit areas. This is an important aspect for adaptation toward flood risks in flood prone areas	Krishnan et al. (2007)
10	Tillage, land allocation and land improvement	Low tillage or no tillage practices, proper land allocation for specific crops and land improvements will induce soil and water conservation and weed control thus are adaptive for the warming conditions and soil moisture loss	Reidsma et al. (2010)
11	Efficient irrigation measures	Various technological improvements in irrigation practices such as drip and sprinkle irrigation are important to reduce the water loss and to maintain soil moisture as needed by some specific crops.	Elkott et al. (2014)
12	Employing new economic measures: insurance and reinsurance, and resource based livelihood options and market availability	Climate insurance is the very important sector to utilize the potentials of growing market forces in globalized world. This will encourage the farmers to use adaptive measures.	Cartwright et al. (2013)
13	Research and development	Introducing genetically engineered drought and flood resistant crop varieties and high yielding varieties for low production areas to adapt with the climatic aberrations in different regions of the world	Uleberg et al. (2014)

CO₂ levels in many wheat growing areas of the world but the impacts of increasing temperatures and its interactions with various physio-biochemical processes are much diverse so that they negate some beneficial impacts. Shifting of cropping areas is one of the major factors which are beneficial and harmful at the same time for all food sources. Much varied and detrimental impacts are seen on maize crop in current climatic trends as compared to wheat and rice. Fruits and vegetable production is under immense stress due to huge vulnerabilities of their reproductive stages for increasing temperature and also due to insect-pest attacks and disease prevalence. The fish-food as the critical animal food source is also facing gregarious impacts of changing climate shown through alteration in their habitat requirements and adjustments to their changing environmental conditions and is on the verge of extreme danger.

By this assessment an absolute illustration can be obtained about the various experimentally proved and observed impacts of the climate change on major food sources to summarize the scales and dimensions of the impacts and to understand that how the changes will lead the world; and how it should be abandoned to enhance food security of the world. Researches should focus more on summer and winter sensitivity differences and cultivar specific research priorities should be fixed to utilize more tolerant and adaptive crop and fish species. Researches on biochemical acclimation responses are now growing and future researches should focus to enhance the acclimation patterns in the susceptible crops. More concerns are needed and sectoral and impact specific plans should be made to avoid any unfavorable situation for food security. Hence, a collective effort is warranted to employ various adaptive and mitigative strategies including research and

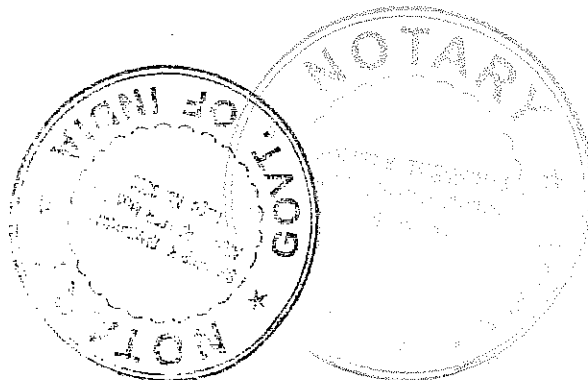
development activities suitable for crop types, regions and specific problems to cope up effectively with climate change impacts.

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References

- Adger, W.N., Arnell, N.W., Tompkins, E.L., 2005. Successful adaptation to climate change across scales. *Glob. Environ. Change* 15 (2), 77–86.
- Alcazar, R., Cuevas, J.C., Planas, J., Zarza, X., Bortolotti, C., Carrasco, P., Alabell, T., 2011. Integration of polyamines in the cold acclimation response. *Plant Sci.* 180 (1), 31–38.
- Alexandrov, V., Bittiger, J., Cajic, V., Oberforster, M., 2002. Potential impact of climate change on selected agricultural crops in northeastern Austria. *Glob. Change Biol.* 8 (4), 372–389.
- Ali, R.J., Adams, D.M., McCarl, B.A., 2002. Projecting impacts of global climate change on the US forest and agriculture sectors and carbon budgets. *For. Ecol. Manage.* 169 (1), 3–14.
- Allen, D.J., Ort, D.R., 2001. Impacts of chilling temperatures on photosynthesis in warm-climate plants. *Trends Plant Sci.* 6 (1), 36–42.
- Allison, E.H., Perry, A.L., Badjeck, M.C., Neil, A.W., Brown, K., Conway, D., Delvy, G.K., 2009. Vulnerability of national economies to the impacts of climate change on fisheries. *Fish. Fish.* 10 (2), 173–196.
- Altenbach, S.B., 2012. New insights into the effects of high temperature, drought and post-anthesis fertilizer on wheat grain development. *J. Cereal Sci.* 56, 39–50.
- Author, J.S., 2001. Effects of atmospheric CO₂ concentration on wheat yield: review of results from experiments using various approaches to control CO₂ concentration. *Field Crops Res.* 72, 1–24.
- Anwar, M.R., Li, L.D., Farquharson, R., Macadam, I., Abadi, A., Finlayson, J., Ramilan, T., 2015. Climate change impacts on phenology and yields of five broadacre crops at four climatologically distinct locations in Australia. *Agric. Syst.* 132, 133–144.
- Apel, K., Hirt, H., 2004. Reactive oxygen species: metabolism, oxidative stress, and signal transduction. *Annu. Rev. Plant Biol.* 55, 373–399.
- Aroca, R., Vernieri, P., Trigo, J.J., Sánchez-De, M., Tognoni, F., Paradossi, A., 2003. Involvement of abscisic acid in leaf and root of maize (*Zea mays* L.) in avoiding chilling-induced water stress. *Plant Sci.* 165 (3), 671–679.
- Ashebir, D., Deckert, T., Nyssen, J., Bihon, W., Fegay, A., Tekie, H., Preisen, J., Halle, M., 2010. Growing apple (*Malus domestica*) under tropical mountain climate conditions in northern Ethiopia. *Exp. Agric.* 46, 53–65.
- Asseng, S., Foster, I.A., Turner, N.C., 2011. The impact of temperature variability on wheat yields. *Glob. Change Biol.* 17 (2), 995–1012.
- Autrid, M.J., Power, M., 2002. Climate influence on a marine fish assemblage. *Nature* 417, 275–278.
- Badu-Apraku, B., Hunter, R.B., Tollenaar, M., 1983. Effect of temperature during grain filling on whole plant and grain yield in maize (*Zea mays* L.). *Crit. J. Plant Sci.* 63 (2), 357–363.
- Babaud, D., Mørkøre, T., Langsrud, Ø., Sinnes, K., Veiseth, E., Østfad, R., Thomassen, M.S., 2008. Effects of -1.5 °C super-chilling on quality of Atlantic salmon (*Salmo salar*) pre-rigor filets: cathepsin activity, muscle histology, texture and liquid leakage. *Food Chem.* 111 (2), 329–339.
- Bandara, J.S., Cai, Y., 2014. The impact of climate change on food crop productivity, food prices and food security in South Asia. *Econ. Anal. Policy* 44 (4), 451–465.
- Barange, M., Merino, G., Blanchard, J.L., Schulteis, J., Harle, J., Allison, E.H., Jennings, S., 2014. Impacts of climate change on marine ecosystem production in societies dependent on fisheries. *Nat. Clim. Change* 4, 211–216.
- Barnabas, B., Jäger, K., Fehér, A., 2005. The effect of drought and heat stress on reproductive processes in cereals. *Plant Cell Environ.* 21 (1), 11–38.
- Barnett, A.C., Hajat, S., Gasparini, A., Rocklöv, J., 2012. Cold and heat waves in the United States. *Environ. Res.* 112, 218–224.
- Barros, V.R., Boninsegna, J.A., Camilloni, I.A., Chidiak, M., Magrin, G.O., Rusticucci, M., 2014. Climate change in Argentina: trends, projections, impacts and adaptation. *Wiley Interdiscip. Rev. Clim. Change* 6 (2), 151–169.
- Basak, J.K., 2009. Climate Change Impacts on Rice Production in Bangladesh: Results from a Model. Center for research and action on development, Dhaka, Bangladesh. <http://www.unnayan.org>.
- Beresford, R.M., McKay, A.H., 2012. Climate Change Impacts on Plant Diseases Affecting New Zealand Horticulture. New Zealand Institute for Plant & Food Research Limited for the Ministry for Primary Industries. <http://cfrnz.agresearch.co.nz/CloudLibrary/>.
- Bergqvist, J., Delizozian, N., Ebisuda, N., 2001. Sunlight exposure and temperature effects on berry growth and composition of Cabernet Sauvignon and Grenache in the Central San Joaquin Valley of California. *Am. J. Enol. Vitic.* 52 (1), 1–7.
- Bloom, A.J., 2006. Rising carbon dioxide concentrations and the future of crop production. *J. Sci. Food Agric.* 86, 1269–1291.
- Bowden, A.J., Gardiner, N.M., Couturier, C.S., Stecyk, J.A.W., Nilsson, G.E., Munday, P.L., Runniner, J.L., 2014. Alterations in gill structure in tropical reef fishes as a result of elevated temperatures. *Comp. Biochem. Phys. A* 175, 64–71.
- Brander, K., 2015. Improving the reliability of fishery predictions under climate change. *Curr. Clim. Change Rep.* 1 (1), 40–43.
- Braun, P., Markus, M., 2012. Effects of Climate Change on Fruit Production in the State of Hesse. http://klimawandel.hhg.de/fileadmin/dokumente/klima/english_data/mklim_plus/braun_abstract.pdf.
- Brian, J.V., Catherine, A.H., Tamsin, J.R., Andrea, F., Giulio, P., Antonio, M., 2008. Evidence of temperature-dependent effects on the estrogenic response of fish: implications with regard to climate change. *Sci. Total Environ.* 397, 72–81.
- Burge, C.A., Mark, E.C., Friedman, C.S., Froslich, R., Hershberger, P.K., Hofmann, E.E., Harvell, C.D., 2014. Climate change influences on marine infectious diseases: implications for management and society. *Annu. Rev. Mar. Sci.* 6, 249–277.
- Cairns, J.E., Sonder, K., Zaidi, R.H., Verhulst, M., Mahuku, G., Babu, K., Prasanna, R.M., 2012. Maize production in a changing climate: impacts, adaptation, and mitigation strategies. *Adv. Agron.* 114, 1.
- Çakir, R., 2004. Effect of water stress at different development stages on vegetative and reproductive growth of corn. *Field Crops Res.* 89 (1), 1–16.
- Calzadilla, A., Zhu, T., Rehman, K., Tol, R.S., Ringler, C., 2013. Economy wide impacts of climate change on agriculture in Sub-Saharan Africa. *Ecol. Econ.* 93, 150–165.
- Campoy, J.A., Ruiz, D., Egea, J., 2010. Effects of shading and thidiazuron-oil treatment on dormancy breaking, blooming and fruit set in apricot in a warm-winter climate. *Sci. Hort.* 125 (3), 203–210.
- Campoy, J.A., Ruiz, D., Egea, J., 2011. Dormancy in temperate fruit trees in a global warming context: a review. *Sci. Hort.* 130, 357–372.
- Cartwright, A., Bignant, J., De Wit, M., Goldberg, K., Mander, M., O'Donoghue, S., Roberts, D., 2013. Economics of climate change adaptation at the local scale under conditions of uncertainty and resource constraints: the case of Durban, South Africa. *Environ. Urban. Syst.* 37, 1347–1364.
- Chakraborty, S., Tiedemann, A.V., Teng, P.S., 2006. Climate change: potential impact on plant diseases. *Environ. Pollut.* 108 (3), 317–326.
- Charles, N., 2014. Economic impacts of climate change on agriculture and implications for food security in Zimbabwe. *Afr. J. Agric. Res.* 9 (11), 1001–1007.
- Chen, Y., Li, Z., Fan, Y., Wang, H., Deng, H., 2015. Progress and prospects of climate change impacts on hydrology in the arid region of northwest China. *Environ. Res.* 139, 1–19.
- Cheung, W.W.L., Watson, R., Pauly, D., 2013. Signature of ocean warming in global fisheries catch. *Nature* 497, 365–368.
- Chmielewski, E.-M., Müller, A., Bruns, E., 2004. Climate changes and trends in phenology of fruit trees and field crop in Germany, 1961–2000. *Agric. For. Meteorol.* 121 (1–2), 69–78.
- Cicchino, M.A., Rattalino Edreira, J.I., Otegui, M.E., 2013. Maize physiological responses to heat stress and hormonal plant growth regulators related to ethylene metabolism. *Crop Sci.* 53 (5), 2135–2146.
- Civantos, E., Thuiller, W., Malerano, L., Guisan, A., Araújo, M.R., 2012. Potential impacts of climate change on ecosystem services in Europe: the case of pest control by vertebrates. *BioScience* 62 (7), 658–666.
- Collier, R., Elie, M.A., Folmer, J., Gregory, P., 2014. UK fruit and vegetable production—impacts of climate change and opportunities for adaptation. Climate change impact and adaptation in agricultural systems. *Soil Ecosyst. Manag. Sustain. Agric.* 5, 86.
- Conner, A.M., Luby, J.J., Hancock, J.E., Berkheimer, S., Hanson, E.J., 2002. Changes in fruit antioxidant activity among blueberry cultivars during cold-temperature storage. *J. Agric. Food Chem.* 50 (4), 893–898.
- Counce, P.A., Bryant, R.J., Bergman, C.J., Baunista, R.C., Wang, Y.J., Siebenmorgen, T.J., Moldenhauer, K.A.R., Meullenet, J.E.C., 2005. Rice milling quality, grain dimensions, and starch branching as affected by light night temperatures. *Cereal Chem.* 82, 645–648.
- Crous, P.W., Groenewald, J.Z., Groenewald, M., Caldwell, P., Braun, U., Harrington, T.C., 2006. Species of *Cercospora* associated with grey leaf spot of maize. *Stud. Mycol.* 55, 129–197.
- Cutforth, H.W., McGinn, S.M., McPhee, K.E., Miller, R.K., 2007. Adaptation of pulse crops to the changing climate of the Northern Great Plains. *Agron. J.* 99, 1684–1699.
- Dai, A., 2006. Precipitation characteristics in eighteen coupled climate models. *J. Clim.* 19, 4605–4630.
- DaMatta, F.M., Grandis, A., Arenque, B.C., Buckeridge, M.S., 2010. Impacts of climate changes on crop physiology and food quality. *Food Res. Int.* 43 (7), 1614–1623.
- Dang, V., Speck, T., Benkendorf, K., 2012. Influence of elevated temperatures on the antiviral and antibacterial immune response of a balone *Haliotis rubra*. *Fish Shellfish Immunol.* 22, 732–740.
- de la Peña, R., Hughes, J., 2007. Improving vegetable productivity in a variable and changing climate. *ICRISAT* 4 (1), 1–22.
- Dietz, T.J., Somero, G.N., 1992. The threshold induction temperature of the 90-kDa heat shock protein is subject to acclimatization in eurythermal goby fishes (genus *Gillichthys*). *Proc. Natl. Acad. Sci. U. S. A.* 89 (8), 3389–3393.
- Dufresne, J.L., Foujols, M.A., Denvil, S., Caubet, A., Marti, O., Aumont, O., Balkanski, Y., Bekki, S., 2013. Climate change projections using the IPSI-CM5 earth system model: from CMIP3 to CMIP5. *Clim. Dyn.* 40, 2123–2165.
- Dumlan, M.R., Darchshouri, A., Cohn, C.M., Müller, O., Mathias, J., Adams III, W.W., Demmig-Adams, B., 2012. Low temperature acclimation of photosynthetic capacity and leaf morphology in the context of phloem loading type. *Photosynth. Res.* 113 (1–3), 181–189.



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- Dupont, F.M., Hurlman, W.J., Venset, W.H., Tanaka, C., Kothari, K.M., Chung, O.K., Altenbach, S.R., 2006. Protein accumulation and composition in wheat grains: effects of mineral nutrients and high temperature. *Eur. J. Agron.* 25 (2), 96–107.
- Edwards, M., Richardson, A.J., 2004. Impact of climate change on marine pelagic phenology and trophic mismatch. *Nature* 430, 881–884.
- Efteglu, B., Ekinenci, V., Cicek, N., 2009. Physiological responses of three maize cultivars to drought stress and recovery. *S. Afr. J. Bot.* 75 (1), 34–42.
- Eisenhauer, N., Stefanski, A., Fischelli, N.A., Rice, K., Rich, R., Reich, P.B., 2014. Warming shifts/worms: effects of experimental warming on invasive earthworms in northern North America. *Sci. Rep.* 4.
- Elliott, J., Deryng, D., Müller, C., Frieler, K., Konzmann, M., Gerien, D., 2014. Constraints and potentials of future irrigation water availability on agricultural production under climate change. *Proc. Natl. Acad. Sci.* 111 (9), 3239–3244.
- Endo, M., Tsuchiya, T., Hamada, K., Kawamura, S., Yano, K., Ohshima, M., Kawagishi-Kobayashi, M., 2009. High temperatures cause male sterility in rice plants with transcriptional alterations during pollen development. *Plant Cell Physiol.* 50 (11), 1911–1922.
- ESRL (Earth System Research Laboratory). Global Monitoring Division, NOAA, Research, US. www.esrl.noaa.gov/gmd/ccgs/trends/.
- Estes, L.D., Beukes, H., Braden, B.A., Debats, S.R., Oppenheimer, M., Ruane, A.C., 2013. Projected climate impacts to South African maize and wheat production in 2055: a comparison of empirical and mechanistic modeling approaches. *Glob. Change Biol.* 19 (12), 3762–3774.
- Evans, R., Baier, A., Semenov, M.A., Gladders, P., Fitt, B.D.L., 2006. Range and severity of a plant disease increased by global warming. *J. R. Soc. Interface* 5, 525–531.
- Fan, M., Shen, J., Yuan, L., Jiang, R., Chen, X., Davies, W.J., Zhang, F., 2011. Improving crop productivity and resource use efficiency to ensure food security and environmental quality in China. *J. Exp. Bot.* 63, 13–24.
- FAO (Food Agriculture Organization), 2004. Rice is Life. FAO, Italy. <http://www.fao.org/newsroom/en/focus/200436867/index.html>.
- FAO (Food Agriculture Organization), 2008. Climate-related Trans Boundary Pests and Diseases. Climate Change, Energy and Food, High Level Conference on Food Security: The Challenges of Climate Change and Bioenergy. Food and agricultural organization, UN, Rome.
- FAOSTAT, 2010. Food and Agricultural Organization of the United Nations (FAO), FAO Statistical Database. from <http://faostat.fao.org>.
- Farooq, M., Walid, A., Kobayashi, N., Fujita, D., Basra, S.M.A., 2009. Plant drought stress: effects, mechanisms and management. *Sustainable Agriculture*. Springer, Netherlands, pp. 153–188.
- Farrell, A.P., 2002. Cardio respiratory performance in salmonids during exercise at high temperature: insights into cardiovascular design limitations in fishes. *Comp. Biochem. Physiol. Part A* 132 (4), 797–810.
- Fayram, A.H., Tober, G.D., Wendel, J.L., 2014. Effects of localized temperature and precipitation on historic Walleye recruitment in Wisconsin, USA with implications for climate change. *Aquat. Ecosyst. Health Manag.* 17 (2), 115–121.
- Ficke, A.D., Myrick, C.A., Hansen, L.J., 2007. Potential impacts of global climate change on freshwater fisheries. *Rev. Fish Biol. Fish.* 17 (4), 581–613.
- Fitzgerald, M.A., Resurrección, A.P., 2009. Maintaining the yield of edible rice in a warming world. *Funct. Plant Biol.* 36, 1037–1045.
- Franklin, C.E., Farrell, A.P., Altunbas, J., Axelsson, M., 2013. Thermal dependence of cardiac function in arctic fish: implications of a warming world. *J. Exp. Biol.* 216 (22), 4251–4258.
- Garrett, K.A., Dendy, S.P., Frank, E.E., Rouse, M.N., Travers, S.E., 2006. Climate change effects on plant disease: genomes to ecosystems. *Annu. Rev. Phytopathol.* 44, 201–221.
- Gautam, H.R., Bhardwaj, M.L., Kuma, R., 2013. Climate change and its impact on plant diseases. *Curr. Sci.* 105 (12), 1685.
- GCOS (Global Climate Observing System), GCOS 1992–2012–20 Years in Service for Climate Observations, 2012. <http://gcos.wmo.int>.
- GISTEMP Team, 2013. GISS Surface Temperature Analysis (GISTEMP). NASA Goddard Institute for Space Studies. Global annual means of temperature. <http://data.giss.nasa.gov/gistemp>.
- Gregory, P.J., Johnson, S.N., Newton, A.C., Ingram, J.S.I., 2009. Integrating pests and pathogens into the climate change/food security debate. *J. Exp. Bot.* 60, 2827–2838.
- Gu, L.H., Polard, S.C., Tu, K., Law, B.E., Wollschlaeger, S.D., 2010. Reliable estimation of biochemical parameters from C_3 leaf photosynthesis–intercellular carbon dioxide response curves. *Plant Cell Environ.* 33 (11), 1852–1874.
- Han, T., Chen, H., Li, X.J., Yang, M.F., Liu, G.S., Shen, S.H., 2009. A comparative proteomic analysis of rice seedlings under various high temperature stresses. *FEBS J. Proteomics* 12 (11), 1625–1634.
- Harborne, A.R., 2013. The ecology, behaviour and physiology of fishes on coral reef flats, and the potential impacts of climate change. *J. Fish Biol.* 83 (2), 417–447.
- Haara, P., Samsul, H.A., Sikder, D., Peter, K.V., 2007. Breeding tomato (*Lycopersicon esculentum* Mill.) resistant to high temperature stress. *Int. J. Plant Breed.* 1 (1), 31–40.
- Hedhly, A., Hormaza, J.L., Herrero, M., 2009. Global warming and sexual plant reproduction. *Trends Plant Sci.* 14, 20–36.
- Heggenes, J., Krog, O.M.W., Undås, O.R., Dokk, J.G., 1993. Homeostatic behavioural responses in a changing environment: brown trout (*Salmo trutta*) become nocturnal during winter. *J. Anim. Ecol.* 295–308.
- Högy, P., Fängeleier, A., 2008. Effects of elevated atmospheric CO_2 on grain quality of wheat. *J. Cereal Sci.* 48, 580–591.
- Holbrook, N.J., Johnson, L.J., 2014. Climate change impacts and adaptation of commercial marine fisheries in Australia: a review of the science. *Clim. Change* 142 (4), 703–715.
- Hurlman, W.J., Wood, D.F., 2011. High temperature during grain fill alters the morphology of protein and starch deposits in the starchy endosperm cells of developing wheat (*Triticum aestivum* L.) grain. *J. Agric. Food Chem.* 59 (9), 4938–4946.
- IPCC (Intergovernmental Panel on Climate Change), 2014. Summary for policymakers. In: Stocker, T.F., Qin, D., Plattner, G.K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M. (Eds.), *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Ishimatsu, A., Hayashi, M., Lee, K.S., Kikawa, T., Kita, J., 2005. Physiological effects on fishes in a high- CO_2 world. *J. Geophys. Res. Oceans* 110, C09509. doi:<http://dx.doi.org/10.1029/2004JC002564>.
- Jablonski, L.M., Wang, X., Curtis, P.S., 2007. Plant reproduction under elevated CO_2 conditions: a meta-analysis of reports on 79 crop and wild species. *New Phytol.* 156 (1), 9–26.
- Janjua, P.Z., Samad, G., Khan, N.U., Nasir, M., 2010. Impact of climate change on wheat production: a case study of Pakistan. *Pak. Dev. Rev.* 799–822.
- Jennings, S., Brander, K., 2010. Predicting the effects of climate change on marine communities and the consequences for fisheries. *J. Mar. Syst.* 79, 18–426.
- Johann, D.B., Chris, R., Michael, J.B., Patrick, L., Rodwell, L., Alistair, J.H., Johanna, Johnson, E., Andreas, D., 2013. Effects of climate change on oceanic fisheries in the tropical Pacific: implications for economic development and food security. *Clim. Change* 119, 199–212.
- Jones, P.G., Thornton, P.K., 2003. The potential impact of climate change on maize production in Africa and Latin America in 2055. *Glob. Environ. Change* 13, 51–59.
- Jones, J., et al., 2003. The DSSAT cropping system model. *Eur. J. Agron.* 18 (3), 225–245.
- Kerosky, S.M., Ana, S., Lauren, K.R., Simone, B.P., Sean, M.W., John, A.H., 2012. Bay's whale seasonal range expansion and increasing presence in the Southern California Bight from 2000 to 2010. *Deep Sea Res. Part I* 65, 125–132.
- Korshbaum, K.C., Nendel, C., 2014. Site-specific impacts of climate change on wheat production across regions of Germany using different CO_2 response functions. *Eur. J. Agron.* 52, 22–32.
- Kim, J., Shen, J., Lee, C.K., Yang, W., Yoon, Y., Yang, W.H., Kim, Y.G., Lee, B.W., 2011. Relationship between grain filling duration and leaf senescence of temperate rice under high temperature. *Field Crops Res.* 122 (3), 207–215.
- Kim, H.Y., Ko, J., Kang, S., Teulonen, J., 2013. Impacts of climate change on paddy rice yield in a temperate climate. *Glob. Change Biol.* 19 (7), 548–562.
- Király, L., Czövek, P., 2002. Changes of MDA level and O_2 scavenging enzyme activities in wheat varieties as a result of FEG treatment. *Acta Biol. Szeged* 46 (3–4), 103–106.
- Kirby, R.R., Braugrand, G., Lindley, J.A., 2009. Synergistic effects of climate and fishing in a marine ecosystem. *Ecosystems* 12 (4), 548–561.
- Knox, J., Hess, T., Daccache, A., Wheeler, T., 2012. Climate change impacts on crop productivity in Africa and South Asia. *Environ. Res. Lett.* 7 (3), 34032.
- Kobayashi, T., Ishiguro, K., Nakajima, T., Kim, H.Y., Okada, M., Kobayashi, K., 2007. Effects of elevated atmospheric CO_2 concentration on the infection of rice blast and sheath blight. *Phytopathology* 96, 425–431.
- Koehn, J.D., Hobbie, A.J., Pratchett, M.S., Giffanders, R.M., 2011. Climate change and Australian marine and freshwater environments, fishes and fisheries: synthesis and options for adaptation. *Mar. Freshw. Res.* 62 (9), 1148–1164.
- Kosová, K., Vládník, P., Prášíl, I.T., Renau, J., 2011. Plant proteome changes under abiotic stress—contribution of proteomics studies to understanding plant stress response. *J. Proteomics* 74, 1301–1322.
- Krishnan, P., Swain, D.K., Chandra, B.B., Nayak, S.K., Dash, R.N., 2007. Impact of elevated CO_2 and temperature on rice yield and methods of adaptation as evaluated by crop simulation studies. *Agric. Ecosyst. Environ.* 122, 233–242.
- Kuden, A.B., 2013. ISHS working group on temperate fruits in the tropics and subtropics. The 9th International Symposium on Temperate Fruits in the Tropics and Subtropics (TFTS). Thailand. http://www.ishs.org/sites/default/files/documents/tfts_9.pdf.
- Lai, R., 2009. Sequestering carbon in soils of arid ecosystems. *Land Degrad. Dev.* 20, 441–451.
- Lam, V.W., Cheung, W.W., Swartz, W., Sumaila, U.R., 2012. Climate change impacts on fisheries in West Africa: implications for economic, food and nutritional security. *Afr. J. Mar. Sci.* 31 (1), 103–117.
- Last, P.R., White, W.T., Gledhill, D.C., Holday, A.J., Brown, R., Edgar, G.J., Pecl, G., 2011. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. *Glob. Ecol. Biogeogr.* 20, 58–72.
- Leakey, A.D., Ainsworth, E.A., Bernacchi, C.J., Rogers, A., Long, S.P., Ort, D.R., 2009. Elevated CO_2 effects on plant carbon, nitrogen, and water relations: six important lessons from FACE. *J. Exp. Bot.* 60 (10), 2859–2876.
- Lee, T.M., Liu, H.S., Chu, C., 1997. Role of abscisic acid in chilling tolerance of rice (*Oryza sativa* L.) seedlings: II. Modulation of free polyamine levels. *Plant Sci.* 126 (1), 1–10.
- Lee, J., Natoliyak, D., Hartarska, V., 2012. Impact of climate change on agricultural production in Asian countries: evidence from panel study. Southern Agricultural Economics Association Annual Meeting, Birmingham, AL.
- Lefort, S., Aumont, O., Bopp, L., Arsouze, T., Gehlen, M., Maury, O., 2015. Spatial and body-size dependent response of marine pelagic communities to projected global climate change. *Glob. Change Biol.* 21 (1), 154–164.

- Legave, J.M., Giovannini, D., Christen, D., Oger, R., 2009. Global warming in Europe and its impacts on floral bud phenology in fruit species. *Acta Hort.* 838, 21–26.
- Li, H., Cai, J., Jiang, D., Liu, F., Dai, T., Cao, W., 2013. Carbohydrates accumulation and remobilization in wheat plants as influenced by combined water logging and shading stress during grain filling. *J. Agron. Crop Sci.* 199 (1), 36–48.
- Lindboom, N., Chang, P.R., Tyler, R.T., 2004. Analytical, biochemical and physicochemical aspects of starch granule size with emphasis on small granule starches: a review. *Starch/Stärke* 56, 89–99.
- Liu, C., Holsra, N., Franz, E., 2013. Impacts of climate change on the microbial safety of pre-harvest leafy green vegetables as indicated by *Escherichia coli* O157 and *Salmonella* spp. *Int. J. Food Microbiol.* 163 (2), 119–128.
- Lobell, D.B., Burke, M., 2008. Why are agricultural impacts of climate change so uncertain? The importance of temperature relative to precipitation. *Environ. Res. Lett.* 3, 034007.
- Lobell, D.B., Field, C.B., 2007. Global scale climate-crop yield relationships and the impacts of recent warming. *Environ. Res. Lett.* 2 (1), 014002.
- Lobell, D.B., Bänziger, M., Magorokosho, C., Vivek, B., 2011. Nonlinear heat effects on African maize as evidenced by historical yield trials. *Nat. Clim. Change* 1, 42–45.
- Lu, D., Cai, X., Yan, F., Sun, X., Wang, X., Lu, W., 2014. Effects of high temperature after pollination on physicochemical properties of waxy maize flour during grain development. *J. Sci. Food Agric.* 94 (7), 1416–1421.
- Ludwig, F., Asseng, S., 2010. Potential benefits of early vigor and changes in phenology in wheat to adapt to warmer and drier climates. *Agric. Syst.* 103, 127–136.
- Luedeling, E., 2012. Climate change impacts on winter chill for temperate fruit and nut production: a review. *Sci. Hort.* 144, 216–229.
- Luo, Q., Bellotti, W., Williams, M., Bryan, B., 2005. Potential impact of climate change on wheat yield in South Australia. *Agric. For. Meteorol.* 132 (3), 273–285.
- Lurie, S., Crisosto, C.H., 2005. Chilling injury in peach and nectarine. *Postharvest Biol. Technol.* 37 (3), 195–208.
- Lyons, J.M., 1973. Chilling injury in plants. *Annu. Rev. Plant Phys.* 24 (1), 445–466.
- Marengo, J.A., Chou, S.C., Torres, R.R., Giarolla, A., Alves, L.M., Lyra, A., 2014. Climate change in central and South America: recent trends, future projections, and impacts on regional agriculture. CCAFS Working Paper, 73. <http://hdl.handle.net/10566/41912>.
- Matsui, T.K., Kobayashi, H.K., Horie, T., 2005. Correlation between viability of pollination and length of basal deliquescence of the theca in rice under a hot-and-humid condition. *Plant Prod. Sci.* 8 (2), 109–114.
- Mbanga, M.S., Wang, X., Hamann, A., 2010. Bioclimatic envelope model predictions for natural resource management: dealing with uncertainty. *J. Appl. Ecol.* 47 (4), 731–740.
- McMaster, G.S., 2005. Phytomorphs, phyllochrons, phenology and temperate cereal development. *J. Agric. Sci.* 143 (2–3), 137–150.
- Miller, C., Suzuki, N., Cifuentes-Yimaz, S., Mittler, R., 2010. Reactive oxygen homeostasis and signaling during drought and salinity stresses. *Plant Cell Environ.* 33, 453–467.
- Milner, A.M., Brown, L.E., Hannah, D.M., 2009. Hydro-ecological effects of shrinking glaciers. *Hydrol. Proc.* 23, 62–77.
- Misra, A., Singh, R., Bagchi, S., Chatterjee, C., Froehlich, J., 2013. Spatial variability of climate change impacts on yield of rice and wheat in the Indian Ganga Basin. *Sci. Total Environ.* 465, 132–135.
- Mondal, P., Jain, M., Robertson, A.W., Galford, G.L., Small, C., DeFries, R.S., 2014. Winter crop sensitivity to inter-annual climate variability in central India. *Clim. Change* 126 (1–2), 61–76.
- Monjardim, P., Smith, A.G., Jones, R.L., 2005. Heat stress effects on protein accumulation of maize endosperm. *Crop Sci.* 45, 1203–1210.
- Moretti, C.L., Mattos, L.M., Calbo, A.G., Sargent, S.A., 2010. Climate changes and potential impacts on postharvest quality of fruit and vegetable crops: a review. *Food Res. Int.* 43 (7), 824–832.
- Motilal, R.P., Baier, W., 2005. Impacts of present and future climate change and climate variability on agriculture in the temperate regions: North America. *Increasing Climate Variability and Change*. Springer, Netherlands, pp. 137–164.
- Myers, S.S., Zanobetti, A., Kloog, L., Huybers, P., Leakey, A.D., Bloom, A.J., et al., 2014. Increasing CO₂ threatens human nutrition. *Nature* 510 (7503), 139–142.
- Nelson, G.C., van der Mensbrugghe, D., Ahammad, H., Blanc, E., Calvin, K., Hasegawa, T., Hayik, P., et al., 2014. Agriculture and climate change in global scenarios: why don't the models agree. *Agric. Econ.* 45, 85–101.
- Okami, M., Kato, Y., Kobayashi, M., Yamagishi, J., 2015. Morphological traits associated with vegetative growth of rice (*Oryza sativa* L.) during the recovery phase after early-season drought. *Eur. J. Agron.* 64, 58–66.
- Olkey, T.A., Aldina, H.M., Lo, V., Jessen, S., 2014. Effects of climate change on Canada's Pacific marine ecosystems: a summary of scientific knowledge. *Rev. Fish Biol.* 24 (2), 519–559.
- Olesen, J.E., Trnka, M., Kersebaum, K.C., Skjelvåg, A.O., Seguin, B., Pelttonen-Sainio, P., Mical, E., 2011. Impacts and adaptation of European crop production systems to climate change. *Eur. J. Agron.* 34 (2), 96–112.
- Olmstead, A.L., Rhode, P.W., 2011. Adapting North American wheat production to climatic challenges, 1830–2009. *Proc. Natl. Acad. Sci.* 108 (2), 480–485.
- Ortiz, R., Sayre, K.D., Govaerts, B., Gupta, R., Subbarao, G.V., Ban, T., Reynolds, M., et al., 2008. Climate change: can wheat beat the heat? *Agric. Ecosyst. Environ.* 126 (1), 46–58.
- Oseni, T.O., Masarirambi, M.T., 2011. Effect of climate change on maize (*Zea mays*) production and food security in Swaziland. *American-Lusitanian J. Agric. Environ. Sci.* 11 (3), 385–391.
- Oury, F.-X., Christelle, G., Aurélie, M., Alain, C., Olivier, G., Alex, G., Emmanuel, H., Jean-Yves, M., 2012. A study of genetic progress due to selection reveals a negative effect of climate change on bread wheat yield in France. *Eur. J. Agron.* 40, 28–38.
- Overmyer, K., Brosché, M., Kangasjärvi, J., 2003. Reactive oxygen species and hormonal control of cell death. *Trends Plant Sci.* 8 (7), 335–342.
- Parry, M.L., Rosenzweig, C., Iglesias, A., Livermore, M., Fischer, G., 2004. Effects of climate change on global food production under SRES emissions and socio-economic scenarios. *Glob. Environ. Change* 14 (1), 53–67.
- Patterson, R.R.M., Sariah, M., Lima, N., 2013. How will climate change affect oil palm fungal diseases? *Crop Prot.* 46, 113–120.
- Pedersen, O., Rich, S.M., Colmer, T.D., 2009. Surviving floods: leaf gas fills improve O₂ and CO₂ exchange, root aeration, and growth of completely submerged rice. *Plant J.* 58 (1), 147–156.
- Peng, S.R., Huang, J.L., Sheehy, J.E., Laza, R.C., Verpaars, R.M., Zhong, X.H., Centeno, G., S., Khush, G.S., Cassman, K.G., 2004. Rice yields decline with higher night temperature from global warming. *Proc. Natl. Acad. Sci.* 101, 9971–9975.
- Perdomo, J.A., Correa, M.A., Medrano, H., Ribas-Carbal, M., Galimés, J., 2014. Effects of long-term individual and combined water and temperature stress on the growth of rice, wheat and maize: relationship with morphological and physiological acclimation. *Physiol. Plant.* 155, 149–165.
- Perry, A.L., Low, P.J., Ellis, J.R., Reynolds, J.D., 2005. Climate change and distribution shifts in marine fishes. *Science* 306 (5730), 1912–1915.
- Philippart, C.J., Anadón, R., Danovaro, R., Dippner, J.W., Drinkwater, K.F., Hawkins, S., J., 2011. Impacts of climate change on European marine ecosystems: observations, expectations and indicators. *J. Exp. Mar. Biol. Ecol.* 400 (1), 52–69.
- Pikarsky, E., Ronen, A., Abramowitz, J., Levavi-Sivan, E., Hutoran, M., Shapira, Y., Kotler, M., 2004. Pathogenesis of acute viral disease induced in fish by carp interstitial nephritis and gill necrosis virus. *J. Virol.* 78 (17), 9544–9551.
- Pinheiro, B.D.S., De Castro, E.D.M., Guimarães, C.M., 2006. Sustainability and profitability of aerobic rice production in Brazil. *Field Crops Res.* 97 (1), 34–42.
- Plagányi, E.E., Bell, J.D., Bustamante, R.H., Danbacher, J.M., Dennis, D.M., Dichmont, C.M., 2011. Modelling climate-change effects on Australian and Pacific aquatic ecosystems: a review of analytical tools and management implications. *Mar. Freshw. Res.* 62 (9), 1132–1147.
- Porter, J.R., Gawth, M., 1999. Temperatures and the growth and development of wheat: a review. *Eur. J. Agron.* 10 (1), 23–36.
- Portner, H.O., Knust, R., 2007. Climate change affects marine fishes through the oxygen limitation of thermal tolerance. *Science* 315 (5808), 95–97.
- Portner, H.O., Peck, M.A., 2010. Climate change effects on fishes and fisheries: towards a cause-and-effect understanding. *J. Fish Biol.* 77 (8), 1745–1779.
- Porter, J.R., Semenov, M.A., 2005. Crop responses to climatic variation. *Philos. Trans. R. Soc. B* 360 (1463), 2021–2035.
- Porters, G., Pasternak, T.P., Guisard, Y., Jansen, M.A., 2009. Different stresses, similar morphogenic responses: integrating a plethora of pathways. *Plant Cell Environ.* 32 (2), 158–169.
- Poudel, S., Ketani, K., 2013. Climatic impacts on crop yield and its variability in Nepal: do they vary across seasons and altitudes? *Clim. Change* 116 (2), 327–355.
- Proveniers, M.C., van Zanten, M., 2013. High temperature acclimation through HIF-1 signaling. *Trends Plant Sci.* 18 (2), 59–64.
- Qiao, F., Song, Z., Huang, C., Xia, C., Dai, D., 2014. Improving the forecasting ability of ocean and climate by inclusion of surface wave. *EGU General Assembly Conference Abstracts* vol. 16, 4804.
- Rang, Z.W., Jagadish, S.V.K., Zhou, Q.M., Craufurd, P.Q., Heuer, S., 2011. Effect of high temperature and water stress on pollen germination and spikelet fertility in rice. *Environ. Exp. Bot.* 70 (1), 58–65.
- Raupach, M.R., Marland, G., Gains, P., Le Quéré, C., Canadell, J.G., Klepper, G., Field, C., 2007. Global and regional drivers of accelerating CO₂ emissions. *Proc. Nat. Acad. Sci.* 104 (24), 10288–10293.
- Reidsma, P., Ewert, F., Oude, L.A., Leemans, R., 2010. Adaptation to climate change and climate variability in European agriculture: the importance of farm level responses. *Eur. J. Agron.* 32, 91–102.
- Reyenga, P.J., Howden, S.M., Meinke, H., Hall, W.B., 2001. Global change impacts on wheat production along an environmental gradient in South Australia. *Environ. Int.* 27, 195–209.
- Ribaut, J.M., Betran, J., Monneveux, P., Setter, T., 2009. Drought tolerance in maize. *Handbook of Maize: Its Biology*. Springer, New York, pp. 311–344.
- Richards, R.G., Davidson, A.J., Meybeck, J.O., Scatena, K., Henneman, V., Lynam, T., van Putten, L.L., 2015. Effects and mitigations of ocean acidification on wild and aquaculture scallop and prawn fisheries in Queensland, Australia. *Fish. Res.* 161, 42–56.
- Riegl, R., 2002. Effects of the 1995 and 1998 positive sea-surface temperature anomalies on corals, coral diseases and fish in the Arabian Gulf (Dubai, UAE). *Mar. Biol.* 140 (1), 29–40.
- Rijnsdorp, A.D., Peck, M.A., Engelhard, G.H., Möllmann, C., Pinxten, J.K., 2009. Resolving the effect of climate change on fish populations. *ICES J. Mar. Sci.* 66.
- Rodrigo, J., Herrero, M., 2002. Effects of pre-blossom temperatures on flower development and fruit set in apricot. *Sci. Hort.* 92 (2), 125–125.
- Rosegrant, M.W., Palmer, M.S., Meijer, S., Witcover, J., 2001. 2020 Global food outlook: trends, alternatives, and choices. *Int. Food Policy Res. Inst.* 11.
- Rosenzweig, C.A., Iglesias, A.R., Yang, J.R., Chivian, E.L., 2001. Climate change and extreme weather events: implications for food production, plant diseases, and pests. *Glob. Change Hum. Health* 2 (2), 90–104.

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- Ruiz, D., Campos, J.A., Egea, J., 2007. Chilling and heat requirements of apricot cultivars for flowering. *Environ. Exp. Bot.* 61, 254–263.
- Rustad, L.E., 2008. The response of terrestrial ecosystems to global climate change: towards an integrated approach. *Sci. Total Environ.* 404, 222–235.
- Savicka, M., Skute, N., 2010. Effects of high temperature on malondialdehyde content, superoxide production and growth changes in wheat seedlings (*Triticum aestivum* L.). *Ekologija* 56 (1–2), 26–33.
- Schlenker, W., Lobell, D.B., 2010. Robust negative impacts of climate change on African agriculture. *Environ. Res. Lett.* 5 (1), 14010.
- Seiler, C., Marshavardhan, V.T., Rajesh, K., Reddy, P.S., Strickert, M., Rolletschek, H., Sreenivasulu, N., 2011. ABA biosynthesis and degradation contributing to ABA homeostasis during barley seed development under control and terminal drought-stress conditions. *J. Exp. Bot.* 62, 2615–2632.
- Seldi, M., Kamei, A., Yamaguchi-Shinozaki, K., Shinozaki, K., 2003. Molecular responses to drought, salinity and frost: common and different paths for plant protection. *Curr. Opin. Biotechnol.* 14 (2), 194–199.
- Shaw, M.W., Bearchell, S.J., Fitt, B.D.L., Fraaije, B.A., 2008. Long-term relationships between environment and abundance in wheat of *Phaeosphaeria nodorum* and *Mycosphaerella graminicola*. *New Phytol.* 177, 229–238.
- Sheffield, J., Wood, E.F., 2012. Drought: Past Problems and Future Scenarios. Routledge.
- Shen, W., Noda, K., Tachibana, S., 2009. Involvement of polyamines in the chilling tolerance of cucumber cultivars. *Plant Physiol.* 124 (1), 431–440.
- Shimono, H., Suzuki, K., Aoki, K., Hasegawa, T., Okada, M., 2010. Effects of panicle removal on photosynthetic acclimation under elevated CO₂ in rice. *Photosynthetica* 48, 530–536.
- Skjerveid, P.D., Flåten, S.O., Ørby, P.B., Einen, O., 2001. Live-chilling and crowding stress before slaughter of Atlantic salmon (*Salmo salar*). *Aquaculture* 192 (2), 265–280.
- Snider, J.L., Oosterhuis, D.M., 2011. How does timing, duration and severity of heat stress influence pollen–pistil interactions in angiosperms. *Plant Signal. Behav.* 6, 931–933.
- Streck, N.A., Bowen, L.C., Lago, L., 2008. Simulating leaf appearance in rice. *Agron. J.* 100 (3), 490–501.
- Sugiura, S., Yukozawa, M., 2004. Impact of global warming on environment for apple and satsuma mandarin production estimated from change of the annual mean temperature. *J. Japan Soc. Sci.* 73 (1), 72–78.
- Suzuki, N., Mittler, R., 2006. Reactive oxygen species and temperature stresses: a delicate balance between signaling and destruction. *Physiol. Plant.* 126 (1), 45–51.
- Taggin, E., Atici, Ö., Nalbantoglu, B., 2003. Effects of salicylic acid and cold on freezing tolerance in winter wheat leaves. *Plant Growth Regul.* 41 (3), 231–236.
- Taub, D.R., Miller, B., Allen, H., 2006. Effects of elevated CO₂ on the protein concentration of food crops: a meta-analysis. *Glob. Change Biol.* 14 (3), 565–575.
- Terao, T., Miura, S., Yanagihara, T., Hirose, T., Nagata, K., Tabuchi, H., 2005. Influence of free-air CO₂ enrichment (FACE) on the eating quality of rice. *J. Sci. Food Agric.* 85, 1861–1868.
- Tester, K.F., Somerville, M.D., 2003. The effects of non-starch polysaccharides on the extent of gelatinisation, swelling and α -amylase hydrolysis of maize and wheat starches. *Food Hydrocol.* 17 (1), 41–54.
- Tripathi, A., Singh, G.S., 2012. Perception, anticipation and responses of people to changing climate in the gangetic plain of India. *Curr. Sci.* 105 (12), 1673–1684.
- Tripathi, D.E., Singh, V.P., Chauhan, D.K., Prasad, S.M., Dubey, N.K., 2014. Role of macronutrients in plant growth and acclimation: recent advances and future perspective. *Improvement of Crops in the Era of Climate Change*, vol. 2. Springer, pp. 197–216.
- Trnka, M., Rötter, R.P., Ruiz-Ramos, M., Kersebaum, K.C., Olesen, J.E., Žalud, Z., Semenov, M.A., 2014. Adverse weather conditions for European wheat production will become more frequent with climate change. *Nat. Clim. Change* 4, 637–642.
- Tschaplinski, T., Clough, Y., Wanger, T.C., Jackson, L., Morzke, I., Perfecto, I., 2012. Global food security, biodiversity conservation and the future of agricultural intensification. *Biol. Conserv.* 151 (1), 32–59.
- Tuomisto, H.L., Hodge, I.D., Riordan, P., Macdonald, D.W., 2012. Does organic farming reduce environmental impacts? A meta-analysis of European research. *J. Environ. Manag.* 112, 309–320.
- Ueberg, E., Hanssen-Hauer, L., van Oort, B., Dalmanndottir, S., 2014. Impact of climate change on agriculture in Northern Norway and potential strategies for adaptation. *Clim. Change* 122, 27–39.
- Ummerhölzer, C.C., Xu, H., Twine, T.E., Grivet, E., McCarthy, H.R., Chhetri, N., Nicholas, K.A., 2015. How climate change affects extremes in maize and wheat yield in two cropping regions. *J. Clim.* doi:10.1175/jcli-d-13-00326.1.
- UNFCCC (United Nations Framework Convention on Climate Change), 2006. Handbook. <http://unfccc.int/resource/docs/publications/handbook.pdf>.
- Ureña, C., Martínez-Meyer, E., Perales, H.R., Álvarez-Buylla, E.R., 2012. Projecting the effects of climate change on the distribution of maize races and their wild relatives in Mexico. *Glob. Change Biol.* 18 (3), 1073–1082.
- Verbeil, M.J., Picatto, C., Stamp, P., 1996. Growth and development of maize (*Zea mays* L.) seedlings under chilling conditions in the field. *Eur. J. Agron.* 5 (1), 31–43.
- Walker, R.R., Blackmore, D.H., Clingeleffer, P.R., Godden, P., Francis, L., Valente, P., 2003. Salinity effects on vines and wines. *Bull. de l'OIV* 200–227.
- Wang, M., Li, Y., Ye, W., Bormann, J.F., Yan, X., 2011. Effects of climate change on maize production and potential adaptation measures: a case study in Jilin Province, China. *Clim. Res.* 46 (3), 223.
- Webb, L.B., Whetton, P.H., Barlow, E.W.R., 2007. Modelled impact of future climate change on the phenology of wine grapes in Australia. *Aust. J. Grape Wine Res.* 13 (3), 165–175.
- Wei, T., Cherry, T.L., Gloomrad, S., Zhang, T., 2014. Climate change impacts on crop yield: evidence from China. *Sci. Total Environ.* 499, 133–140.
- Wheeler, T., von Braun, J., 2013. Climate change impacts on global food security. *Science* 341, 508–513.
- Wheeler, T.R., Craufurd, P.Q., Ellis, R.H., Porter, J.R., Prasad, P.V., 2000. Temperature variability and the yield of annual crops. *Agric. Ecosyst. Environ.* 82 (1), 159–167.
- Wieser, H., Mauderscheid, R., Erbs, M., Weigel, H.J., 2008. Effects of elevated atmospheric CO₂ concentrations on the quantitative protein composition of wheat grain. *Agric. Food Chem.* 56 (15), 6571–6575.
- Williams, M.M., 2006. Planting date influences critical period of weed control in sweet corn. *Weed Sci.* 54 (5), 928–933.
- William, W.L., Cheung, R.W., Daniel, P., 2013. Signature of ocean warming in global fisheries catch. *Nature* 505–508.
- Wilson, S.K., Adjeroud, M., Bellwood, D.R., 2010. Crucial knowledge gaps in current understanding of climate change impacts on coral reef fishes. *J. Exp. Biol.* 213 (6), 894–900.
- WMO (World Meteorological Organization), 2014. Climate Knowledge for Climate Action. https://www.wmo.int/pages/index_en.html.
- Woodward, G., Perkins, D.M., Brown, I.E., 2010. Climate change and freshwater ecosystems: impacts across multiple levels of organization. *Philos. Trans. R. Soc. B* 365, 2093–2106.
- Yamane, T., Jeong, S.T., Goto-Yamanishi, N., Koshita, Y., Kobayashi, S., 2006. Effects of temperature on anthocyanin biosynthesis in grape berry skins. *Am. J. Enol. Vitic.* 57 (1), 54–59.
- Yan, S.P., Zhang, Q.Y., Tang, Z.C., Su, W.A., Sun, W.M., 2006. Comparative proteomic analysis provides new insights into chilling stress responses in rice. *Mol. Cell. Proteom.* 5 (3), 484–496.
- Yang, J., Zhang, J., Liu, K., Wang, Z., Liu, L., 2007. Involvement of polyamines in the drought resistance of rice. *J. Exp. Bot.* 58 (6), 1545–1555.
- Young, I.W., Wilen, R.W., Benham-Smith, P.C., 2004. High temperature stress of *Brassica napus* during flowering reduces micro- and megagametophyte fertility, induces fruit abortion, and disrupts seed production. *J. Exp. Bot.* 55 (396), 485–495.
- Yunxia, W., Michael, F., 2011. Stressed food—the impact of abiotic environmental stresses on crop quality. *Agric. Ecosyst. Environ.* 141, 271–286.
- Yvon-Durocher, G., Jones, J.I., Trimmer, M., Woodward, G., Montoya, J.M., 2010. Warming alters the metabolic balance of ecosystems. *Philos. Trans. R. Soc. B* 365, 2117–2126.
- Zhang, T., Huang, Y., 2012. Impacts of climate change and inter-annual variability on cereal crops in China from 1980 to 2008. *J. Sci. Food Agric.* 92 (5), 1643–1652.
- Zhao, J., Huang, Q., Chang, J., Liu, D., Huang, S., Shi, X., 2015. Analysis of temporal and spatial trends of hydro-climatic variables in the Wei River Basin. *Environ. Res.* 139, 55–64.

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ANNEXURE A-9

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INDIAN COUNCIL FOR ENVIRO-LEGAL ACTION v. UNION OF INDIA

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(1996) 5 Supreme Court Cases 281

(BEFORE KULDIP SINGH, S. SAGHIR AHMAD AND B.N. KIRPAL, JJ.)

a INDIAN COUNCIL FOR ENVIRO-LEGAL ACTION .. Petitioner;
Versus
UNION OF INDIA AND OTHERS .. Respondents.

Writ Petition (C) No. 664 of 1993†, decided on April 18, 1996

b A. Constitution of India — Arts. 32 & 226, 21, 48-A and 51-A — PIL —
Ecological fragility — Non-compliance with anti-pollution laws — Govt. apathy
— Orders and directions are issued by court for implementation and
enforcement of the laws to protect the fundamental right to life of the people —
Passing such orders and directions do not amount to usurpation of legislative or
executive function — They are issued by the court in discharge of its judicial
function — However, Court is not concerned with day-to-day enforcement of
c the law which is the function of the executive — High Courts being acquainted
with the local conditions, they would be in a better position of ensure proper
implementation of the law — PIL complaining ecological degradation in coastal
areas — Notification issued by Central Govt. under R. 5(3)(d) of Environment
Protection Rules, 1986 after detailed study of relevant issues — Non-compliance
with the notification alleged and subsequent amendments to the notification
challenged on ground that the same resulted in defeating the intent of the
d notification — Contentions directed to be raised before respective High Courts
— Meanwhile no development should take place in 'no-development zone' in the
coastal area — Environment Protection Act, 1986, S. 3(1) and (2)(v) —
Environment Protection Rules, 1986, R. 5(3)(d)

B. Ecology — Generally — Anti-pollution laws — Proper implementation
and enforcement of, is of prime importance to avoid ecological degradation and
its adverse effects — Jurisprudence — Law — Enforcement of

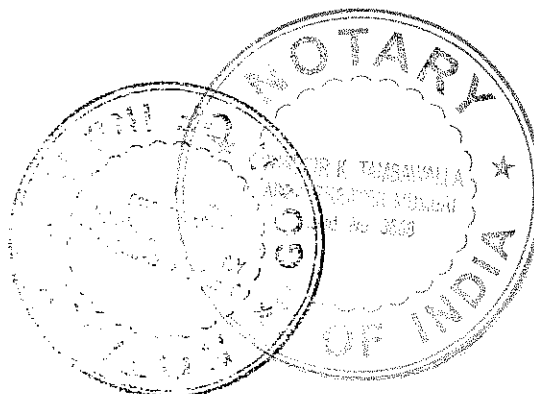
e C. Environment Protection Rules, 1986. — R. 5(3)(d) — Central Govt.'s
notification under — Presumed to have been issued after due deliberations and
study — While issuing such notification Govt. should endeavour to strike a
balance between ecological interests and economic, social and cultural interests
— Industrial development at the cost of environmental degradation or
environmental protection at the cost of industrial and economic growth not
f warranted

D. Jurisprudence — Law — Object and purpose of — Non-enforcement or
condonation of violation of — Propriety — Rule of law — Public Interest
Litigation — Seeking enforcement of laws — Maintainability — Constitution of
India, Arts. 32 & 226, 51-A and 48-A

g E. Constitution of India — Art. 226 — PIL — High Courts must shoulder
greater responsibilities in taking up local issues of which they can have closer
awareness and easy monitoring such as ecological matters in their respective
States in the light of law laid down by the Supreme Court — This would ensure
that the orders passed are effective and complied with — Ecology — PIL —
Place of filing

h The Central Government issued a notification dated 19-2-1991 ('the main
Notification') in exercise of the powers conferred on it by clause (d) of sub-rule (3)
of Rule 5 of the Environment Protection Rules, 1986. By this notification, it declared

† Under Article 32 of the Constitution of India



the coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters which were influenced by tidal action (in the landward side) up to 500 metres from the High Tide Line ('HTL') and the land between Low Tide Line ('LTL') and HTL as Regulation Zones. With regard to this area, it imposed, with effect from the date of the said notification, various restrictions on the setting up and expansion of industries, operation or processes etc. in the said Regulation Zones. It was clarified that for the purposes of the main Notification, HTL was defined as the line up to which the highest high tide reaches at springtime. Subsequently, a Notification dated 18-8-1994 was issued making six amendments in the main Notification. These amendments were made after the receipt of the report of a committee, headed by Mr B.B. Vohra, which had been set up by the Central Government. There is no challenge to the validity of the main Notification. A writ petition by way of public interest litigation was filed alleging that there had been blatant violation of the main notification and industries were illegally being set up, thereby causing serious damage to the environment and ecology of the area. It was also submitted that the Ministry of Environment and Forests except for issuing the main Notification, had taken no steps to follow up its own directions contained in the main Notification. The validity of the Notification dated 18-8-1994 was also challenged. The main prayer in the writ petition was that the Supreme Court should issue appropriate writ, order or direction to the respondent so as to enforce the main Notification.

Held:

The main Notification was issued under Sections 3(1) and 3(2)(v) of the Environment Protection Act, presumably after a lot of study had been undertaken by the Government. Normally, such notifications are issued after a detailed study and examination of all relevant issues. In matters relating to environment, it may not always be possible to lay down rigid or uniform standards for the entire country. While issuing the notifications like the present, the Government has to balance various interests including economic, ecological, social and cultural. While economic development should not be allowed to take place at the cost of ecology or by causing widespread environment destruction and violation; at the same time, the necessity to preserve ecology and environment should not hamper economic and other developments. Both development and environment must go hand in hand, in other words, there should not be development at the cost of environment and vice versa, but there should be development while taking due care and ensuring the protection of environment. This is sought to be achieved by issuing notifications like the present, relating to developmental activities being carried out in such a way so that unnecessary environmental degradation does not take place. In other words, in order to prevent ecological imbalance and degradation such developmental activity is sought to be regulated.

(Paras 32 and 31)

Having issued the main Notification, no follow-up action was taken either by the coastal States and Union Territories or by the Central Government. The provisions of the main Notification appear to have been ignored and, possibly violated with impunity. There has been a complete laxity in the implementation of the Act and other related statutes.

(Paras 27 and 45)

Enactment of a law, but tolerating its infringement, is worse than not enacting a law at all. The continued infringement of law, over a period of time, is made possible by adoption of such means which are best known to the violators of law. Continued tolerance of such violations of law not only renders legal provisions nugatory but such tolerance by the enforcement authorities encourages lawlessness and adoption of means which cannot, or ought not to, be tolerated in any civilized society. Law should not only be meant for the law-abiding but is meant to be obeyed by all for whom it has been enacted. A law is usually enacted because the legislature feels that

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a it is necessary. It is with a view to protect and preserve the environment and save it for the future generations and to ensure good quality of life that Parliament enacted the anti-pollution laws, namely, the Water Act, Air Act and the Environment (Protection) Act, 1986. These Acts and Rules framed and notification issued thereunder contain provisions which prohibit and/or regulate certain activities with a view to protect and preserve the environment. When a law is enacted containing some provisions which prohibit certain types of activities, then, it is of utmost importance that such legal provisions are effectively enforced. If a law is enacted but is not being voluntarily obeyed, then, it has to be enforced. Otherwise, infringement of law, which is actively or passively condoned for personal gain, will be encouraged b which will in turn lead to a lawless society. Violation of anti-pollution laws not only adversely affects the existing quality of life but the non-enforcement of the legal provisions often results in ecological imbalance and degradation of environment, the adverse effect of which will have to be borne by the future generations. (Para 26)

c With rapid industrialisation taking place, there is an increasing threat to the maintenance of the ecological balance. The general public is becoming aware of the need to protect environment. Even though, laws have been passed for the protection of environment, the enforcement of the same has been tardy, to say the least. With the governmental authorities not showing any concern with the enforcement of the said Acts, and with the development taking place for personal gains at the expense of environment and with disregard of the mandatory provisions of law, some public-spirited persons have been initiating public interest litigations. The legal position relating to the exercise of jurisdiction by the courts for preventing environmental d degradation and thereby, seeking to protect the fundamental rights of the citizens, is now well settled by various decisions of this Court. (Para 41)

e The primary effort of the court, while dealing with the environmental-related issues, is to see that the enforcement agencies, whether it be the State or any other authority, take effective steps for the enforcement of the laws. The courts, in a way, act as the guardian of the people's fundamental rights but in regard to many technical matters, the courts may not be fully equipped. Perforce, it has to rely on f outside agencies for reports and recommendations whereupon orders have been passed from time to time. Even though, it is not the function of the court to see the day-to-day enforcement of the law, that being the function of the executive, but because of the non-functioning of the enforcement agencies, the courts as of necessity have had to pass orders directing the enforcement agencies to implement the law for the protection of the fundamental rights of the people. Passing of appropriate orders requiring the implementation of the law cannot be regarded as the court having usurped the functions of the legislature or the executive. The orders are passed and directions are issued by the court in discharge of its judicial function, namely, to see that if there is a complaint by a petitioner regarding the infringement of any constitutional or other legal right, as a result of any wrong action or inaction on the part of the State, then such wrong should not be permitted to continue. (Paras 41 and 28)

g For effective orders to be passed, so as to ensure that there can be protection of environment along with development, it becomes necessary for the court dealing with such issues to know about the local conditions. Such conditions in different parts of the country are supposed to be better known to the High Courts. The High Courts would be in a better position to ascertain facts and to ensure and examine the implementation of the anti-pollution laws where the allegations relate to the spreading of pollution or non-compliance of other legal provisions leading to the h infringement of the anti-pollution laws. For a more effective control and monitoring of such laws, the High Courts have to shoulder greater responsibilities in tackling



such issues which arise or pertain to the geographical areas within their respective States. Even in cases which have ramifications all over India, where general directions are issued by the Supreme Court, more effective implementation of the same can, in a number of cases, be effected, if the High Courts concerned assume the responsibility of seeing to the enforcement of the laws and examine the complaints, mostly made by the local inhabitants, about the infringement of the laws and spreading of pollution or degradation of ecology. (Para 42)

There is a likelihood that there will be instances of infringement of the main Notification and also of the Management Plans, as and when framed, taking place in different parts of the country. Instead of agitating these questions before the Supreme Court, now that the general principles have been laid down and are well-established, it will be more appropriate that action with regard to such infringement even if they relate to the violation of fundamental rights, should first be raised before the High Court having territorial jurisdiction over the area in question. It is expected that each High Court will deal with such issues urgently. Environmental law has now become a specialised field. In the decision which was taken at the United Nations Conference on Environment and Development held at Rio de Janeiro in June 1992 in which India had also participated, the States had been called upon to develop national laws regarding liability and compensation for the victims of pollution and other environmental damages. (Para 43)

Allegations relating to infringement of any Government notification should be filed in the High Courts having territorial jurisdiction and the High Courts should issue appropriate orders and directions. (Para 43)

There is 6000 kms long coastline of India. It is the responsibility of the coastal States and Union Territories in which these stretches exist to see that both the notifications are complied with and enforced. Management Plans have to be prepared by the States and approved by the Central Government. If the said plans have been approved, the development can take place only in accordance therewith. Till the preparation and approval of the said plans by virtue of the provisions of the main Notification, no development in the coastal areas within the NDZ can take place. Therefore, it is in the interest of all concerned that the Management Plans are submitted and approved at the earliest. (Para 44)

With increasing threat to the environmental degradation taking place in different parts of the country, it may not be possible for any single authority to effectively control the same. Environmental degradation is best protected by the people themselves. In this connection, some of the non-governmental organisations (NGOs) and other environmentalists are doing singular service. Time has perhaps come when the Government can usefully draw upon the resources of such NGOs to help and assist in the implementation of the laws relating to protection of the environment. Under Section 3 of the Act, the Central Government has the power to constitute one or more authorities for the purposes of exercising and performing such powers and functions, including the power to issue directions under Section 5 of the Act of the Central Government as may be delegated to them. (Para 47)

Considering the fact that the Pollution Control Boards are not only overworked but simultaneously have a limited role to play insofar as it relates to controlling of pollution for the purpose of ensuring effective implementation of the notifications of 1991 and 1994, as also of the Management Plans, the Central Government should consider setting up under Section 3 of the Act, State Coastal Management Authorities in each State or zone and also a National Coastal Management Authority. (Para 47)

NOTED

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[Directions for the State and Central Governments and submission of reports passed. (Para 47)]

a *Indian Council for Enviro-Legal Action v. Union of India*, (1995) 3 SCC 77, referred to R-M/T/16136/C

Advocates who appeared in this case :

Ms Seema Midha and K.R. Rajesekaran, Advocates, for the Petitioner;
Ms H. Wahi, P.K. Manohar, S.K. Sinha, R.K. Mehta, K.L. Taneja, C.V.S. Rao, S.K. Mehta, A.S. Bhasme, Ms M. Karanjawala, V. Krishnamurthi, Vineet Kumar, K. Ram Kumar, A. Mariarputham, R. Sasiprabhu, P.N. Puri, Kh. Nobin Singh, Ms Indu Malhotra, Ms Meenakshi Arora, Sanjay Parikh, Anip Sachthey, H.K. Puri, S.N. Bhat and Ms Ruby Ahuja, Advocates, for the Respondents.

Chronological list of cases cited

1. (1995) 3 SCC 77, *Indian Council for Enviro-Legal Action v. Union of India* 292a

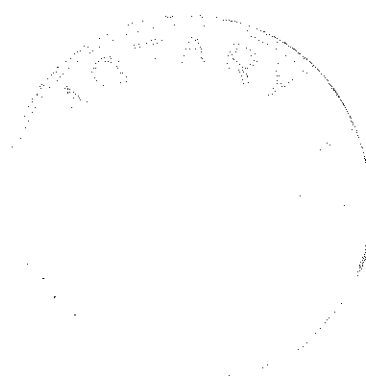
ORDER

c 1. Concern for the protection of ecology and for preventing irreversible ecological damage to the coastal areas of the country has led to the filing of the present petition under Article 32 of the Constitution of India as a public interest litigation.

d 2. The main grievance in this petition is that a notification dated 19-2-1991 declaring coastal stretches as Coastal Regulation Zones (hereinafter referred to as 'the Regulation Zones') which regulates the activities in the said zones has not been implemented or enforced. This has led to continued degradation of ecology in the said coastal areas. There is also a challenge to the validity of the notification dated 18-8-1994 whereby the first notification dated 19-2-1991 has been amended, resulting in further relaxations of the provisions of the 1991 Notification and such relaxation, it is alleged, will help in defeating the intent of the main Notification itself.

f 3. The petitioner is a registered voluntary organisation working for the cause of environment protection in India. India has a coastline running into 6000 kms which has abundance of natural endowments, geographic attractions and natural beauty. According to the petitioner, these coastal areas are highly complex and have dynamic ecosystems, sensitive to development pressures. The stresses and pressure of high population growth, non-restrained development, lack of adequate infrastructure facilities for the resident population are stated to be some of the factors responsible for the decline in environmental quality in these areas. The developmental activities in the coastal areas are stated to cause short-term and long-term physical, chemical and biological changes that will and has caused damage to flora and fauna, public health and environment. It is further alleged that as a consequence of indiscriminate industrialisation and urbanisation, without the requisite pollution control systems, the coastal waters are highly polluted.

h 4. It is further the case of the petitioner that some of the coastal areas contained extensive groundwater resources and sometimes mineral resources, while in other areas, there are iron ore, oil and gas resources and mangrove forests. As a result of the impact of tidal waves and cyclones, mangrove forests are being increasingly destroyed, while some of the major



fishing areas in some of the coastal areas of the country are undergoing serious damage consequent to ecologically unsound development. Over-exploitation of groundwater in the coastal areas in places like Madras and Vishakhapatnam is stated to have resulted in growing intrusion of salt water from the sea to inland areas and fresh water aquifers previously used for drinking, agriculture and horticulture are getting highly damaged. Unplanned urbanisation and industrialisation in the coastal belts is stated to be causing fast disappearance of fertile agricultural lands, fruit gardens and energy plantations like casuarina trees, that serve as windbreakers and protect inland habitations from the cyclonic damages.

5. With a view to protect the ecological balance in the coastal areas, the then Prime Minister is stated to have written a letter in November 1981 to the Chief Ministers of coastal States in which she stated as under:

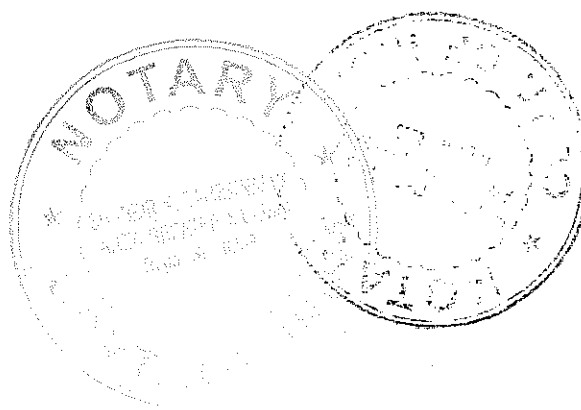
"The degradation and misutilization of beaches in the coastal States is worrying as the beaches have aesthetic and environmental value as well as other values. They have to be kept clear of all activities at least up to 500 metres from the water at the maximum high tide. If the area is vulnerable to erosion, suitable trees and plants have to be planted on the beaches without marring their beauty. Beaches must be kept free from all kinds of artificial development. Pollution from industrial and town wastes must also be avoided totally."

Working groups were set up by the Ministry of Environment and Forests in 1982 to prepare environmental guidelines for development of beaches and coastal areas. In July 1983 environmental guidelines for beaches were promulgated which, inter alia, stated:

"The traditional use of sea water as a dump site from our land-derived wastes has increased the polluted loads of sea and reduced its development potentials including the economic support it provides to people living nearby. Degradation and misutilization of beaches are affecting the aesthetic and environmental loss. These could be avoided through prudent coastal development and management based on assessment of ecological values and potential damages from coastal developments."

These guidelines further stated that "adverse direct impact" of development activities was possible within 500 metres from the high watermark or beyond two kilometres from it. The example which was given was that the sand-dunes and vegetation clearing, high density construction etc. along the coast could alter the ecological system of the area.

6. The environment guidelines for the development of beaches, inter alia, required the State Governments to prepare a status report on the obtaining situation of the coastal areas, as a prerequisite to environmental management of the area. Such a status report was required to be followed by a master plan identifying the areas required for conservation, preservation and development and other activities. A master plan so prepared would ensure a scientific assessment and development of the coastline and this



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would ultimately ensure the preservation and enforcement of the coastal ecosystem.

a 7. The Ministry of Environment and Forests undertook an exercise with regard to the protection and development of the coastal areas. It invited objections against the declaration of the coastal stretches as Regulation Zones and imposing restrictions on industries, operation and processes in the Regulation Zones.

b 8. After considering all the objections, the Central Government issued a notification dated 19-2-1991 (hereinafter referred to as 'the main Notification') in exercise of the powers conferred on it by clause (d) of sub-rule (3) of Rule 5 of the Environment Protection Rules, 1986. By this notification, it declared the coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters which were influenced by tidal action (in the landward side) up to 500 metres from the High Tide Line (hereinafter referred to as 'HTL') and the land between Low Tide Line (hereinafter referred to as 'LTL') and HTL as Regulation Zones. With regard to this area, it imposed, with effect from the date of the said notification, various restrictions on the setting up and expansion of industries, operation or processes etc. in the said Regulation Zones. It was clarified that for the purposes of the main Notification, HTL was defined as the line up to which the highest high tide reaches at springtime.

c 9. The salient features of the main Notification are that a number of activities were declared as prohibited in the Regulation Zones, which are as follows:

e "(i) setting up of new industries and expansion of existing industries, except those directly related to waterfront or directly needing foreshore facilities;

(ii) manufacture or handling or storage or disposal of hazardous substances as specified in the notifications of the Government of India in the Ministry of Environment and Forests No. SO 594(E) dated 28-7-1989, SO 966(E) dated 27-11-1989 and GSR 1037(E) dated 5-12-1989;

f (iii) setting up and expansion of fish processing units including warehousing (excluding hatchery and natural fish drying permitted areas);

g (iv) setting up and expansion of units mechanisms for disposal of wastes and effluents, except facilities required for discharging treated effluents into the watercourse with approval under the Water (Prevention and Control of Pollution) Act, 1974 except for storm water drains;

(v) discharge of untreated wastes and effluents from industries, cities or towns and other human settlements; schemes shall be implemented by the authorities concerned for phasing out the existing practices, if any, within a reasonable time period not exceeding three years from the date of this notification;

h (vi) dumping of city or town wastes for the purposes of landfilling or otherwise; the existing practice, if any, shall be phased out within a

reasonable time not exceeding three years from the date of this notification;

(vii) dumping of ash or any wastes from thermal power stations; a

(viii) land reclamation, bunding or disturbing the natural course of sea water with similar obstructions, except those required for control of coastal erosion and maintenance or clearing of waterways, channels and ports and for prevention of sandbars and also except for tidal regulators, storm water drains and structures for prevention of salinity ingress and for sweet water recharge; b

(ix) mining of sands, rocks and other substrata materials, except those rare minerals not available outside the CRZ areas;

(x) harvesting or drawal of groundwater and construction of mechanisms therefore, within 200 m of HTL; in the 200 m to 500 m zone it shall be permitted only when done manually through ordinary wells for drinking, horticulture, agriculture and fisheries; c

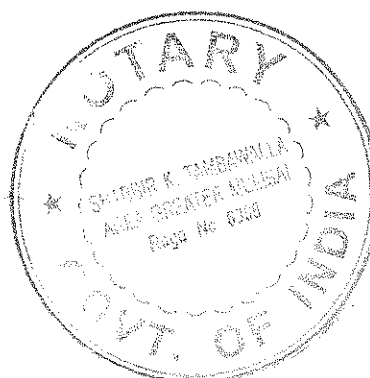
(xi) construction activities in ecologically sensitive areas as specified in Annexure I of this notification;

(xii) any construction activity between the Low Tide Line and High Tide Line except facilities for carrying treated effluents and waste water discharges into the sea, facilities for carrying sea water for cooling purposes, oil, gas and similar pipelines and facilities essential for activities permitted under this notification; and d

(xiii) dressing or altering of sand-dunes, hills, natural features including landscape changes, 50 per cent of the plot size and the total height of construction shall not exceed 9 metres."

Secondly, the main Notification provided for regulation of permissible activities. Furthermore, the coastal States and Union Territory Administrations were required to prepare, within one year from the date of the main Notification, Coastal Zone Management Plans (hereinafter referred to as 'the Management Plans') identifying and clarifying the Regulation Zones areas within their respective territories in accordance with the guidelines contained in the main Notification and those plans were required to be approved, with or without modification, by the Central Government, Ministry of Environment and Forests. The main Notification also stipulated that within the framework of the approved Management Plans, all developments and activities within the Regulation Zones, except the prohibited activities and those which required environment clearance from Ministry of Environment and Forests, Government of India, were to be regulated by the State Government, Union Territory Administration or the local Authority, as the case may be, in accordance with the guidelines contained in Annexures I and II of the main Notification. e

10. Anticipating that it will take time till the Management Plans are prepared and approved, the main Notification provided that till the approval of the Management Plans, "all development and activities within CRZ shall not violate the provisions of this Notification". The State Governments and f



Union Territory Administrations were required to ensure adherence to the provisions of the main Notification and it was provided that any violation thereof, shall be subject to the provisions of the Environment Protection Act, 1986 (hereinafter referred to as 'the Act').

11. It was also provided in clause 4 of the main Notification that the Ministry of Environment and Forests and the State Government or Union Territory, and such other authorities at the State or Union Territory levels, as may be designated for the purpose, shall be responsible for the monitoring and enforcement of the main Notification within their respective jurisdictions.

12. As already noticed, there are two annexures, namely, Annexure I and Annexure II to the main Notification. While Annexure I contains the Coastal Area Classification and Development Regulations which are for general application, Annexure II is the specific provision which contains the guidelines for development of beach resorts/hotels in the designated areas of CRZ III for temporary occupation of tourists/visitors with prior approval of the Ministry of Environment and Forests.

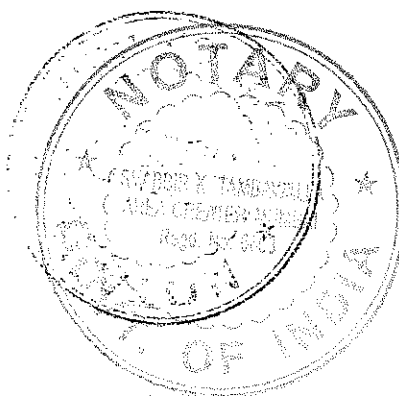
13. Annexure I consists of clause 6(1) which relates to the classification of Coastal Regulation Zones. The norms for regulation activities in the said zones are provided by clause 6(2) for regulating development activities. The coastal stretches within 500 metres of HTL of the landward side are classified under clause 6(1) into four categories, which are as under:

(a) Category I (CRZ I) includes the areas that are ecologically sensitive and important, such as national parks/marine parks, sanctuaries etc., areas rich in genetic diversity, areas likely to be inundated due to rise in sea level consequent upon global warming and such other areas as have been declared by the Central Government or the authorities concerned at the State/Union Territory level from time to time. In addition thereto, CRZ I also contains the area between the LTL and the HTL.

(b) Category II (CRZ II) contains the areas that have already been developed up to or close to the shore line. This is the area which is within the municipal limits or in other legally designated urban areas which is already substantially built up and which has been provided with drainage and approach roads and other infrastructural facilities, such as water supply and sewerage mains.

(c) Category III (CRZ III) is the area which was originally undisturbed and includes those areas which do not belong either to Category I or Category II. CRZ III includes coastal zone in the rural areas (developed and undeveloped) and also areas within the municipal limits or in other legally designated urban areas which are not substantially built up.

(d) Category IV (CRZ IV) contains the coastal stretches in the Andaman and Nicobar, Lakshadweep and small islands except those designated as CRZ I, CRZ II or CRZ III.



14. Clause 6(2) of Annexure I provides for norms for regulation of activities in CRZ I, II, III and IV. With regard to CRZ I, the norms for regulation of activities do not permit new construction within 500 metres of the HTL. Furthermore, practically, no construction activity is allowed between the LTL and HTL. The norms for regulation of activities in CRZ II relate to construction or reconstruction of the buildings within the said zone. a

15. With regard to CRZ III, the norms for regulation of activities, inter alia, provide that the area up to 200 metres from the HTL is to be earmarked as "No Development Zone". The only exception is that there can be repairs of existing authorised structures but, the permissible activity in this zone is for its use for agriculture, horticulture, gardens, pastures etc. The norms further provide for development of vacant plots between 200 and 500 metres of HTL in designated areas of CRZ III with prior approval of the Ministry of Environment and Forests for construction of hotels/beach resorts for temporary occupation of tourists/visitors subject to the conditions as stipulated in the guidelines in Annexure II. b

16. In CRZ IV also, detailed norms for regulation of activities are provided in the said clause 6(2) of Annexure I. c

17. As already noticed, Annexure II contains the guidelines for development of beach resorts/hotels in the designated area of CRZ III for temporary occupation of tourists/visitors. The vacant area beyond 200 metres in the landward side, even if it is within 500 metres of the HTL can be used, after obtaining permission, for construction of beach resorts for tourists/visitors. There was no provision for allowing any fresh construction within 200 metres of the HTL or within the LTL and HTL. Clause 7(1) of the main Notification which comes under Annexure II contains various conditions which have to be fulfilled before approval can be granted by the Ministry of Environment and Forests for the construction of beach resorts/hotels in the designated area of CRZ III. d

18. In the background of the aforesaid facts, we will now deal with the main contentions raised, namely, the non-implementation of the main Notification and the validity of the notification dated 18-8-1994 (hereinafter referred to as 'the 1994 Notification'). e

Re: Non-Implementation of the main Notification

19. It is the case of the petitioner that with a view to protect the ecological balance in the coastal areas, the aforesaid notification was issued by the Central Government which contained various provisions for regulating development in the coastal areas. It was contended that there had been a blatant violation of this notification and industries were illegally being set up, thereby causing serious damage to the environment and ecology of the area. It was also submitted that the Ministry of Environment and Forests except for issuing the main Notification, had taken no steps to follow up its own directions contained in the main Notification. The main prayer in the writ petition was that this Court should issue appropriate writ, order or direction to the respondent so as to enforce the main Notification. f

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20. In the writ petition, specific allegations were also contained to the effect that the Ministry of Environment and Forests, Government of India
a had issued another notification dated 20-6-1991 under clause (5) of sub-section (2) of Section 3 of the Act declaring Dahanu Taluka, District Thane, Maharashtra as an ecologically fragile area.

21. The main Notification was issued so as to ensure that the development activities are consistent with the environmental guidelines for beaches and coastal areas and to impose restrictions on the setting up of
b industries which have detrimental effect on the coastal environment. This notification also required the Government of Maharashtra to prepare a master plan or regional plan for the Dahanu Taluka based on the existing land use of Dahanu within a period of one year from the notification and to get the said plan approved by the Ministry of Environment and Forests. The master plan and the regional plan was to demarcate all the existing green
c areas, orchards, tribal areas and other environmentally sensitive areas in the said Dahanu Taluka. Industries which were using chemicals above the limits/quantities prescribed by the Act or by the rules were to be considered hazardous industries. The hazardous waste was required to be disposed of in the identified areas after taking precautionary measures. This notification also required the Government of Maharashtra to constitute a monitoring
d committee to ensure the compliance or conditions mentioned in the notification in which local representatives may be included. According to the petitioner, the Maharashtra Government has not implemented the directions contained in the said notification and has permitted development activities which have resulted in new polluting industries being established in the coastal area, thereby seriously endangering the ecology. The industries
e which are operating in Dahanu are stated to be balloon-manufacturing units, buffing and chromium-plating units and chemical units. There has been a failure to make the master plan or the regional plan for the said Dahanu Taluka and indiscriminate licences have been issued and consent given to new industries by the State Government and the predominately agricultural area is slowly being converted into an industrial area in complete disregard
f of environmental laws, guidelines and notifications. There are other instances stated to be in the writ petition with relation to the Dahanu Taluka but, for the view we are taking, it is not necessary to deal with the same in any great length.

22. Notices were issued by this Court on 3-10-1994 to the respondents including the coastal States, namely, Maharashtra, Kerala, Karnataka, Orissa,
g West Bengal, Tamil Nadu, Andhra Pradesh and the Union Territory of Pondicherry. On 12-12-1994, while granting time to the respondents to file their counter-affidavits, this Court directed that "the respondent States shall not permit the setting up of any industry or construction of any type on the area at least up to 500 metres from the sea water at the maximum high tide". Notice was also directed to issue to the State of Goa, the Union Territory of
h Daman and Diu and the islands of Andaman & Nicobar and Lakshadweep, which were added as respondents. The aforesaid interim order dated 12-12-



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1994 was slightly modified by this Court by its order dated 9-3-1995* in the following terms: (SCC pp. 77-78, para 1)

"We modify our order dated 12-12-1994 and direct that all the restrictions, prohibitions regarding construction and setting up of industries or for any other purpose contained in the notification dated 19-2-1991 issued by the Ministry of Environment and Forests, Government of India under clause (d) of sub-rule (3) of Rule 5 of the Environment (Protection) Rules, 1986 shall be meticulously followed by all the States concerned. The activities which have been declared as prohibited within the Coastal Regulation Zone shall not be undertaken by any of the respondent-States. The regulations of permissible activities shall also be meticulously followed. The restrictions imposed by the Coastal Areas Classification and Development Regulations contained in Annexure I to the abovesaid notification shall also be strictly followed by the respondent-States."

23. According to clause 3(i) of the main Notification, the coastal States and Union Territory administrations were required to prepare the Management Plans within one year from the date of the main Notification. This was essential for the implementation of the said notification. The lack of commitment on the part of these States and administrations, towards the protection and regulation of the coastal stretches, is evident from their inaction in complying with the aforesaid statutory directive requiring the preparation of Management Plans within the specified period. In view of the fact that there had been a non-compliance with this provision, this Court on 3-4-1995 directed all the coastal States and Union Territory Administrations to frame their plans within a further period of six weeks thereof.

24. A status report was filed in court by the Union of India which shows non-compliance of clause 3(i) by practically everyone concerned. While some of the States and Union Territory Administrations submitted their plans, though belatedly, except in the case of Pondicherry, none of the other plans were approved by the Central Government. It appears that some modifications were suggested and those States and Union Territories had to resubmit their plans. Directions will have to be issued to these States and Union Territories to resubmit their plans and the Central Government will also be required to approve the resubmitted plans within a specified time. The State of Orissa had only partly complied with this Court's order dated 3-4-1995 inasmuch as the plans submitted by it were only for a small part of a coast. The State of West Bengal only submitted a preliminary concept while the States of Andhra Pradesh, Gujarat, Karnataka and Kerala did not care to submit any plans at all. Therefore, these six States namely, Orissa, West Bengal, Andhra Pradesh, Gujarat, Karnataka and Kerala have to be answerable for non-compliance with the directions issued by this Court on 3-4-1995.

* *Indian Council for Enviro-Legal Action v Union of India*, (1995) 3 SCC 77

25. Affidavits which have been filed by the respondents clearly show that all the provisions of the main Notification have not been complied with.
- a Explanations for the delay in preparation of the Management Plans and their approval have been offered, but they are far from satisfactory. If the mere enactment of the laws relating to the protection of environment was to ensure a clean and pollution-free environment, then India would, perhaps, be the least polluted country in the world. But, this is not so. There are stated to be over 200 Central and State Statutes which have at least some concern
 - b with environment protection, either directly or indirectly. The plethora of such enactments has, unfortunately, not resulted in preventing environmental degradation which, on the contrary, has increased over the years. Enactment of a law, relating to protection of environment, usually provides for what activity can or cannot be done by people. If the people were to voluntarily respect such a law, and abide by it, then it would result in law being able to
 - c achieve the object for which it was enacted. Where, however, there is a conflict between the provision of law and personal interest, then it often happens that self-discipline and respect for law disappears.
26. Enactment of a law, but tolerating its infringement, is worse than not enacting a law at all. The continued infringement of law, over a period of time, is made possible by adoption of such means which are best known to
- d the violators of law. Continued tolerance of such violations of law not only renders legal provisions nugatory but such tolerance by the enforcement authorities encourages lawlessness and adoption of means which cannot, or ought not to, be tolerated in any civilized society. Law should not only be meant for the law-abiding but is meant to be obeyed by all for whom it has been enacted. A law is usually enacted because the legislature feels that it is
 - e necessary. It is with a view to protect and preserve the environment and save it for the future generations and to ensure good quality of life that Parliament enacted the anti-pollution laws, namely, the Water Act, Air Act and the Environment (Protection) Act, 1986. These Acts and Rules framed and notification issued thereunder contain provisions which prohibit and/or regulate certain activities with a view to protect and preserve the
 - f environment. When a law is enacted containing some provisions which prohibit certain types of activities, then, it is of utmost importance that such legal provisions are effectively enforced. If a law is enacted but is not being voluntarily obeyed, then, it has to be enforced. Otherwise, infringement of law, which is actively or passively condoned for personal gain, will be encouraged which will in turn lead to a lawless society. Violation of anti-
 - g pollution laws not only adversely affects the existing quality of life but the non-enforcement of the legal provisions often results in ecological imbalance and degradation of environment, the adverse effect of which will have to be borne by the future generations.
27. The present case also shows that having issued the main Notification, no follow-up action was taken either by the coastal States and
- h Union Territories or by the Central Government. The provisions of the main Notification appear to have been ignored and, possibly violated with

impunity. The coastal States and Union Territory administrations were required to prepare Management Plans within a period of one year from the date of the notification but this was not done. The Central Government was to approve the plans which were to be prepared but it did not appear to have reminded any of the coastal States or the Union Territory administrations that the plans had not been received by it. Clause 4 of the main Notification required the Central Government and the State Governments as well as Union Territory administrations to monitor and enforce the provisions of the main Notification, but no effective steps appear to have been taken and this is what led to the filing of the present writ petition. a
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28. There is no challenge to the validity of the main Notification. Counsel for all the parties are agreed that the main Notification is valid and has to be enforced. Instances have been given by the petitioner as well as some of the intervenors where in different States, infringement of the main Notification is taking place but no action has been taken by the authorities concerned. The courts are ill-equipped and it is not their function to see day-to-day enforcement of law. This is an executive function which it is bound to discharge. A public interest litigation like the present, would not have been necessary if the authorities, as well as the people concerned, had voluntarily obeyed and/or complied with the main Notification or if the authorities who were entrusted with the responsibility, had enforced the main Notification. It is only the failure of enforcement of this notification which has led to the filing of the present petition. The effort of this Court while dealing with public interest litigation relating to environmental issues, is to see that the executive authorities take steps for implementation and enforcement of law. As such the court has to pass orders and give directions for the protection of the fundamental rights of the people. Passing of appropriate orders requiring the implementation of the law cannot be regarded as the court having usurped the functions of the legislature or the executive. The orders are passed and directions are issued by the court in discharge of its judicial function, namely, to see that if there is a complaint by a petitioner regarding the infringement of any constitutional or other legal right, as a result of any wrong action or inaction on the part of the State, then such wrong should not be permitted to continue. It is by keeping the aforesaid principles in mind that one has to consider as to what directions should be issued to ensure, in the best possible manner, that the provisions of the main Notification which has been issued for preserving the coastal areas are not infringed. c
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Validity of notification of 1994

29. The notification dated 18-8-1994 made six amendments in the main Notification. These amendments were made after the receipt of the report of a committee, headed by Mr B.B. Vohra, which had been set up by the Central Government. The validity of the amended notification was also challenged in IA No. 19 of 1995 which was filed by three environment protection groups, namely, the Goa Foundation, Nirmal Vishwa and Indian Heritage Society (Goa Chapter). In the said application, the applicants gave a table containing the main points of the main Notification, the g
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recommendations made by the Vohra Committee and the amendments made by amended notification of 1994. The said particulars are as follows:

a	<i>"Main CRZ Notification dated 19-2-1991 issues for relaxation"</i>	<i>Vohra Committee recommendations</i>	<i>Amending notification dated 18-8-1994</i>
b	1. 200 metres from HTL is no-development zone.	Relaxation allowed rocky and hilly areas; no limit specified.	Blanket relaxation for all areas up to HTL if Central Government so desires.
c	2. No-development zone for rivers, creeks and backwaters 100 metres.	Clarification demanded about limits; no relaxation suggested.	No-development zone relaxed to 50 metres.
d	3. No levelling or digging of sand-dunes or sand.	Allows destruction of sand-dunes	No destruction of sand-dunes allowed. However, goalposts, net posts, lampposts allowed.
e	4. No-development zone area cannot be used for FSI calculations.	Recommends no-development zone area be permitted for FSI calculations.	Relevant section not amended but explanation added as an afterthought in the notification permitting no-development zone area to be included for FSI calculations. Basements allowed.
f	5. No basements allowed area not to be included in FSI.	Basements permitted.	
g	6. No fencing permitted within 200 metre-zone from HTL.	Only green fencing permitted, no barbed wire fencing allowed.	Allows green and barbed wire fencing."

g Contending that the 1994 Notification will adversely affect the environment and would lead to unscientific and unsustainable development and ecological destruction, an application was filed by the petitioner being IA No. 16 of 1995, inter alia, praying for the quashing of the said notification.

30. A reply was filed by the Union of India justifying the amendments and giving reasons for the issuance of the 1994 Notification.

h 31. While examining the validity of the 1994 Notification, it has to be borne in mind that normally, such notifications are issued after a detailed

study and examination of all relevant issues. In matters relating to environment, it may not always be possible to lay down rigid or uniform standards for the entire country. While issuing the notifications like the present, the Government has to balance various interests including economic, ecological, social and cultural. While economic development should not be allowed to take place at the cost of ecology or by causing widespread environment destruction and violation; at the same time, the necessity to preserve ecology and environment should not hamper economic and other developments. Both development and environment must go hand in hand, in other words, there should not be development at the cost of environment and vice versa, but there should be development while taking due care and ensuring the protection of environment. This is sought to be achieved by issuing notifications like the present, relating to developmental activities being carried out in such a way so that unnecessary environmental degradation does not take place. In other words, in order to prevent ecological imbalance and degradation that developmental activity is sought to be regulated.

32. The main Notification was issued under Sections 3(1) and 3(2)(v) of the Environment Protection Act, presumably after a lot of study had been undertaken by the Government. That such a study had taken place is evident from the bare perusal of notification itself which shows how coastal areas have been classified into different zones and the activities which are prohibited or permitted to be carried out in certain areas with a view to preserve and maintain the ecological balance.

33. According to the Union of India, while implementing the main Notification, certain practical difficulties were faced by the authorities concerned. There was a need for having sustainable development of tourism in coastal areas and that amendments were effected after giving due consideration to all relevant issues pertaining to environment protection and balancing of the same with the requirement of development. It has been specifically averred that a committee headed by Mr B.B. Vohra was set up by the Government in response to the need for examining the issues relating to development of tourism and hotel industry in coastal areas and to regulate the same keeping in view the requirements of sustainable development and the fragile coastal ecology. According to the Union of India, the Committee also included three environmentalist members who had expressed their views and that the Government had accepted the recommendations of the Vohra Committee with slight modifications. According to it, there has been no blanket relaxation in any area as alleged and adequate environmental safeguards have been provided in the 1994 Notification.

34. In this background, we now deal with each of these six amendments separately:

(i) According to the main Notification, distance of 200 metres from the HTL was a no-development zone (hereinafter referred to as 'NDZ'). The representation of the Hotel and Tourism Industry was that the



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- a existing 200 metres' depth of NDZ constituted a serious handicap to the said industry competing with the beach hotels of other countries where there were no such restrictions. It was represented that a reduction of the NDZ would not be ecologically harmful and there was no convincing scientific reason for fixing 200 metres as the appropriate width for the NDZ. It was also stated before the Committee that according to its projection, the Hotel Industry in India would at the most require only about 20-30 kms of coastline for the construction of seaside resorts over the next 15 years or so. If this requirement was viewed in the context of the fact that the total coastline of the country was over 6000 kms in length, the industry represented that relaxation with regard to this limited area would not pose any big threat to the country's ecology.

- b 35. The Vohra Committee in its recommendations observed that certain members of the Committee had felt that a blanket provision of 200 metres in the case of sandy beaches would lead to difficulties and there should be provision for relaxation to be made in suitable cases, but the consensus that emerged was that the present regulations should not be disturbed. The Committee, however, recommended that relaxations in 200 metres' rule may be made in a case-to-case basis with regard to such stretches of the coastline which were rocky or hilly, but the relaxations should be made after carrying out necessary impact assessment studies. Furthermore, this relaxation should be made by the Ministry of Environment and Forests and not by the State Governments concerned.

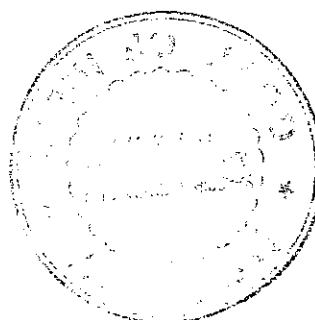
- c 36. In the 1994 Notification, there is a clear departure from the recommendations of the Vohra Committee. The notification now provides that for reasons to be recorded, the Central Government may permit any construction within the said 200 metres NDZ subject to such conditions and restrictions as it may deem fit.

d 37. In the written submissions filed by the Union of India in this Court on 29-9-1995, this amendment has been sought to be justified and explained by it in the following words:

- f "As regards the developmental activities up to the High Tide Line, the Central Government may for reasons recorded in writing permit construction in any particular case taking into account the geographical features and other relevant aspects.

- g This is necessary as providing of 200 metres of no-development zone all along was not possible in the coastal line in a uniform way on account of wide variations in geographical features, existing human settlements and developmental activities requiring foreshore facilities etc."

- h The relaxation with regard to NDZ was sought by the Hotel and Tourism Industry and they desired concession only with regard to 20-30 kms of coastline. By the amended notification, power had been given to the Central Government to make such relaxation with regard to any part of the 6000 kms long coastline of India. The Central Government has, thus, retained the



absolute power of relaxation of the entire 6000 kms long coastline and this, in effect, may lead to the causing of serious ecological damage as the said provision gives unbridled power and does not contain any guidelines as to how or when the power is to be exercised. The said provision is capable of abuse. The Central Government also did not confine the relaxation to the extent as specified by the Vohra Committee. No satisfactory reason has been given by the Union of India as to why it departed from the opinion of the Expert Committee and that too in such a manner that the concession which has now been given is far in excess of what was demanded by the Hotel and Tourism Industry. a
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38. We, accordingly, hold that the newly added proviso in Annexure II in paragraph 7 in sub-paragraph (1) (Item i) which gives the Central Government arbitrary, uncanalized and unguided power, the exercise of which may result in serious ecological degradation and may make the NDZ ineffective is ultra vires and is hereby quashed. No suitable reason has been given which can persuade us to hold that the enactment of such a proviso was necessary, in the larger public interest, and the exercise of power under the said proviso will not result in large-scale ecological degradation and violation of Article 21 of the citizens living in those areas. c

(ii) The NDZ for rivers, creeks and backwaters which was 100 metres from HTL has, by the amended notification, been relaxed to 50 metres. As already seen the main Notification does not apply to all the rivers. It applies only to tidal rivers which are part of the coastal environment. It was contended that the reduction from 100 metres to 50 metres was arbitrary and was not made on any basis. It was also contended that the Vohra Committee had made no proposal for relaxation along the rivers but it merely asked for a clarification of the limits to which the control would apply since in some areas, tidal ingress could go up to 50 kms from the coastline. d
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39. Justifying this amendment, it was contended by the Union of India that in case of creeks, rivers or backwaters, it is not possible to have a uniform basis for demarcating NDZ. The zone shall be regulated based upon each individual case. It is no doubt true that there can be no uniform basis for demarcating NDZ and it will depend upon the requirements by each State authority concerned in their own Management Plans but no reason has been given why in relation to tidal rivers, there has been a reduction of the ban on construction from 100 metres to 50 metres. Even the Vohra Committee which had been set up to look into the demands of Hotel and Tourism Industry had not made such a proposal and, therefore, it appears to us that such a reduction does not appear to have been made for any valid reason and is arbitrary. This is more so when it has been alleged that in some areas like Goa, there are mangrove forests that need protection and which stretch to more than 100 metres from the river bank and this contention had not been denied. In the absence of any justification for this reduction being given the only conclusion which can be arrived at is that the relaxation to 50 metres has been done for some extraneous reason. It was submitted, at the time of f
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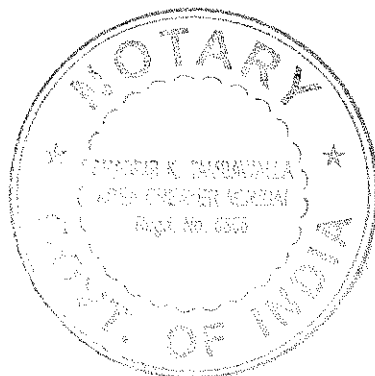
INDIAN COUNCIL FOR ENVIRO-LEGAL ACTION v. UNION OF INDIA 299

arguments by the Additional Solicitor General that construction has already taken place along such rivers, creeks etc. at a distance of 50 metres and more, but no such explanation has been given in the reply affidavit. Even if this be so such reduction will permit new construction to take place and this reduction cannot be regarded as a protection only to the existing structures. In the absence of a categorical statement being made in an affidavit that such reduction will not be harmful or result in serious ecological imbalance, we are unable to conclude that the said amendment has been made in the larger public interest and is valid. This amendment is, therefore, contrary to the object of the Environment Act and has not been made for any valid reason and is, therefore, held to be illegal.

(iii) The main Notification had provided that there would be no levelling of sand-dunes or sand extraction. The Vohra Committee, however, allowed extraction of sand. This recommendation has not been accepted but the amended notification allowed the installation of goalposts or lampposts. Justifying this amendment, it was contended by the Union of India that installing such goalposts or lampposts will not result in flattening of sand-dunes and will also not have any other undesirable effect with regard to the said sand-dunes. No permanent structure for sport facilities is permitted. We do not see any illegality having been committed by allowing the goalposts, net posts and lampposts to be erected. In fact the erection of these would facilitate or lead to more enjoyment of the beaches. Therefore, the challenge to this amendment fails.

(iv) By the amended notification, the NDZ is now to be included for FSI calculations. Justifying this amendment, it was submitted by the Union of India that an explanation had been added to the effect that although no construction is allowed in NDZ, for the purpose of calculation of FSI the area of the entire plot including portions which fall within NDZ shall be taken into account. This modification has been brought in because the area in NDZ will in any case be left vacant and although this land may belong to a private owner, he has to keep it vacant. To compensate for this, he is allowed to construct a building of such FSI as permissible after taking into account the area which falls in NDZ. This, it was submitted, is based upon fair and equitable conditions and as such this would have no effect on the ecological balance in the coastal area.

40. In view of the aforesaid reasons given by the Union of India and also keeping in view the fact that a similar recommendation had also been made by the Vohra Committee, we agree with the principle that some compensation is to be allowed to the private owner whose land falls in the NDZ, but at the same time haphazard and congested construction — a pollutant in itself — cannot be permitted in any area of the city. We, therefore, modify the amendment and direct that a private owner of land in NDZ shall be entitled to take into account half of such land for the purpose



of permissible FSI in respect of the construction undertaken by him outside the NDZ.

(v) With regard to the amendment which allows construction of the basements, it was contended that the deep foundations and structure could interfere in the coastal areas where there is an intermixture of salt and sweet aquifers. According to the Union of India, this amendment has been made on the recommendation of the Vohra Committee. It was, however, stated that the basements shall be allowed subject to the condition that the other authorities such as State Ground Water Boards will permit such construction and will issue no-objection certificate after confirming that the basement will not hamper free flow of groundwater in that area. It is, therefore, obvious that there will not be any adverse effect to the ecological balance in the area if basements are allowed to be constructed subject to the satisfaction of the authorities concerned that the same will not hamper free flow of groundwater.

(vi) The main Notification had not permitted fencing within 200 metres' zone from HTL. By the amended notification, green and barbed wire fencing within the said zone has been permitted. Challenging this amendment, it was contended that the effect of such fencing would be to prevent the public from using the beaches. Justifying this amendment, the Union of India had stated that the Vohra Committee had permitted green fencing. By the amended notification barbed fencing, in addition to green fencing, has also been allowed. The reason for this is that green and barbed fencing has been allowed so that private owners are in a position to stop encroachment on their properties. Furthermore, in the interest of security also, a private owner would like to have some kind of boundary so that his property is safe. The implication, therefore, clearly is that it is not as if public beaches will be encroached upon or fenced. The fencing is being allowed only of the privately-owned property in order to protect the same. We, however, direct that fencing should not be raised in such a manner so as to prevent access of the public to public beaches. In other words, the right of way enjoyed by the general public to those areas which they are free to enjoy, should in no way be closed, hampered or curtailed. The amendment as made, does not, in our opinion, call for any interference.

General conclusion

41. With rapid industrialisation taking place, there is an increasing threat to the maintenance of the ecological balance. The general public is becoming aware of the need to protect environment. Even though, laws have been passed for the protection of environment, the enforcement of the same has been tardy, to say the least. With the governmental authorities not showing any concern with the enforcement of the said Acts, and with the development taking place for personal gains at the expense of environment and with disregard of the mandatory provisions of law, some public-spirited persons have been initiating public interest litigations. The legal position relating to the exercise of jurisdiction by the courts for preventing

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environmental degradation and thereby, seeking to protect the fundamental rights of the citizens, is now well settled by various decisions of this Court.

a The primary effort of the court, while dealing with the environmental-related issues, is to see that the enforcement agencies, whether it be the State or any other authority, take effective steps for the enforcement of the laws. The courts, in a way, act as the guardian of the people's fundamental rights but in regard to many technical matters, the courts may not be fully equipped. Perforce, it has to rely on outside agencies for reports and recommendations

b whereupon orders have been passed from time to time. Even though, it is not the function of the court to see the day-to-day enforcement of the law, that being the function of the Executive, but because of the non-functioning of the enforcement agencies, the courts as of necessity have had to pass orders directing the enforcement agencies to implement the law.

42. As far as this Court is concerned, being conscious of its

c constitutional obligation to protect the fundamental rights of the people, it has issued directions in various types of cases relating to the protection of environment and preventing pollution. For effective orders to be passed, so as to ensure that there can be protection of environment along with development, it becomes necessary for the court dealing with such issues to know about the local conditions. Such conditions in different parts of the

d country are supposed to be better known to the High Courts. The High Courts would be in a better position to ascertain facts and to ensure and examine the implementation of the anti-pollution laws where the allegations relate to the spreading of pollution or non-compliance of other legal provisions leading to the infringement of the anti-pollution laws. For a more effective control and monitoring of such laws, the High Courts have to

e shoulder greater responsibilities in tackling such issues which arise or pertain to the geographical areas within their respective States. Even in cases which have ramifications all over India, where general directions are issued by this Court, more effective implementation of the same can, in a number of cases, be effected, if the High Courts concerned assume the responsibility of seeing to the enforcement of the laws and examine the complaints, mostly

f made by the local inhabitants, about the infringement of the laws and spreading of pollution or degradation of ecology.

43. There is a likelihood that there will be instances of infringement of the main Notification and also of the Management Plans, as and when framed, taking place in different parts of the country. In our opinion, instead of agitating these questions before this Court, now that the general principles have been laid down and are well-established, it will be more appropriate

g that action with regard to such infringement even if they relate to the violation of fundamental rights, should first be raised before the High Court having territorial jurisdiction over the area in question. We are sure and we expect that each High Court will deal with such issues urgently. Environmental law has now become a specialised field. In the decision which was taken at the United Nations Conference on Environment and

h Development held at Rio de Janeiro in June 1992 in which India had also participated, the States had been called upon to develop national laws



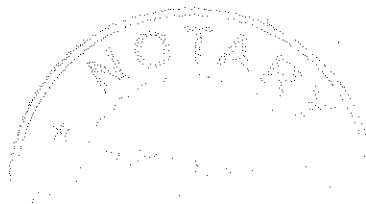
regarding liability and compensation for the victims of pollution and other environmental damages.

44. There is 6000 kms long coastline of India. It is the responsibility of the coastal States and Union Territories in which these stretches exist to see that both the notifications are complied with and enforced. Management Plans have to be prepared by the States and approved by the Central Government. If the said plans have been approved, the development can take place only in accordance therewith. Till the preparation and approval of the said plans by virtue of the provisions of the main Notification, no development in the coastal areas within the NDZ can take place. Therefore, it is in the interest of all concerned that the Management Plans are submitted and approved at the earliest.

45. There has been a complete laxity in the implementation of the Act and other related statutes. Under the said Act, the Central Government has essentially been entrusted with the responsibility to enforce and implement the Act. Section 23 of the Act, however, enables the Central Government, by notification in the Official Gazette, to delegate such of its powers and functions to the State Governments or authorities. Thus, the implementation of the provisions of the Act has now essentially become the function of the State Governments. In an effort to control pollution, State Pollution Boards have also been established but the extent of its effectiveness is yet to be demonstrated. The Environment (Protection) Act, as framed, and Section 5 of the Act in particular, gives the Government extensive powers to issue directions to any person, officer or authority which they are bound to comply. The directions as issued have necessarily to be in accordance with the provisions of law and to give protection to environment.

46. As far as the implementation of the main Notification is concerned, the Vohra Committee has stated in its report that many members of the Committee expressed great concern that sufficient attention was not being paid to the enforcement of regulations. It also noted that "in the absence of anything like adequate machinery to implement the regulations, a great deal of unauthorised development is taking place on most beaches which it will be difficult if not impossible to remove in the future". The Committee also recommended that the problems relating to the implementation of the regulations should be given high priority by the Ministry, if these are not to become a mockery.

47. With increasing threat to the environmental degradation taking place in different parts of the country, it may not be possible for any single authority to effectively control the same. Environmental degradation is best protected by the people themselves. In this connection, some of the non-governmental organisations (NGOs) and other environmentalists are doing singular service. Time has perhaps come when the Government can usefully draw upon the resources of such NGOs to help and assist in the implementation of the laws relating to protection of the environment. Under Section 3 of the Act, the Central Government has the power to constitute one or more authorities for the purposes of exercising and performing such



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powers and functions, including the power to issue directions under Section 5 of the Act of the Central Government as may be delegated to them.

a *Directions*

(1) Keeping in view the aforesaid observations in mind, we would direct that if any question arises with regard to the enforcement or implementation or infringement of the main Notification as amended by the notification of 1994, the same should be raised before and dealt with by the respective High Courts. In the present case, there were allegations of infringement having been taking place by allowing the setting up of industries in Dahanu Taluka in Maharashtra in violation of the provisions of the main Notification and which industries are stated to be causing pollution. Similarly, there were allegations of non-compliance with the provisions of law by a unit manufacturing alcohol in Pondicherry; with regard to Goa also allegations have been made. As we have already observed, it will be more appropriate if the allegations so made are dealt with by the respective High Courts, for they would be in a better position to know about and appreciate the local conditions which are prevailing and the extent of environmental damage which is being caused. We, accordingly, direct that the contentions raised in the petition regarding infringement of the main Notification and of the notification dated 20-6-1991 relating to Dahanu Taluka should be dealt with by the Bombay High Court. The High Court may issue such directions as it may deem fit and proper in order to ensure that the said notifications are effectively implemented and complied with. A copy of the writ petition along with a copy of the judgment should be sent to the High Court by the Registry for appropriate orders. As regards IAs Nos. 17-18 of 1995 relating to alcohol-manufacturing unit at Pondicherry, the said application is transferred to the Madras High Court for disposal in accordance with law.

(2) Any allegation with regard to the infringement of any of the notifications dated 19-2-1991, 20-6-1991 and 18-8-1994 be filed in the High Courts having territorial jurisdiction over the areas in respect of which the allegations are made. As far as this Court is concerned, this matter stands concluded except to examine the reports which are to be filed by all the States with regard to the approval of the Management Plans, or any classification which may be sought.

(3) Considering the fact that the Pollution Control Boards are not only overworked but simultaneously have a limited role to play insofar as it relates to controlling of pollution for the purpose of ensuring effective implementation of the notifications of 1991 and 1994, as also of the Management Plans, the Central Government should consider setting up under Section 3 of the Act, State Coastal Management Authorities in each State or zone and also a National Coastal Management Authority.

(4) The States which have not filed the Management Plans with the Central Government are directed to file the complete plans by 30-6-1996. The Central Government shall finalise and approve the said plans,

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with or without modifications within three months thereafter. It is possible that the plans as submitted by the respective State Governments and Union Territories may not be acceptable to the Ministry of Environment and Forests. Returning the said plans for modifications and then resubmission of the same may become an unnecessary, time-consuming and, perhaps, a futile exercise. In order to ensure that these plans are finalised at the very earliest, we direct that the plans as submitted will be examined by the Central Government who will inform the State Government or the Union Territory concerned with regard to any shortcomings or modifications which the Ministry of Environment and Forests may suggest. If necessary, a discussion amongst the representatives of the State Governments and the Ministry of Environment and Forests should take place and thereafter the plans should be finalised by the Ministry of Environment, if necessary, by carrying out such modifications as may be required. The decision by the Ministry of Environment and Forests in this regard shall be final and binding.

A report with regard to the submission and the finalisation of the plans should be filed in this Court and the case will be listed for noting compliance in September 1996.

(5) Pending finalisation of the plans, the interim orders passed by this Court on 12-12-1994 and 9-3-1995 shall continue to operate.

(6) Four States, namely, Andhra Pradesh, Gujarat, Karnataka and Kerala have not yet submitted their Management Plans to the Central Government. There is thus a clear non-compliance with the direction issued by this Court on 12-12-1994 and 9-3-1995. We issue notices to the Chief Secretaries of these States to explain and show cause why further appropriate action be not taken for this non-compliance. The notices are to be returnable after six weeks.

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(BEFORE K. RAMASWAMY, FAIZAN UDDIN AND G.B. PATTANAIK, JJ.)

CH. RAMA RAO

Petitioner;

Versus

LOKAYUKTA AND OTHERS

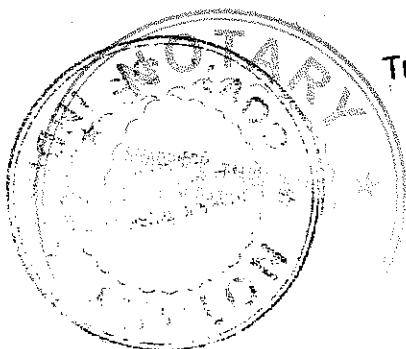
Respondents.

SLPs (C) Nos. 10754-55 of 1996[†], decided on May 9, 1996

A. Andhra Pradesh Lokayukta and Upa-Lokayukta Act, 1983 (2 of 1983) — Ss. 10(1)(a), (b) & (2)(a) and 11(2) — Preliminary verification and investigation — Procedure — Affording opportunity to a public servant, held, necessary at the stage of the investigation but not at the stage of the preliminary verification — Administrative Law — Natural justice — Applicability

[†] From the Judgment and Order dated 23-4-1996 of the Andhra Pradesh High Court in WPs Nos. 8274 and 8715 of 1996

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Zaman Ali
Advocate, High Court



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Advocate

ANNEXURE A-10

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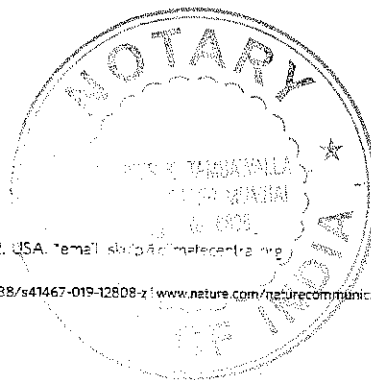
Corrected: Author correction

New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding

Scott A. Kulp^{1*} & Benjamin H. Strauss¹

Most estimates of global mean sea-level rise this century fall below 2 m. This quantity is comparable to the positive vertical bias of the principle digital elevation model (DEM) used to assess global and national population exposures to extreme coastal water levels, NASA's SRTM. CoastalDEM is a new DEM utilizing neural networks to reduce SRTM error. Here we show – employing CoastalDEM—that 190 M people (150–250 M, 90% CI) currently occupy global land below projected high tide lines for 2100 under low carbon emissions, up from 110 M today, for a median increase of 80 M. These figures triple SRTM-based values. Under high emissions, CoastalDEM indicates up to 630 M people live on land below projected annual flood levels for 2100, and up to 340 M for mid-century, versus roughly 250 M at present. We estimate one billion people now occupy land less than 10 m above current high tide lines, including 230 M below 1 m.

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Driven by climate change, global mean sea level rose 11–16 cm in the twentieth century^{1,2}. Even with sharp, immediate cuts to carbon emissions, it could rise another 0.5 m this century^{3–12}. Under higher emissions scenarios, twenty-first century rise may approach or in the extremes exceed 2 m in the case of early-onset Antarctic ice sheet instability^{4,8}. Translating sea-level projections into potential exposure of population is critical for coastal planning and for assessing the benefits of climate mitigation, as well as the costs of failure to act.

Land topography and elevation, as represented by DEMs, lie at the foundation of such translation. High-accuracy DEMs derived from airborne lidar are freely available for the coastal United States, much of coastal Australia, and parts of Europe, but are lacking or unavailable in most of the rest of the world. By contrast, SRTM is a near-global satellite-based DEM covering latitudes from 56 south to 60 north and thereby land home to 99.7% of world population (based on 2010 Landsat data¹³). It is the standard choice for extreme coastal water level (ECWL) exposure analysis covering areas where high-quality elevation data are unavailable or prohibitively expensive^{14–21}.

SRTM models the elevation of upper surfaces and not bare earth terrain. It thus suffers from large error with a positive bias when used to represent terrain elevations. This is especially true in densely vegetated and in densely populated areas^{22–25}. Mean error in SRTM's 1–20 m elevation band is 3.7 m in the US and 2.5 m in Australia when using DEMs from airborne lidar as ground truth²⁶. Spaceborne lidar from NASA's ICESat satellite²⁷, a sparser, noisier and less reliable source of ground truth than airborne lidar, indicates SRTM has a global mean bias of 1.9 m in the same band²⁶. This degree of error leads to large underestimates of ECWL exposure²⁸, and exceeds projected sea-level rise this century under almost any scenario^{3–12}.

In this article, we present ECWL exposure assessments that address this problem by employing CoastalDEM, a new DEM developed using a neural network to perform nonlinear, non-parametric regression analysis of SRTM error. This model incorporates 23 variables, including population and vegetation indices, and was trained using lidar-derived elevation data in the US as ground truth. CoastalDEM covers the same near-global latitudes as SRTM while reducing vertical bias to decimeter scale (0.01 m and 0.11 m as measured versus airborne lidar in the coastal US and Australia; -0.29 m as tested versus spaceborne lidar globally). CoastalDEM also cuts RMSE roughly in half compared to SRTM²⁶. In low-elevation US coastal areas (where SRTM elevation is less than or equal to 20 m) in which population density exceeds 20,000 per square kilometer, including areas in 14 coastal cities such as Miami, New York City, and Boston, CoastalDEM reduces linear vertical bias from 4.71 m to less than 0.06 m. An overview of the methods used to generate CoastalDEM can be found in the methods section.

Central estimates in the recent literature broadly agree that global mean sea level is likely to rise 20–30 cm by 2050^{3–10}. End-of-century projections diverge more, with typical central estimates ranging from 50–70 cm under representative concentration pathway (RCP) 4.5 and 70–100 cm under RCP 8.5^{3,9,10,12}, though more recent projections incorporating Antarctic ice sheet dynamics indicate that sea levels may rise 70–100 cm under RCP 4.5 and 100–180 cm under RCP 8.5, and could even exceed 2 m or more in far-tail scenarios^{4,7,8,11}. Via a structured elicitation of opinion, experts now estimate there is a 5 percent chance 21st century sea-level rise will exceed 2 m²⁹. Essentially all estimates are below the vertical bias of SRTM. Of these, we consider two representative sea-level projections for this assessment, labeled here as K14³ and K17⁴. K14 is a probabilistic projection that is closely aligned with IPCC findings^{10,30}, while K17 is not probabilistic and emphasizes the possibility of more rapid sea-level

rise because of unstable ice-sheet dynamics³¹. Further details of these models are discussed in the methods section.

Both sets of projections are conditional on global carbon emissions; RCPs 2.6 (low emissions), 4.5 (moderate emissions), and 8.5 (high emissions) are considered for this analysis³². These models use 2000 as the baseline year (zero sea-level rise), which we treat as present-day with respect to sea level for relevant vulnerability estimates. The results we present here are based on median sea-level projections, along with 90% credible intervals when derived from K14, and 90% intervals from simulation frequency distributions when derived from K17 (we abbreviate both interval types as CI).

Because higher and more frequent coastal flooding is a direct impact of sea-level rise^{33,34}, we also assess potential exposure to ECWLs resulting from annual floods added on top of rising seas. We use local one-year return level heights (RL1) from the Global Tides and Surge Reanalysis³⁵. These return levels vary spatially from a 5th percentile of 0.2 m to a 95th percentile of 2.8 m above local mean higher-high water (MHHW)—roughly speaking, the high tide line—across the near-global set of coastal cells assessed in this study (median value, 0.7 m).

We find that assessments using CoastalDEM instead of SRTM multiply median global ECWL exposure by roughly three or more for all scenarios and models considered. The majority of people living on implicated land are in developing countries across Asia, and chronic coastal flooding or permanent inundation threatens areas occupied by more than 10% of the current populations of nations including Bangladesh, Vietnam, and many Small Island Developing States (SIDS) by 2100.

Results

Global. Given each sea level scenario analyzed (Supplementary Table 1), and alternately using SRTM and CoastalDEM, we estimate the number of people on land that may be exposed to coastal inundation—either by permanently falling below MHHW, or temporarily falling below the local annual flood height (Table 1, Supplementary Data 1). Coastal defenses are not considered, but hydrologic connectivity to the ocean is otherwise enforced using connected components analysis. Figure 1 presents permanent inundation surfaces at select locations for median K17/RCP 8.5/2100. Future population growth and migration are also not considered; rather, we use 2010 (essentially current) population density data from Landsat¹³ to indicate threats relative to present development patterns.

Population exposure to projected sea level or coastal flooding is most commonly expressed as the total estimated exposure below a particular water level (total exposure)^{14,16,17,19,21,36}, but is increasingly also presented as the difference in exposure above a contemporary baseline (marginal exposure)^{16,21,37}. Each approach has complementary strengths and limitations, discussed later. Here, we include marginal exposure values for key findings, while focusing more on total exposure. The latter is simpler and supports a wider and more easily interpretable set of comparisons between CoastalDEM-derived and SRTM-derived results.

For the present day, CoastalDEM estimates a global total of 110 M people on land below the current high tide line and 250 M on land below annual flood levels, in contrast with corresponding SRTM-based estimates of 28 M and 65 M. These values form the basis of the difference between total and marginal exposure estimates.

For one moderate future scenario, sea levels projected by 2050 are high enough to threaten land currently home to a total of 150 (140–170) million people to a future permanently below the high tide line, or a marginal increase of 40 (30–60) million. Total and marginal exposure each rise by another 50 (20–90)

Table 1 Global populations on land at risk

Model	RCP	Frequency	2100					
			2030		Total		Marginal	
			Total		CoastalDEM	SRTM	CoastalDEM	SRTM
K14	2.6	Permanent	150 (130–160)	37 (32–43)	40 (20–50)	9 (4–15)	190 (150–250)	48 (36–65)
		RLI	300 (270–320)	78 (71–86)	50 (20–70)	13 (5–21)	340 (300–400)	95 (78–120)
		Permanent	150 (140–170)	38 (33–44)	40 (30–60)	10 (5–16)	200 (160–260)	52 (39–70)
	4.5	Permanent	300 (280–320)	79 (72–87)	50 (30–70)	14 (7–22)	360 (310–420)	100 (82–130)
		RLI	150 (140–170)	39 (33–45)	40 (30–60)	11 (5–17)	230 (180–310)	60 (44–85)
		Permanent	300 (280–330)	80 (73–89)	50 (30–80)	15 (8–24)	390 (330–460)	110 (90–150)
K17	2.6	Permanent	150 (130–170)	37 (29–47)	40 (20–60)	9 (1–19)	190 (140–280)	50 (32–75)
		RLI	290 (260–330)	77 (68–91)	40 (10–80)	12 (3–26)	350 (290–430)	97 (72–140)
		Permanent	150 (130–180)	38 (30–48)	40 (20–70)	10 (2–20)	250 (170–380)	64 (41–110)
	4.5	Permanent	300 (260–330)	78 (68–92)	50 (10–80)	13 (3–27)	400 (320–510)	120 (84–180)
		RLI	150 (130–180)	39 (31–50)	40 (20–70)	11 (3–22)	340 (220–520)	94 (56–180)
		Permanent	300 (270–340)	81 (69–95)	50 (20–90)	16 (4–30)	480 (380–630)	170 (110–260)

† Estimates of people (millions) currently on land that may be exposed to permanent inundation or annual flooding (RLI) after projected (median and 90% CI) sea-level rise by the year 2100. Marginal values are included as well, estimating current or upland of land between present and projected future high tide and RLI. Population data from 2010 was used, when the estimated global total of population was roughly 6800 million.

million people by end of century. A total of 360 (310–420) million people are on land threatened by annual flood events in 2100, or an extra 110 (60–170) million beyond the contemporary baseline. This case reflects greenhouse gas emissions cuts roughly consistent with warming of 2°C (emissions scenario RCP 4.5) and assumes a mostly stable Antarctic (sea-level model K14).

In the case of Antarctic instability, a total of 300 (270–340) million people today live on land indicated as vulnerable to an annual flood event by mid-century, rising to as many as 480 (380–630) million by 2100. These values represent marginal increases of 50 (20–90) and 230 (130–380) million from the present, respectively. All 90% CIs given originate from uncertainty in sea-level projections.

More broadly, the effect on estimated ECWL exposure from changing the elevation data used exceeds the combined effects of emissions level, Antarctic behavior, and incorporation of annual flooding, as assessed using SRTM. For example, based on CoastalDEM, the total median current population on land falling below the projected mean higher high water line in 2100 under low emissions and a fairly stable Antarctica (RCP 2.6 and K14) is 190 million. This figure doubles the median SRTM-based estimate of 94 million under high emissions and Antarctic instability (RCP 8.5 and K17), and even exceeds SRTM-based figures under the same scenario after the addition of areas below the annual flood level (170 million).

More straightforwardly, Supplementary Data 2 and 3 tabulate people currently occupying land from 0–10 m MHHW at 1 m intervals, according to CoastalDEM and SRTM, respectively. In previous work using SRTM¹⁸, about 640 M people have been estimated to live in the low elevation coastal zone (LECZ), defined as areas below 10 m. Defining the LECZ to reference MHHW instead of EGM96, we find SRTM predicts 780 M people below this threshold, and with CoastalDEM, the estimate rises to just over one billion people. Remarkably, this latter prediction includes 770 M below 5 m, versus 230 M from 5–10 m, illustrating a strong concentration in the lowest areas. The densest 1-m vertical band among the first ten is from 1-to-2 m, with 170 M inhabitants (or 1.7 M per vertical centimeter), pointing to a risky global pattern of development in light of sea-level rise.

National. With both SRTM and CoastalDEM, and regardless of emissions scenario or sea-level model, we find that more than 70% of the total number of people worldwide currently living on implicated land are in eight Asian countries: China, Bangladesh, India, Vietnam, Indonesia, Thailand, the Philippines, and Japan (Fig. 2, Supplementary Data 1). China alone accounts for 18–32% of global ECWL exposure across DEMs, depending upon the scenario, but CoastalDEM increases absolute estimates for China by a factor of roughly three compared to SRTM. Under K14/RCP 4.5, China could see land now home to a total of 43 (29–64) million people below MHHW by end of century, or 57 (30–100) million in the case of Antarctic instability (K17/RCP 4.5). The marginal increases in exposure from baseline are 20 (6–41) million and 34 (7–77) million, respectively. Under the same emissions scenario and either sea-level model, annual flood events at least double the corresponding estimates, threatening land occupied by over 60 million additional people.

In several developing countries south of China, ECWL exposure may be an order of magnitude more serious than previously expected as based on SRTM. As indicated by CoastalDEM, Bangladesh, India, and Vietnam come to rival China in the median number of people living on land implicated by 2100, totaling 21–30 million even under the low emissions

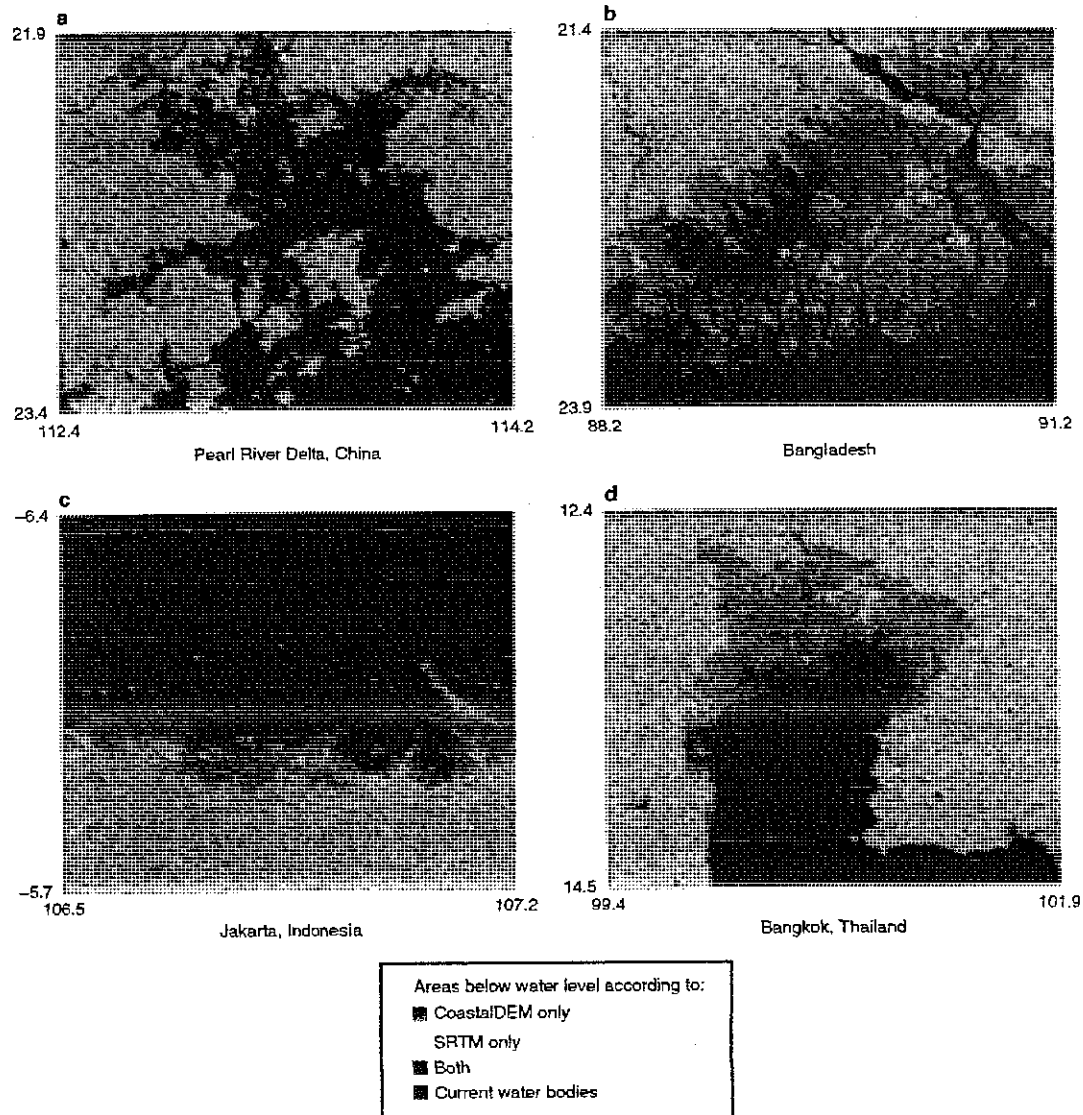


Fig. 1 Permanent inundation surfaces predicted by CoastalDEM and SRTM given the median K17/RCP 8.5/2100 sea-level projection. Locations include (a) the Pearl River Delta, China; (b) Bangladesh; (c) Jakarta, Indonesia; and (d) Bangkok, Thailand. Low-lying areas isolated from the ocean are removed from the inundation surface using connected components analysis. Current water bodies are derived from the SRTM Water Body Dataset. Gray areas represent dry land. Axis labels denote latitude and longitude

scenario (K14/RCP 2.6), compared to 9–19 M today, and with another 7–20 million on land threatened by annual storm surge. Bangladesh, India, Indonesia, and the Philippines see a 5-fold to 10-fold change in estimated current populations below the projected high tide line after applying CoastalDEM. Globally, application of CoastalDEM leads to increased exposure estimates for the great majority of nations (Fig. 3).

Percentage rather than absolute exposure serves as a normalized metric of threat (Supplementary Data 4). In Asia,

CoastalDEM indicates that even with deep cuts to carbon emissions (K14/RCP 2.6), Bangladesh, Vietnam, and Thailand may, by end-of-century, face high tide lines higher than land now home to 19 (15–25)%, 26 (23–31)%, and 17 (15–18)% of their people, respectively, before accounting for episodic flooding events. These figures correspond to marginal exposure increases of 13 (9–19)%, 5 (2–10)%, and 15 (13–16)% of national populations. Continued high emissions with Antarctic instability (K17/RCP 8.5) could entail land currently home to roughly one-

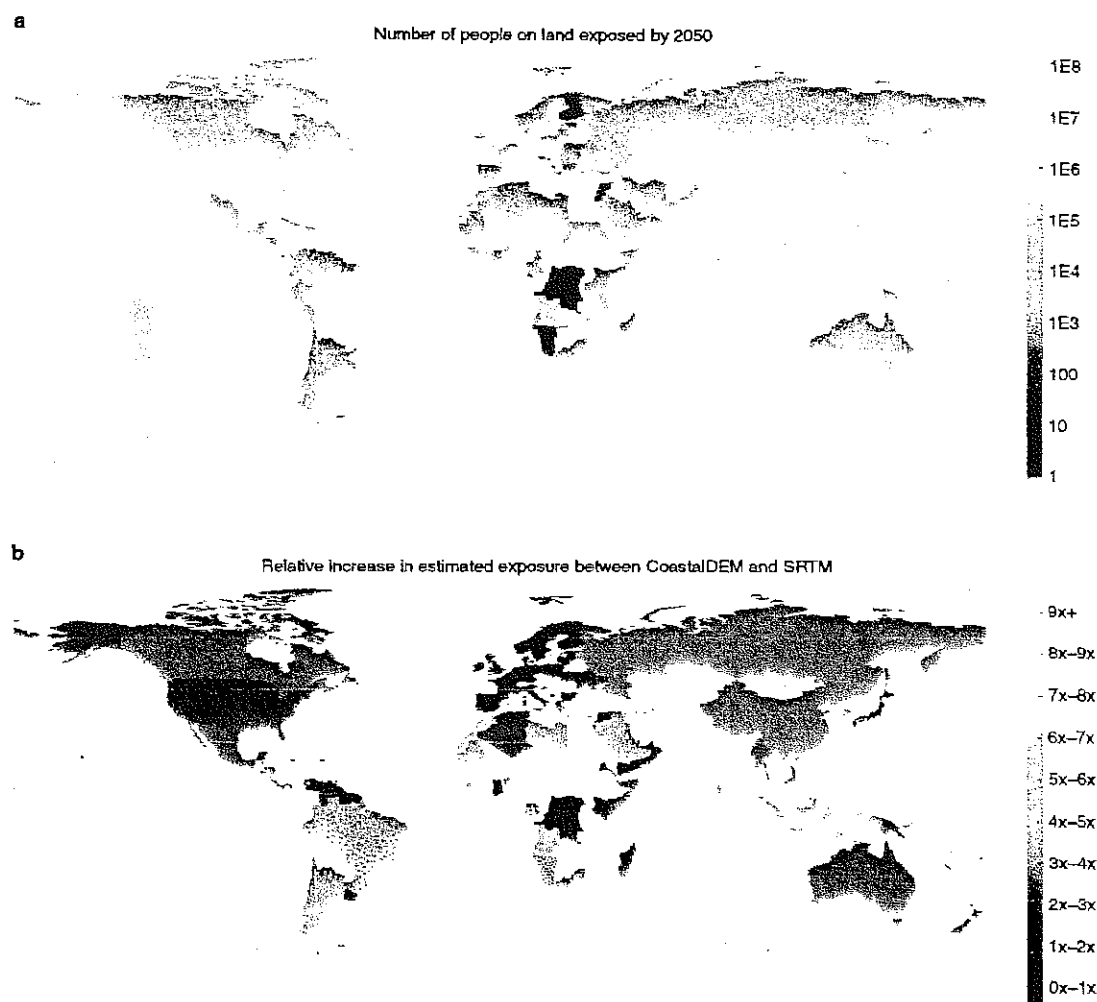


Fig. 2 Total populations on vulnerable land. **a** Current population on land below projected mean higher high water level in 2100 assuming intermediate carbon emissions (RCP 4.5) and relatively stable Antarctic ice sheets (sea level model K14). Estimates based on CoastalDEM. **b** Factor by which CoastalDEM increases estimates of people on vulnerable land over SRTM in each country under K14/RCP 4.5. Countries wholly north of 60 degrees N are excluded because CoastalDEM is undefined at those latitudes. Source data are provided as a Source Data file. National boundaries based on public domain vector map data by Natural Earth (natureearthdata.com)

third of Bangladesh's and Vietnam's populations permanently falling below the high tide line. It follows that some coastal municipalities within these nations will see even larger proportions of their populations threatened with displacement.

Outside of Asia and excluding the Netherlands, where an extensive flood control network is not captured by any of the elevation models studied, CoastalDEM indicates that 19 other countries are expected to see land currently home to 10% or more of their total populations fall below end-of-century high tide lines (based on median estimates), even under the deep emissions cuts of RCP 2.6. This count is up from two using SRTM. Except for

Djibouti and Guyana, all of these are island nations, and thirteen are classified by the United Nations as Small Island Developing States (SIDS).

Supplementary Data 1 and 4 provide results for the present, mid-century, and 2100.

Validation. The aspirational outcome of applying CoastalDEM to ECWL exposure analysis is to, as closely as possible, estimate the same amount of coastal vulnerability that a DEM derived from airborne lidar data would. We validate our results by first performing three representative ECWL exposure analyses using

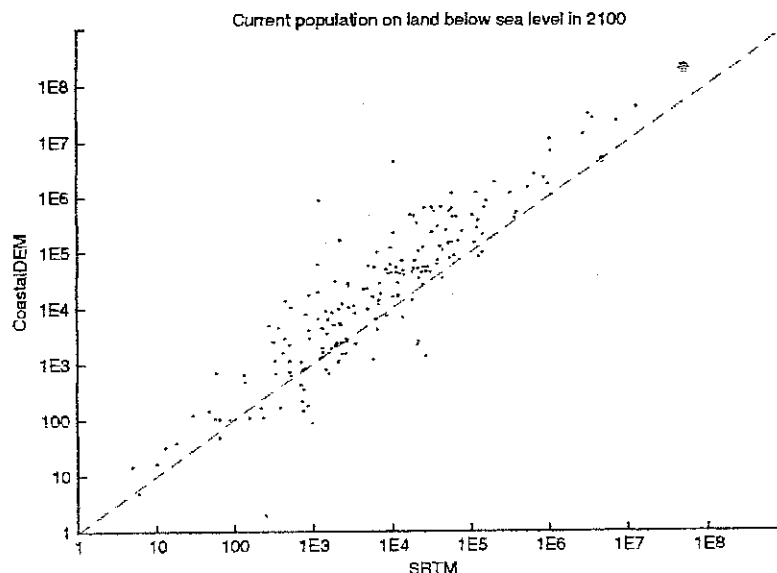


Fig. 3 CoastalDEM versus SRTM by country. Each point represents a country, and its position corresponds to estimated total current population on land below the projected mean higher-high water level in 2100 (K14/RCP 4.5) using CoastalDEM (y-axis) versus SRTM (x-axis). The total global value is designated with the red point. Very large differences typically indicate large low-lying areas hydrologically connected to the ocean under CoastalDEM, but not SRTM. Source data are in Supplementary Data 1

lidar-derived data in the US and Australia. In Fig. 4, we plot the relative differences of predicted current population exposure between lidar and each global DEM at different water heights. Values of nearly zero imply a close match between exposure computed using both lidar and the target DEM, while larger absolute values suggest under-estimation or over-estimation of vulnerability. In addition to CoastalDEM and SRTM, we also include the alternative elevation models AW3D30 and MERITDEM, discussed more below.

We find that CoastalDEM strongly and consistently outperforms SRTM (as well as the other global DEMs) with this metric. At 1 m above MHHW, CoastalDEM improves linear relative difference in every state except for New York. Error is reduced from -69% (SRTM) to -43% (CoastalDEM) across the US, and from -77% (SRTM) to -23% (CoastalDEM) in Australia. Even larger improvements are seen at higher water levels, and at 3 m, relative errors in the US and Australia are smaller than -29 and 7% , respectively. We note that while the neural network that generated CoastalDEM was trained on lidar-derived data in the US, Australian lidar data is used only to validate the results, meaning strong results seen here mitigate fears that the model has been overfitted.

Error in the US is dominated by Florida, where an exceptionally large population occupies the coastal plain, and where SRTM vertical error in the southern half of the state is unusually high (exceeding 4 to 10 m). The neural network that generated CoastalDEM did not fully correct this large error. Discounting Florida, US relative error at 1 m drops from -62% (SRTM) to -30% (CoastalDEM)—a comparable improvement to that seen in Australia.

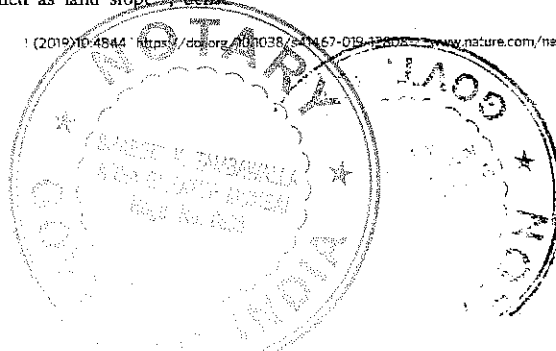
Sensitivity analysis. Spatial autocorrelation commonly characterizes DEM error, including error within SRTM³⁸. SRTM error is strongly correlated with factors such as land slope³⁹, dense

vegetation²⁴, and high population density⁴⁰, which themselves exhibit natural spatial autocorrelation. These features could manifest at any number of spatial scales (some towns may be only a few kilometers wide, while some urban agglomerations and forests are far larger). Furthermore, there exist well-known striping artifacts present in SRTM caused by satellite micro-adjustments⁴¹, resulting, in cases, in multi-meter upward or downward bias across regions that may reach on the order of 100 km wide.

While CoastalDEM makes substantial improvements to SRTM, and includes, in its construction, inputs designed to reduce or eliminate striping, we anticipate that CoastalDEM also suffers from autocorrelated error. We therefore conduct a sensitivity analysis to explore the potential effects of error in CoastalDEM on our population exposure estimates, including the effects of autocorrelated error.

Monte Carlo simulations are regularly used to model DEM error and generate distributions of flood exposure estimates, from which uncertainty may be evaluated^{38,42,43}. Such approaches typically either assume zero spatial autocorrelation, using the DEM's documented RMSE to generate random error surfaces^{42,44}, or use low-pass filters across the error fields to simulate small-scale autocorrelation⁴⁵; or employ sequential Gaussian simulations, which require widely dispersed ground-control-point data to accurately measure error statistics across the DEM^{43,46}. The wide range of autocorrelation scale present here makes the second option unsuitable, and with no ground-control-point data available globally, the third is not possible.

Because of our expectations around the importance of spatial autocorrelation, we apply a modified, multi-scale approach to the first of these three methods. Assuming a normal distribution of error centered on zero and using a fixed global standard deviation, we generate 100 error fields using each of 6 different block sizes within which uniform error applies, ranging from 1



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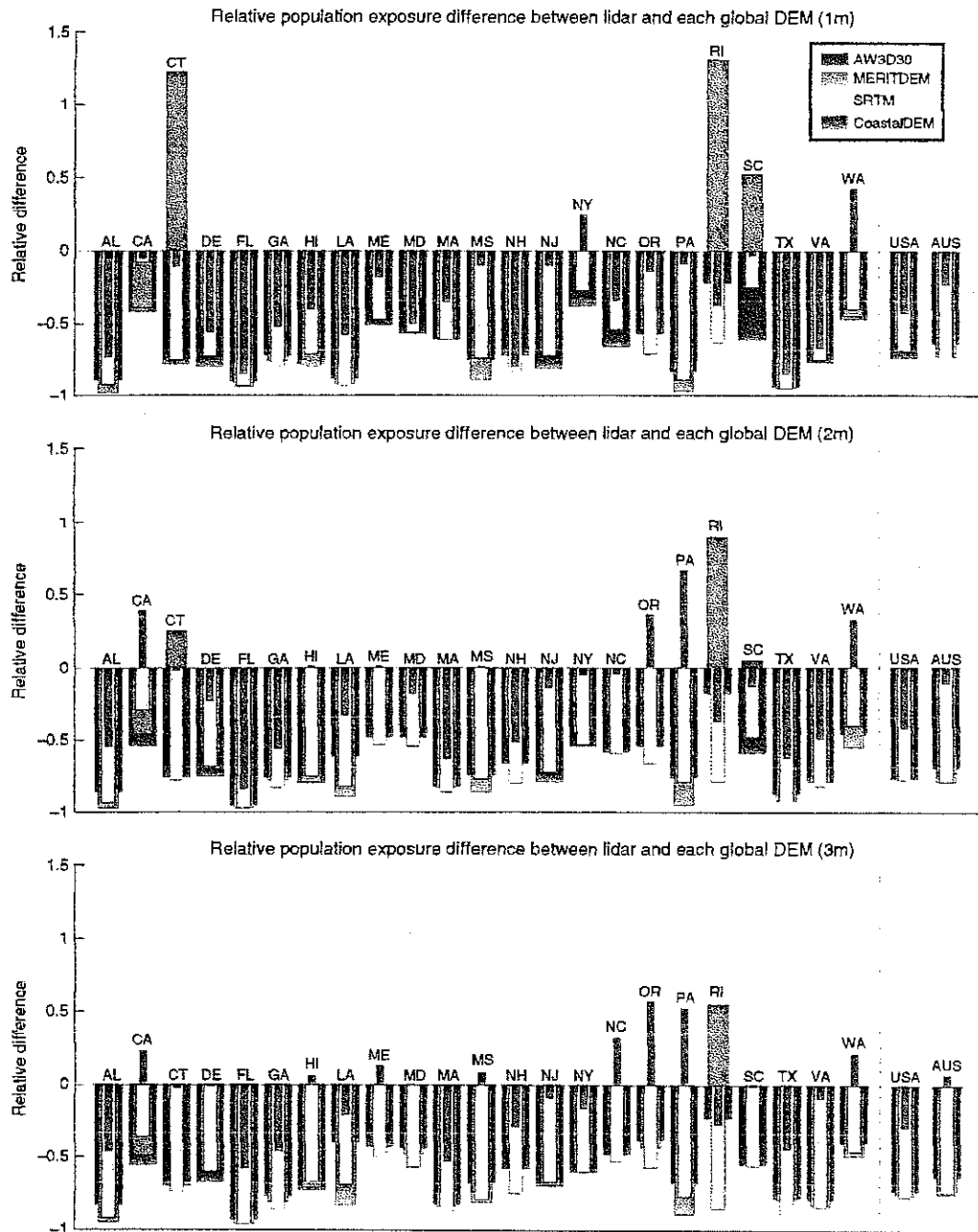


Fig. 4 The relative difference of computed population ECWL exposure between lidar and four global DEMs. Populations living on land below 1, 2, and 3 m are computed in the US and Australia with each DEM. Zero relative differences indicate both lidar and the given global DEM predict the same number of people below the elevation threshold whereas, for example, -0.5 and 0.5 would indicate that the global DEM underestimation or overestimated by 50%, respectively. Results are given for each US state, as well as at the national scale in the US and Australia. Source data are provided as a Source Data file

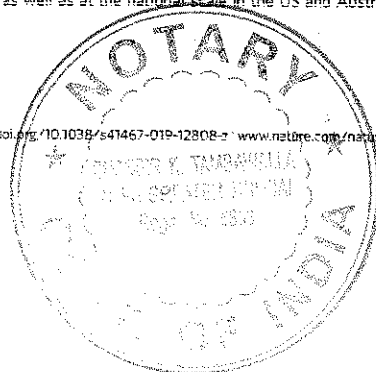


Table 2 Global simulated error assessment results

Error resolution	Percentile		
	5th	50th	95th
Pixel (3 arcseconds)	370 (−0%)	370	370 (−0%)
1 km	370 (−0%)	370	380 (+3%)
0.1 deg	380 (−3%)	390	400 (+3%)
0.25 deg	380 (−3%)	390	420 (+8%)
0.5 deg	370 (−8%)	400	420 (+5%)
1 deg	360 (−10%)	400	440 (+10%)

100 simulated error surfaces are generated at each listed spatial resolution to represent different spatial scales of error autocorrelation, and added to CoastalDEM. 1-pixel simulations have no autocorrelation. Population exposure below 2 m local MHHW is computed for each simulated elevation dataset (each retaining CoastalDEM's original 3 arcsecond resolution), and the 5th/50th/95th percentiles of these results are presented. Percent differences from the median are provided for the 5th and 95th percentiles in parentheses. Units are in millions of people. Population exposure based on the unmodified CoastalDEM dataset is 400 M.

pixel (3 arcseconds) to 1 degree. We add the blocked errors to the original CoastalDEM to produce new simulated 3 arcsecond DEMs for computing exposure; the resulting exposure distributions are then evaluated separately for each block resolution. We use CoastalDEM's RMSE in Australia (2.46 m), as determined using lidar, to serve as the global standard deviation for our error distributions. We choose RMSE from Australia versus the US (RMSE 2.39 m) because the CoastalDEM model was trained in the US (albeit on just a 1% coastal sample). While vertical error will inevitably vary some from place to place, the similarity in error between the US and Australia increases our confidence in the value we employ.

We elect to use a water height of 2 m above MHHW (roughly and generally corresponding to a bad flood in the nearer term or an extreme sea-level scenario for 2100) as a case study. As in the main study, connected components analysis is used to remove isolated areas under the inundation surface before computing exposure. Unmodified CoastalDEM estimates 400 M people worldwide live below this threshold. Table 2 and Supplementary Data 5, respectively, provide global and country-level results for this sensitivity analysis.

Smaller error-block sizes (1-pixel through 1/10-degree resolution, roughly the size of a small city) produce highly consistent exposure estimates at the global scale, though biased low relative to the 400 M predicted without simulated error. This bias may be caused by higher spatial frequency DEM alterations cutting off some low-lying inland areas connected to the ocean through narrow pathways in the original CoastalDEM. Consistent with this mechanism, bias dissipates at larger error-block sizes. Also as autocorrelation scale grows, we see that 90% confidence intervals widen. At the extreme 1 degree resolution, roughly the scale of SRTM striping, the global 90% CI reaches plus or minus 10% about the 400 M median.

Countries also experience widening CI's across error resolutions, though considerably more rapidly than seen at the global scale. In countries with at least 1 M people below the 2 m threshold, the 90% CI's are, on average, plus or minus 2% about the median at 1 pixel, 5% at 1 km, 23% at 1/10 degree, 32% at 1/4 degree, 41% at 1/2 degree, and 49% at 1 degree. For example, at the 1-degree-error resolution, Bangladesh, India, and Vietnam have CI's of (−43 to 54%), (−40 to 27%), and (−29 to 23%) about their respective medians, while China is predictably less sensitive at (−21 to 21%). In general, larger areas of analysis and smaller error blocks lead to less sensitivity in ECWL exposure estimates, because each of these factors leads to larger random samples, making errors more likely to cancel out. Conversely, smaller areas and larger blocks each lead to smaller samples and more sensitivity.

These results suggest that CoastalDEM error exerts little influence on our global estimates, but reasonable caution should be applied when interpreting national scale assessments, particularly for smaller countries such as the SIDS. That said, we note that the 1-degree simulations represent worst-case scenarios, because they assume that CoastalDEM's RMSE derives exclusively from the largest considered spatial scale. Given the known factors at many spatial scales that contribute to DEM error, this assumption is unrealistic. Assessing characteristic error autocorrelation scales is beyond the scope of this study, but realistic CIs will be considerably narrower than implied by the 1-degree scale.

Discussion

Despite improvements, elevation dataset error remains an important limitation in this study. We see that CoastalDEM still underestimates population exposure in both the US and Australia when compared to lidar-derived DEMs, suggesting the current assessment does not fully eliminate the bias in exposure estimates based on SRTM. CoastalDEM may still experience difficulty in dense cities, where exceptionally tall buildings in even the lowest-lying areas can cause SRTM elevations erroneously above 20 m. Since CoastalDEM is defined only where SRTM elevation is lower than or equal to 20 m, such areas are disregarded in this analysis, leading to some underestimation of exposure.

Older global scale DEMs, such as GLOBE⁴⁷ and GTOPO30⁴⁸, have been used in previous work, and generally predict higher coastal flood exposure than SRTM^{19,20}. However, their extremely high vertical errors (up to 100 m RMSE in both cases), low horizontal resolution (1 km), and spatial inconsistency in quality make them unreliable for ECWL vulnerability assessments. Their use for research has faded in comparison with SRTM, given its higher horizontal resolution and order-of-magnitude lower error. More recently, other DEM's have been released, such as AW3D30⁴⁹ and MERITDEM⁵⁰. AW3D30 is a digital surface model primarily derived from stereo optical satellite imagery, and does not specifically attempt to improve vertical bias in either urban or forested areas. MERITDEM, like CoastalDEM, is based off of SRTM. It uses regression analysis to remove vertical error correlated with a number of vegetation metrics. However, MERITDEM does not seek to correct errors due to urban development. For sake of comparison, the analyses described in this article were repeated for these DEMs, and included in Supplementary Data 1 and 4. Results from both AW3D30 and MERITDEM, including US/Australia ECWL exposure error (Fig. 4), are generally consistent with those derived from SRTM, and so we maintain that these DEMs are equally inadequate for assessing coastal vulnerability.

Future modeling efforts may improve estimation of terrain elevations in tall-building districts and areas affected by SRTM striping. Ultimately, the most accurate assessments of vulnerability to rising seas, especially for smaller areas, will require development and public release of improved coastal area elevation datasets building directly off of new high resolution observations increasingly collected by satellites today.

Another limitation of this assessment comes from the population dataset Landscan, which is a 1 km² resolution model of ambient population density. While Landscan is widely used in the research literature, it cannot capture any bias toward or away from development within the lowest-lying coastal areas at sub-kilometer spatial scales. GRUMP is another population dataset with the same horizontal resolution, though it involves less sophisticated spatial modeling and is available only through 2000. It models nighttime (rather than ambient) population density⁵¹, and has been shown to produce notably higher predictions of

exposure to ECWL²⁰. Gridded Population of the World⁵³ is another alternative, based directly on census data without further modeling. While nominally at 1 km horizontal resolution, the data is piecewise constant between administrative boundaries, meaning its effective resolution is actually much coarser than Landsat. Newer datasets, such as Worldpop⁵³ and the High Resolution Settlement Layer⁵⁴, are anticipated to model population densities with higher accuracy at finer resolution, but are not yet available globally.

We emphasize that this analysis combines future water level projections with contemporary population densities. Results should therefore not be taken as projected impacts. Rather, they reflect the portion of presently developed land at risk in the future, which we interpret as a threat indicator. Efforts to integrate projected population growth, migration, economic development and coastal defenses into ECWL exposure projections have begun^{19,36,55}. However, the spatial scales of socioeconomic projections remain very coarse compared to the scales at which elevation and current development data are available, posing a stiff challenge to their meaningful integration into analyses where fine-scale detail is critical. In addition, behavioral and economic responses to rising seas are likely to be unpredictable, due to the largely unprecedented nature and scale of the problem.

The vulnerability model employed in this analysis, a bathtub model where we classify all land below a given water height and hydrologically connected to the ocean as exposed to extreme coastal water levels, presents another partial limitation of the study. While this approach is reasonable in indicating land threatened with permanent inundation due to higher sea levels, it tends to overestimate exposure from episodic flooding, especially at small spatial scales^{56,57}. It is likely that hydrodynamic models would predict less vulnerability to one-year floods than we estimate here. Areas accordingly misclassified as exposed to annual flooding would nonetheless likely face relatively frequent inundation risks.

Furthermore, this analysis assumes a static coastal topography, with the exception of a linear model of vertical land motion implicit in the sea-level projections used. Erosion, wetland migration/accretion, and other morphological processes are not considered. It is difficult to predict how these factors affect the uncertainty of our results, especially since sea-level change may trigger complex process responses. However, we note that armored, developed, and maintained shorelines in urban areas, where vulnerable populations are concentrated, may generally be less susceptible to such factors than undeveloped land.

This study focuses on estimating populations occupying land below future high tide lines or annual flood levels, but results also indicate that some 110 M people live below MHHW today (with many more below annual flood lines). Several explanations are possible. First, elevation error may drive the finding. However, in the US and Australia, CoastalDEM identifies fewer people living below MHHW (0.9 M and 69,000, respectively) than lidar-based analysis does (1.7 M and 75,000), consistent with our more general finding that CoastalDEM tends to underestimate coastal exposure relative to lidar.

Second, other sources of error may be important, including from the population data used and from the sea level data and tidal models used to determine local MHHW. A more detailed lidar-based analysis employing high resolution (block-level) US Census data⁵⁸ and NOAA's nearly continuous model for local MHHW⁵⁹ within the US cuts the original lidar-based estimate of 1.7 M nearly in half, to 0.9 M residents on land below MHHW. If these US results are indicative, and global population and MHHW estimates inflate exposure values derived from lidar elevation data, they likely also inflate values derived from CoastalDEM. Higher accuracy and higher resolution population,

sea level and tidal inputs are likely important for improving coastal exposure assessments in the future.

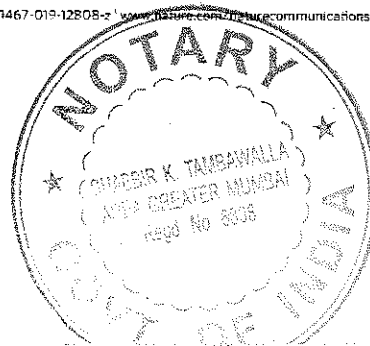
Third, many people today do in fact live on land below (or just above) MHHW, behind the protection of levees or other defenses. In the US, these account for 0.8 M out of the 0.9 M residents that our more detailed lidar analysis identifies as today occupying land below MHHW. Globally at present, levees and seawalls protect low-lying populations in many major deltas, such as around Shanghai, the Netherlands and New Orleans, and in areas experiencing rapid subsidence, such as parts of Jakarta and Tokyo. However, levee location data are not globally available, to our knowledge, and so are not incorporated into this analysis.

Fourth and finally, many people today do live in unprotected areas subject to frequent coastal flooding (if not below the high tide line), such as in Bangladesh, or in boats or structures on or above the water (such as homes on stilts). These possibilities are likely to be most common in developing countries, and to be poorly documented.

The levees, seawalls and other defenses and accommodations currently protecting tens or hundreds of millions of coastal-area residents globally point to the potential for protecting ever-larger areas as seas rise. At the same time, current coastal defenses should not be assumed adequate to protect against future sea levels and storms without continued maintenance and, likely, enhancement. These countervailing possibilities point to the merits of reporting results based both on total ECWL exposure and on marginal increases in exposure from the contemporary baseline. Total exposure recognizes the potential vulnerability of all populations on low-lying coastal lands as sea levels rise. Marginal exposure highlights new populations of concern, while leaving out populations in areas that may be defended at present, and thus may be more likely to be defended in the future.

Even in light of the limitations identified, this research, using a significantly improved model of coastal elevations, provides new best estimates of the vulnerability of populated low-lying areas to rising oceans at global and national scales. Reliability increases with the size of the area evaluated, and with the water level considered; thus, global assessments for end-of-century sea levels and floods, under high sea-level scenarios, should be considered most robust. Analysis reveals a developed global coastline three times more exposed to extreme coastal water levels than previously thought. Even with low carbon emissions and stable Antarctic ice sheets, leading to optimistically low future sea levels, we find that the global impacts of sea-level rise and coastal flooding this century will likely be far greater than indicated by the most pessimistic past analyses relying on SRTM. These results point to great need for the development and public release of improved terrain elevation datasets for coastal areas, for example via the high-resolution imagery and lidar point clouds increasingly collected by satellite today. There is also great need for improved population data; data on the location, height and condition of coastal-area levees and seawalls; and improved global sea-level and tidal models.

If our findings stand, coastal communities worldwide must prepare themselves for much more difficult futures than may be currently anticipated. Recent work has suggested that, even in the US, sea-level rise this century may induce large-scale migration away from unprotected coastlines, redistributing population density across the country and putting great pressure on inland areas⁶⁰. It is difficult to extrapolate such projections and their impacts to more resource-constrained developing nations, though historically, large-scale migration events have posed serious challenges to political stability, driving conflict⁶¹. Further research on global-scale modeling of the timing, locations, and intensity of migratory responses to increased coastal flooding is urgently needed to minimize the potential human harm caused by such threats.



Methods

Sea-level projections. We use two sea-level models for this assessment. K14³ employs a probabilistic approach and includes very little contribution from Antarctica in its central projections. K17⁴ links physical models of ice sheet loss to the projection framework established in K14, thus emphasizing the possibility of early-onset Antarctic instability¹¹. However, the ice sheet model parameters used were not derived from probability distributions. Unlike K14, the resulting projection distributions produced by K17 are therefore considered simulation frequency distributions, rather than probabilistic ones. While more recent work² suggests that these Antarctic projections may be biased high, the resulting overall sea-level projections align roughly with the high end of what the sea level research community broadly expects²⁰. Both models incorporate spatially explicit submodels for all climatic components of sea-level rise considered. They each also incorporate nonclimatic background contributions, such as glacial isostatic adjustment and sediment compaction. Leveraging sea-level records collected at 1022 PSMSL tide gauges worldwide, both K14 (updated in 2017⁴) and K17 employ a Gaussian process model to estimate nonclimatic contributions at points on a 2° × 2° grid along the entire global coastline. Results for both models at the tide gauge and grid point locations are included in Supplementary Datasets 3 and 4 of Kopp et al.⁴.

CoastalDEM. A multilayer perceptron (MLP) artificial neural network, a computational model often used for highly nonlinear non-parametric regression, was employed to predict the vertical error present at any SRTM pixel sample. MLP's are made up of layers of nodes in a weighted, directed graph, starting with an input layer (in our case, a 23-dimensional vector of known attributes at the target location) and ending with an output layer (1-dimensional error prediction at the target location). The neural network is trained by using lidar-derived elevation data in the US⁶³ as ground truth, iteratively adjusting weights in the graph to most accurately reproduce desired targets given the training set of samples. Our training set was made of over 51 million samples, and the 23 variables included neighborhood elevation values, land slope, population density, vegetation density, canopy height, and local SRTM deviations from ICESat altitude observations⁶⁴. After training, the MLP predicted and removed SRTM errors at every pixel in the DEM with elevation between 1 and 20 m (inclusive). Details on the implementation and vertical error assessment of CoastalDEM were published earlier²⁶. For this report, we used median resampling to convert CoastalDEM to a 3-arcsecond horizontal resolution.

Vertical datum conversion. We convert all elevation data to a common vertical reference frame (datum) for valid intercomparisons, electing the tidal datum mean higher high water (MHHW). MHHW is roughly equivalent to local high tide line and captures spatial variation in both mean sea level (MSL) and tidal amplitude. We use the globally extensive MSL model MSS_CNES_CLS_15⁶⁵, based on a 1993–2012 record of satellite sea surface height measurements from TOPEX/Poseidon, and referenced to the GLAS ellipsoid at 1-arcminute horizontal resolution. We also employ MHHW deviations from MSL provided by Mark Merrifield, University of Hawaii, developed using the model TPX08⁶⁶ at 2-arcminute horizontal resolution. Using NOAA's VDatum tool⁶⁷ version 3.7, we convert CoastalDEM, SRTM, AW3D30 and MERITDEM, plus the GLAS-referenced MHHW elevations, to a common ellipsoidal datum (WGS84). This allows us to subtract the elevation map of MHHW from each DEM to produce our final elevation maps above local MHHW.

A similar approach is taken in converting 1-year return levels to MHHW. The Global Tides and Surge Reanalysis, as distributed, is referenced to local MSL, so we use the MHHW-MSL deviation surfaces to change its vertical datum to MHHW.

Exposure analysis. Employing a modified bathtub model, we threshold each pixel in the DEMs to produce inundation surfaces at 0–10 m above MHHW. These inundation surfaces are computed at 1 m intervals with SRTM and AW3D30 (equivalent to their vertical resolutions), and at 0.25 m intervals with CoastalDEM and MERITDEM (which have continuous vertical resolutions). The surfaces are then refined using connected components analysis to remove all low-lying sub-threshold areas that the analysis indicates to be isolated by topography from the ocean.

To assess population exposure, we employ the LandScan 2010 High Resolution global Population Data Set, which estimates total populations living in 1 km² cells¹³. We refine this data using the SRTM Water Body Data Set, which defines land cells at up to 1-arcsecond resolution (30 m). We resample LandScan to align our DEM grids, assuming zero population in water cells, while proportionally increasing the population density in land cells to ensure total population in each original 1 km square remains unchanged.

The population density grids are integrated under each 0.25 m-interval inundation surface, and tabulated according to the smallest administrative boundaries defined by the Global Administrative Areas (GADM) 2.0 Data Set⁶⁷. In general, these administrative units are roughly the size of US counties, or smaller. The local sea-level rise projections and 1-year return level heights, now referenced to local MHHW, are then computed and added at the centroid of each boundary by linearly interpolating from nearby sample points from the corresponding models. At the scale of these administrative units, the sea-level rise and RL1 gradients are relatively small, so any local factors affecting water heights are captured. Populations on land under each of these water heights are then estimated using

linear interpolation between the 0.25 m interval analyses. Results are aggregated to larger administrative areas, such as states and nations, as needed.

Reporting summary. Further information on research design is available in the Nature Research Reporting Summary linked to this article.

Code availability

The methods described in this article were implemented using custom Matlab (R2017b), Python, and C++ code. Due to licensing restrictions by Climate Central, this code is not publicly available.

Data availability

All exposure analyses (national populations on vulnerable land) that support the findings of our study are available within this article and its supplementary information files. The datasets SRTM, AW3D30, MERITDEM, LandScan 2010, and GADM are publicly available from their respective owners. The 3-arcsecond (90-m) version of CoastalDEM used in this analysis is available at no cost from Climate Central for non-commercial research use.

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References

- Hay, C. C., Morrow, E., Kopp, R. E. & Mitrovica, J. X. Probabilistic reanalysis of twentieth-century sea-level rise. *Nature* **517**, 481–484 (2015).
- Dangendorf, S. et al. Reassessment of 20th century global mean sea level rise. *Proc. Natl. Acad. Sci.* **114**, 5946–5951 (2017).
- Kopp, R. E. et al. Probabilistic 21st and 22nd century sea-level projections at a global network of tide-gauge sites. *Earth's Future* **2**, 383–406 (2014).
- Kopp, R. E. et al. Evolving Understanding of Antarctic Ice-Sheet Physics and Ambiguity in Probabilistic Sea-Level Projections. *Earth's Future* **5**, 1217–1233 (2017).
- Nauels, A., Meinshausen, M., Mengel, M., Lorbacher, K. & Wigley, T. M. L. Synthesizing long-term sea level rise projections the MAGICC sea level model v2.0. *Geoscientific Model Dev.* **10**, 2495–2524 (2017).
- Nauels, A., Rogelj, I., Schleussner, C.-F., Meinshausen, M. & Mengel, M. Linking sea level rise and socioeconomic indicators under the Shared Socioeconomic Pathways. *Environ. Res. Lett.* **12**, 114002 (2017).
- Bakker, A. M. R., Wong, T. E., Ruckert, K. L. & Keller, K. Sea-level projections representing the deeply uncertain contribution of the West Antarctic ice sheet. *Sci. Rep.* **7**, 3880 (2017).
- Wong, T. E., Bakker, A. M. & Keller, K. Impacts of Antarctic fast dynamics on sea-level projections and coastal flood defense. *Clim. Change* **144**, 347–364 (2017).
- Jevrejeva, S., Moore, J. & Grinsted, A. Sea level projections to AD2500 with a new generation of climate change scenarios. *Glob. Planet. Change* **80**, 14–20 (2012).
- Stocker, T. et al. *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, Cambridge, New York, 2013).
- Le Bars, D., Dridjout, S. & de Vries, H. A high-end sea level rise probabilistic projection including rapid Antarctic ice sheet mass loss. *Environ. Res. Lett.* **12**, 044013 (2017).
- Jackson, L. P. & Jevrejeva, S. A probabilistic approach to 21st century regional sea-level projections using RCP and High-end scenarios. *Glob. Planet. Change* **146**, 179–189 (2016).
- Bright, E. A., Coleman, P. R., Rose, A. N. & Urban, M. L. LandScan 2010. <https://landscan.ornl.gov> (2011).
- Hallegatte, S., Green, C., Nicholls, R. J. & Corfee-Morlot, I. Future flood losses in major coastal cities. *Nat. Clim. Change* **3**, 802–806 (2013).
- Neumann, T. & Abrendt, K. Comparing the “Bathtub Method” with MIKE 21 HD Flow Model for Modelling Storm Surge Inundation: Case Study Kiel Fjord. In: *RADOST Report Series* (Rostock, Germany, 2013).
- Neumann, B., Vafeidis, A. T., Zimmermann, J. & Nicholls, R. J. Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding—A Global Assessment. *PLoS ONE* **10**, e0118571 (2015).
- Rasmussen, D. J. et al. Extreme sea level implications of 1.5 °C, 2.0 °C, and 2.5 °C temperature stabilization targets in the 21st and 22nd centuries. *Environ. Res. Lett.* **13**, 034040 (2018).
- McGranahan, G., Balk, D. & Anderson, B. The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones. *Environ. Urban* **19**, 17–37 (2007).

19. Hinkel, J. et al. Coastal flood damage and adaptation costs under 21st century sea-level rise. *Proc. Natl Acad. Sci. USA* 111, 3292–3297 (2014).
20. Lichter, M., Vafeidis, A. T., Nicholls, R. J. & Kaiser, G. Exploring data-related uncertainties in analyses of land area and population in the “Low-Elevation Coastal Zone” (LECZ). *J. Coast. Res.* 274, 757–768 (2011).
21. Jongman, B., Ward, P. J. & Aerts, J. C. Global exposure to river and coastal flooding: long term trends and changes. *Glob. Environ. Change* 22, 823–835 (2012).
22. Tighe, M. & Chamberlain, D. Accuracy Comparison of the SRTM, ASTER, NED, NEXTMAP USA Digital Terrain Model over Several USA Study Sites DEMs. In: *Proceedings of the ASPRS/MAPPS 2009 Fall Conference* (2009).
23. LaLonde, T., Shortridge, A. & Messina, J. The Influence of Land Cover on Shuttle Radar Topography Mission (SRTM) Elevations in Lowrelief Areas. *Trans. GIS* 14, 461–479 (2010).
24. Shortridge, A. & Messina, J. Spatial structure and landscape associations of SRTM error. *Remote Sens. Environ.* 115, 1576–1587 (2011).
25. Beck, K. Assessing Global Digital Elevation Models Using the Runway Method: The Advanced Spaceborne Thermal Emission and Reflection Radiometer Versus the Shuttle Radar Topography Mission Case. *IEEE Trans. Geosci. Remote Sens.* 52, 4823–4831 (2014).
26. Kulp, S. A. & Strauss, B. H. CoastalDEM: a global coastal digital elevation model improved from SRTM using a neural network. *Remote Sens. Environ.* 206, 231–239 (2018).
27. Zwally, H. et al. ICESat’s laser measurements of polar ice, atmosphere, ocean, and land. *J. Geodynamics* 34, 405–445 (2002).
28. Kulp, S. & Strauss, B. H. Global DEM Errors Underpredict Coastal Vulnerability to Sea Level Rise and Flooding. *Front. Earth Sci.* 4, 36 (2016).
29. Bathier, J. L., Oppenheimer, M., Kopp, R. E., Aspinall, W. P. & Cooke, R. M. Ice sheet contributions to future sea-level rise from structured expert judgment. *Proc. Natl Acad. Sci. USA* 116, 11195–11200 (2019).
30. Church, J. A. et al. Sea-level rise by 2100. *Science* 342, 1445 (2013).
31. DeConto, R. M. & Pollard, D. Contribution of Antarctica to past and future sea-level rise. *Nature* 531, 591–597 (2016).
32. ILASA. RCP Database 2.0.5, <https://intcat.nasa.acad/RcpDb> (2009).
33. Tebaldi, C., Strauss, B. H. & Zervas, C. E. Modelling sea level rise impacts on storm surges along US coasts. *Environ. Res. Lett.* 7, 014932 (2012).
34. Buchanan, M. K., Kopp, R. E., Oppenheimer, M. & Tebaldi, C. Allowances for evolving coastal flood risk under uncertain local sea-level rise. *Clim. Change* 137, 347–362 (2016).
35. Muis, S. et al. A global reanalysis of storm surges and extreme sea levels. *Nat. Commun.* 7, 11969 (2016).
36. Hauer, M. E., Evans, J. M. & Mishra, D. R. Millions projected to be at risk from sea-level rise in the continental United States. *Nat. Clim. Change* 6, 691–695 (2016).
37. Hallegatte, S. et al. Assessing climate change impacts, sea level rise and storm surge risk in port cities: a case study on Copenhagen. *Clim. Change* 104, 113–137 (2010).
38. Gesch, D. B. Best Practices for Elevation-Based Assessments of Sea-Level Rise and Coastal Flooding Exposure. *Front. Earth Sci.* 6 (2018).
39. Ludwig, R. & Schneider, P. Validation of digital elevation models from SRTM X-SAR for applications in hydrologic modeling. *ISPRS J. Photogramm. Remote Sens.* 60, 339–358 (2006).
40. Gamba, P., Acqua, F. D. & Houshmand, B. SRTM data characterization in urban areas. *International Archives of Photogrammetry Remote Sensing and Spatial. Inf. Sci.* 34, 55–58 (2002).
41. Rodriguez, E. et al. An assessment of the SRTM topographic products. Technical Report TPL D-31639 (2005).
42. Wechsler, S. P. & Kroll, C. N. Quantifying DEM Uncertainty and its Effect on Topographic Parameters. *Photogrammetric Eng. Remote Sens.* 72, 1081–1090 (2006).
43. Wechsler, S. P. Uncertainties associated with digital elevation models for hydrologic applications: a review. *Hydrol. Earth Syst. Sci.* 11, 1481–1500 (2007).
44. Cooper, H., Fletcher, C., Chen, Q. & Barbea, M. Sea-level rise vulnerability mapping for adaptation decisions using LIDAR DEMs. *Prog. Phys. Geogr.* 37, 745–766 (2013).
45. Enwright, N. et al. The Impact of Lidar Elevation Uncertainty on Mapping Intertidal Habitats on Barrier Islands. *Remote Sens.* 10, 5 (2017).
46. Leon, J. X., Heuvelink, G. B. M. & Phinn, S. R. Incorporating DEM Uncertainty in Coastal Inundation Mapping. *PLoS ONE* 9, e108727 (2014).
47. Hastings, D. A. et al. Global Land One-kilometer Base Elevation (GLOBE) Digital Elevation Model, Documentation, Volume 1.0, <http://www.ngdc.noaa.gov/mgg/topo/report/globaldocumentationmanual.pdf> (1999).
48. USGS. GTOPO30 Documentation, <https://webgis.wr.usgs.gov/globalgis/gtopo30/gtopo30.htm#h31> (1999).
49. Tadono, T. et al. Generation of the 30 M-Mesh Global Digital Surface Model by Alos Prism. *ISPRS—Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci.* XIII-B4, 157–162 (2016).
50. Yamazaki, D. et al. A high-accuracy map of global terrain elevations. *Geophys. Res. Lett.* 44, 5844–5853 (2017).
51. Balk, D., Francesca, P., Yelman, G., Deichmann, U. & Nelson, A. The distribution of people and the dimension of place: methodologies to improve the global estimation of urban extents. In *Proceedings of the Urban Remote Sensing Conference* (2005).
52. Dossy-Whitfield, E. et al. Taking Advantage of the Improved Availability of Census Data: A First Look at the Gridded Population of the World, Version 4. *Pop. Appl. Geogr.* 1, 226–234 (2015).
53. Tatem, A. J. WorldPop, open data for spatial demography. *Sci. Data* 4 170004 (2017).
54. CIESIN. High Resolution Settlement Layer (HRS), <https://www.ciesin.columbia.edu/data/hrs/> (2016).
55. Desmet, K. et al. Evaluating the Economic Cost of Coastal Flooding. Technical Report. National Bureau of Economic Research, Cambridge. <http://www.nber.org/papers/w24918.pdf> (2018).
56. Seenath, A., Wilson, M. & Müller, K. Hydrodynamic versus GIS modelling for coastal flood vulnerability assessment: Which is better for guiding coastal management? *Ocean Coast. Manag.* 120, 99–109 (2016).
57. Vafeidis, A. T. et al. Water-level attenuation in global-scale assessments of exposure to coastal flooding: a sensitivity analysis. *Nat. Hazards Earth Syst. Sci.* 19, 973–984 (2019).
58. US Census Bureau. TIGER/Line Shapefiles Technical Documentation. Technical Report. https://www.census.gov/geos/maps-data/data-pdfs/tiger/tgrshp2012/TGRSHP2012_TechDoc.pdf (2012).
59. Parker, B., Hesa, K., Milbert, D. & Gill, S. A national vertical datum transformation tool. *Sea Technol.* 44, 10–16 (2003).
60. Hauer, M. E. Migration induced by sea-level rise could reshape the US population landscape. *Nat. Clim. Change* 7, 321–325 (2017).
61. Reuveny, R. Climate change-induced migration and violent conflict. *Polit. Geogr.* 26, 656–673 (2007).
62. Edwards, T. L. et al. Revisiting Antarctic ice loss due to marine ice-cliff instability. *Nature* 566, 58–64 (2019).
63. NOAA. Digital Coast Coastal Lidar, <http://coast.noaa.gov/digitalcoast/data/coastallidar> (2015).
64. Schultz, B. E., Zwally, H. J., Shuman, C. A., Hancock, D. & DiMarzio, J. P. Overview of the ICESat Mission. *Geophys. Res. Lett.* 32, L21S01 (2005).
65. Aviso. MSS CNES-CLS15, <https://www.aviso.ocean-view.com/data/products/auxiliary-products/mss.html> (2015).
66. Egbert, G. D. & Erofeeva, S. Y. Efficient inverse modeling of barotropic ocean tides. *J. Atmos. Ocean. Technol.* 19, 183–204 (2002).
67. University of Berkeley, Museum of Vertebrate Zoology and International Rice Research Institute. Global Administrative Areas (Boundaries), <http://www.gadm.org/>, <https://library.mcmaster.ca/maps/geospatial/global-administrative-areas-gadm> (2012).

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Author contributions

S.K. and B.S. conceived and designed the analysis. S.K. performed the analysis. S.K. and B.S. wrote the paper.

Competing interests

The authors declare no competing interests.

Additional information

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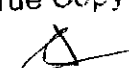
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Advocate



The New York Times

ANNEXURE A-11

Rising Seas Will Erase More Cities by 2050, New Research Shows

By Denise Lu and Christopher Flavelle Oct. 29, 2019

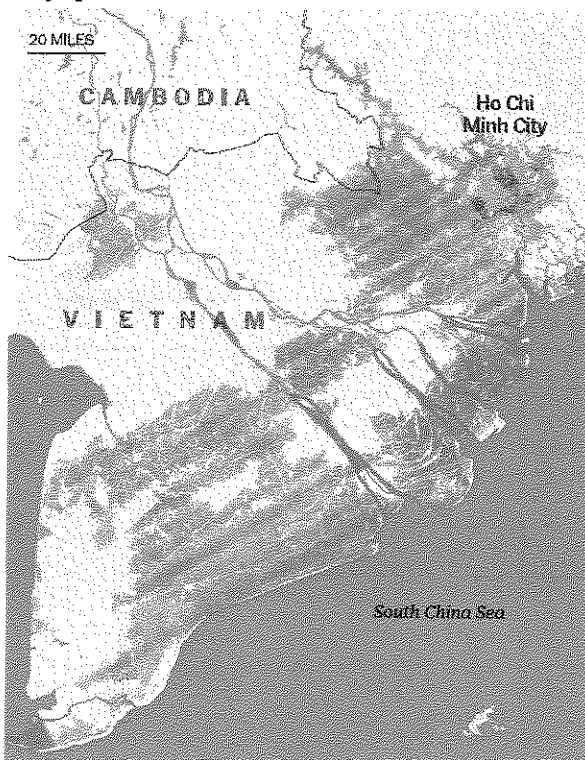
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Rising seas could affect three times more people by 2050 than previously thought, according to new research, threatening to all but erase some of the world's great coastal cities.

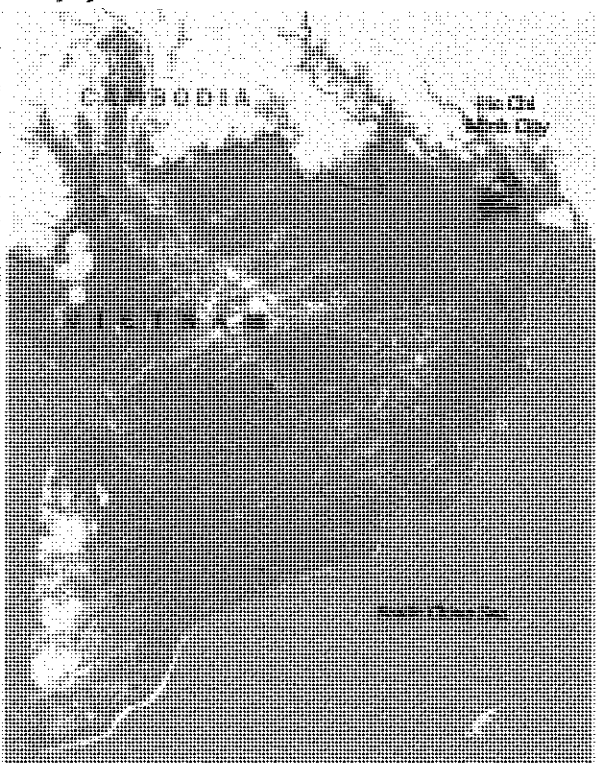
The authors of a paper published Tuesday developed a more accurate way of calculating land elevation based on satellite readings, a standard way of estimating the effects of sea level rise over large areas, and found that the previous numbers were far too optimistic. The new research shows that some 150 million people are now living on land that will be below the high-tide line by midcentury.

Land underwater at high tide Populated area

Old projection for 2050



New projection for 2050



Southern Vietnam could all but disappear.

The first map shows earlier expectations of submerged land by 2050. But the new outlook, the second map, indicates that the bottom part of the country will be underwater at high tide.

More than 20 million people in Vietnam, almost one-quarter of the population, live on land that will be inundated.

Much of Ho Chi Minh City, the nation's economic center, would disappear with it, according to the research, which was produced by Climate Central, a science organization based in New Jersey, and published in the journal Nature Communications. The projections don't account for future population growth or land lost to coastal erosion.

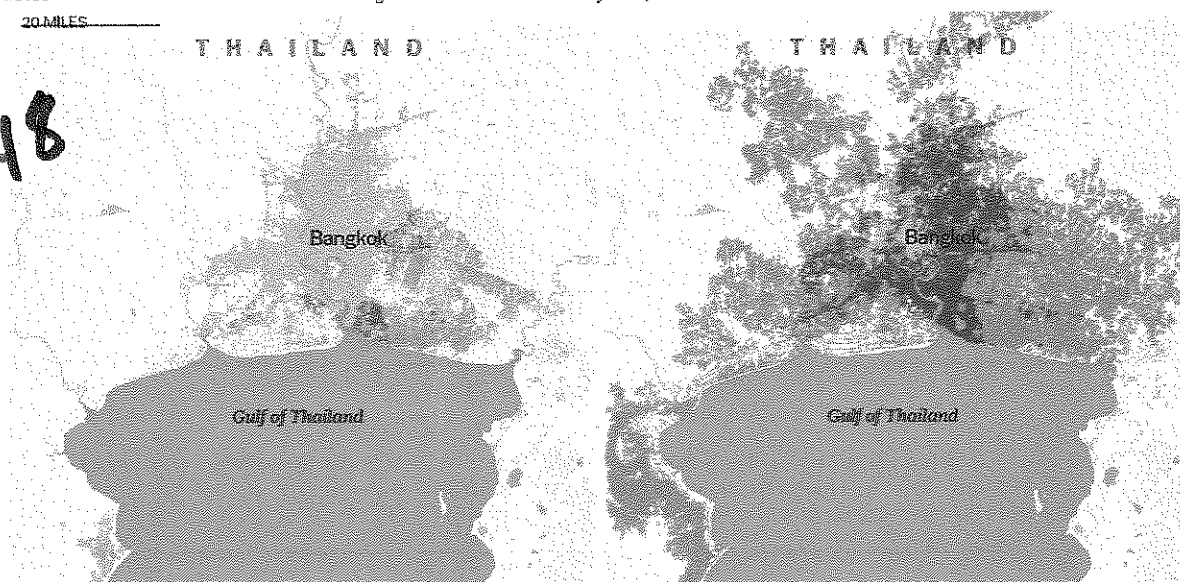
Land underwater at high tide Populated area

Old projection for 2050

New projection for 2050

20 MILES

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Standard elevation measurements using satellites struggle to differentiate the true ground level from the tops of trees or buildings, said Scott A. Kulp, a researcher at Climate Central and one of the paper's authors. So he and Benjamin Strauss, Climate Central's chief executive, used artificial intelligence to determine the error rate and correct for it.

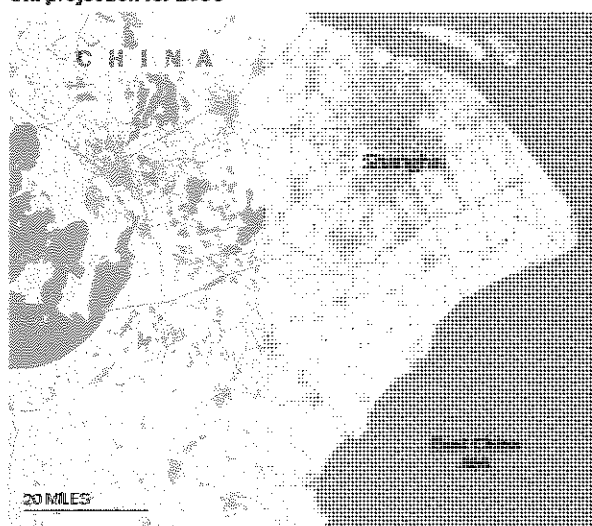
In Thailand, more than 10 percent of citizens now live on land that is likely to be inundated by 2050, compared with just 1 percent according to the earlier technique. The political and commercial capital, Bangkok, is particularly imperiled.

Climate change will put pressure on cities in multiple ways, said Loretta Hieber Girardet, a Bangkok resident and United Nations disaster risk-reduction official. Even as global warming floods more places, it will also push poor farmers off the land to seek work in cities.

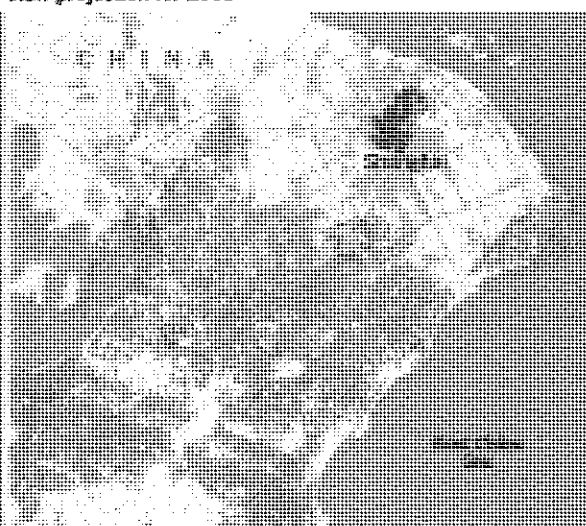
"It is a dire formula," she said.

■ Land underwater at high tide ■ Populated area

Old projection for 2050



New projection for 2050



In Shanghai, one of Asia's most important economic engines, water threatens to consume the heart of the city and many other cities around it.

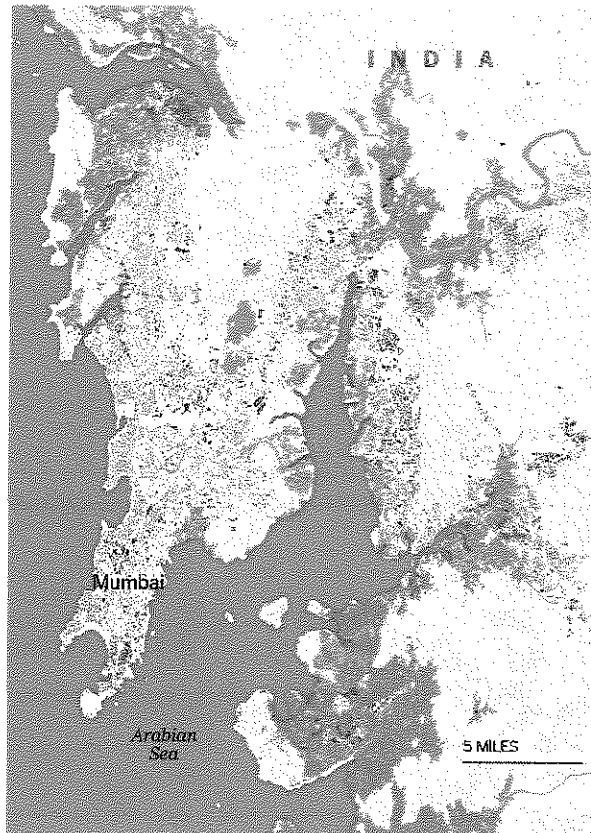
The findings don't have to spell the end of those areas. The new data shows that 110 million people already live in places that are below the high tide line, which Mr. Strauss attributes to protective measures like seawalls and other barriers. Cities must invest vastly greater sums in such defenses, Mr. Strauss said, and they must do it quickly.

But even if that investment happens, defensive measures can go only so far. Mr. Strauss offered the example of New Orleans, a city below sea level that was devastated in 2005 when its extensive levees and other protections failed during Hurricane Katrina. "How deep a bowl do we want to live in?" he asked.

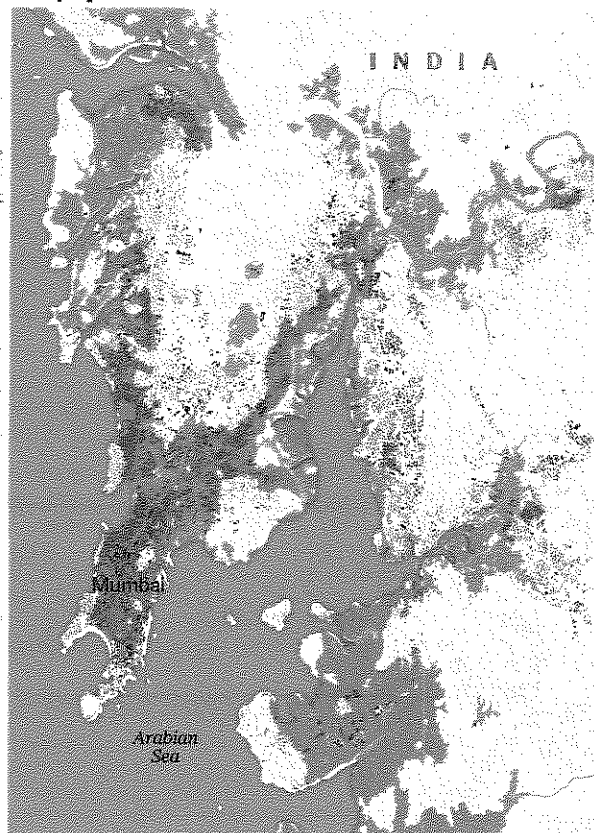
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■ Land underwater at high tide ■ Buildings

Old projection for 2050



New projection for 2050



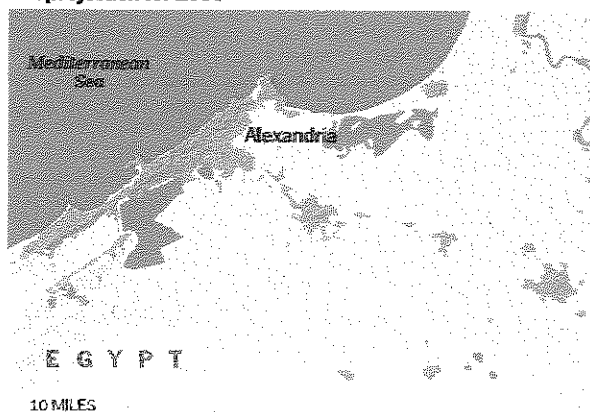
The new projections suggest that much of Mumbai, India's financial capital and one of the largest cities in the world, is at risk of being wiped out. Built on what was once a series of islands, the city's historic downtown core is particularly vulnerable.

Over all, the research shows that countries should start preparing now for more citizens to relocate internally, according to Dina Ionesco of the International Organization for Migration, an intergovernmental group that coordinates action on migrants and development.

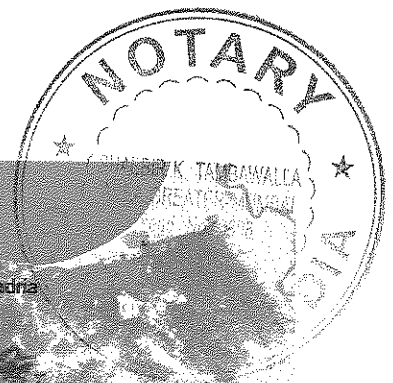
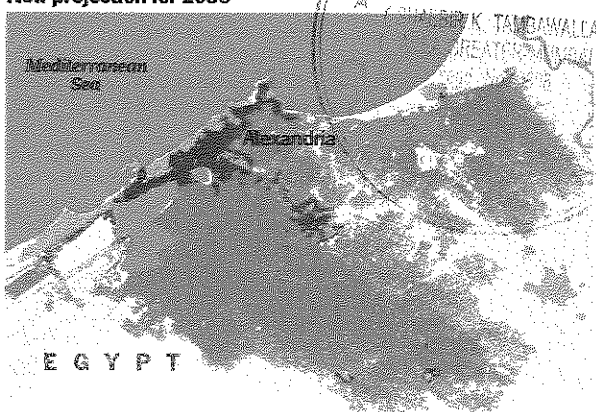
"We've been trying to ring the alarm bells," Ms. Ionesco said. "We know that it's coming." There is little modern precedent for this scale of population movement, she added.

■ Land underwater at high tide ■ Populated area

Old projection for 2050



New projection for 2050



The disappearance of cultural heritage could bring its own kind of devastation. Alexandria, Egypt, founded by Alexander the Great around 330 B.C., could be lost to rising waters.

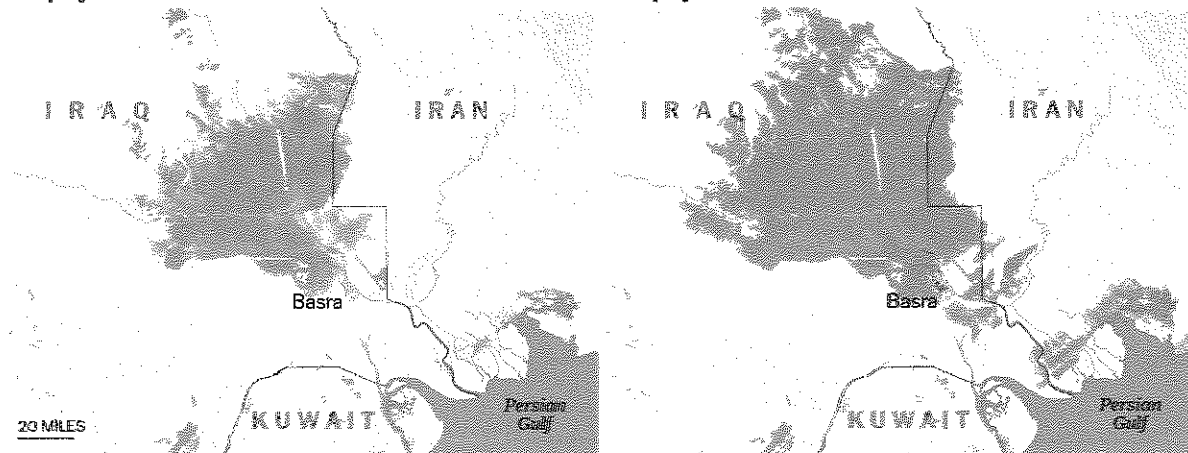
In other places, the migration caused by rising seas could trigger or exacerbate regional conflicts.

Basra, the second-largest city in Iraq, could be mostly underwater by 2050. If that happens, the effects could be felt well beyond Iraq's borders, according to John Castellaw, a retired Marine Corps lieutenant general who was chief of staff for United States Central Command during the Iraq War.

■ Land underwater at high tide ■ Populated area

Old projection for 2050

New projection for 2050



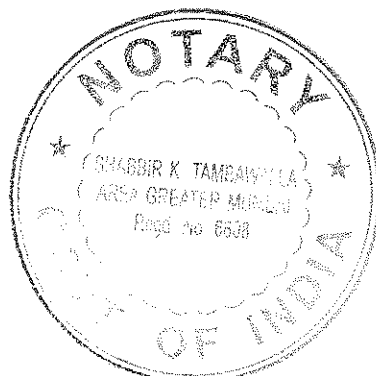
Further loss of land to rising waters there “threatens to drive further social and political instability in the region, which could reignite armed conflict and increase the likelihood of terrorism,” said General Castellaw, who is now on the advisory board of the Center for Climate and Security, a research and advocacy group in Washington.

“So this is far more than an environmental problem,” he said. “It’s a humanitarian, security and possibly military problem too.”

Population data from WorldPop and building footprints from OpenStreetMap.

TRUE COPY

Zaman Ali
Advocate, High Court



ANNEXURE A-12

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Making India's Coastal Infrastructure Climate- Resilient: Challenges and Opportunities

APARNA ROY

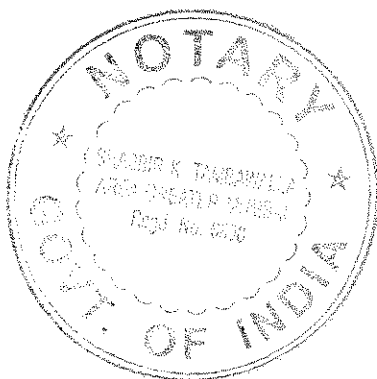
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Making India's Coastal Infrastructure Climate-Resilient: Challenges and Opportunities

APARNA ROY

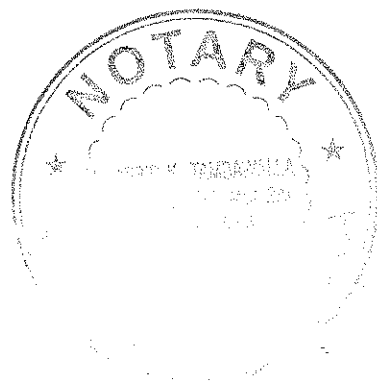


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Making India's Coastal Infrastructure Climate-Resilient: Challenges and Opportunities

ABSTRACT

In recent years, India's coastal regions have become more vulnerable to multiple risks related to climate change. Intense and more frequent cyclones such as the recent Fani, Gaja and Hudhud as well as severe floods have caused massive devastation to the country's coastal states. While efficient disaster preparedness in many of these states has helped save many lives, there remain significant challenges in rebuilding damaged infrastructure and returning to normalcy after the disruptions. This paper assesses the vulnerability of India's coastal infrastructure to climate change impacts, examines the obstacles to building the climate resilience of such infrastructure, and recommends entry points at multiple levels of decision-making for fostering climate-resilient development.

Attribution: Aparna Roy, "Making India's Coastal Infrastructure Climate-Resilient: Challenges and Opportunities", *Occasional Paper No. 207*, August 2019, Observer Research Foundation.

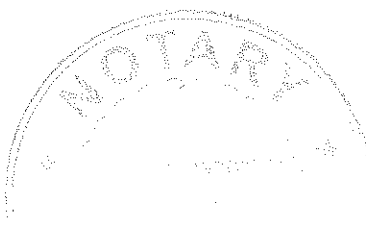
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I. INTRODUCTION

India has been witnessing increasingly intense and frequent climatic events and climate-induced natural disasters in recent times. The country's fragile coasts are particularly vulnerable. Intense cyclones such as the recent Fani, Gaja and Hudhud as well as severe floods have caused massive devastation to its coastal states, Odisha, Andhra Pradesh, Tamil Nadu and Kerala, respectively.¹ Many of these coastal states have upgraded their disaster preparedness and response mechanisms, instituting effective early warning systems and well-planned evacuation strategies. These measures have helped millions of people safely move to disaster shelters, thereby saving the lives of the vulnerable population of the sensitive coastal ecosystem.²

However, most of these states are facing significant challenges in rebuilding the critical infrastructure lost and damaged, and in recovering from the consequent disruptions caused by disasters.³ The August 2018 floods in Kerala, for example, destroyed 280,000 houses, 140,000 hectares of standing crops, and about 70,000 kilometres of road network.⁴ The total recovery needs of the State were estimated at INR 310 billion, according to the Post Disaster Needs Assessment (PDNA) conducted by the UN Agencies.⁵ Similarly, the April 2019 cyclone Fani damaged 500,000 houses, 6,700 hospital buildings, and 100,880 lakh ha. of agricultural land. Electricity infrastructure was also damaged, bringing the total losses to INR 500 billion.⁶ Studies⁷ and the damage assessment report indicate that it will take the coastal states about five to 10 years to rebuild and recover.⁸

Scientists warn that the intensity and frequency of extreme weather events will only increase in the coming years. Given the highly climate-sensitive nature of India's coastal infrastructure, the question is



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whether or not India's coastal infrastructure are equipped to withstand the impacts of these climate change-induced events. Do the coastal ecosystems have the capacity to cope and recover?

II. CLIMATE CHANGE AND THE VULNERABILITY OF INDIA'S COASTAL INFRASTRUCTURE: AN OVERVIEW

India is the third worst-affected country due to climate-induced natural disasters.⁹ The country's coastal regions, in particular, are highly vulnerable because of rapid urbanisation, high population densities and related economic activities such as agriculture, aquaculture, tourism, industries and trade. The 7,517-km-long coastline is home to 260 million people or one-third of India's population, who live in low-lying areas within 50 km of the sea coast and are perennially exposed to climate variabilities and extreme weather events.¹⁰ (See Figure 1)

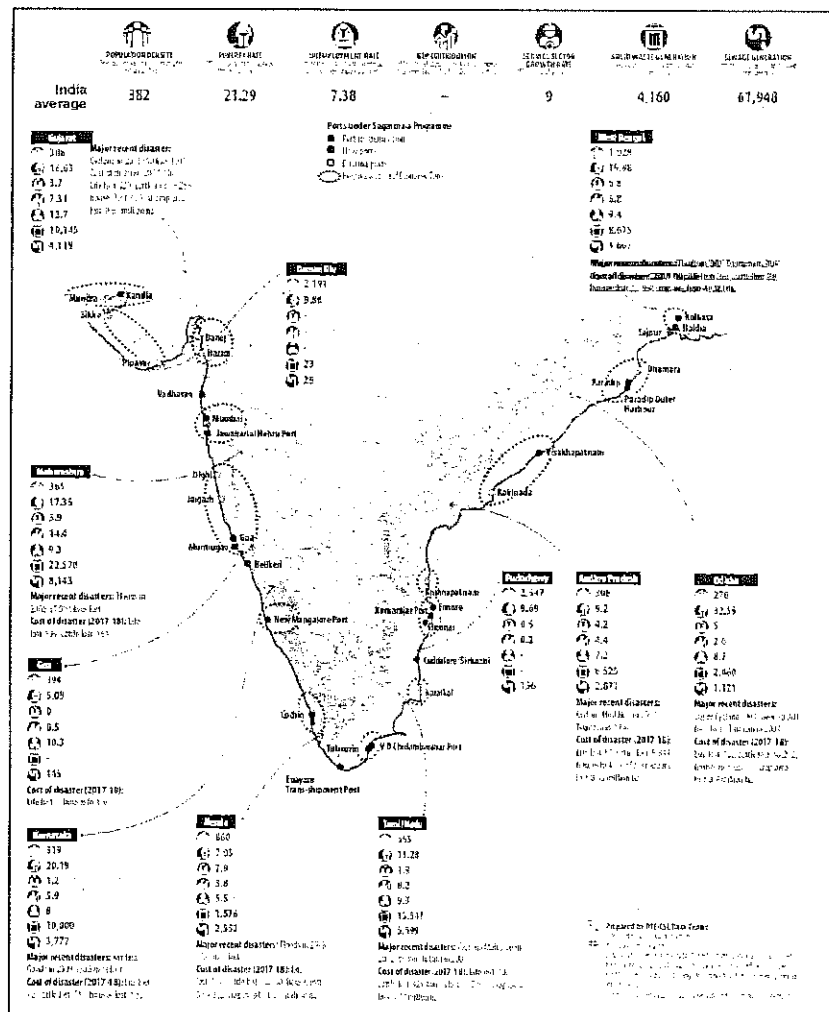
The 130 towns and 77 cities within India's 84 coastal districts¹¹ are of enormous socio- economic importance. Majority of the largest and most dense coastal urban agglomerations such as Mumbai, Kolkata, Chennai, and Vishakhapatnam are hubs of critical infrastructure and assets that contribute to the nation's economy and growth: transport and freight networks, road and rail corridors, industrial zones and parks, maritime and port facilities, petroleum industries, and refineries.¹² The nine coastal states, collectively, receive more than 60 percent of India's FDI (foreign direct investments) inflow.¹³ Development gains, however, are being threatened by the impacts of climate change—including sea-level rise, floodings, storm surges and cyclones. An increase in greenhouse gas (GHG) emissions, predominantly from the economic activities, is projected to aggravate the impacts of climate change and the vulnerability of coastal ecosystems.¹⁴



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MAKING INDIA'S COASTAL INFRASTRUCTURE CLIMATE-RESILIENT: CHALLENGES AND OPPORTUNITIES

Figure 1.



Source: Down to Earth, 2019²⁵

Warming oceans leading to sea-level rise provide a source of thermal expansion of sea water, contributing to more intense and frequent

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storm surges and cyclones¹⁶ in the coastal regions. Between 1877-2005, a total of 283 cyclones made landfall in India's coastal regions; 106 of them were severe cyclones that occurred in a 50-km-wide strip on the east coast, and 35 were less severe ones on the west coast. In 19 severe cyclonic storms, the combined mortality rate exceeded 10,000.¹⁷ In 1999 a super cyclone wreaked havoc in coastal Odisha, claiming more than 30,000 lives. India today is projected to be at 'very high' risk levels in terms of intensity of cyclones.¹⁸ The mangroves ecosystem along the coastal regions that act as a natural barrier against cyclones and coastal erosion have become severely degraded and face even worse decline due to the cumulative climate change impacts.¹⁹

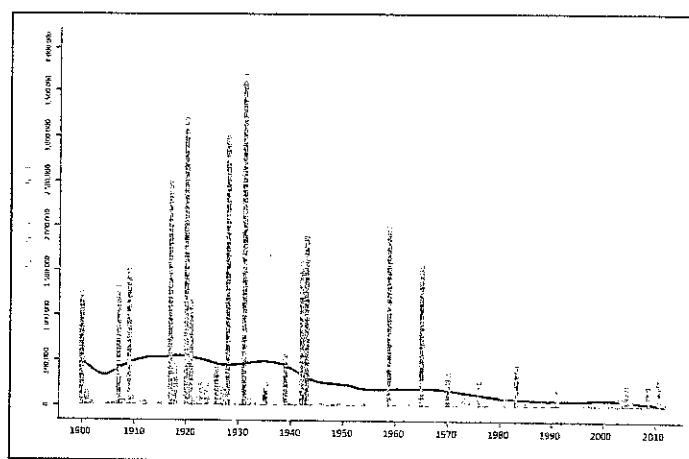
This is not to say that the governments in India's coastal states have been completely remiss. Following the devastating trail of extreme weather events such as the super cyclones Bob (1999) and Phalin (2013), these states have significantly upgraded their respective disaster response mechanisms. They established Disaster Management Authority (DMA), built cyclone and flood shelters, invested in early warning systems, created Disaster Rapid Action Force, conducted public awareness campaigns,²⁰ and created a disaster loss database under the Sendai Framework for Disaster Risk Reduction (SFDRR).²¹ Consequently, there has been a dramatic decrease in the casualty count: over 10,000 in 1999; 24 in 2014 because of cyclone Hudhud; and 16 in 2019 due to cyclone Fani.²²

While the upgrade of disaster preparedness mechanisms in many of India's coastal states has led to significant reduction in the mortality rate, the number of people affected and the impacts on physical assets have remained unchanged.²³ (See Graphs 1a and 1b) The greatest impact of the extreme weather events are increasingly being felt in terms of the loss and damage to the critical infrastructure in India's coastal regions.²⁴



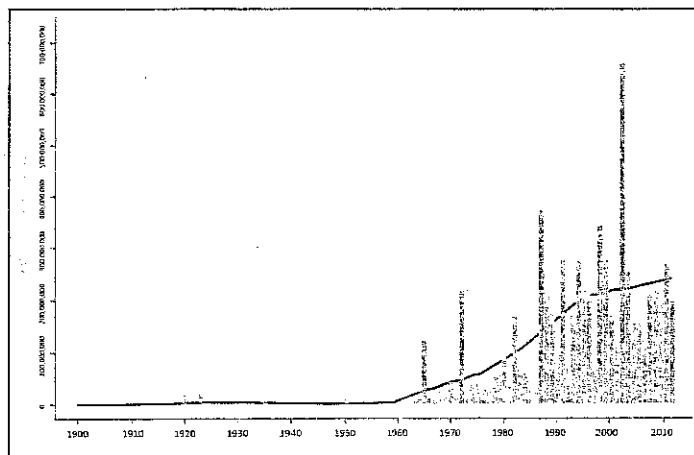
For instance, the damage assessment figures indicate a total loss of 90,000 crores (approximately US\$20 billion) due to the Hudhud cyclone that struck the east coast of India in 2014.²⁵ In the case of recent cyclone Fani, the first preliminary assessment report of the Odisha government suggests damages to 500,000 houses and 6,700 hospital buildings and 1.88 lakh hectares of agricultural land, while 3.4 million livestock perished. In the district of Puri and parts of Khurda and Bhubaneswar, the electricity infrastructure has been totally devastated. Total losses have reached at least INR 50,000 crore. The damage to infrastructure has severely affected nearly 1.51 crore people spread over 16,659 villages in Odisha.²⁶ Reports suggest that it will take the Odisha government five to 10 years to rebuild the state from the loss and damage caused by cyclone Fani alone. Similarly, the 2018 floods in Kerala destroyed 280,000 houses and 140,000 hectares of standing crops, and damaged about 70,000 km of road network.²⁷ The total recovery needs of the State was estimated at 31,000 crores as per the Post Disaster Needs Assessment (PDNA) conducted by the UN Agencies.²⁸

Graph 1a. Number of People Killed by Natural Disasters, 1900-2011



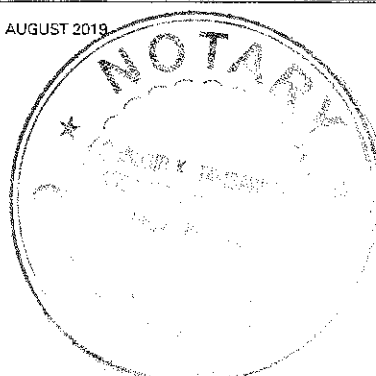
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Graph 1b. Number of People Affected by Natural Disasters, 1900-2011



Source: NIDM²⁹

Furthermore, India's coastline has already been affected by the sea level rise (SLR) that has been recorded at a rate of 2.5 mm per year since the 1950s. A 15 and 38 cm projected rise in sea level along India's coast by 2050 is likely to affect 5,763 sq km combined area of the coastal states, resulting in the submergence of coastal areas, floodings and an increase in tropical cyclones and storm surges, thereby threatening infrastructure (See Table 1). Gujarat and West Bengal are projected to be the most severely affected, with a loss of 1 metre land area to SLR.³⁰ The estimated economic costs from the impact of climate change to coastal infrastructure ranges from INR 2287 billion in the case of Mumbai to INR 3.6 billion for Baleshwar district of Odisha.³¹ According to data from the Central Water Commission (CWC), the cost of damages from climate-related extreme weather events on infrastructure and housing has been INR 3,65,860 crore, or three percent of India's GDP. Poor or inadequate infrastructure such as drainage capacity of rivers, unplanned regulation and failure of flood control structures to withstand the climate impact, will further add to the vulnerability of coastal regions.³²



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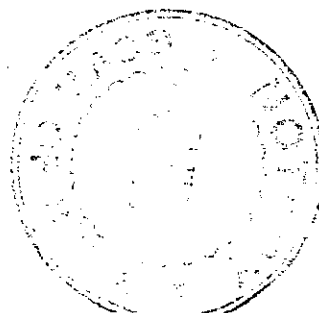
Table 1: Potential impact of 1metre sea level rise on India's coastal area and population

STATE/UNION TERRITORIES	COASTAL AREA (MILLION HECTARES)			POPULATION (MILLIONS)		
Andra Pradesh	27.504	0.055	0.19	66.36	0.617	0.93
Goa	0.37	0.016	4.34	1.17	0.085	7.25
Gujarat	19.602	0.181	0.92	41.17	0.441	1.07
Karnataka	19.179	0.029	0.15	44.81	0.25	0.56
Kerala	3.886	0.012	0.3	29.08	0.454	1.56
Maharashtra	30.771	0.041	0.13	78.75	1.376	1.75
Odisha	15.571	0.048	0.31	31.51	0.555	1.76
Tamil Nadu	13.006	0.067	0.52	55.64	1.621	2.91
West Bengal	8.875	0.122	1.38	67.98	1.6	2.35
Andaman and Nicobar Islands	0.825	0.006	0.72	0	0	0
India	139.594	0.571	0.41	416.74	7.1	1.68

Source: TERI, 1996

III. PLANNING CLIMATE-RESILIENT COASTAL INFRASTRUCTURE:³³ OPPORTUNITIES AND BENEFITS

The defining feature of climate-resilient infrastructure is that it is "planned, designed, built and operated in a way that anticipates, prepares for, and adapts to changing climate conditions. It can also withstand, respond to, and recover rapidly from disruptions caused by these climate conditions."³⁴ As extreme weather events caused by climate change are becoming more frequent and extreme in India's coastal regions, so is the level of disruption that they cause. It is therefore imperative for any coastal development plan to integrate measures towards building climate resilience. As a country still building much of its basic infrastructure, India has the opportunity to make the infrastructure in vulnerable coastal regions climate-resilient from the outset. This will incur no or little additional cost, and avoid costly retrofitting later.



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Planning and investing in climate-resilient infrastructure would yield India and its coastal regions multiple benefits. It would help avoid losses during extreme weather events, unlock development potential, and produce economic, social, and environmental co-benefits.

3.1 Avoiding loss and damage

The value (in present terms) of risk to the global stock of manageable assets owing to climate change impacts is estimated to rise to up to US\$43 trillion by 2105.³⁵ At the same time, the rapid growth in population and consequent urbanisation has led to an estimated rise in total global exposure to river and coastal flooding—from US\$46 trillion in 2010 to US\$158 trillion by 2050.³⁶ India is among the top five countries in the world that was most frequently affected by natural disasters between 2006-2015. According to the World Bank, over eight percent of India's landmass is susceptible to floods; almost 5,700 kilometres of the 7,500-km coastline is prone to cyclones; and 68 percent of the country's total territory is susceptible to drought episodes. India's average losses due to multi-hazard disasters are worth around US\$9.8 billion, of which US\$7.4 billion is lost due to floods alone.³⁷ A projected increase of 1-1.5°C in mean annual air temperature in India from 2016 to 2045 is likely to result in floodings, particularly in coastal regions, thereby causing huge damage to infrastructure.³⁸ India's overall government spending on adaptation to climate change was pegged at US\$ 91.8 billion in 2013-14 alone.³⁹ According to the Asian Development Bank, the economic damage and loss from climate impact in India is projected to be around 1.8 percent of its GDP annually by 2050.⁴⁰

For a middle-income country such as India that faces significant resource constraints, to begin with, incurring huge economic losses due to climatic calamities would significantly set the country back in terms

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MAKING INDIA'S COASTAL INFRASTRUCTURE CLIMATE-RESILIENT: CHALLENGES AND OPPORTUNITIES

of development (See Table 2). Making the infrastructure of the most vulnerable coastal regions “climate-proof” would allow the resources to be utilised for constructive welfare projects and economic programmes.

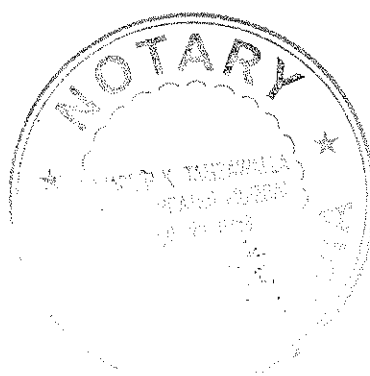
Table 2: Climate Change Impacts on Different Sectors

Transport	- Melting road surfaces and buckling railway lines - Damage to roads due to melting of seasonal ground frost or permafrost - Changing demand for ports as sea routes open due to melting of arctic ice	- Inundation of coastal infrastructure, such as ports, roads or railways	- Disruption of transport due to flooding - Changing water levels disrupt transport on inland waterways	- Damage to assets, such as bridges - Disruption to ports and airports
Energy	- Reduced efficiency of solar panels - Reduced output from thermal plants due to limits on cooling water temperatures - Increased demand for cooling	- Inundation of coastal infrastructure, such as generation, transmission and distribution	- Reduced output from hydropower generation - Disruption of energy supply due to flooding - Insufficient cooling water	- Damage to assets – e.g. wind farms, distribution networks - Economic losses due to power outages
Telecoms	- Increased cooling required for datacenters	- Inundation of coastal infrastructure, such as telephone exchanges	- Flooding of infrastructure - Damage to infrastructure from subsidence	- Damage to above ground transmission infrastructure, such as radio masts
Urban development	- Increased cooling demand - Reduced heating demand	- Inundation and increased flood risk - Changes in land use due to relocation of people living in exposed areas	- Risk of drought - Flooding	- Damage to buildings - Deaths and injuries
Water	- Increased need for treatment - Increased evaporation from reservoirs	- Inundation of coastal infrastructure - Salinisation of water supplies - Decreased standard of protection offered by coastal defences	- Increased need for water storage capacity - Increased risk of river embankments being overtopped	- Damage to assets - Decreased standard of protection offered by food defences

Source: OECD, 2018⁴¹. For more comprehensive assessment refer to IPCC's Fifth Assessment Report

3.2 Ensuring growth and development

India's coastal regions are of immense economic and strategic significance, as approximately 90 percent of their trade by volume (or 70 percent in terms of value) is carried out by sea.⁴² The coastal



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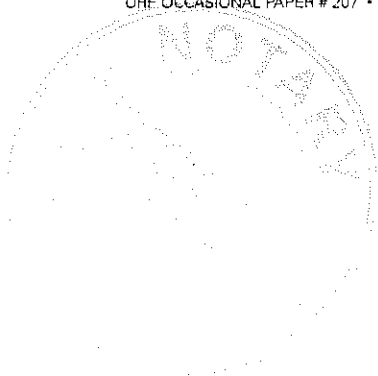
infrastructure that supports lives and livelihoods, including houses, hospital buildings, transport networks, ports and shipping industries, are therefore vital to sustaining growth and development.

Indeed, current investments for tomorrow's well-being could be wiped out by a disaster.⁴³ As a result, sectors refrain from investing in potentially revenue-generating assets nor in long-term planning. The background risk of a disaster causes a rise in risk aversion, in turn preventing higher-return investments. Consequently, innovation is stifled, jobs are not created and development opportunities are lost.⁴⁴ Large firms move to locations that offer safer operating environments; this adds to the economic difficulties of the coastal regions.⁴⁵

Reducing the burden of background risk by increasing the resilience of infrastructure would generate benefits that extend across sectors to the macroeconomic level. For instance, protecting coastal regions, towns, business districts, or ports with flood protection infrastructure, will foster economic activity, long-term planning and capital investments. In turn, a boost to entrepreneurship, innovation and productive investments would aid India's overall growth and development.

3.3 Co-benefits

Aiming for resilient infrastructure in coastal regions will deliver co-benefits that are not related to extreme weather events. For instance, building new resilient infrastructure or retrofitting existing ones would create direct employment opportunities for the coastal communities. Flood protection infrastructure would create provision of reliable water supplies and hydroelectricity. A study of community-based adaptation measures has found, for example, that boats that had been purchased initially for evacuation purposes were then used as fishing vessels;

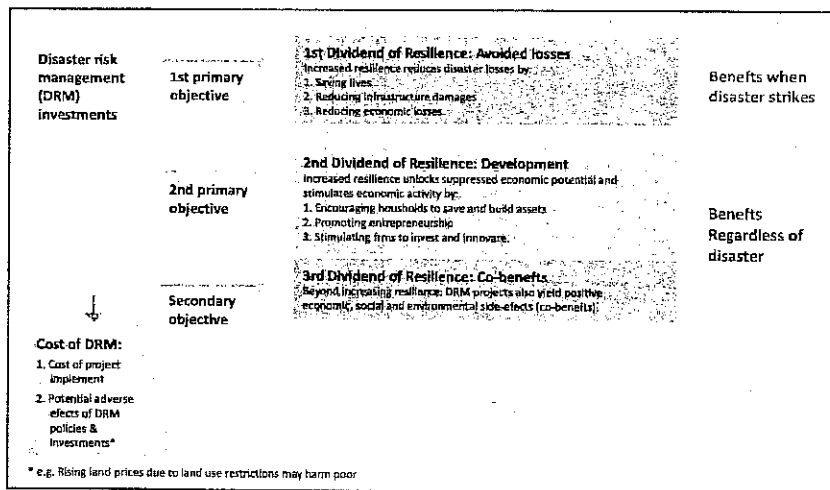


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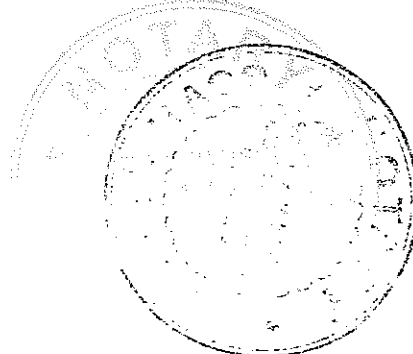
evacuation shelters were used for community meetings or as schools; and raised water wells provided clean water throughout the year.⁴⁶ The installation of dedicated irrigation systems to overcome the impact of droughts has also helped farmers to increase their productivity and output, while also reducing soil erosion and deforestation by optimising previously inefficient farming practices.⁴⁷ Other co-benefits may be more indirect: for one, improving the resilience of transport networks for commercial activity may also improve human mobility to access employment.⁴⁸

Similarly, community participation in developing and managing climate-resilient infrastructure may also generate significant social benefits. The local government's reliance on communities for knowledge, communications, vehicles, storage facilities and labour, can strengthen community cohesion, as well as local-state-society relations even during non-emergency situations. Measures to build resilience can therefore contribute significantly to social welfare and inclusiveness.⁴⁹

Figure 2. Benefits of Climate-Resilient Infrastructure



Source: Adapted from Tanner et al., "The Triple Dividends of Resilience," 2015, ODI



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IV. CHALLENGES IN MAINSTREAMING CLIMATE RESILIENCE IN INFRASTRUCTURE PLANNING AND DEVELOPMENT

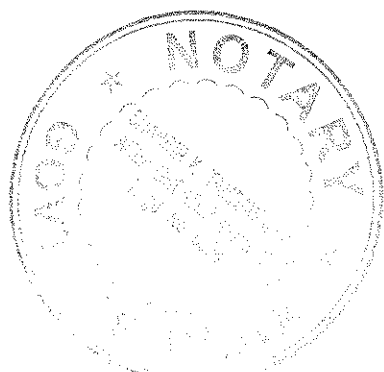
The coast of India is confronted with a host of challenges that it must address to make its infrastructure resilient to climate-induced natural hazards. This section examines these crucial obstacles: liberalisation of coastal regulations; lack of scientific data and regulatory frameworks; unplanned cities and urbanisation; inadequate capacities of municipal councils; and lack of funds.

4.1 Liberalisation of coastal zone regulations

The Union Cabinet approved the Coastal Regulation Zone Notification, 2018 which, according to official statements, “will lead to enhanced activities in the coastal regions thereby promoting economic growth while also respecting the conservation principles of coastal regions.”⁵⁰ Environment activists, however, say the notification “dilute(s) India’s protection system for the fragile ecology and open(s) it up for large-scale development projects.” Since India’s coastline is extremely vulnerable to climate change impacts such as erosion, cyclones and floods, allowing for infrastructure development and construction along the shoreline will further heighten the vulnerability. By opening up 6,068 km of mainland coastline for more commercial activities, India’s own regulation has put at risk the sensitive ecology and infrastructure that are already vulnerable to extreme weather events and sea level rise.⁵¹

Since the aftermath of the 2004 tsunami,[#] the primary purpose of India’s coastal zone regulation (CRZ) has been to regularise population and commercial pressure near the High Tide Line (HTL) by drawing

‘A magnitude 9.1 earthquake struck beneath the Indian Ocean near Indonesia, generating a massive tsunami that claimed more than 230,000 lives in fourteen different countries, one of the deadliest natural disasters ever recorded.’



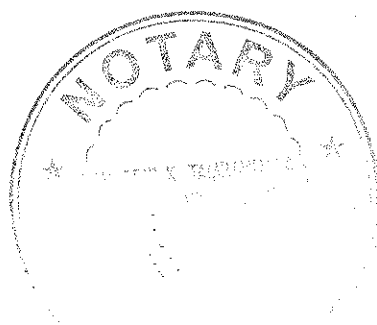
classification depending on land use or sensitivity in order to save the region from significant loss and damage.⁵² In reality, however, the CRZ has been more violated than followed. The coastal ecology is becoming extremely volatile, with changing coastline due to climate change impacts. In such a context, allowing denser construction closer to the HTL would expose infrastructure to increased risk of the projected intense extreme weather events, thereby increasing the vulnerability of the coastal populations.

4.2 Uncertainties in modelling future climate scenarios

Policy planners at the national and subnational levels in the coastal region would require definite risk assessment and data of time, probability, occurrence, and the degree of potential hazard to different infrastructure, to be able to plan for new infrastructure or retrofit existing ones. These assessments are either not available with the government or are not in a useable format, that could inform public policies and decisions.⁵³ Moreover, there are inherent uncertainties in modelling how the climate, and other factors affecting infrastructure resilience, will evolve in the future. For example, assessments for sea level rise (SLR) project scenarios for 100 years, whereas development planning is carried out considering a much shorter 10–15-year horizon.⁵⁴

4.3 Lack of inventory/database system

To plan for resilient infrastructure, it is imperative for policymakers and planners to have comprehensive information on the infrastructure's design details, age, maximum capacity, and location. However, no Indian state maintains up-to-date records of their current infrastructure. The data on infrastructure and services in India is generally spread across various departments.⁵⁵ In the absence of a single



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repository where the data is either inventoried or maintained, it would be difficult for the decision-makers to use such data to formulate strategic plans and designs.

4.4 Lack of integration of climate concerns in land use planning and project planning

The environment and sustainability concerns have just begun to be mainstreamed in master and land use planning processes in the coastal cities. National government schemes like the Jawaharlal Nehru National Urban Renewal Mission (JNNURM)—since re-introduced as Atal Mission on Rejuvenation and Urban Transformation (AMRUT)—have been channelling financial resources for urban infrastructure development.⁵⁶ The JNNURM scheme, with an investment of about US\$ 20 billion on urban infrastructure development over a period of seven years, primarily focused on provision of housing and basic urban services.⁵⁷ It did not expressly stress on making the newly developed infrastructure in coastal cities climate-resilient. Nor does the AMRUT scheme, which envisions an investment to the tune of about US\$ 7 billion for five years—it focuses largely on water supply, sewerage, transport and green spaces.⁵⁸ The risks related to climate change and its impact on infrastructure are yet to be integrated in the urban development planning paradigm in coastal India. With exceptions to small-scale implementation of programmes by a few coastal states such as the Heat Action Plan developed by Ahmedabad Municipal Corporation, the early warning system for floods developed by Surat Municipal Corporation, or using rainwater harvesting for recharging borewells in Solapur, the focus of a majority of city planning has remained on infrastructure development for better service delivery. Climate concerns come as secondary benefits.⁵⁹

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4.5 Potential misalignments and non-compliance with policies

Majority of infrastructure planning in coastal states such as water, sewage, telecommunication and roads, lie with various government departments that have no integration point for multi-sectoral planning.⁶⁰ Issues of jurisdiction and overlapping policies and mandates of government agencies often interfere with the effective implementation of resilience-building measures in development plans.

Given the complexity of challenges, the respective governments across the national and subnational levels must work in a systematic manner towards a coordinated policy response, roadmap and action plan. Stringent mandates, mechanisms and institutional arrangements are required to address these barriers. Ensuring collaboration between the public sector, infrastructure owners and operators, professional associations, investors and engineers is critical in planning for new infrastructure and retrofitting the existing ones. Investing in and integrating climate-resilient infrastructure in development and policy plans would yield the country's coastal regions a range of dividends.

Moreover, one of the major reasons for the vulnerability of India's infrastructure to severe weather events is the non-compliance with national guidelines and lack of adequate by-laws. The *Model Building Bye-laws 2016* of the Ministry of Housing and Urban Affairs provides for risk classification of buildings and climate-resilient construction;⁶¹ however, most of the venerable cities do not adhere to the provisions.

4.6 Gaps in financing for resilience

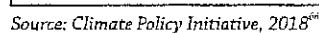
India's economy has suffered a massive US\$ 79.5-billion loss due to climate-related disasters in the last 20 years.⁶² Ironically, investments in resilience-building is yet to be reflected in the majority of policy and practice by governments, aid agencies, communities or businesses (World



A world map showing the distribution of 100,000 U.S. military personnel by region. The regions and their corresponding numbers are:

- AMERICAS: 1
- WESTERN EUROPE: 1
- CENTRAL & EASTERN EUROPE: 1
- MIDDLE-EAST & NORTH AFRICA: 1
- SOUTH ASIA: 2
- EAST ASIA & PACIFIC: 4
- SUB-SAHARAN AFRICA: 4
- LATIN AMERICA & CARIBBEAN: 1
- TRANSREGIONAL: 1
- OTHER OCEANIA: 1

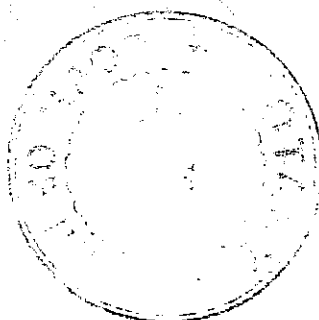
Graph 2: Adaptation finance by sector (2015-16 average, in USD billion)



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There is no available data on the investments and expenditure in building climate-resilient infrastructure in India. The Disaster Management Act 2005 mandated the creation of a Disaster Response and Mitigation Funds at the National, States and District levels,⁶⁷ clearly reflecting prioritisation of disaster response and mitigation over resilience-building activities. Moreover, the funding needs for disaster management activities are designed to be integrated within the regular budgeting of line ministries, addressed at various administrative scales, and are allocated for both risk reduction and relief-oriented funds.⁶⁸ There is no mainstreaming of a dedicated disaster resilience fund. The lack of funds specifically aimed at creating resilient infrastructure is a major roadblock for putting risk-resilience plans into operation, while making it complex for other departments to mainstream concerns about climate resilience.⁶⁹

The impacts of climate change are projected to increase the demand of investment required for development infrastructure such as flood defences, water supply and sanitation.⁷⁰ It is estimated that US\$1.7 trillion will be required annually to meet demand for new infrastructure in Asia over the next 12 years, including US\$200 billion to ensure that new infrastructure is resilient to disasters and climate-related events.⁷¹ The long-lived nature of infrastructure assets means that decisions made now will lock-in vulnerability if they fail to consider these impacts.⁷² Therefore, it is critical for developing countries such as India to see the building of climate-resilient infrastructure not as an additional expense but as an opportunity to create shared value for the economy and society. Developing infrastructure plans of the coastal states based on their different climate vulnerability needs would allow policymakers to gain a strategic view and aid in designing investment pathways that address sustainable and resilient development.



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V. RECOMMENDATIONS: ENTRY POINTS FOR CREATING CLIMATE-RESILIENT COASTAL INFRASTRUCTURE

5.1 Regulatory Mechanisms

The lack of enabling legislations or the absence of institutional frameworks prevents the implementation of climate-resilient development measures in coastal regions. The governments, both at the centre and states must formulate appropriate zoning regulations, building by-laws and land use restrictions to conserve the coastal ecosystems and protect its critical infrastructure from future climate impacts. Since there are overlaps in the roles of various sector-wise ministries and departments in infrastructure planning,⁷³ integrating resilience measures in infrastructure would require the growth of multi-stakeholder partnerships and interventions. For instance, under the Asian Cities Climate Change Resilience Network's (ACCCRN) intervention, the coastal city of Surat in the state of Gujarat established the country's pioneering institution, the Urban Health and Climate Resilience Centre (UHCRC) within Surat Municipal Corporation's (SMC) Health Department to make the health systems and infrastructure resilient to projected climate impacts.⁷⁴

Given the frequency and intensity of risk, it is imperative for densely populated coastal regions to encourage decentralised management of supplementary infrastructure through statutory processes. For instance, rising sea levels will lead to increased flooding and erosion of coastal dump sites that are located in low-lying swampy areas, thereby causing further pollution of coastal waters.⁷⁵ Decentralised treatment of wastes at the ward/ district level would be an effective way to address the risk and disruptions caused by unmanaged wastes at the time of disaster events. However, it is important that the relevant supporting policies must include appropriate institutional mechanisms for effective

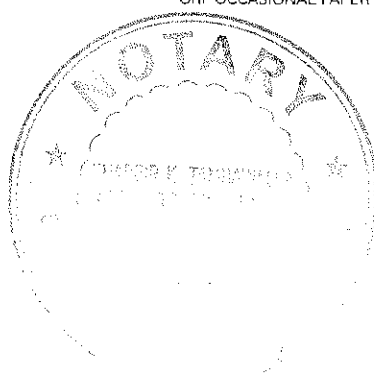


implementation. A government-NGO (non-governmental organisation) partnership can assist vulnerable communities in learning the operation, maintenance, and management of infrastructure.

5.2 Increased role of knowledge

Technical assessments through modelling of climate change impacts and vulnerability mapping is an extremely important tool that supports policy decision-making on infrastructure design, planning and locations. Generating analyses on cyclones and storm surges, or flood modelling would help in a holistic evaluation of future risks.⁷⁶ For instance, a detailed flood modelling of coastal zones would allow planners to select design features based on future vulnerability scenarios. Major loss and damage faced by India's coastal regions during extreme weather events are due to its impact on critical infrastructure such as damage to equipment, and disruption of transport networks and services such as waste management. Therefore, constant generation and update of knowledge on various kinds of assessments—such as local topography, drainage flow patterns and higher vertical elevation of sites—are critical for the region's resilience building. Uptake of detailed regional climatological studies could identify sector-specific vulnerabilities and guide micro-level design interventions required to build the resilience of infrastructure assets.⁷⁷ This could also help analyse the cumulative impact that damage to one infrastructure sector can have on others, state functions and populations.

India already has an excellent institutional framework for predicting disasters. The Indian Space Research Organisation (ISRO) and National Remote Sensing Agency (NRSA) provide satellite eyes capable of high-resolution imaging of weather systems while the India Meteorological Department (IMD) carries out their real-time monitoring. The GSI



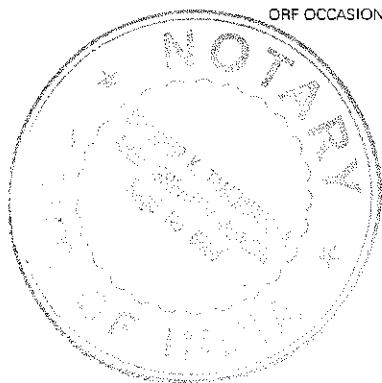
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maps out the high-risk areas and can effectively predict tsunamis. These institutional climate capabilities should be collectively mobilised to create a comprehensive approach that could guide the design, plan and delivery on resilient infrastructure building. Access to the knowledge of traditional or local practices of resilience building and their dissemination, as well as encouraging adoption of diverse and locally appropriate techniques for vulnerable coastlines would be crucial. Each of the disaster events that the coasts face are opportunities to collect detailed data and carry out simulations and analysis of their impact on major and critical infrastructure.⁷⁸ A well-planned collaboration between government, academia and industry to get the best learning out of such events would benefit the state as well as the country.

5.3 Innovative Financing

Climate-resilient coastal infrastructure development is a major challenge for India given the enormous funding requirements. The key is in examining the sources and modalities of financing. While low-cost public finance plays a vital role in the initial stages due to associated risks, mobilisation of private capital for investing in resilient infrastructure is extremely important. The funds available with institutional investors such as pension funds, insurance premiums, and sovereign wealth funds, are crucial supplementary sources of funding. However, private investors make decisions based on profitable and higher returns. Coastal regions are projected as 'high risk' zones, thereby making the flow of investments from the private sector extremely difficult.⁷⁹

There is a need therefore for 'out of the box' solutions as well as institutional innovations for bundling risks and returns. To incentivise private investors, institutional capacity to develop financially viable project proposals must be strengthened; incentive structures in



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contracts in the form of guarantees against exchange rate volatility need to be devised; and investment-related dispute resolution and proper sequencing of funding plans at phases of the project cycle should be made more efficient. Further, it is important to get the private players to enter into long-term partnerships with the Multilateral Development Banks and Development Financial Institutions to work on various models of innovative financing for resilient and sustainable infrastructure.⁸⁰

Besides attracting large investments, it is also important for the government to initiate policy reforms by incorporating environment and sustainability concerns in every phase of the project cycle as well as the budgeting processes. This would require institutionalisation and implementation of measures including the phasing out of wasteful subsidies such as fossil fuels and introducing 'green taxes' that could boost government revenues.⁸¹

5.4 Innovations in technology, standards and governance

To protect the longevity and performance of India's coastal infrastructure from damage due to SLR and extreme weather, there is a need to adopt innovative measures that involve elevating road embankments, water treatment works, and enhancing design and maintenance standards. Moreover, integrating innovative processes such as improved equipment / materials in construction and operations, environmentally optimised road designs using local and marginal materials, could reduce the cost of lifecycle, increase durability and improve long-term performance of infrastructure.⁸²

Incorporating global standards on resilience and sustainability, that could assess environmental, social and governance (ESG) performance and impact of infrastructure projects is crucial to monitor resilience

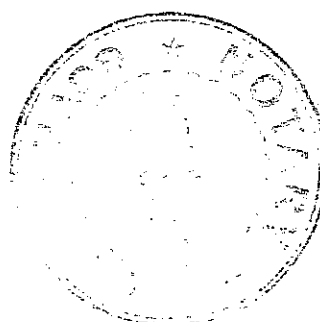


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building. The framework for quality assessment and standardisation could be adopted from SuRe, a multi-stakeholder, inclusive, transparent, accessible and holistic standard for sustainable and resilient infrastructure that is jointly led by Global Infrastructure Basel (GIB) and Natixis; and the World Standards Cooperation — a high-level collaboration between the IEC (International Electro-technical Commission), ISO (International Organization for Standardization) and ITU (International Telecommunication Union). These standards are supported by multilateral organisations and public sector bodies [OECD, European Investment Bank (EIB), ICLEI, CREAM Europe and FOEN], financiers (Erste Bank Group and Mirova), the IDFC Foundation (Infrastructure Development Finance Company Ltd, India's leading integrated infrastructure financier), non-governmental organisations (NGOs) and civil society (WWF and GIP Pacifico) and consultants (BASE, FIDIC, CAPEC and Quantis Switzerland).⁸³

While innovations to foster resilient infrastructure is a priority, there is a need for creating standards, codes and manuals to integrate state-of-the-art engineering technologies. There is also the need to promote the use of science and technology applications such as Geographical Information Systems (GIS), geological-geographical and hydrological research capacities that can improve risk and vulnerability assessments.

As communities are the direct and most valuable stakeholders of resilient infrastructure, there is a need to find a sense of local ownership that the infrastructure projects would attract. Sustainable and resilient infrastructure calls for integration of environmental, social and governance factors into the planning of projects. Therefore, stakeholder consultation process is important to assess the needs, identify the opportunities and ensure the inclusion of local communities.



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5.5 Capacity building and awareness generation

Capacity building at all levels has to be taken up in terms of state and city level decision-makers, community, and key stakeholders in the cities. Sensitisation and awareness generation amongst the citizens is also an integral step for city-level resilience planning. Strong community support and community demand can often lead to building consensus at the level of the decision-makers and planners.

VI. CONCLUSION

Half of the infrastructure needed in Asia by 2050 is yet to be built. It is estimated that, globally, US\$6 trillion needs to be invested in infrastructure every year until 2030 to meet current demands. Given the importance of India's coastal regions to the country's economy and growth, massive investments would be required for building even the most basic of essential infrastructure. This level of investment provides a window of opportunity to ensure that all new infrastructure is made resilient to withstand future shocks, including those brought about by a changing climate.

As climatic variabilities and extreme weather events are becoming the new normal in an increasingly climate-constrained world, it is important for a developing country such as India to invest in making its infrastructure climate-resilient, if it has to protect the development gains it has achieved so far. It is imperative to build climate-resilient infrastructure and services to equip coastal states to withstand the impacts of extreme events such as floods, cyclones, and storm surges. Given the multiple sustainable development challenges that already cost India significant amounts of resources, building climate-resilient infrastructure will aid in the achievement of goals set by the Paris Agreement, as well as the Sendai Framework for Disaster Risk Reduction. ORF

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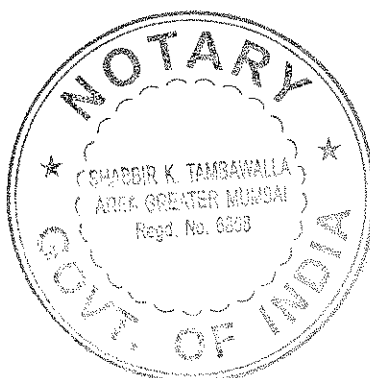
ENDNOTES

1. "Cyclone Fani: Indians shelter from powerful storm," *BBC News*, May 03 2019. Accessed on June 02, 2019. <https://www.bbc.com/news/world-asia-india-48121606>
2. Aparna Roy and Biplob Chatterjee, "After a month of cyclone Fani Odisha remains shattered, are we a resilient enough state to face a natural disaster?," *Observer Research Foundation*, June 04, 2019. Accessed June 20, 2019. <https://www.orfonline.org/expert-speak/after-a-month-of-cyclone-fani-odisha-remains-shattered-are-we-resilient-enough-state-to-face-a-natural-disaster-51632/>
3. Anumita Roychowdhury, "Rebuild to tame cyclones," *Down to Earth*, May 06, 2019. Accessed June 02, 2019. <https://www.downtoearth.org.in/blog/natural-disasters/rebuild-to-tame-cyclones-64345>
4. Pinarayi Vijayan, "Resilient Rebuilding – Lessons from the Kerala Floods," *The Hindu*, May 15, 2019. Accessed June 04, 2019. <https://www.thehindu.com/news/national/kerala/resilient-rebuilding-lessons-from-the-kerala-floods/article27134928.ece>
5. United Nations, Asia Development Bank, The World Bank and European Union, "Kerala Post Disaster Needs Assessment Floods and Landslides - August 2018," *United Nations Development Programme*, October 2018. <https://www.undp.org/content/undp/en/home/librarypage/crisis-prevention-and-recovery/post-disaster-needs-assessment—kerala.html>
6. "Cyclone Fani caused loss of over Rs 9,000 crore in Odisha; 1.6 crore people affected," *Business Today*, June 7, 2019. Accessed June 15, 2019. <https://www.businesstoday.in/current/economy-politics/cyclone-fani-news-odisha-fani-cyclone-disaster-total-loss-due-to-cyclone-fani/story/354287.html>
7. Tripathi, Prakash. "Flood disaster in India: an analysis of trend and preparedness." *Interdiscip J Contemp Res* 2, no. 4 (2015): 91-98.
8. United Nations, Asia Development Bank, The World Bank and European Union, "Kerala Post Disaster Needs Assessment Floods and

579

Landslides - August 2018," *United Nations Development Programme*, October 2018. https://www.undp.org/content/dam/undp/library/Climate%20and%20Disaster%20Resilience/PDNA/PDNA_Kerala_India_Executive_Summary.pdf

9. "India third worst-hit country by natural disasters: Antonio Guterres," *The Economic Times*, September 19, 2017. Accessed 04 June 2019. <https://economictimes.indiatimes.com/news/politics-and-nation/india-third-worst-hit-country-by-natural-disasters-antonio-guterres/artideshow/60755819.cms>
10. Senapati, Sibananda, and Vijaya Gupta, "Climate change and coastal ecosystem in India: Issues in perspectives," *International Journal of Environmental Sciences* 5, no. 3 (2014): 530.
11. Sharma, Divya and Raina Singh "Towards a Policy for Climate Resilient Infrastructure and Services in Coastal Cities," *The Energy and Resources Institute*, Policy Brief (2015).
12. Nair, K. Shadananan. "An Assessment of the Impact of Climate Change on the Megacities of India and of the Current Policies and Strategies to meet Associated Challenges," *In fifth urban research symposium*, pp. 1-10. 2009.
13. Senapati, Sibananda, and Vijaya Gupta. "Climate change and coastal ecosystem in India: Issues in perspectives," *International Journal of Environmental Sciences* 5, no. 3 (2014): 530.
14. Change, IPCC Climate, "Synthesis Report Summary for Policymakers. 2014." URL: https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf (2014).
15. Ishan Kukreti, "Coastal Regulation Zone Notification: What development are we clearing our coasts for," *Down to Earth*, February 04, 2019. Accessed June 05, 2019. <https://www.downtoearth.org.in/coverage/governance/coastal-regulation-zone-notification-what-development-are-we-clearing-our-coasts-for-63061>
16. Mimura, Nobuo. "Sea-level rise caused by climate change and its implications for society," *Proceedings of the Japan Academy, Series B* 89, no. 7 (2013): 281-301.



580

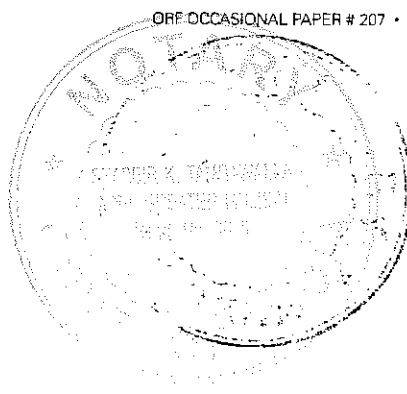
17. Rana, Duni Chand, and Himachal Pradesh Secretariat. "Current Status of Emergency Response System (ERS) in India and Model ERS Based on International Best Practices," Final Research Report, *Asian Disaster Reduction Center (ADRC), Visiting Researcher Program FY2012B*. https://www.adrc.asia/aboutus/vrdata/finalreport/2012B_IND_fr.pdf
18. National Disaster Management Guidelines, Management of Cyclones. *National Disaster Management Authority, Government of India*, 2008. Available at: <https://ndma.gov.in/images/guidelines/cyclones.pdf>
19. Senapati, Sibananda, and Vijaya Gupta. "Climate change and coastal ecosystem in India: Issues in perspectives." *International Journal of Environmental Sciences* 5, no. 3 (2014): 530
20. United Nations Development Programme, "Preparing for Disaster: Lessons from Phailin Response," *UNDP* (2015) <https://reliefweb.int/sites/reliefweb.int/files/resources/UNDP%20-%20Preparing%20for%20Disaster%20-%20Lessons%20from%20Phailin%20Response.pdf>
21. Aparna Roy and Biplob Chatterjee, "After a month of cyclone Fani Odisha remains shattered, are we a resilient enough state to face a natural disaster?," *Observer Research Foundation*, June 04, 2019. Accessed June 20, 2019. <https://www.orfonline.org/expert-speak/after-a-month-of-cyclone-fani-odisha-remains-shattered-are-we-resilient-enough-state-to-face-a-natural-disaster-51632/>
22. Mangroves for the Future (MFF) Small Grant Facility (SGF) project, "Role of coastal ecosystems in enabling resilience of coastal communities post a natural disaster," Implemented by Institute of Economic Growth. December 2014 – January 2016. <https://www.mangrovesforthefuture.org/assets/Repository/Documents/IEF-SGF-Final-Technical-Report.pdf>
23. Aparna Roy and Biplob Chatterjee, "After a month of cyclone Fani Odisha remains shattered, are we a resilient enough state to face a natural disaster?," *Observer Research Foundation*, June 04, 2019. Accessed June 20, 2019. <https://www.orfonline.org/expert-speak/after-a-month-of-cyclone-fani-odisha-remains-shattered-are-we-resilient-enough-state-to-face-a-natural-disaster-51632/>



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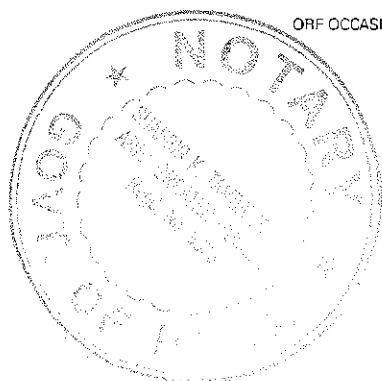
speak/after-a-month-of-cyclone-fani-odisha-remains-shattered-are-we-resilient-enough-state-to-face-a-natural-disaster-51632/

24. National Intelligence Council, United States, "India: The Impact of Climate Change to 2030- A Commissioned Research Report," *Joint Global Change Research Institute and Battelle Memorial Institute, Pacific Northwest Division*, April 2009. https://www.dni.gov/files/documents/climate2030_india.pdf
25. A Rajendra Krishna, "Urban resilience and recovery of hudhud cyclone in Visakhapatnam: A leadership approach," *Centre for Cities Development and Coordination*, 2015. <http://www.ccdcindia.in/hud/hudhudbook.pdf>
26. "Cyclone Fani caused loss of over Rs 9,000 crore in Odisha; 1.6 crore people affected," *Business Today*, June 7, 2019. Accessed on: June 15, 2019. <https://www.businesstoday.in/current/economy-politics/cyclone-fani-news-odisha-fani-cyclone-disaster-total-loss-due-to-cyclone-fani/story/354287.html>
27. Official Website of the Chief Minister of Kerala. Address by Pinarayi Vijayan, Hon'ble Chief Minister of Kerala at the Opening Session of World Reconstruction Conference held at Geneva on May 13, 2019. <https://www.keralacm.gov.in/2019/07/02/geneva-listened-stubborn-voice-rebuilding-kerala/>
28. United Nations, Asia Development Bank, The World Bank and European Union, "Kerala Post Disaster Needs Assessment Floods and Landslides - August 2018," *United Nations Development Programme*, October 2018. <https://www.undp.org/content/undp/en/home/librarypage/crisis-prevention-and-recovery/post-disaster-needs-assessment—kerala.html>
29. National Institute of Disaster Management (NIDM), Disaster Trends, *Ministry of Home Affairs, Government of India*. https://nidm.gov.in/PDF/Disaster_trends.pdf
30. Senapati, Sibananda, and Vijaya Gupta, "Climate change and coastal ecosystem in India: Issues in perspectives," *International Journal of Environmental Sciences* 5, no. 3 (2014): 530



582

31. Dinda, Soumyananda, ed., "Handbook of Research on Climate Change Impact on Health and Environmental Sustainability," *IGI Global*, 2015.
32. Akshit Sangomla, "Floods damage 55,000 houses, kill 511 people this monsoon," *Down to Earth*, July 18, 2018. Accessed June 03, 2019. <https://www.downtoearth.org.in/news/natural-disasters/floods-damage-55-000-houses-kill-511-people-this-monsoon-61168>
33. A comprehensive definition of infrastructure includes both traditional types of infrastructure (everything from energy to public transport, buildings, water supply and sanitation) and, critically, also natural infrastructure (such as forest landscapes, wetlands and watershed protection).
34. Michael Mullan, "Climate-resilient Infrastructure," *OECD Environment Policy Paper* No. 14, 2018.
35. The Economist Intelligence Unit, "The cost of inaction: Recognising the value at risk from climate change," *The Economist*, 2015. https://www.eiuperspectives.economist.com/sites/default/files/The%20cost%20of%20inaction_0.pdf
36. Jongman, Brenden, Philip J. Ward, and Jeroen CJH Aerts. "Global exposure to river and coastal flooding: Long term trends and changes," *Global Environmental Change* 22, no. 4 (2012): 823-835.
37. "World Bank's India Disaster Risk Management Program, India Brochure," The World Bank and GFDRR. <http://siteresources.worldbank.org/INTSOUTHASIA/Resources/2234971378327471830/IndiaBrochureFinalSingles.pdf>
38. Aggarwal, Manu, and Kanika Chawla, "Deepening Renewable Energy Markets in South Africa: Lessons for and from the Indian renewable energy market," *Council on Energy, Environment and Water*, 2019. <https://www.ceew.in/sites/default/files/CEEW-Deepening-Renewable-Energy-Markets-in-South-africa-17Jul19.pdf>
39. Garg, Amit, Vimal Mishra, and Hem H. Dholakia, "Climate change and India: adaptation GAP," *Indian Institute of Management Ahmedabad*, Research and Publication Department, (2015). No. WP2015-11-01.



583

40. Ministry of Finance, Government of India and Research and Information System (RIS), "AIIB Annual Meeting 2018: Host Country Seminars. Background Papers." http://ris.org.in/sites/default/files/Host%20Country%20Seminar%20Background%20Paper_Report.pdf
41. Michael Mullan, "Climate-resilient Infrastructure," *OECD Environment Policy Paper* NO. 14, 2018.
42. The growth profile of the shipping sector in India shows that there has been a 53-fold increase in the Gross Registered Tonnage (GRT) since India's independence (1947). See Government of India, Ministry of Shipping, Indian Shipping Statistics (2010), available at <http://shipping.nic.in/writereaddata/1892s/shipstat-12478603.pdf>.
43. Tanner, Thomas, and Jun Rentschler, "Unlocking the "Triple Dividend" of Resilience: Why Investing in Disaster Risk Management Pays Off," *Interim Policy Note*. (2015).
44. Hallegatte, Stephane, Colin Green, Robert J. Nicholls, and Jan Corfee-Morlot, "Future flood losses in major coastal cities," *Nature climate change* 3, no. 9 (2013): 802.
45. Pozsar, Zoltan, Tobias Adrian, Adam Ashcraft, and Hayley Boesky, "Shadow banking," *New York* 458, no. 458 (2010): 3-9.
46. Tran, K, "Community based adaptation strategy for the urban poor under a changing climate," *School of Global, Urban and Social Studies, Design and Social Context Portfolio, RMIT University* (2014).
47. Ibid
48. Michael Mullan, "Climate-resilient Infrastructure," *OECD Environment Policy Paper* No. 14, 2018
49. Hallegatte, Stephane, Colin Green, Robert J. Nicholls, and Jan Corfee-Morlot, "Future flood losses in major coastal cities," *Nature climate change* 3, no. 9 (2013): 802.
50. Press Information Bureau, Government of India, Cabinet, "Cabinet approves Coastal Regulation Zone (CRZ) Notification 2018," December 28, 2018. Accessed 05 June 2019. <http://pib.nic.in/newsite/PrintRelease.aspx?relid=186875>

58h

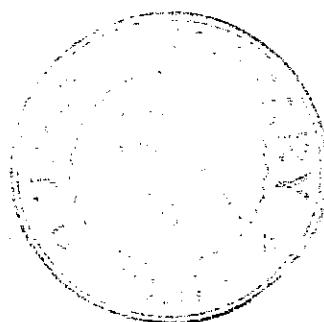
51. Ishan Kukreti, "Coastal Regulation Zone Notification: What development are we clearing our coasts for," *Down to Earth*, February 04, 2019. Accessed June 05, 2019. <https://www.downtoearth.org.in/coverage/governance/coastal-regulation-zone-notification-what-development-are-we-clearing-our-coasts-for-63061>
52. Ibid
53. Michael Mullan, "Climate-resilient Infrastructure," *OECD Environment Policy Paper* No. 14, 2018
54. Sharma, Divya and Raina Singh, "Towards a Policy for Climate Resilient Infrastructure and Services in Coastal Cities," *The Energy and Resources Institute*, Policy Brief (2015).
55. Ministry of Statistics and Programme Implementation Website. Strengthening Infrastructure Statistics. <http://mospi.nic.in/83-strengthening-infrastructure-statistics>
56. Ministry of Housing and Urban Affairs, Government of India, Website. Atal Mission for Rejuvenation and Urban Transformation -AMRUT. <http://mohua.gov.in/cms/amrut.php>
57. Special issue on JNNURM Vol VII Issue 2 Autumn/Winter 2010, *Journal of the Development and Research Organisation for Nature, Arts and Heritage*. <https://www.dronah.org/wp-content/uploads/2017/03/context-12.pdf>
58. Ministry of Housing and Urban Affairs, Government of India, Website. Atal Mission for Rejuvenation and Urban Transformation -AMRUT. <http://mohua.gov.in/cms/amrut.php>
59. Bedoshruti Sadhukhan, "Indian Infrastructure Must Be Climate-Proofed to the Core," ICLEI South Asia. January 28, 2019. Accessed June 05, 2019. <http://southasia.iclei.org/es/newsdetails/article/blog-indian-infrastructure-must-be-climate-proofed-to-the-core.html>
60. Planning Commission, 9th Five Year Plan (Vol-2), *Human and Social Development*. <http://planningcommission.nic.in/plans/planrel/fiveyr/9th/vol2/v2c3-7.htm>

61. Ministry of Urban Development, Government of India, 2016. *Model Building Bye-Laws- 2016*. <http://www.indiaenvironmentportal.org.in/files/file/MODEL%20BUILDING%20BYE%20LAWS-2016.pdf>
62. Wallemacq, Pascaline, "Economic losses, poverty & disasters: 1998-2017," *Centre for Research on the Epidemiology of Disasters*, CRED, 2018.
63. Tanner, Thomas, and Jun Rentschler, "Unlocking the "Triple Dividend" of Resilience: Why Investing in Disaster Risk Management Pays Off," *Interim Policy Note*, (2015).
64. Kellett, Jan, Alice Caravani, and Florence Pichon, "Financing disaster risk reduction," *Overseas Development Institute and Global Facility for Disaster Reduction and Recovery* (2013).
65. Oliver, P., A. Clark, and C. Meattle, "Global Climate Finance: An Updated View 2018," *Climate Policy Initiative*, November (2018).
66. Ibid
67. Bahadur, A., E. Lovell, and F. Pichon, "Strengthening disaster risk management in India: A review of five state disaster management plans," *Climate Development Knowledge Network (CDKN) and the Overseas Development Institute (ODI)*, UK (2016).
68. Ibid
69. Ibid
70. Michael Mullan, "Climate-resilient Infrastructure," *OECD Environment Policy Paper No. 14*, 2018
71. Asian Development Bank, Annual Report, *ADB Sustainable infrastructure for future needs 2018*, <https://www.adb.org/sites/default/files/institutional-document/411996/adb-annual-report-2017bog.pdf>
72. OECD, "Investing in Climate, Investing in Growth," *OECD Publishing*, 2017, Paris https://www.oecd-ilibrary.org/economics/investing-in-climate-investing-in-growth_9789264273528-en
73. Sapatnekar, Sanhita, Ila Patnaik, and Kamal Kishore, "Regulating

586

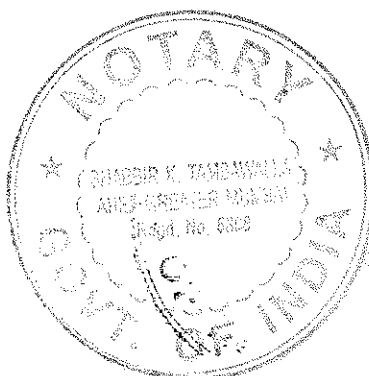
infrastructure development in India," *National Institute of Public Finance and Policy, New Delhi* No. 18/230. 2018.

74. Anguelovski, Isabelle, Eric Chu, and JoAnn Carmin, "Variations in approaches to urban climate adaptation: Experiences and experimentation from the global South," *Global Environmental Change* 27 (2014): 156-167.
75. "Responding to Rising Seas. OECD Country Approaches to Tackling Coastal Risks," *OECD*, 2019. <http://www.oecd.org/environment/cc/policy-highlights-responding-to-rising-seas.pdf>
76. Dube, Shishir K., Tad S. Murty, Jesse C. Feyen, Reggina Cabrera, Bruce A. Harper, Jerad D. Bales, and Saud Amer. "Storm surge modeling and applications in coastal areas." In *Global Perspectives on Tropical Cyclones: From Science to Mitigation*, pp. 363-406. 2010.
77. Turnquist, Mark, and Eric Vugrin, "Design for resilience in infrastructure distribution networks," *Environment Systems & Decisions* 33, no. 1 (2013): 104-120.
78. Aparna Roy and Biplob Chatterjee, "After a month of cyclone Fani Odisha remains shattered, are we a resilient enough state to face a natural disaster?," *Observer Research Foundation*, June 04, 2019. Accessed June 20, 2019. <https://www.orfonline.org/expert-speak/after-a-month-of-cyclone-fani-odisha-remains-shattered-are-we-resilient-enough-state-to-face-a-natural-disaster-51632/>
79. Ministry of Finance, Government of India and Research and Information System (RIS), AIIB Annual Meeting 2018: Host Country Seminars. Background Papers. http://ris.org.in/sites/default/files/Host%20Country%20Seminar%20Background%20Paper_Report.pdf
80. Ibid
- 81.
82. International Workshop on Disaster Resilient Infrastructure 2018: Workshop Summary, https://ndma.gov.in/iwdri/ppts/15jan/TS-1/2/IWDRI2018_TS1_Kumar_World%20Bank.pdf



587

83. Basel, Global Infrastructure. "SuRe—the Standard for Sustainable and Resilient Infrastructure." Version 0.3. *Basel* (2016). protection).



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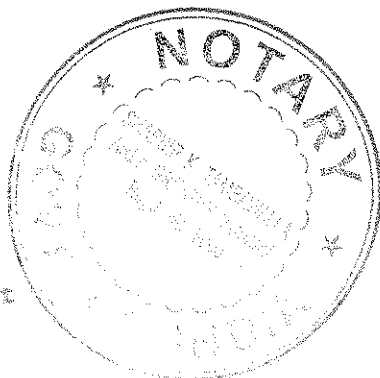
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ANNEXURE A-13

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SURESH ESTATES (P) LTD. v. MUNICIPAL CORPN. OF GREATER MUMBAI 439

(2007) 14 Supreme Court Cases 439

(BEFORE K.G. BALAKRISHNAN, C.J. AND L.S. PANTA
AND J.M. PANCHAL, JJ.)

a

SURESH ESTATES PRIVATE LIMITED
AND OTHERS

Appellants;

Versus

b

MUNICIPAL CORPORATION OF GREATER
MUMBAI AND OTHERS

Respondents.

Civil Appeal No. 5948 of 2007[†], decided on December 14, 2007

c

A. Environment Protection and Pollution Control — Environment (Protection) Act, 1986 — Ss. 3 and 5 — Notification issued under S. 3 to prevail over “any other law” — Scope — CRZ Noti. No. 1 dated 19-2-1991 issued under — Overriding effect of — Reference to “existing rules” — Meaning of — Rules existing at date of notification — Government contending that Development Control Rules, 1967 are not applicable to appellants which could entitle them to additional FSI because the date on which their application was considered, draft regulations of 1989 were in force — Held, when CRZ notification refers to existing rules, the same shall mean existing as on date of notification and not on the date of grant of permission — On 19-2-1991 Development Control Rules of 1967 were in force hence building activities to be governed by them only — Environment (Protection) Rules, 1986 — R. 5(3)(d) — Maharashtra Regional and Town Planning Act, 1966 (37 of 1966) — S. 46 — Development Control Rules, 1967 — Development Control Regulations for Greater Bombay, 1991 — Environment (Protection) Rules, 1986, R. 5(3)(d) — Words and Phrases — “Existing rules”

e

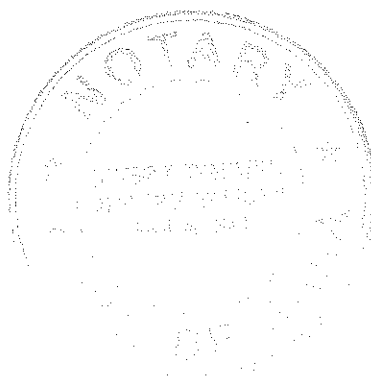
B. Town Planning — Maharashtra Regional and Town Planning Act, 1966 (37 of 1966) — S. 46 — Grant of permission for development — Emphasis on “due regard” by Planning Authority to draft regulations — Effect — Legislature has not used the phrases “must have regard” or “shall have regard” — Held, contention of the Govt. that Planning Authority has to take into consideration the draft regulations of 1989 and appellants are not entitled to additional FSI, cannot be accepted — Discretion can be exercised by competent authority under R. 10(2) of Development Control Rules, 1967 (Maharashtra) — Words and Phrases — “Due regard”, “must have regard” or “shall have regard” (Paras 25 to 29)

g

The appellant holds/owns a plot of land at Mumbai. Respondent 1 is Municipal Corporation for Greater Mumbai, and the Planning Authority under the provisions of the Mumbai Municipal Corporation Act, 1888 as well as the Maharashtra Regional and Town Planning Act, 1966 (“the MRTP Act”, for short). The appellant obtained requisite rights in respect of the said plot. The plot was reserved for playground of municipal school as well as for D.P. Road. Appellant 1 caused a purchase notice to be served to the municipal authorities on 16-6-2005. The Municipal Corporation decided not to purchase the said plot of land, as a result of which the reservations on the plot lapsed on 16-12-2005 under the relevant provisions of the MRTP Act. The appellants thereupon desired to develop the plot for construction of a luxury hotel. In exercise of rule-making

h

[†] Arising out of SLP (C) No. 14578 of 2007. From the Final Judgment and Order dated 13-8-2007 of the High Court of Bombay in Writ Petition No. 1627 of 2007



power conferred by the MRTP Act, the State Government had earlier framed the Development Control Rules, 1967.

The Ministry of Environment and Forests issued Notification I on 19-2-1991 under Sections 3(1) and 3(2)(v) of the Environment (Protection) Act, 1986 and Rule 5(3)(d) of the Environment (Protection) Rules, 1986 declaring coastal stretches as Coastal Regulation Zone (CRZ) and regulating activities in CRZ, as a result of which the plot belonging to the appellants falls within CRZ II. What is claimed by the appellants is that the buildings permitted in CRZ II on the landward side of the existing and proposed road would be subject to the existing local town planning regulations and, therefore, the luxury hotel will have to be constructed as per the Development Control Rules of 1967 which were the existing local town planning regulations. The appellant submitted the plans to develop the land in question by constructing a luxury hotel in terms of Rules of 1967 on 26-12-2005. The case of the appellants is that they are entitled to additional FSI of 3.73 times the FSI in addition to 1.33 FSI allowable on the said plot as per the provisions of Rule 10(2) of the Development Control Rules, 1967. The appellants did not receive any communication from the Municipal Authorities about their application by which permission to develop the plot was sought.

The Division Bench by judgment dated 13-8-2007, directed the Government to take a decision on the application filed by the appellants within 6 weeks from the date of the order and communicate the order so passed to them, which had given rise to the instant appeal.

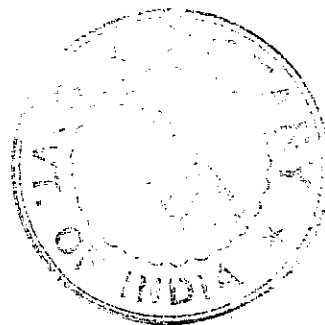
Partly allowing the appeal, the Supreme Court

Held :

The word "existing" as employed in the CRZ notification means the town and country planning regulations in force as on 19-2-1991. If it had been the intention that the town and country planning regulations as in force on the date of the grant of permission for building would apply to the building activity, it would have been so specified. (Para 19)

The argument that in view of the provisions of Section 46 of the MRTP Act, 1966, the Planning Authority has to take into consideration the draft regulations of 1989 and, therefore, the appellants would not be entitled to additional FSI is devoid of merits. Section 3 of the Environment (Protection) Act, 1986 inter alia provides that the provisions of the Act and any order or notification issued under the said Act will prevail over the provisions of any other law. The phrase "any other law" will also include the MRTP Act, 1966. As noticed earlier the Notification dated 19-2-1991 issued under the provisions of the Environment (Protection) Act, 1986 freezes the building activity in an area falling within CRZ II to the law which was prevalent and in force as on 19-2-1991. The draft regulations of 1989 would therefore not apply as they were not existing law in force and prevalent as on 19-2-1991. (Paras 21, 22 and 23)

In view of the peculiar circumstances obtaining in the instant case, Section 46 of the MRTP Act, 1966 would not apply to the facts of the instant case. Further, when the sanctioned Development Control Regulations for Greater Bombay, 1991 do not apply to areas covered within CRZ II, since those Regulations came into force with effect from 20-3-1991, its previous draft also cannot apply. As far as development in the area covered by CRZ II is concerned, one will have to proceed on the footing that the draft plan after CRZ notification never existed. Even otherwise what is envisaged under Section 46 of the MRTP Act is due regard to draft plan only if there is no final plan. The Development



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Control Rules of 1967 were in existence as on 19-2-1991 and therefore the plan prepared thereunder would govern the case. (Para 24)

- a *Overseas Chinese Cuisine (India) (P) Ltd. v. Municipal Corpn. of Greater Bombay*, (2000) 1 Bom CR 341, cited

The clarification issued by the Central Government in respect of the CRZ notification on 8-9-1998 states that the existing rules would be those, which were in force as on 19-2-1991. The draft regulations of 1989 were not in force as on 19-2-1991 and, therefore, would not apply to the plot in question. What is emphasised in Section 46 of the MRTP Act, 1966 is that the Planning Authority should have due regard to the draft regulations. The legislature has not used the phrase "must have regard" or "shall have regard". The Municipal Corporation of Greater Mumbai which is the Planning Authority had given due regard to the draft Development Control Regulations of 1989 in the light of CRZ notification and recommended to the Government to grant additional FSI of 3.73 times permissible as per the Development Control Rules, 1967 over and above 1.33 permissible, to the appellants. Having regard to the facts of the case the Supreme Court is of the opinion that the contention that the Planning Authority has to take into consideration the draft regulations of 1989 and, therefore, the appellants would not be entitled to additional FSI, cannot be accepted and is hereby rejected. (Paras 25 and 26)

- d The case of the appellants is that normally all luxury hotels which had applied for additional FSI under Rule 10(2) of the Development Control Rules, 1967 were allowed additional FSI. Having regard to the intention of the legislature the prevalent norm of FSI under Rule 10(1) of the Rules, 1967 will have to be construed to mean also the norm of FSI which can be granted in exercise of discretion under Rule 10(2) of the Rules. Therefore, the stand taken by the respondents that the appellants would not be entitled to more than 1.33 FSI in view of norm set out in the Development Control Rules of 1967 cannot be upheld and it is held that the question of grant of FSI would be subject to the discretion to be exercised by the competent authority under Rule 10(2) of the Rules on analysis of objective facts placed before it. (Paras 27 and 29)

- e C. Town Planning — Maharashtra Regional and Town Planning Act, 1966 (37 of 1966) — S. 127 — Scope of — Plot reserved as playground for school and for road — Purchase notice served on competent authority — Land not acquired by authority — Held, Govt. cannot blow hot and cold in the same breath and oppose hotel project on land which it did not acquire despite purchase notice under S. 127 and allowed its reservation to lapse

- f The contention that even if it is assumed that the appellants are entitled to higher FSI, they cannot use the plot in question for construction of a hotel as the land was reserved for public purpose on the date when CRZ notification was issued, cannot be accepted. As noticed earlier the plot was reserved as playground for secondary school as well as for primary school and also for DP Road. The appellants had caused the purchase notice dated 16-6-2005 served to the competent authority under Section 127 of the MRTP Act, 1966. (Para 30)

- g The CRZ notification has only frozen the FSI/FAR norms but not the operation of Section 127 of the Act. In terms of the provisions of Section 127 of the MRTP Act, 1966, the reservations lapsed. If the argument of the respondent is accepted, it is likely to result into a piquant situation not contemplated by the

h

Act, because the respondents do not want to acquire land whereas the appellants would not be entitled to use the land for any purpose for all time to come. The argument advanced by the respondent is misconceived inasmuch as the State Government in one breath asserts that the appellants are entitled to FSI of 1.33 for construction of hotel whereas in the same breath it asserts that the property is reserved and cannot be used for hotel project. The underlying principle envisaged by Section 127 of the MRTP Act, 1966 is either to utilise the land for the purpose it is reserved in the plan or let the owner utilise the land for the purpose it is permissible under the Town Planning Scheme. Therefore, the plea that the appellants would not be entitled to use the plot in question for hotel project in view of the reservations which were earlier prevalent cannot be accepted. (Para 32)

D. Town Planning — Development Control Rules, 1967 (Maharashtra) — R. 10(2) — Discretion/Prerogative of State Govt. under — Exercise of — Discretion vested in an authority has to be exercised judicially and not arbitrarily and capriciously — Held, discretion used by authority under R. 10(2) of Development Control Rules, 1967 for grant of additional FSI must be in consonance with principles incorporated in Art. 14 of Constitution so as not to suffer from vice of arbitrariness — Constitution of India — Art. 14 — Arbitrariness — Additional FSI — Grant of (Para 33)

E. Town Planning — Maharashtra Regional and Town Planning Act, 1966 (37 of 1966) — S. 45(5) — Deeming provision — Applicability of — Appellants seeking permission to develop their plot from Planning Authority and contending that under S. 45(5) if the Authority failed to communicate its decision of granting or refusing permission within 60 days from receipt of application, permission is deemed to have been granted — Held, since the matter was under active consideration of different authorities in respect of additional FSI and was being contested, deeming provision would apply only if the permission applied for is strictly in conformity with relevant Development Control Rules (Para 34)

F. Constitution of India — Arts. 226 and 32 — Direction by court on exercise of discretionary power (conferred by statute) — Permissibility — When a statute confers a discretionary power to be exercised by competent authority, courts cannot direct the competent authority to exercise discretion in a particular manner — Court can always direct competent authority to exercise discretion vested in it in accordance with law — Considering the facts of the case, Supreme Court directed the State Govt. to exercise discretion under R. 10(2) of Development Control Rules after taking into account inter alia that in the past other hotels were also granted additional FSI — Town Planning — Development Control Rules, 1967 (Maharashtra), R. 10(2) — Administrative Law — Judicial review — Limits of Judicial Review (Paras 35 and 36)

SA-M/A/37141/S

Advocates who appeared in this case :

Harish N. Salve and Mukul Rohatgi, Senior Advocates [M/s Parimal Shroff, Mohd. Himmayatullah, Mahesh Agarwal, Rishi Agrawala and Gourav Goyal (for E.C. Agarwala), Advocates] for the Appellants;

T.R. Andhyarajina and Shekhar Naphade, Senior Advocates (Ravindra Keshavrao Adsure, Pallav Shishodia, Atul Y. Chitale, Ms Suchitra Atul Chitale and Ms Sunaina Dutta, Advocates) for the Respondents.

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(Panchal, J.)

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- a 1. (2000) 1 Bom CR 341. *Overseas Chinese Cuisine (India) (P) Ltd. v. Municipal Corpn. of Greater Bombay* 445d-e

The Judgment of the Court was delivered by

J.M. PANCHAL, J.—Leave granted.

- b 2. The instant appeal is directed against judgment dated 13-8-2007 rendered by the Division Bench of the High Court of Judicature at Bombay in Writ Petition No. 1627 of 2007 by which the prayers made by the appellants, (1) to declare that application submitted by them on 26-12-2005 to Municipal Corporation of Greater Mumbai to give permission to develop land bearing CTS No. 2193 (P) of Bhuleshwar Division at Dr. Babasaheb Jaykar Marg stands granted in view of Section 45(5) of the Maharashtra Regional and Town Planning Act, 1966, (2) in the alternative to direct the respondents to grant forthwith their application for permission to develop land referred to above with additional FSI of 3.73 times the FSI permissible under Rule 10(2) of the DC Rules, 1967, and (3) to direct the respondents to allow them to proceed with the development of their plot mentioned above for construction of luxury hotel by utilisation of additional FSI of 3.73 times the FSI permissible on the said plot as per the DC Rules, 1967, are refused.

- d 3. Appellants 1 and 2 are the companies incorporated under the provisions of the Companies Act, 1956. Petitioner 2 holds/owns a plot of land bearing CTS No. 2193 (P) of Bhuleshwar Division at Dr. Babasaheb Jaykar Marg, Thakurdwar. The plot admeasures approximately 8983 sq m. Respondent 1 is Municipal Corporation of Greater Mumbai, and the Planning Authority under the provisions of the Mumbai Municipal Corporation Act, 1888 as well as the Maharashtra Regional and Town Planning Act, 1966 ("the MRTP Act", for short). Appellant 1 obtained requisite rights in respect of plot referred to above. The plot was reserved for playground of municipal primary school and secondary school as well as for D.P. Road. Appellant 1 caused a purchase notice to be served to the municipal authorities on 16-6-2005. The Municipal Corporation found that the land was encumbered with residential as well as commercial structures and the cost of purchase would be roughly about Rs 13.6 crores which was very high. The Municipal Corporation, therefore, decided not to purchase the said plot of land, as a result of which the reservations on the plot lapsed on 16-12-2005 under the relevant provisions of the MRTP Act. The appellants thereupon desired to develop the plot for construction of a luxury hotel. It may be mentioned that in exercise of rule-making power conferred by the MRTP Act, the State Government had earlier framed the Development Control Rules, 1967.

- g 4. According to the appellants, the Ministry of Environment and Forests issued Notification I on 19-2-1991 under Sections 3(1) and 3(2)(v) of the Environment (Protection) Act, 1986 and Rule 5(3)(d) of the Environment (Protection) Rules, 1986 declaring coastal stretches as Coastal Regulation Zone (CRZ) and regulating activities in CRZ, as a result of which the plot belonging to them falls within CRZ II. What is claimed by the appellants is

that the buildings permitted in CRZ II on the landward side of the existing and proposed road would be subject to the existing local town planning regulations and, therefore, the luxury hotel will have to be constructed as per the DC Rules of 1967 which were the existing local town planning regulations. The appellant, therefore, submitted the plans to develop the land in question by constructing a luxury hotel in terms of Rules of 1967 on 26-12-2005. The case of the appellants is that they are entitled to additional FSI of 3.73 times the FSI in addition to 1.33 FSI allowable on the said plot as per the provisions of Rule 10(2) of the DC Rules, 1967. The appellants did not receive any communication from the municipal authorities about their application by which permission to develop the plot was sought. a b

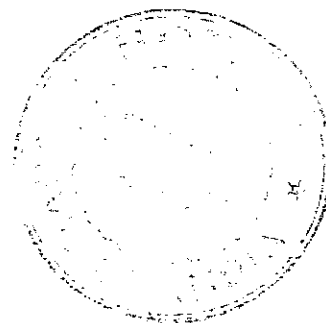
5. On 31-12-2005 the Municipal Corporation submitted a proposal to the Principal Secretary, Urban Development Department, Government of Maharashtra recommending inter alia that in view of the provisions of CRZ notification and the DC Rules, 1967, additional FSI as applied for by the appellants be granted under Rule 10(2) of the DC Rules, 1967. c

6. On 2-8-2006 a letter was addressed by the State Government to the Ministry of Environment and Forests, Union of India ("MoEF") requesting to examine the proposal of the appellants and communicate to the Government of Maharashtra whether the stand taken by the appellants for additional FSI was correct. d

7. On 18-8-2006 a communication was addressed by MoEF to Principal Secretary, Urban Development Department, Government of Maharashtra clarifying that in view of earlier clarification issued on 8-9-1998, the DC Rules as existed on 19-2-1991 would apply to the areas falling within the CRZ notification and further mentioning that "the word existing has been interpreted by the Ministry vide letter dated 8-9-1998 to mean the rules which prevailed on 19-2-1991". It was also stated in the said communication that the DC Regulations which were in force on 19-2-1991 i.e. the approved DC Rules of 1967 shall be considered and not the draft regulations of 1989 which came into force on 20-2-1991 as the draft development plan of 1989 was still at a draft stage on 19-2-1991. e

8. On 20-2-2007 a letter was addressed by the Government of Maharashtra to Municipal Corporation of Greater Mumbai in which reference was invited to the application submitted by the appellants for development permission and remarks from the Municipal Corporation were called for. The Municipal Commissioner convened a meeting of the personnel belonging to different departments and at the said meeting the matter was considered. The Committee decided to recommend the proposal for consideration of the Government in terms of the provisions of DC Rule 52(8)(vii). On 1-3-2007 the Municipal Corporation recommended for grant of additional FSI in terms of the DC Rules, 1967 as demanded by the appellants. f g

9. On 21-2-2007 MoEF granted environmental clearance to the appellants for construction of a residential hotel and commercial project subject to the terms and conditions set out therein. Appellant 2, on 30-4-2007 h



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a created a registered mortgage of the land in favour of H. and FS Trust Company Ltd. & Ors. for securing loan facilities amounting to Rs 550 crores for construction of the luxury hotel. The appellants did not receive any further communication from the respondents.

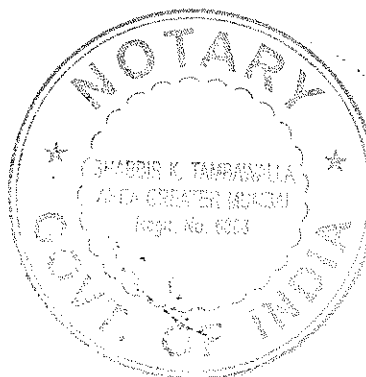
b 10. The case of the appellants was that the Planning Authority did not communicate its decision to them as to whether the permission sought for was granted or refused, within 60 days from the date of the receipt of application and therefore they were entitled to a declaration that the permission was deemed to have been granted to them in terms of Section 45(5) of the MRTP Act. In the alternative it was their case that in terms of the amended DC Rules of 1967 the competent authority, with the previous approval of the Government, has authority to permit the person who has applied for permission to exceed floor space indices in respect of buildings of educational and medical relief institutions as well as the government and c seni-government offices and luxury hotels and as the Taj Mahal, Oberoi, Sea Rock, President, Ambassador amongst other hotels, were granted benefit of additional FSI under Rule 10(2) of the DC Rules, 1967, they were also entitled to additional FSI, 3.73 times the permissible FSI of 1.33 available under the relevant Rule.

d 11. What was asserted by the appellants was that in view of the Division Bench decision of the Bombay High Court in *Overseas Chinese Cuisine (India) (P) Ltd. v. Municipal Corpn. of Greater Bombay*¹ the provisions of the DC Rules of 1967 would be applicable and therefore the appellants were entitled to additional FSI. Under the circumstances the appellants invoked extraordinary jurisdiction of the High Court of Judicature of Bombay under e Article 226 of the Constitution by filing Writ Petition No. 1627 of 2007 and claimed the reliefs referred to earlier.

f 12. On service of notice a reply was filed by the Corporation and the State Government controverting the averments made in the petition. The Division Bench of the Bombay High Court did not go into the merits of the contentions raised by the learned counsel for the parties. The High Court noticed that the main grievance of the appellants was that the Government had not disposed of their application till the date of hearing of the petition which was causing serious loss to them. The learned Advocate General, appearing for the State submitted that the Government would deal with the matter expeditiously and pass appropriate orders which would be communicated to the petitioners. In view of this state of affairs, the Division g Bench by judgment dated 13-8-2007, directed the Government to take a decision on the application filed by the appellants within 6 weeks from the date of the order and communicate the order so passed to them, which has given rise to the instant appeal.

h 13. The matter was placed for preliminary hearing before the Court on 17-8-2007 and after hearing the learned counsel for the appellants, the Court

1 (2000) 1 Bom CR 341



issued notice to the respondents. On service of notice the respondents have filed the reply. According to the State Government, the Development Control Regulations for Greater Bombay, 1991 are applicable, which do not provide for higher FSI to the proposed hotel project of the appellants located in 'C' ward. What is pointed out in the alternative by the State is that under Section 46 of the MRTP Act, the Planning Authority has to give due regard to the draft regulations of 1989, which do not permit grant of additional FSI to the appellants. a

14. It is further stated in the reply that CRZ notification of 1991 provides that in CRZ area, the construction shall be subject to existing local town and country planning regulations including existing norms of FSI and as existing norm is to give FSI of only 1.33 the appellants are not entitled to additional FSI claimed by them. According to the State Government, even if it is assumed that the appellants are entitled to higher FSI, they cannot use the property for construction of a hotel as the land was reserved for public purpose on the date when the CRZ notification was issued. What is asserted in the reply is that since it is prerogative of the State to grant discretionary additional FSI under Rule 10(2) of the DC Rules of 1967, the prayers made by the appellants to grant additional FSI should be refused. b c

15. This Court has heard the learned counsel for the parties at length and in great detail. This Court has also considered the documents forming part of the appeal. d

16. The contention advanced by the learned counsel for the respondents that the DC Rules, 1967 would not apply to the development permission sought for by the appellants, but the Development Control Regulations of 1991 would apply, cannot be accepted. It is not in dispute that on 19-2-1991 MoEF issued a notification under the provisions of the Environment (Protection) Act, 1986 regulating building activities in coastal zones which is known as coastal regulation zone notification. The said notification classifies the areas within 500 metres of high tide land into CRZ I, CRZ II, CRZ III and CRZ IV categories. It is also not in dispute that the plot belonging to the appellants falls within CRZ II category. The notification inter alia provides that buildings shall be permitted only on the landward side of the existing road and buildings permitted at landward side of the existing and proposed roads shall be subject to the existing local town and country planning regulations including the existing norms of floor space index/floor area ratio. e f

17. It is true that the DC Regulations for Greater Bombay, 1991 were notified on 20-2-1991 and came into force with effect from 25-3-1991. However, a doubt was raised whether the existing DC Regulations for Coastal Regulation Zone II (CRZ II) would mean the DC Rules, 1967 or Draft Development Control Regulations, 1989 which ultimately culminated into the DC Regulations, 1991 and, therefore, MoEF was consulted. MoEF issued a clarification on 8-9-1998 stating that the DC Regulations as existing on 19-2-1991 would apply for all developmental activities in Coastal Regulation Zone including CRZ II. MoEF also issued clarification on 18-8- g h



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- a 2006 reiterating that the existing DC Regulations applicable to CRZ II areas in Mumbai would mean the DC Rules, 1967. Even the Municipal Corporation in its letter dated 31-12-2005 addressed to the Principal Secretary, Urban Development Department, Government of Maharashtra, had expressed the view that the application made by the appellants for construction of a luxury hotel with additional FSI under the DC Rules, 1967 he granted under Rule 10(2) of the Rules.
- b 18. As observed earlier a letter dated 20-2-2007 was addressed by the Government of Maharashtra to the Municipal Commissioner of Greater Mumbai in which reference was invited to the application submitted by the appellants for development permission and remarks from the Municipal Corporation were called for. The Municipal Commissioner had convened a meeting of officials belonging to different departments of the State
- c Government and the Committee after discussion had decided to recommend to grant the application made by the appellants pursuant to which on 1-3-2007 the Municipal Corporation submitted its report to the State Government and recommended for grant of additional FSI in terms of the DC Rules, 1967.
- d 19. The word "existing" as employed in the CRZ notification means the town and country planning regulations in force as on 19-2-1991. If it had been the intention that the town and country planning regulations as in force on the date of the grant of permission for building would apply to the building activity, it would have been so specified. It is well to remember that CRZ notification refers also to structures which were in existence on the date of the notification. What is stressed by the notification is that irrespective of
- e what local town and country planning regulations may provide in future the building activity permitted under the notification shall be frozen to the laws and norms existing on the date of the notification.
- f 20. On 2-2-1991 when the CRZ notification was issued, the only building regulations that were existing in city of Mumbai, were the DC Rules, 1967. In view of the contents of CRZ II notification issued under the provisions of the Environment (Protection) Act which has the effect of prevailing over the provisions of other Acts, the application submitted by the appellants to develop the plot belonging to them would be governed by the provisions of the DC Rules, 1967 and not by the draft development regulations of 1989 which came into force on 20-2-1991 in the form of the Development Control Regulations for Greater Bombay, 1991.
- g 21. The argument that in view of the provisions of Section 46 of the Town Planning Act, 1966, the Planning Authority has to take into consideration the draft regulations of 1989 and, therefore, the appellants would not be entitled to additional FSI is devoid of merits.
- h 22. Section 3 of the Environment (Protection) Act, 1986 inter alia provides that the provisions of the Act and any order or notification issued under the said Act will prevail over the provisions of any other law.



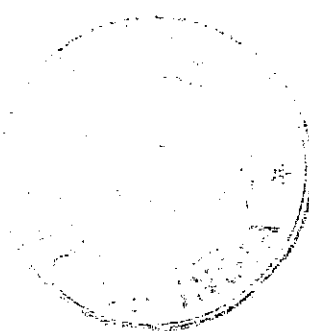
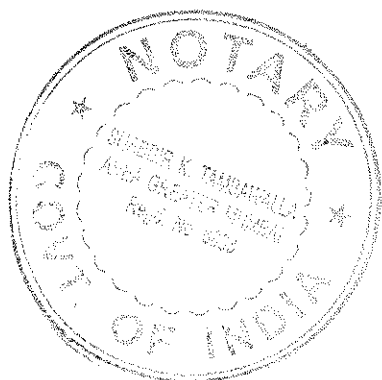
23. The phrase "any other law" will also include the MRTP Act, 1966. As noticed earlier the Notification dated 19-2-1991 issued under the provisions of the Environment (Protection) Act, 1986 freezes the building activity in an area falling within CRZ II to the law which was prevalent and in force as on 19-2-1991. The draft regulations of 1989 would therefore not apply as they were not existing law in force and prevalent as on 19-2-1991. a

24. In view of the peculiar circumstances obtaining in the instant case, the Court is of the opinion that Section 46 of the MRTP Act, 1966 would not apply to the facts of the instant case. Further, when the sanctioned DC Regulations for Greater Bombay, 1991 do not apply to areas covered within CRZ II, since those Regulations came into force with effect from 25-3-1991, its previous draft also cannot apply. The draft published is to be taken into consideration so that the development plan is advanced and not thwarted. The draft development plan was capable of being sanctioned, but when the final development plan is not applicable, its draft would equally not apply as there is no question of that plan being thwarted at all. As far as development in the area covered by CRZ II is concerned, one will have to proceed on the footing that the draft plan after CRZ notification never existed. Even otherwise what is envisaged under Section 46 of the MRTP Act is due regard to draft plan only if there is no final plan. The DC Rules of 1967 were in existence as on 19-2-1991 and therefore the plan prepared thereunder would govern the case. b c d

25. It is relevant to notice at this stage that the State Government had sought a clarification from MoEF on 2-8-2006 as to whether the DC Rules, 1967 or the DC Regulations, 1991 will apply to the areas covered by CRZ II. MoEF on 18-8-2006 clarified that the Development Control Rules of 1967 would apply. The assertion made by the appellants that the clarification issued by MoEF is binding on the State Government in view of the salutary provisions of Sections 3, 5 and 24 of the Environment (Protection) Act, 1986 deserves consideration. The clarification issued by the Central Government in respect of the CRZ notification on 8-9-1998 states that the existing rules would be those, which were in force as on 19-2-1991. e

26. The draft regulations of 1989 were not in force as on 19-2-1991 and, therefore, would not apply to the plot in question. What is emphasised in Section 46 of the MRTP Act, 1966 is that the Planning Authority should have due regard to the draft rules (*sic* regulations). The legislature has not used the phrase "must have regard" or "shall have regard". Municipal Corporation of Greater Mumbai which is the Planning Authority had given due regard to the draft DC Regulations of 1989 in the light of CRZ notification and recommended to the Government to grant additional FSI of 3.73 times permissible as per the Development Control Rules, 1967 over and above 1.33 permissible, to the appellants. Having regard to the facts of the case this Court is of the opinion that the contention that the Planning Authority has to take into consideration the draft regulations of 1989 and, therefore, the appellants would not be entitled to additional FSI, cannot be accepted and is hereby rejected. f g

27. The argument that even if it is assumed that the provisions of the DC Rules, 1967 would be applicable to the application submitted by the h



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- a appellants seeking permission to develop their plot, they would be entitled to FSI of only 1.33 which is the existing norm set out in the Rules and would not be entitled to additional FSI, has no substance at all. It is true that in the DC Rules, 1967 the norm of permissible FSI is laid down to be 1.33. However, there is no manner of doubt that under Rule 10(2) of the Rules of 1967, the floor space indices specified may be permitted to be exceeded in respect of buildings of educational and medical relief institutions as well as government and semi-government offices and luxury hotels with the previous approval of the Government.
- b 28. The respondents could not lay factual data before the Court to indicate that there was no norm of giving higher FSI over and above 1.33 to hotels and to the buildings contemplated under Rule 10(2) of the DC Rules, 1967. On the contrary the appellants have placed material on record of the appeal which would indicate that the norm adopted by the Government in case of Taj Hotel and Hotel Oberoi was to grant FSI of 5.32.
- c 29. The norm of FSI specified in Rule 10(1) of the Rules of 1967 would be subject to the discretion to be exercised by the Government under Rule 10(2) of the Rules. The norm as set out regarding FSI in the DC Rules of 1967 will have to be construed to mean also the norm of FSI which can be granted by the Government in exercise of discretion vested in it under Rule 10(2) of the Rules of 1967. The case of the appellants is that normally all luxury hotels which had applied for additional FSI under Rule 10(2) of the DC Rules, 1967 were allowed additional FSI. Having regard to the intention of the legislature the prevalent norm of FSI under Rule 10(1) of the Rules, 1967 will have to be construed to mean also the norm of FSI which can be granted in exercise of discretion under Rule 10(2) of the Rules. Therefore,
- d the stand taken by the respondents that the appellants would not be entitled to more than 1.33 FSI in view of norm set out in the DC Rules of 1967 cannot be upheld and it is held that the question of grant of FSI would be subject to the discretion to be exercised by the competent authority under Rule 10(2) of the Rules on analysis of objective facts placed before it.
- e 30. The contention that even if it is assumed that the appellants are entitled to higher FSI, they cannot use the plot in question for construction of a hotel as the land was reserved for public purpose on the date when CRZ notification was issued, cannot be accepted. As noticed earlier the plot was reserved as playground for secondary school as well as for primary school and also for DP Road. The appellants had caused the purchase notice dated 16-6-2005 served to the competent authority under Section 127 of the MRTP Act, 1966.
- f 31. After following the procedure the State Government decided not to acquire the plot which is quite evident from the contents of letter dated 18-7-2006, addressed by the Government of Maharashtra to Municipal Corporation of Greater Mumbai. By the said letter Municipal Corporation of Greater Mumbai was informed that the procedure for acquisition of the land in question had not been commenced within the prescribed period by the
- g
- h

Municipal Corporation and therefore there was no objection for presuming that the reservation had lapsed.

32. The CRZ notification has only frozen the FSI/FAR norms but not the operation of Section 127 of the Act. In terms of the provisions of Section 127 of the MRTP Act, 1966, the reservations lapsed. If the argument of the respondent is accepted, it is likely to result into a piquant situation not contemplated by the Act, because the respondents do not want to acquire land whereas the appellants would not be entitled to use the land for any purpose for all time to come. The argument advanced by the respondent is misconceived inasmuch as the State Government in one breath asserts that the appellants are entitled to FSI of 1.33 for construction of hotel whereas in the same breath it asserts that the property is reserved and cannot be used for hotel project. The underlying principle envisaged by Section 127 of the MRTP Act, 1966 is either to utilise the land for the purpose it is reserved in the plan or let the owner utilise the land for the purpose it is permissible under the Town Planning Scheme. Therefore, the plea that the appellants would not be entitled to use the plot in question for hotel project in view of the reservations which were earlier prevalent cannot be accepted.

33. Similarly, the assertion made by the respondents in the reply that since it is prerogative of the State Government to exercise discretion for grant of additional FSI, the prayer made by the appellants to direct the State Government to grant additional FSI should be turned down, cannot be accepted. It is true that under Rule 10(2) of the DC Rules, 1967 a discretion is vested in the Government to grant additional FSI in respect of the buildings of education and medical relief as well as government and semi-government offices and luxury hotels. However, it is well settled by a catena of reported decisions that the discretion vested in an authority has to be exercised judiciously. The discretion vested under Rule 10(2) of the DC Rules, 1967 cannot be exercised arbitrarily or capriciously or as per the whims of the authority concerned. The exercise of the discretion must be in consonance with the principles incorporated in Article 14 of the Constitution so that it does not suffer from the vice of the arbitrariness. Therefore, the assertion made by the State Government that it is prerogative of the State Government to grant additional FSI and, therefore, the reliefs claimed in the appeal should be refused, cannot be accepted.

34. The contention of the appellants that in view of the provisions of subsection (5) of Section 45 of the MRTP Act, 1966, the application submitted by them for seeking permission to develop their plot should be deemed to have been granted to them as the Planning Authority had failed to communicate its decision whether to grant or refuse permission within 60 days from the date of receipt of their application, cannot be upheld. The facts of the case would indicate that the matter of grant of permission was under active consideration of different authorities. The question whether the appellants were entitled to additional FSI as claimed by them was considered and contested by the respondents. Further, the proviso to Section 45(5) of the MRTP Act, 1966 makes it clear that the deeming provision would apply only if the permission applied for is strictly in conformity with the relevant DC

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a Regulations. The competent authority had no occasion to consider whether the plans submitted by the appellants for development of their plot were in accordance with the DC Rules, 1967.

b 35. On the facts and in the circumstances of the case this Court is of the opinion that the appellants are not entitled to a declaration that the permission applied for was deemed to have been granted to them as the Planning Authority had failed to communicate its decision whether to grant or refuse permission within 60 days from the date of receipt of their application.

c 36. Similarly, the claim made by the appellants that the respondents should be directed by this Court to grant permission to the appellants to develop their plot with demanded FSI cannot be accepted. As noticed earlier Rule 10(2) of the Rules of 1967 confers discretion upon the competent authority to grant additional FSI to the buildings mentioned therein including luxury hotels. When a statute confers a discretionary power to be exercised by competent authority, the court cannot direct the competent authority to exercise discretion in a particular manner. The court can always direct the competent authority to exercise discretion vested in it in accordance with law. Therefore, the prayer made by the appellants to direct the State Government to grant additional FSI as was granted to other hotels or to grant them FSI of 5.32 cannot be accepted. However, this Court is of the opinion that having regard to the facts of the case interest of justice should be served if the respondent State is directed to exercise discretion vested in it under Rule 10(2) of the DC Rules, 1967 after taking into consideration the relevant material including the fact that other hotels were in past granted additional FSI.

e 37. For foregoing reasons the appeal partly succeeds. The judgment dated 13-8-2007 rendered by the Division Bench of the High Court of Judicature at Bombay in Writ Petition No. 1627 of 2007 is modified. The State Government is directed to take a decision on the application submitted by the appellants seeking permission to develop their plot on the basis that the provisions of the DC Rules, 1967 with discretion available to the competent authority under Rule 10(2) of the said Rules would be applicable and decide the said application in the light of recommendations made by the competent authority as well as the fact that other hotels as pointed out by the appellants were also granted more FSI than 1.33 permissible under Rule 10(1) of the DC Rules, 1967. The application submitted by the appellants shall be considered by the respondents in the light of observations made in this judgment as early as possible and preferably within six weeks from today. The decision taken on the application of the appellants shall be communicated to them.

g 38. The appeal accordingly stands disposed of. The parties to bear their own costs.

h

TRUE COPY

Zaman Ali
Advocate, High Court

True Copy

Advocate

602 ANNEXURE A-14

National Assessment of Shoreline Changes along Indian Coast

R.S. Kankara, M.V. Ramana Murthy & M. Rajeevan

Status Report for

years
1990-2016



Ministry of Earth Sciences
National Centre for Coastal Research
Chennai-600100

July-2018



National Assessment of Shoreline changes along Indian Coast

R. S. Kankara, M. V. Ramana Murthy & M. Rajeevan

Status report for
26 years
1990-2016



**Ministry of Earth Sciences
National Centre for Coastal Research
Chennai-600100**

July- 2018

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National Assessment of Shoreline changes along Indian Coast: Status report for 26 years (1990 - 2016)

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DISCLAIMER

This report is part of series of reports that includes text summarizing methods, results, in addition to maps illustrating zones of shoreline change. Zones of shoreline change are being published for the purpose of coastline characterization. The report / maps are not intended to be equated to either as revenue maps of the respective State/ UT/ Government agencies or as the topographic maps of the Survey of India. The maps conform to the National Map Policy dated May 19, 2005 of the Ministry of Science and Technology, Government of India.

CITATION:

R.S. Kankara, M.V. Ramana Murthy and M. Rajeevan (2018) National Assessment of Shoreline changes along Indian Coast - A status report for 1990 - 2016, NCCR Publication, 2018, available at NCCR Web site <http://www.nccr.gov.in>

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सचिव
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PREFACE

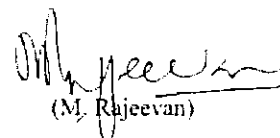
The coastal zone of the world is in constant change due to natural and anthropogenic activities. Natural processes such as waves, tides, littoral currents, sea-level rise, severe storm events etc., have influence on shoreline changes at local and regional scales. While, human activities further aggravate these changes, as they interrupt the natural coastal processes and modify the sediment transport, which leads to rapid changes in the coastline.

The coastline of India is undergoing changes due to various anthropogenic and natural interventions. Population explosion along the coastal area has added to an increase demand for coastal resources. Precise information on shoreline changes is essential to address the various coastal problems such as coastal erosion, closure of river / lagoons creeks mouths, etc. Thorough understanding of Long-term shoreline change, its behaviour, extent, etc are required before implementing any coastal protection scheme. It is also important to understand the causes of erosion to undertake proper safeguards in building structures, and infrastructure in eroding coastal areas. Coastal managers and policy makers need accurate information on long term shoreline changes before implementing any structure on coast.

The National Centre for Coastal research, Chennai an attached office of Ministry of Earth Sciences is engaged in mapping the shoreline changes along Indian coast to enhance the country's preparedness to face coastal hazards like storm-surges, tsunami etc and to guide the sustainable coastal development. Now NCCR has prepared a status report on shoreline changes for the period 26 years (1990 to 2016) using 9 shoreline data sets i.e. year 1990, 2000, 2006, 2008, 2012, 2013, 2014, 2015 and 2016. It provides details of shoreline changes, 3 types of map, shoreline vulnerability for erosion / accretion, land loss / land gain etc for entire mainland coast of India. These maps will be available online for each of the coastal state UT on the NCCR's website.

I congratulate Dr. M. V. Ramana Murthy, Director, NCCR, Dr. R. S. Kankara, Head, Coastal Processes and Shoreline Management Group, NCCR, Project Team and expert committee for bringing out the status report on Shoreline changes along Indian coast for the period of 1990 -2016. I also thank Dr. Shailesh Nayak, Former Secretary, MoES for conceptualising this important activity and reviewing the mapping work.

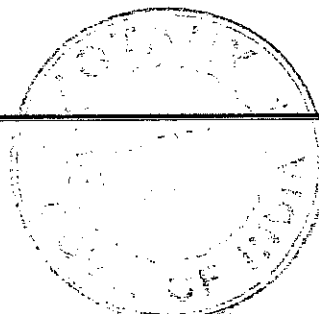
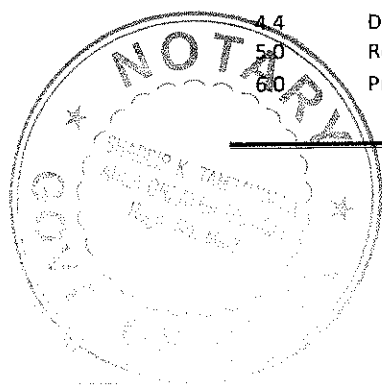
I hope this information will be very useful to coastal managers and other stakeholders in identifying critical area for coastal management to safeguard property and population living in coastal areas.


(M. Rajeevan)

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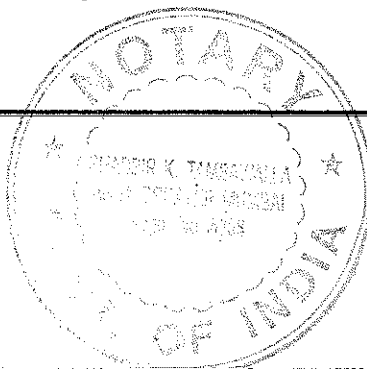
National Assessment of Shoreline changes along Indian Coast (1990 - 2016)

EXECUTIVE SUMMARY

Beach erosion is a chronic problem along many shores of the Indian coast. As coastal population continues to grow and community infrastructures are threatened by erosion, there is increased demand for accurate information regarding past and present trends and rates of shoreline movement. There is also a need for a comprehensive analysis of shoreline movement that is inconsistent from one coastal region to another. To meet these national needs, the National Centre for Coastal research (NCCR) is carried out a study on shoreline changes along mainland of India. One purpose of this work is to develop standard, repeatable methods for mapping and analyzing shoreline movement so that systematic periodic updates on shoreline changes, coastal erosion hotspots, land gain/ loss etc. can be made for Indian coast.

In the case of the analysis of shoreline change along Indian coast, the shoreline proxy is interpreted as wet/dry line in sandy shore, vegetative line and sea shore facing direction of seawall. This report, summarizes the methods of analysis, interprets the results, provides information on shoreline changes for the period of 1990 to 2016, and rates of change. Shoreline change analyses are based on a comparison of different shoreline positions digitized from satellite images. The shorelines position covers a variety of time periods ranging from 1990 to 2016. Long-term rates of change are calculated using all 9 different ya shorelines positions i.e. for the year 1990, 2000, 2006, 2008, 2012, 2013, 2014, 2015 and 2016. The rates of change presented in this report represent conditions up to the date of the most recent shoreline data and therefore are not intended for predicting future shoreline positions or rates of change. The Indian mainland was analyzed separately in a state-wise manner for the purpose of reporting regional trends in shoreline change rates.

About 6031 km long coastline was mapped in 1:25000 to analyse the temporal shoreline changes during 1990 to 2016 using 9 data sets. The results are classified in three categories i.e. erosion, stable and accretion. Overall, about 33% of coastline is under varying degree of coastal erosion, 29% is of accreting nature condition and the remaining 38% falls stable state. The state wise analysis suggests that the more that 40% of erosion is noticed in four states/UT i.e. West Bengal (63%), Pondicherry (57%), Kerala (45%) and Tamil Nadu (41%) coast. While accretion is exceeding to 40% along Odisha (51%) and Andhra Pradesh (42%) coast. The west coast of India (except Kerala) is mainly stable condition, along with isolated pockets of eroding coast. Land loss and land gain analyses revealed that West Bengal coast has lost about 99 sq km land during last 26 years. The shoreline changes along with infrastructure details, ports, industries, anthropogenic activities, are also mapped. 526 maps are generated for entire Indian coast for identifying the vulnerable coastal areas in 1:25000 scales along with 66 district maps, 10 state /UT maps. These maps shall be updated regularly. The outcome of the project is aimed to generate the systematic information on coastal changes at various temporal scales, its nature, and extent, needed to evolve better management solutions.



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National Assessment of Shoreline changes along Indian Coast (1990 - 2016)

1. Introduction

The shoreline is constantly influenced by sea level variations, climate and ecosystems that occur over a wide range of time-scales. The combination of natural and manmade activities often exacerbates the shoreline change and increases the risk factors to coastal community. Shoreline change is one of the three identified environmental concerns considered for the developmental activities such as ports, harbour, fishing jetties and embankment facilities. The changing position of shoreline over time is of elemental importance to coastal scientists, engineers, and managers for coastal management and engineering design for coastal development. Precise shoreline information is required for the design of coastal protection, structures calibration/verification of numerical models, assessment of sea-level rise, preparation of hazard zones, formulation of policies, the regulation of coastal developmental activities, etc. A systematic long-term shoreline change study can provide information on shoreline reorientation due to structures, changes in beach width, land loss, land gain and historical rate of changes.

Major causes for shoreline change

Shoreline is subject to change due to natural and manmade activities (P. Bruun and B. U. Nayak, 1980). Some of the changes are summarized below:

Natural Causes

1. Action of Waves: Waves are generated by offshore and nearshore winds, which blow over the sea surface and transfer their energy to the water surface. As waves move towards the shore, waves break, and the turbulent energy is released to the water column. This energy stirs up and moves the sediments deposited on the seabed.
2. Winds: Wind act not just as a generator of waves, but also aids in the landward movement of dunes (Aeolian erosion).
3. Tides: Tides are rise and fall in water elevation due to the attraction of water masses by the moon and the sun. During high tides, the energy of the breaking waves is released higher on the foreshore.
4. Nearshore currents: Sediments scoured from the seabed are transported away from their original location by currents. The transport of (coarse) sediments defines the boundary of coastal sediment cells, i.e. relatively self-contained system within which (coarse) sediments stay. Currents are generated by winds, tides (ebb and flood currents), wave breaking at an oblique angle with the shore (longshore currents), and the backwash of waves on the foreshore (rip currents). All these currents contribute for shoreline changes.
5. Storms: Storms generate storm surges and high energy waves. Combined with high tides, storms may result in catastrophic damages. Besides damages to coastal infrastructure, storms cause beaches and dunes to retreat tens of meters in a few hours.

6. Sea Level Rise: Sea level has risen about 40 cm in the past century and is projected to rise another 60 cm in the next century. Sea level has risen nearly 110 meters since the last ice age. Due to global warming, average rise of sea level is of the order of 1.5 to 10 mm per year. It has been observed that sea level rise of 1 mm per year could cause an inundation of the order of about 0.5 m per year (IPCC report).

Anthropogenic Causes

Human influence, particularly urbanization and economic activities, in the coastal zone has turned coastal erosion into a problem of growing intensity. Anthropological effects that trigger shoreline changes are: construction of coastal structures, mining of beach sand, offshore dredging and damming of rivers. Human intervention can alter the natural processes through the following actions:

- dredging of tidal entrances and navigational channels
- construction of harbours and coastal structures such as groins and jetties
- River water regulation works such as damming
- hardening of shorelines with seawalls
- beach nourishment
- Destruction of mangroves and other natural buffers
- Beach sand mining

1.1 Shoreline and its definitions

Coastal scientists and other coastal agencies have been quantifying the shoreline change rates for many decades. There are various definition of shoreline identified and some of them are summarized here.

The line of contact between land and water is defined as shoreline. In other term shoreline is defined as the intersection of a specified plane of water with the shore or beach (e.g., the high water shoreline would be the intersection of the plane of mean high water with the shore or beach).

However, the shoreline approximates the mean high-water line on coast and Geodetic Survey nautical charts and surveys. In Coast Survey usage, the term is considered synonymous with coastline (Shalowitz, 1962). The line delineating the shoreline on National Ocean Service nautical charts and surveys approximates the mean high water line (USACE, 1984).

Apparent shoreline is the line drawn on a map or chart in lieu of a mean high-water line or the mean water level line in areas where either may be obscured by marsh, mangrove, cypress, or other type of marine vegetation. This line represents the intersection of the appropriate datum on the outer limits of vegetation and appears to the navigator as the shoreline (Ellis, 1978).

High-Water Line Mark: A line or mark left upon tide flats, beach, or alongshore objects indicating the elevation of the intrusion of high water. The mark may be a line of oil or scum along shore objects, or a more or less continuous deposit of fine shell or debris on the foreshore or berm. This mark is physical evidence of the general height reached by wave run-up at recent high waters. It should not be confused with the mean high water line or mean higher high water line (Hicks, 1984).



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High-water line - Visible in the field and can be identified by the change in grey or colour tone on aerial photographs or satellite imagery (Zhang et al., 2002). This definition makes it more practical when satellite imagery is concerned.

Different proxies for shoreline position are used to analyse the coastal changes. Some of the proxies of shoreline positions are High Water Line (HWL), wet-dry line, vegetation line, dune toe or crest, toe of the beach, cliff base or top and Mean High Water Line (MHWL) etc. Earlier days, High Water Line in Toposheets was also used as one of the shoreline positions.

1.2 Indian coast and its Geomorphology in general

Indian mainland coast includes 9 coastal states and 2 union territories having 66 coastal districts. Morphology of the coast consists of 43% sandy beach, 11% rocky coast, 36% of muddy flats 10% of marshy coast, 97 major estuaries and 34 lagoons (CPDAC Report). There are 13 major ports, 46 fishing harbours and 187 minor ports.

Table 1: Coastal geomorphic features of India

Sl. No.	State	Landforms and features
East coast of India		
1	Tamil Nadu	Deltas, long narrow beaches, spits, tidal flats, mangroves, coral reefs, sand dunes, Ridge swale complex etc.
2	Andhra Pradesh	Deltas, long narrow beaches, spits, mangroves, Cliffs, long sand dunes, Ridge swale complex etc.
3	Odisha	Deltas, long beaches, spits, tidal flats, long sand dunes, Ridges etc.
4	West Bengal	Large delta, very thick mangroves, tidal channels, islands, dunes, tidal flat, beaches etc
West Coast of India		
5	Kerala	Estuaries, lagoons, barriers, spits, dunes, Tombolo, cliff, beaches etc
6	Karnataka & Goa	Estuaries, spits, sand dunes, Tombolo, cliff, wave cut platforms, beaches etc
7	Maharashtra	Estuaries, cliffs, small sand dunes, Tombolo, cliff, wave cut platforms, pocket beaches etc
8	Gujarat	Marshy land, tidal flats, estuaries, cliffs, mud flats, mangroves wave cut platforms, beaches etc.

Coastal geomorphology deals with the shaping of coastal features (landforms), the processes at work on them and the changes taking place. The shore is the zone between the water's edge at low tide and the upper limit of effective wave action, usually extending to the cliff base. It includes the foreshore exposed at low tide and submerged at high tide and the backshore extending landward from the normal high tide limit, but inundated by exceptionally high tides or by large waves during storms.

Coastal geomorphology is susceptible to coastal changes and plays an important role in determining the impact of sea-level rise. Every landform offers certain degree of resistance to erosion. For example, rocky coast and wave-cut benches offers maximum resistance. On the other hand, sandy beaches, sand dunes, mudflats, mangroves, etc, show least resistance to sea-level rise.

East coast is mostly dominated by coastal plains and is wider with many large deltas, lagoons, mangroves, long and wide stretches of sand dunes, ridges and beaches are the common features observed along the coast. Along the west coast, most common geomorphic features are rocky coast, headlands, cliffs, estuaries and bays, etc. The general distribution of geomorphic features along the Indian coast is given in Table 1.

1.3 Past studies on Shoreline mapping in India

Several proxies are being used worldwide for shoreline change studies. In India, NCSCM has prepared shoreline change maps for few coastal states. The shoreline changes maps were prepared by considering the latest shoreline for year 2010 as a onetime exercise in 1:50,000 scale.

Further, SAC has prepared shoreline change maps with Central Water Commission in the form of Atlas (1: 25000 scale). The major objective of this activity is to prepare a digital shoreline change atlas in GIS environment on 1:25,000 scale using satellite data (1989-91 and 2004-06). This report gives an overview of erosion/accretion by plotting 2 high water line polygons obtained from land use /land cover mapping work carried out at SAC earlier for these two different periods of datasets i.e. 1989-91 and 2004-06. However, these maps don't depict the temporal behaviour and non-linear changes of shoreline, which is very essential for coastal management.

1.4 Shoreline proxies adopted Shoreline mapping at ESSO-NCCR

In 2013 ICMAM has conducted a R&D study on shoreline changes using different proxies and varying datasets and prepared a report on methodology for shoreline change mapping. In this report, ICMAM proposed high Water line (HWL) mark as shoreline position considering the varying coastal features, other variability and limitations of RS data along Indian coast. In August 2014, a committee of experts from ICMAM, INCOIS and NCESS evaluated the results and recommended that,

- In sandy shore, "**wet/dry line**" which is clearly identifiable from all images was considered as shoreline proxy. This wet/dry line is equivalent to **high Water line (HWL)** mark from all satellite images. The identification of the feature "**wet/dry line**" from the images is as follows: on a rising tide, it is equal to maximum run up line, and on falling tide, it is equal to part of beach which is still wet, but it may be beyond the instantaneous run up limit.
- **Vegetative line** is considered as shoreline proxy, where there is no sandy beach. The waves directly interact with the vegetations along the coast. Seashore facing direction of vegetative limits is demarcated as shoreline proxy and it can be clearly interpreted with the satellite images.
- In case of **artificial structures** (seawalls), the sea shore facing direction of seawall is considered as shoreline position. In rocky coast, cliff base or sea shore edge is considered as shoreline position.

1.5 Scope of Long-term shoreline change mapping

The knowledge on shoreline changes, its behaviour, erosion in historical perspective and related morphological characteristics are primary requirements for coastal development and shore protection projects. Though some attempts are made, systematic information of Indian coast based on widely

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accepted, standardized method of shoreline change is not available. Therefore, in XII plan (October 2012), MoES (ICMAM) was entrusted the task of studying shoreline changes along the Indian coast using remote sensing, field investigation, Numerical modelling and GIS. The main objectives of this work are:

- ↓ To assess the consistency and generate reliable information of complex systems of the Indian coast using a standard method
- ↓ To prepare shoreline change maps using standard protocol (1:25000 scale) for the entire coast.
- ↓ To carry out shoreline change analysis at state and district levels.
- ↓ To estimate annual land loss / land gain due to shoreline changes.
- ↓ To initiate a web based coastal service on annual shoreline changes along the Indian coast.

2. Data used

Satellite data sets are used as the primary data source. The Multi-temporal satellite data such as Landsat TM, ETM+, IRS- P5 (Cartosat-1), IRS-P6 (LISS-III) and (LISS-IV) were used to calculate the shoreline change for different years (Table 2).

Table 2: Details of satellite data used

List of Image	Pixel Size(m)	Date	Source
Landsat 5 TM	30.0	1989-1992	USGS
Landsat 7 ETM+	30.0	1999-2001	USGS
IRS P5 (Cartosat-1) PAN	2.5	2005-2006	INDIAN
IRS P6 (Resourcesat-1) - (LISS-III)	23.5	2008	INDIAN
Resourcesat 2 - (LISS-IV)	5.8	2012	INDIAN
Resourcesat 2 - (LISS-IV)	5.8	2013	INDIAN
Resourcesat 2 - (LISS-IV)	5.8	2014	INDIAN
Resourcesat 2 - (LISS-IV)	5.8	2015	INDIAN
Resourcesat 2 - (LISS-IV)	5.8	2016	INDIAN

3. Methodology

Shoreline evolution is one of the most significant factors in analyzing the change rate. There are several approaches to calculate the rates of shoreline change, such as numerical models and remote sensing technique. Remote sensing technique and GIS technology are considered as dominant tools for quantifying the shoreline change on temporal scale (Nayak. S., 2002). By integrating the modern techniques of remote sensing and GIS, rates of shoreline change would be easily and quickly determined for any given area. The methodology adopted for shoreline change calculation is shown in the flow chart (Figure 1).

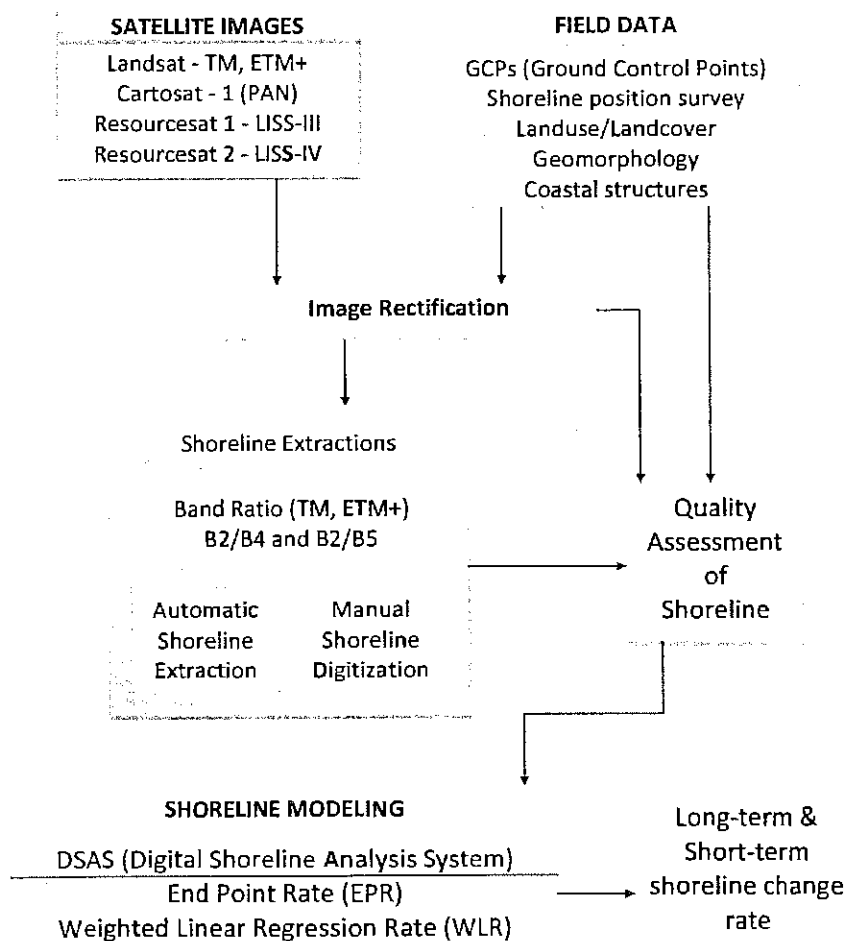


Figure 1: Flow chart of methodology

3.1 Determination of shoreline from Remote Sensing and field data

Determination of shoreline position from satellite data is very subjective due to limiting factors, such as, different ranges of tide induced variability, variations in meteorological conditions, inequalities in data resolution, seasonal setup and scaling of RS data during different periods of data acquisition. In the past, the researchers had used various proxies such as high tide line (HTL) (Fisher and Overton, 1994; Stockdonet *al.*, 2002), high water line (HWL) (Fenster and Dolan, 1999), wet-dry line (Overton et

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al., 1999), vegetation line (Hoeke *et al.*, 2001), dune toe or crest (Stafford and Langfelder, 1971), toe or Berm of the beach (Norcross *et al.*, 2002), cliff base or top (Moore *et al.*, 1998) and mean high water (MHW) line (Galgano and Leatherman, 1991). However, it becomes subjective to extract these proxies in practical sense due to varying geomorphology of coastal environment. Some of the shoreline proxies which are commonly used in shoreline extraction are shown in Figure 2.

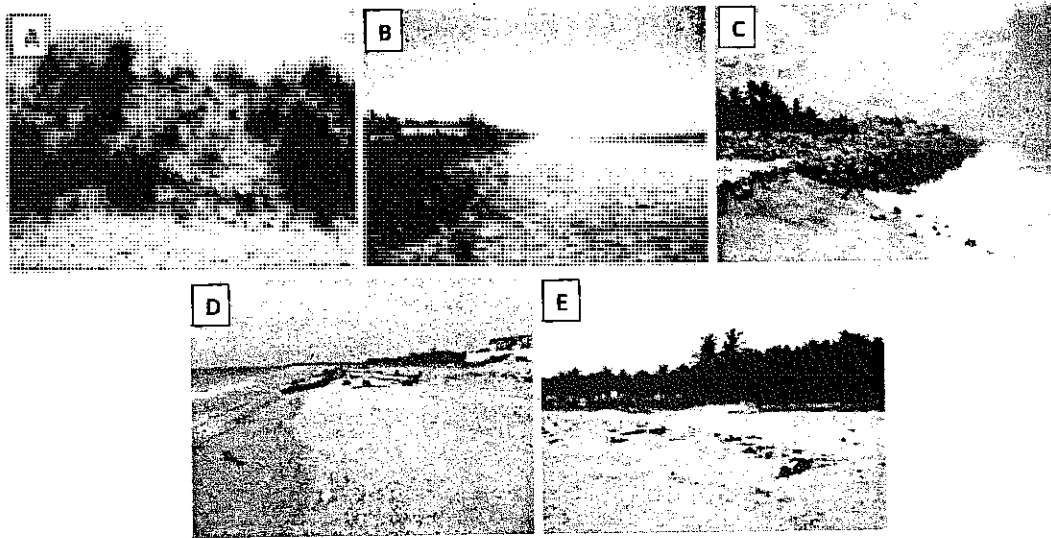


Figure 2: Shoreline proxies used for shoreline extraction. A-Sand dunes with vegetative cover. B-Vegetative line. C-Riprap structures in case there is no sandy shore. D-High water line (HWL). E- Debris brought by the waves.

3.2 Shoreline extraction from satellite data

Before analyzing the shoreline change rate, it is necessary to define the shoreline proxy for any particular scenes used in the analysis. Advantages and limitations of the coast have to be understood before defining the shoreline position within the available data source. Same proxy cannot be used for the entire coast due to different geomorphological conditions.

In the present study, semi-automated method (automatic and manual digitization) was carried out to extract the shoreline. It can reduce the pixel misinterpretation error which is more common in automatic method. The shoreline proxy used in the analysis also varies from place to place. Therefore, semi-automated method is the best suited for shoreline extraction.

3.3 GIS database for shoreline mapping

The 'GEODATABASE' term describes any information system that integrates, stores, edits, analyzes, shares and displays geographic information for informed decision making. GDB supports all the different elements of GIS data used by ArcGIS. The shoreline GDB includes the attribute fields such as ObjectID (a unique number assigned to each transect, shape, shape length, ID, date (original survey year) and uncertainty values for calculating the rate. The other information stored in GDB format are shoreline rate file, field photographs, co-ordinates, base map information and sediments locations.

3.4 Shoreline change calculation

There are many statistical methods used by DSAS to calculate the shoreline change rate. These methods are End Point Rate (EPR), Linear Regression Rate (LRR) and Weighted Linear Regression (WLR). Of these methods, EPR and WLR are used for the analysis. DSAS is purely a statistical approach which gives output based on input parameters such as date and year.

3.4.1 Periodic changes

End point rate (EPR)

The minimum requirement is 2 data sets of shoreline over a time to compute shoreline movement. This is a simple and popular approach adopted to calculate the shoreline change rates by dividing the distance of shoreline movement by time elapsed as given in figure 3.

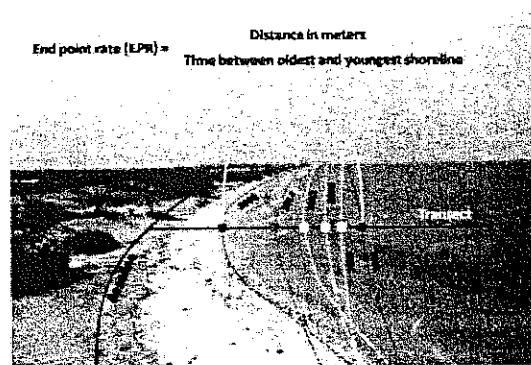


Figure 3: Shoreline change: End point rate method (distance between the 1990 and 2016 shorelines divided by the span of time elapsed between the two shoreline positions; all other shoreline data are ignored in this computation).

3.4.2 Cumulative changes

Weighted linear regression rate (WLR)

The cumulative shoreline changes are computed considering the nine series of data sets. These rates are calculated by determining a linear regression rate-of-change (fitting a least-square regression lines) for point /transect along the coast. Further, a weightage was attached to shoreline data considering the measurement and positional uncertainties involved in obtaining the data. Fine resolution/quality data sets are given greater emphasis or weightage towards determining a best-fit line in comparison with unreliable or poor data sets, i.e. the regression line can be placed in such a way that the sum of the squared residuals is minimized.

The weight (w) is defined as a function of the variance in the uncertainty of the measurement (e): $w = 1/(e^2)$, where, e = shoreline uncertainty value. The uncertainty and shoreline position at these transects are used to calculate the rate-of-change statistics. Figure 4 shows the shoreline positions of a particular transect plotted with respect to time. The error bar in shoreline measurement point is obtained after adding the weighted values to each shoreline position.

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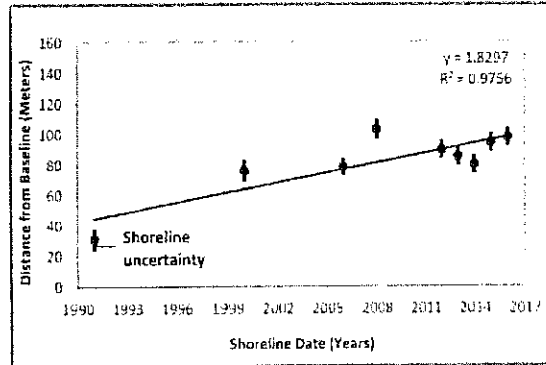


Figure 4: Shoreline change by the weighted linear regression rate method (determined by plotting the shoreline positions with respect to time and calculating the linear regression equation of y . The slope of the regression line is the rate).

3.5 Uncertainty in shoreline measurement

Further the accuracy of shoreline positions extracted from remote sensing data is influenced by several factors such as positional uncertainties (Seasonal error, Tidal fluctuation, Conversion error) and measurement uncertainties (Digitizing, Pixel, Rectification & T-sheet plotting error).

There are issues in shoreline mapping in wider intertidal zones. The extraction of "HWL" or "wet/dry line" from various images has potential uncertainties and errors with reference to tide and resolution. Therefore, the same may be accounted while considering these positional and measurement uncertainties, which may be within the limitations of the data itself.

Positional Uncertainties: related to the features and phenomena that reduce the precision and accuracy of defining a shoreline position from a given data set such as Seasonal error (E_s), and Tidal fluctuation (E_{td}).

Measurement Uncertainties: related to the skill and approach such as Digitizing error (E_d), Rectification error (E_r) and Pixel error (E_p).

Finally, overall total uncertainty value has been estimated for each shoreline by accounting for both positional and measurement uncertainties as:

$$Et = \pm \sqrt{E_s^2 + E_{td}^2 + E_d^2 + E_p^2 + E_r^2} \longrightarrow \text{Eqn 1}$$

This approach considers varying rate of changes between each dataset by fitting a least-square regression line for all datasets. In this approach, high resolution data sets are given greater emphasis or weightage towards determining a best-fit line in comparison with unreliable or poor data sets.

The total uncertainties considered in the analysis are given in Table 3

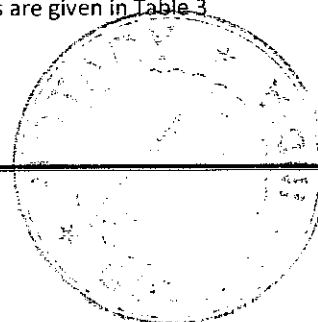
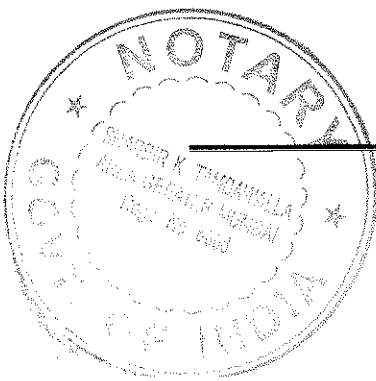


Table 3: List of uncertainties used in the analysis

Errors	Consideration	Uncertainty Value
Tidal error	Tidal values are taken from the tide table and tidal stations along the coast. The tidal value differs from place to place based on the station.	Tide range from the nearest station
Seasonal error	Seasonal error is the horizontal distance along the coast. This error mainly depends on the coastal slope. The coasts are either steep or gentle. Taking this factor in to account the seasonal error to be considered.	based on the slope (availability of slope data is a question; or 5 - 10 m based on the regions)
Digitizing error	Digitizing the shoreline is a difficult task. Digitizing the shoreline position by the same analyst may change when he does it again. After considering all the factors, the error is fixed.	Half of the pixel size is considered.
Rectification error	Rectification error is the error obtained from the ortho-rectification process. The RMSE error thus obtained during rectification is considered as error value.	RMSE value (the rectification accuracy should be maintained with in a pixel)

3.6 Field database

Field work was undertaken for entire coastal region of India, mainly focusing to collection of GCPs, shoreline tracking during satellite pass time, sediment data collection, validation/verification of landuse/landcover and geomorphology.

3.6.1 Shoreline mapping

Shorelines were tracked for select locations using handheld GPS instrument. Shoreline tracking was carried out mainly during the satellite pass time. The shoreline extracted from satellite imagery is then cross validated with the shoreline tracked from the field. Plate 1 shows the shoreline tracking along Battigavuru coast, Andhra Pradesh.

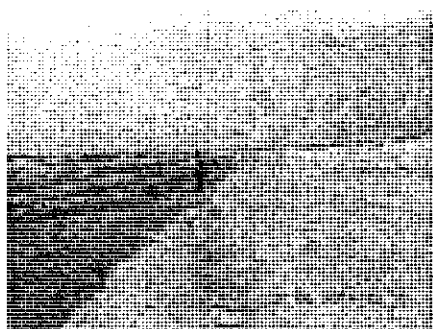


Plate 1. Shoreline tracking along Battigavuru, Andhra Pradesh



Plate 2. GCP collection at NH-5, Srikakulam, Andhra Pradesh

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3.6.2 Collection of Ground Control Points (GCP's)

GCPs were collected to rectify the satellite imagery which is used for shoreline extraction. 15km width from the coast is considered as the boundary for GCP collection. All the GCPs were evenly collected all along the image for minimising the error while extracting the shoreline positions. All the satellite images should be brought into a common projection system (WGS 84) so that the error or shift in the images can be reduced. GCP collection at NH-5, Srikakulam , Andhra Pradesh is shown in Plate 2.

3.6.3 Sediment Sample Collection

About 1050 Sediment samples were collected at various locations along Indian coast (Figure 5). Three samples (foreshore, bermline and backshore) at each location were collected. Position of sampling locations was observed by hand-held GPS. In the laboratory, dead shells were separated from sediments and the mixed saline content was removed from the grains by washing with water. The grain size distribution was carried out using a sieve shaker and it consisted of 8 sieves containing mesh sizes of 75 μ m, 125 μ m, 180 μ m, 250 μ m, 355 μ m, 500 μ m, 1000 μ m and 2000 μ m. The statistical parameters such as mean, standard deviation, skewness and kurtosis were computed by (Folk and Ward, 1957) using the GRADISTAT grain size distribution and statistical package (Blott and Pye, 2001). The sediment sample collection in the foreshore at Lakshmipuram, AP is shown in Plate 3.

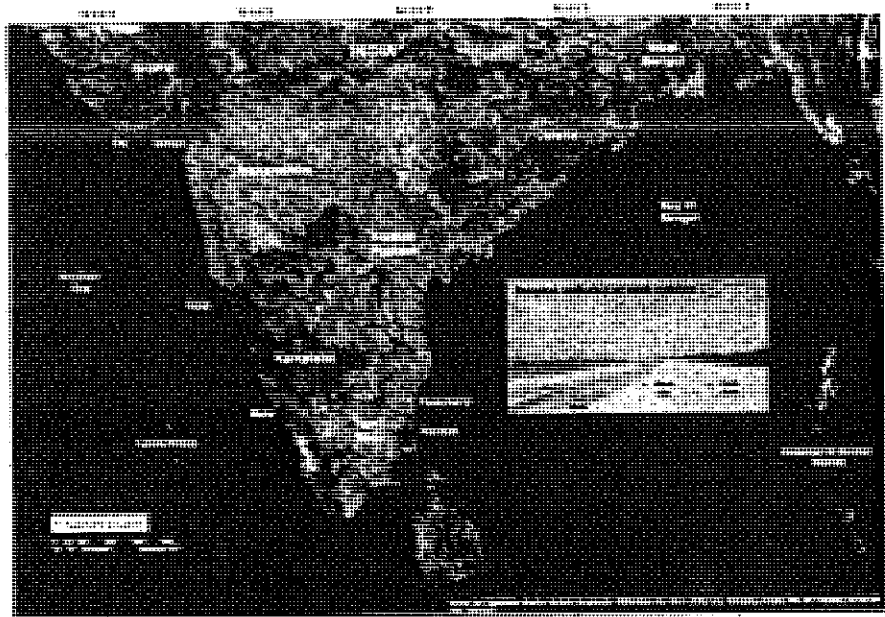


Figure 5: Locations of sediment samples collected along coastline



Plate 3. Sediment collection at Lakshmipuram, Andhra Pradesh

3.6.4 Landuse/Landcover feature identification/validation

Management of coastal areas depends on understanding the different uses of coastal land and the physical processes impacting on the coast. Hence delineation of landuse and landcover is important for understanding the impact of shoreline changes. The land features thus digitized from imagery is then classified based on the NRSC classification schemes. Resourcesat-2 (LISS-IV) data were used to classify the land features and results were validated with field observation at select locations.

3.7 Other observations

3.7.1 Beach Width

The width of the beach changes continually because beaches are naturally dynamic, and their width can be altered by human activities or natural processes.

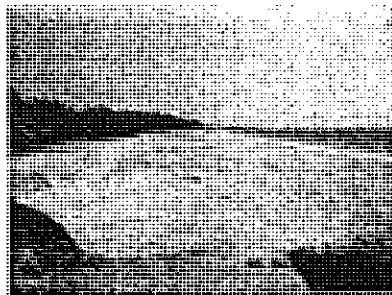


Plate 4. Beach during non-monsoon season at Midalam, Tamil Nadu



Plate 5. Beach during monsoon season at Midalam, Tamil Nadu

Measuring the beach width gives indirect evidence about the erosion process at any given coastal sites. In most of the places beaches erode during monsoon season, and again regain in post-monsoon season (Plates 4&5). Therefore, understanding of these features is very important to precisely measure the shoreline from satellite images.

3.7.2 Artificial Structures

The major artificial structures adopted for coastal protection are seawalls and groins. The jetties, fishing harbours and ports are constructed at many coastal sites for development purpose. Construction of any structure on the coast naturally causes erosion in the downdrift side and accretion in the updrift side. Extensive field work was carried out for mapping these artificial structures to calculate the shoreline positions precisely (Plates 6 to 8).



Plate 6. Damaged seawall at Thengaipattinam, Tamil Nadu



Plate 7. Pier at Valathura, Kerala



Plate 8. Seawall at Chellanam, Kerala

3.8 Quality check

There are several geospatial standards, viz. Natural Resources Information System (NRIS), National Natural Resources Management System (NNRMS), National Spatial Data Infrastructure (NSDI) and National Urban Information System (NUIS), are being used in India. These standards were used for quality check at NCCR in integrated manner to suite our requirement. The broad points are given below:

- NCCR has prepared a Standard Operating Protocol (SOP) to generate shoreline change map at 1:25000 scale. The description of each standard is shown in **Annexure-1**.
- Image rectification, shoreline digitization, and map accuracy were followed as per NNRMS standard. The rectification accuracy is maintained within a pixel using 2nd order polynomial method.
- The planimetric shoreline map accuracy was maintained within 1mm in scale at 90% confidence interval and classification accuracy of 90% at 90% confidence interval.
- Considering the uncertainties, shoreline change rate was analyzed using weighted linear regression rate method along with 85% confidence interval (DSAS manual).

3.9 Mapping of Shoreline Change

The results obtained from the analysis of shoreline changes are in the form of numbers i.e., $\pm m/yr$, where + is for accretion, and - is for erosion. These quantitative results are plotted in GIS environment using standard mapping format in 1:25000 scale. However, mapping requires classifications of accretion/erosion rates in sub-classes considering the magnitude of changes. The classification of shoreline changes is further a subjective aspect. We have classified the shoreline change rates into seven classes (Table 4) (Kankara et al., 2014). The marginal change of $\pm 0.5m/yr$ is considered as no change or stable coast, in view of uncertainties in the data.

Table 4: Shoreline classification schemes used in the analysis

Classification	Rate (m/year)	Colour Schemes
High Erosion	< -5.0	—
Moderate Erosion	-5.0 to -3	
Low Erosion	-3.0 to -0.5	
Stable Coast	-0.5 to 0.5	
Low Accretion	0.5 to 3.0	
Moderate Accretion	3.0 to 5.0	—
High Accretion	> 5.0	—

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4. Status of shoreline changes along the Indian coast

4.1 Status of coastal erosion along the Indian mainland

About 6632km long shoreline (in 1:25000 scale) distributed among nine coastal states and two union territories was analyzed for the period 1990-2016 to estimate the shoreline change i.e., erosion, accretion and stable. Coastal erosion has become one of the most alarming threats in varying pockets along the Indian coast. Shoreline length used in the analysis is the shoreface length (excluding the interior parts of river /creeks) obtained from Resourcesat-2, LISS-IV satellite data (by zooming in 1:15000 scales). The shoreline analysis suggests that 33% of coast is eroding, 29% is accreting and 38% is in stable state (table 5).

Table 5: Summary of shoreline changes along the Indian coast

Sl No	States		Shoreline used for mapping (in km)	Status of the coast					
				Erosion		Stable		Accretion	
				km	%	km	%	km	%
1	West Coast	Gujarat, Daman & Diu	1701.78	434.78	26	741.46	43	525.54	31
2		Maharashtra	739.57	178.26	24	472.67	64	88.64	12
3		Goa	139.64	16.82	12	95.58	68	27.24	20
4		Karnataka	313.02	70.02	22	151.16	48	91.84	30
5		Kerala	592.96	263.04	45	201.52	34	128.40	21
6	East Coast	Tamil Nadu	991.47	407.05	41	353.56	36	230.86	23
7		Pondicherry	41.66	23.80	57	14.63	35	3.23	8
8		Andhra Pradesh	1027.58	272.34	27	320.98	31	434.26	42
9		Odisha	549.50	153.80	28	113.52	21	282.18	51
10		West Bengal	534.35	336.52	63	68.78	13	129.05	24
Total			6631.53	2156.43		2533.86		1941.24	
%				33		38		29	

The state-wise analysis suggests that in the West Bengal (63%) and Pondicherry (57%) coasts, erosion exceeds more than 50%, followed by Kerala (45%) and Tamil Nadu (41%). Odisha (51%) is the only coastal state which is having more than 50% of accretion, followed by Andhra Pradesh with 42%. Apart from Kerala coast, coasts in other states on the west coast of India fall in stable condition. More than 50% of West Bengal and Pondicherry coasts are under erosion, followed by Kerala (45%) and Tamil Nadu (41%). Odisha is the only coastal state which has more than 50% accretion followed by Andhra Pradesh with 42%. The state-wise details of shoreline change status are given in Tables 6&7.

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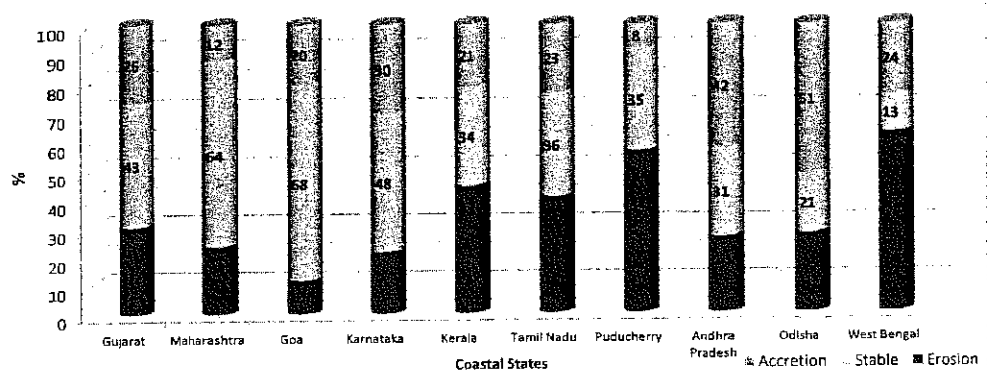


Figure 6:Shoreline change status of Indian coastal states in percentage

Table 6: Erosion-stable-accretion status along the west coast of India

SL No	State	Coast Length (in km)	Coast length (in km)						
				Moderate Erosion	Low Erosion	Stable	Low Accretion	Moderate Accretion	High Accretion
1	Gujarat, Daman and Diu	1701.78		46.04	447.84	741.98	357.64	50.06	27.26
2	Maharashtra	739.57	2.54	9.38	166.34	472.67	78.22	5.38	5.04
3	Goa	139.64	0.08	1.46	15.28	95.58	23.00	3.52	0.72
4	Karnataka	313.02	2.20	4.46	63.36	151.16	81.64	8.12	2.08
5	Kerala	592.96	5.30	8.98	248.76	201.52	96.50	14.68	17.22
Total		3486.97	37.62	74.48	850.82	1662.392	727.44	78.04	56.18
%			1	2	24	48	21	2	2

Table 7: Erosion-stable-accretion status along the east coast of India

SL No	State	Coast Length (in km)	Coast length (in km)						
				Moderate Erosion	Low Erosion	Stable	Low Accretion	Moderate Accretion	High Accretion
1	Tamil Nadu	991.47	14.66	36.65	355.74	353.56	194.27	23.96	12.63
2	Puducherry	41.66	0.00	0.32	23.48	14.63	1.45	1.78	0.00
3	Andhra Pradesh	1027.58	101.50	32.78	138.06	320.98	273.58	67.18	93.50
4	Odisha	549.50	68.26	30.50	55.04	113.52	138.94	45.60	97.64
5	West Bengal	534.35	173.64	51.96	110.92	68.78	56.26	19.80	52.99
Total		3144.56	358.06	152.20	683.24	871.47	664.51	158.31	256.76
%			11	5	22	28	21	5	8

4.2 Status of land loss and land gain due to shoreline changes

Land loss and gain due to shoreline changes were quantified in square kilometres (sq.km) by geoprocessing shorelines of 1990 and 2016 in GIS environment (figure 7). The results elucidate significant amount of land either gained or lost during the above time frame. It can be seen that the coastal states of Gujarat, Andhra Pradesh, Odisha and West Bengal have undergone drastic change in the past 26 years. Land gain of greater than 60 sq.km is observed along the states of Gujarat and Odisha. In Andhra Pradesh, Kerala and Tamil Nadu both land gain as well as loss is seen to have occurred simultaneously in significant amounts. Land gain is slightly higher than land loss in Andhra Pradesh and Kerala; however in case of Tamil Nadu it's reverse (land loss is more than gain). States in the Konkan sector along the west coast of India viz., Maharashtra, Goa and Karnataka are seen to exhibit very less changes. Land gain and loss in these states are of the order of 0.55 and 5.84 sq.km respectively. Of all the states maximum land loss is in West Bengal, 99.05 sq.km is seen to have lost by erosion. Over all during 1990 to 2016, about 231.50 sq.km of land is gained by accretion and 234.25 sq.km land is lost by erosion along the Indian mainland.

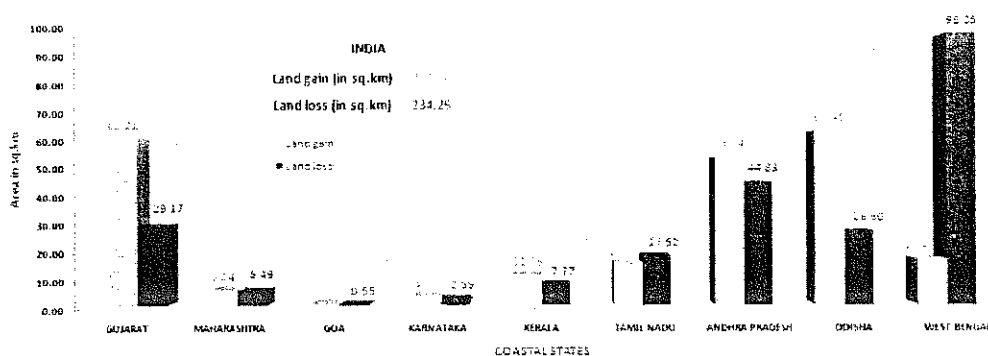


Figure 7: Land loss/land gain distribution along Indian coast.

4.3 List of Shoreline change maps in 1:25000 scale

The shoreline change maps for both long and short term were prepared in 1:25,000 scale and shall be hosted on NCCR website. These maps are being updated every subsequent year. The details state-wise maps are listed in Table 8 and Gird wise information is listed in Annexure-1.

Table 8: Total number of 1:25,000 scale maps along the Indian coast

East coast of India		
Sl. No	State	Number of maps(1:25,000)
1	Tamil Nadu & Puducherry	80
2	Andhra Pradesh	89
3	Odisha	46
4	West Bengal	29
West coast of India		
5	Kerala	55
6	Karnataka & Goa	32
7	Maharashtra	45
8	Gujarat and Daman & Diu	150
Total Numbers		526

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Considering the maximum and minimum values of the shoreline change rate, the shoreline is divided into seven categories as low erosion, moderate erosion, high erosion, stable, low accretion, moderate accretion and high accretion (figure 8). The status of the shoreline change along with infrastructure details, assessment of erosion, locations likely factor of erosion ports, industries, anthropogenic activities, will also be provided the shoreline change maps. The map will be updated every year. The overall distribution of shoreline change rate along the Indian coast for 1990-2016 is shown in figure 6.

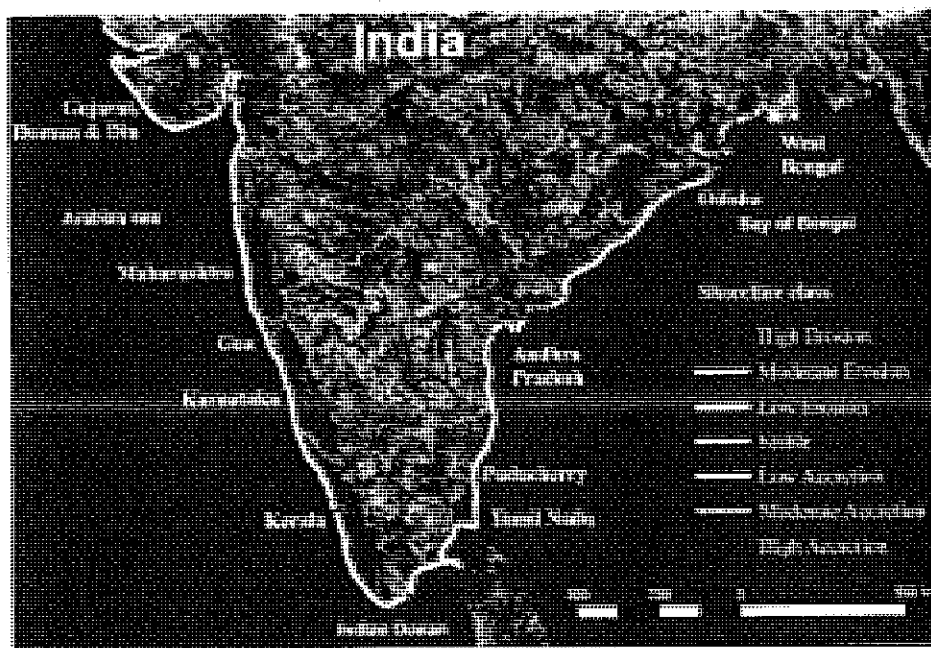
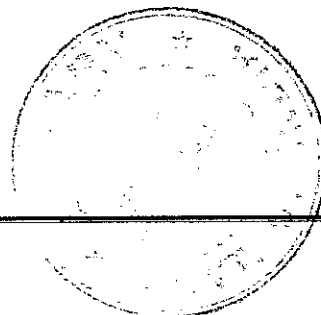
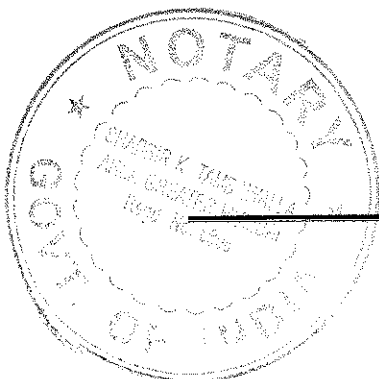


Figure 8: Shoreline change map along Indian coast (1990-2016)



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4.3.2 Maharashtra

The coastline of Maharashtra is more or less N-S oriented and is bound by Arabian Sea in the west and Western Ghats in the east, with narrow coastal tract. Rivers like Terekhol, Karli, Savitri, Vashi, Shastri, Patalganga, Kundalika, Ulhas and Vaitarna and 5 major creeks are reported along the coast. The drainage pattern is parallel to sub parallel structurally controlled by joints and faults. Rocky Coast, Sandy shores, Muddy and mangrove shore are the coastal types prevalent here with the occasional presence of patches of corals in places like Malvan. Rivers, creeks and outcrops from foot hills of Sahyadri highly dissect the coast and contribute to the diversified coastal configuration and beaches along this stretch. The coastal stretch constitutes 7 districts, viz., Sindhudurg, Ratnagiri, Raigad, Mumbai city, Mumbai suburba, Thane and Palghar.

Coastal length of the state is estimated to be approximately 740 km from 2016 satellite imagery. Shoreline change analysis carried out along the 740 km of coast from 1990-2016 elucidates that around 24% of the coast is eroding, 12% is accreting and 64% remains in stable condition. It is seen that Sindhudurg, Ratnagiri and Raigad districts of the state is dominated by stable coast with a few pockets of low erosion and accretion. Upon moving north of Thane creek, from Mumbai to northern end of the state in Thane district, erosion is evident. Coastal protection measures taken in the form of ripraps, seawall etc., can be observed along the districts of Palghar, Thane and Mumbai.

Accretion is observed along Malvan, Tarkarli, Gad River, Girye, Devgad, Undi, Ambolagad, Velas, Revadanda, Alibag, Akshi and Aksa regions. Above mentioned places are seen to accrete naturally. Artificial land reclamation of 20.23 ha is observed north of Mahim bay in Mumbai. Rocky coast of the state constitutes to about 331.08 km, which remains in stable condition. Coast of Shiroda and Anjarle are also found to exhibit stable condition. Beach in Vengurla, Mirya, Velshwar, Dabhol, Murud, Shrivarshan, Arvai, Diveaga, Kihim, Erangal, Manori, Gorai, Bordi, Kelva and Shrigaon are observed with erosion.

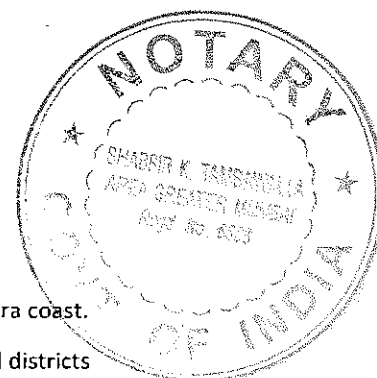
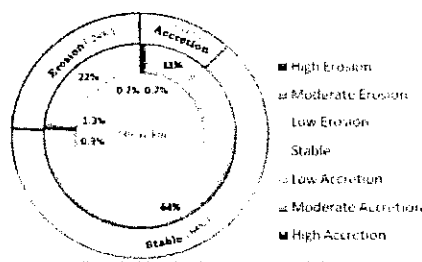


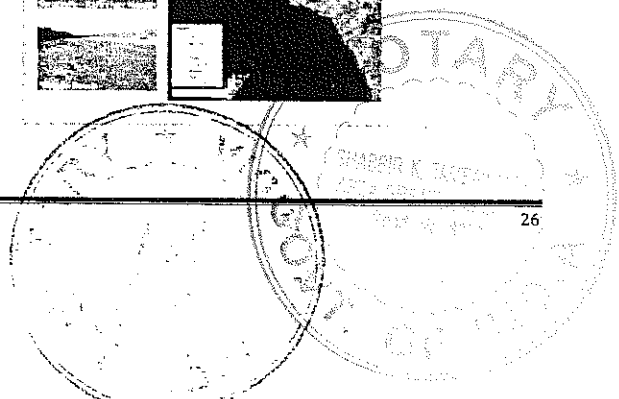
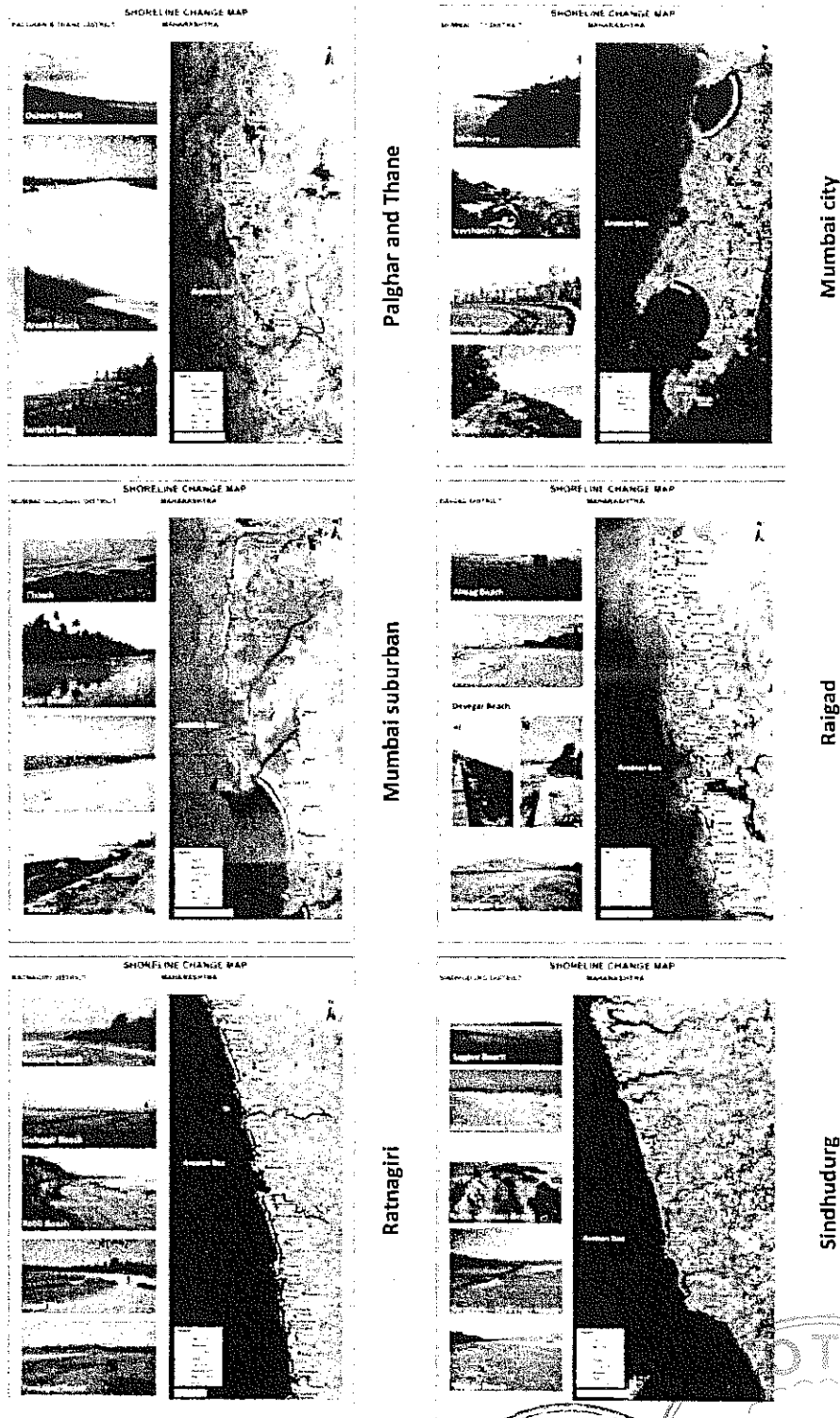
Figure 13: Percentage of shoreline change rate along Maharashtra coast.

Table 10: Erosion-stable-accretion status of Maharashtra coastal districts

SL No	District	Coast Length (in km)	Coast length (in km)						
				Moderate Erosion	Low Erosion	Stable	Low Accretion	Moderate Accretion	High Accretion
1	Sindhudurg	137.02	0.04	0.20	6.50	82.00	46.88	1.02	0.38
2	Ratnagiri	258.93	0.78	1.08	36.32	203.39	15.80	0.82	0.74
3	Raigad	134.83	0.58	2.90	42.98	81.73	5.16	0.70	0.78
4	Mumbai city	41.02	0.00	0.00	1.34	38.36	1.32	0.00	0.00
5	Mumbai suburban	41.15	0.02	0.22	17.54	18.77	2.78	0.58	1.24
6	Palghar & Thane	126.64	1.12	4.98	61.66	48.44	6.28	2.26	1.90
TOTAL		739.57	2.54	9.38	166.34	472.67	78.22	5.38	5.04

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Figure 15: Coastal district of Maharashtra



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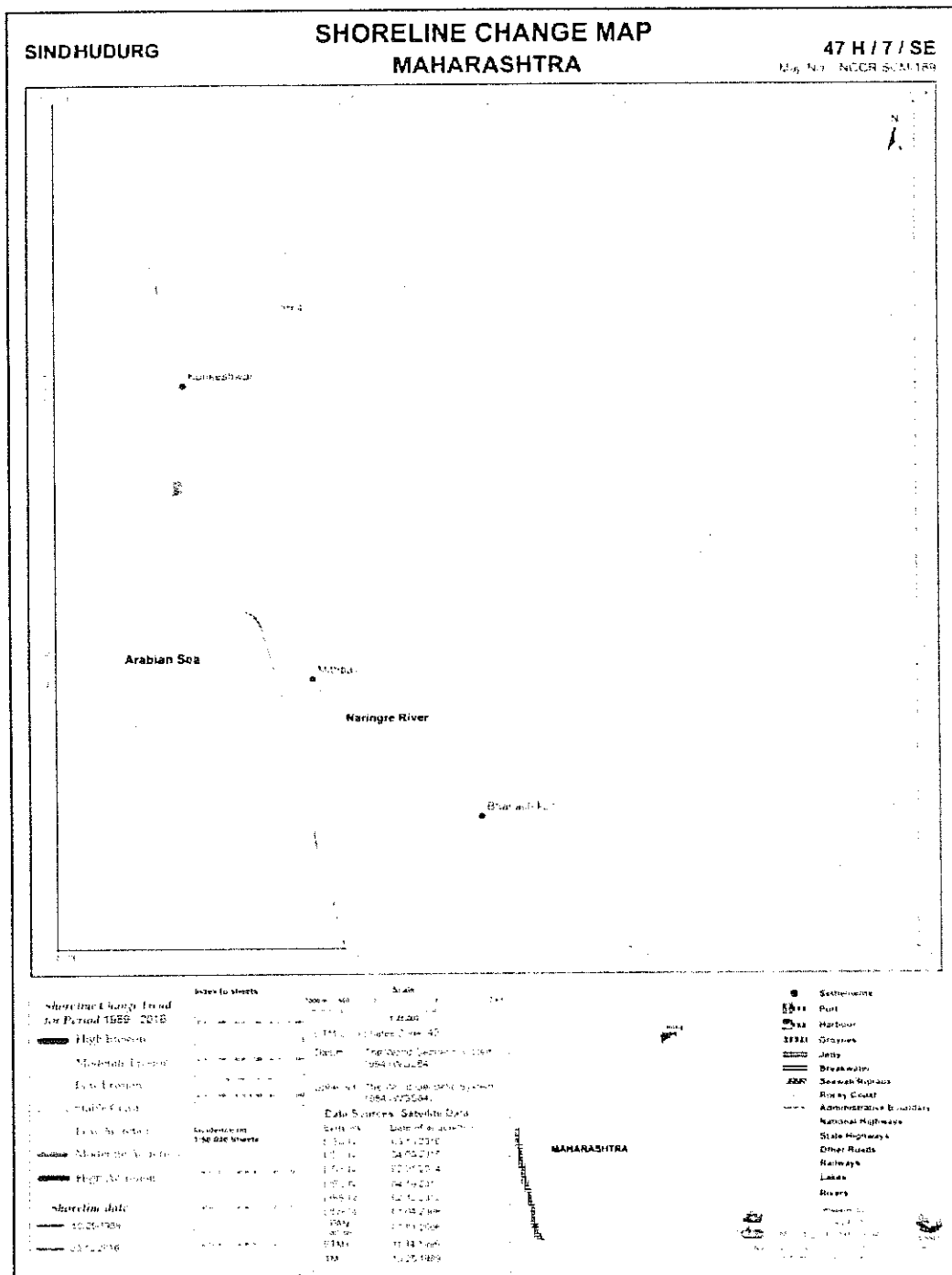


Figure 16: 1:25,000 scale map of Sindhudurg district, Maharashtra.

629

4.3.3 Goa

Geomorphologically the coast of Goa can be divided into three sections - long, linear and wide beaches of north, central bay area around Aguada&Mormagao and rocky cliff with pocket beaches of south. Zuari, Mandovi, Chapora, Talpona andGalgibag are a few of the important rivers flowing through the state. These rivers drain into Arabian Sea forming estuary at their mouth region. About 12 species of mangroves are found along the estuaries in the state. Morjim beach found north of Chapora River is nesting site of endangered olive ridley sea turtles. Picturesque beaches along the coast attract international tourists and promote economy of the coastal belt through tourism. Port in Mormagao bay of the state is one of the biggest natural ports of south Asia.

Coast length of Goa is about 140 km as measured from 2016 satellite imagery. Shoreline analysis of the state from 1990 - 2016 shows that around 68% of the coast is in stable condition, 20% is accreting and 12% is eroding. The coast of North Goa district is stable with a few pockets of erosion and accretion regions. It's observed that 29% of North Goa district is eroding. South Goa is also dominated by stable coast with about 20% of the coast showing accretion. Major portion of the Goa coast which comes under stable category constitutes rocky cliff, headlands and promontories of basaltic origin which are resistant to wave action. Headlands and promontories occurring in the stretch play an important role in controlling the morphology of the beach adjacent to them. Sediments along the pocket beaches get circulated within the headland, bounding their ends depending on season.

In figure 18, we find that accretion is observed in Majorda, Velsao, Arossim, Utorda, Colva, Morbor, Betul regions of South Goa and northern part of Calangute beach, northern bank of Chapora river and along coastal stretch from Harmal to Mandrem of North Goa. Erosion is seen in the coast of Keri, Vagotor, southern part of Calangute, Mandrem to Morjim, Candolim in North Goa and Palolem, Talpona, north of Galgibaga and region from Varca to Cavelossim in South Goa.

Sl No	District	Coast Length (in km)	Coast length (in km)						
				Moderate Erosion	Low Erosion	Stable	Low Accretion	Moderate Accretion	High Accretion
1	North Goa	36.40	0.06	1.36	9.18	19.46	6.08	0.22	0.04
2	South Goa	103.24	0.02	0.10	6.10	76.12	16.92	3.30	0.68
TOTAL		139.64	0.08	1.46	15.28	95.58	23.00	3.52	0.72

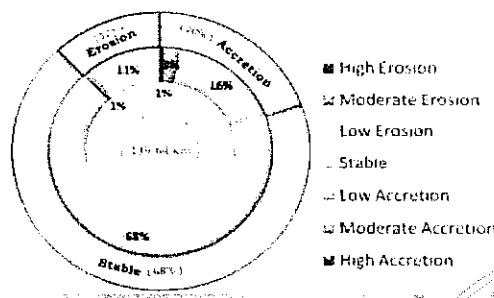


Figure 17: Percentage of shoreline change rate along Goa coast.

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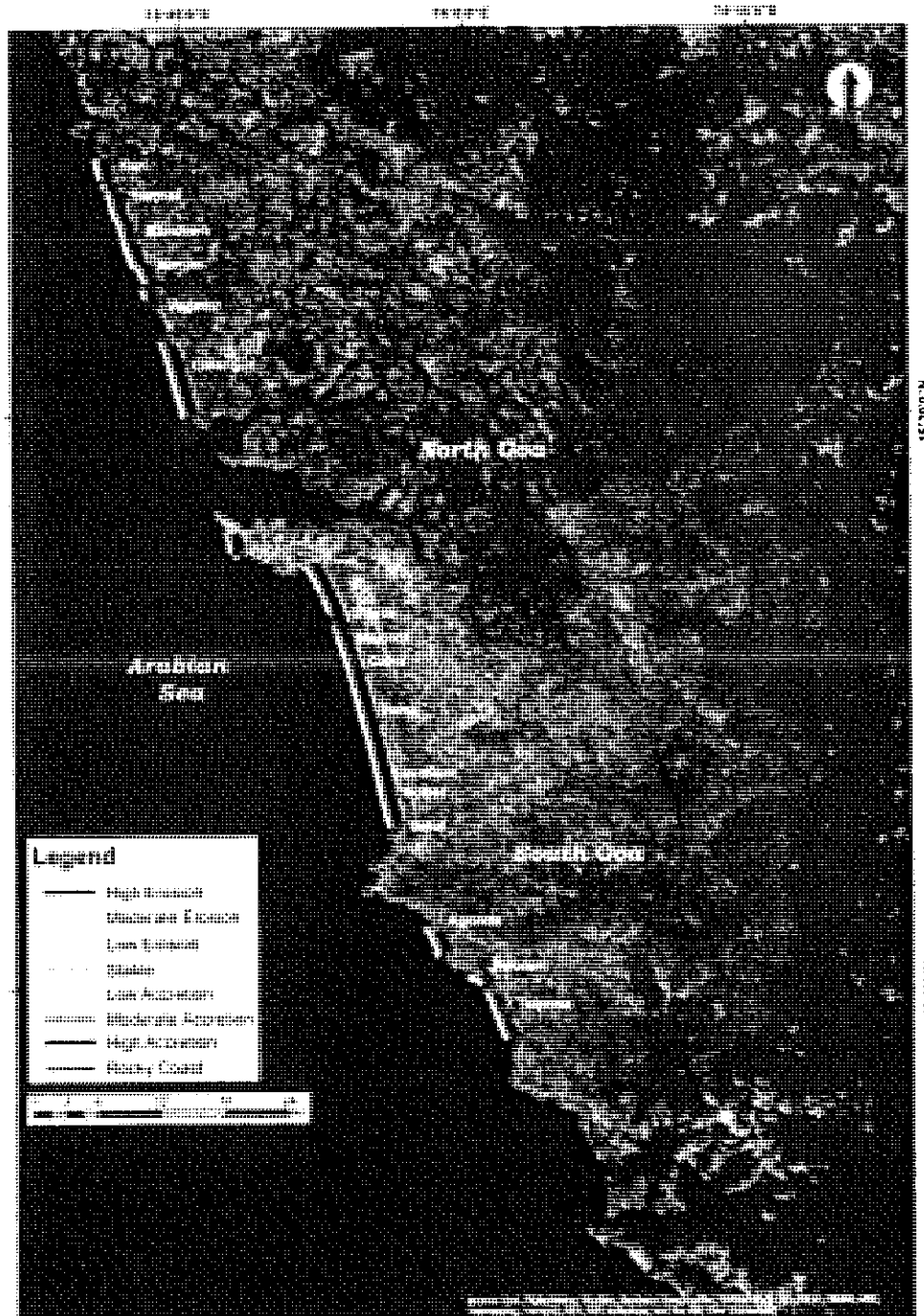


Figure 18: Shoreline change map of Goa coast (1990-2016).

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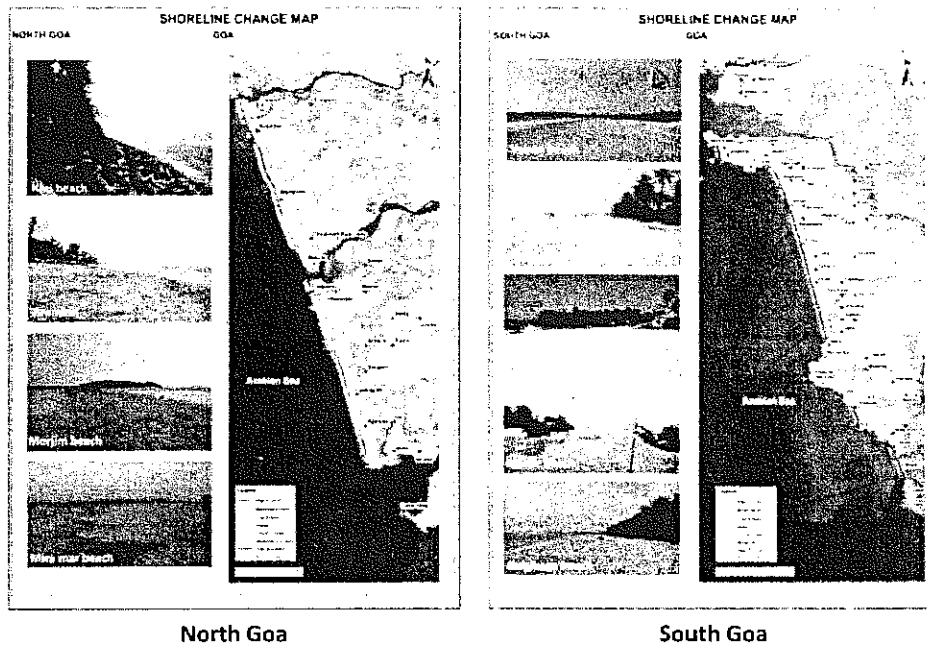


Figure 19: Coastal district of Goa

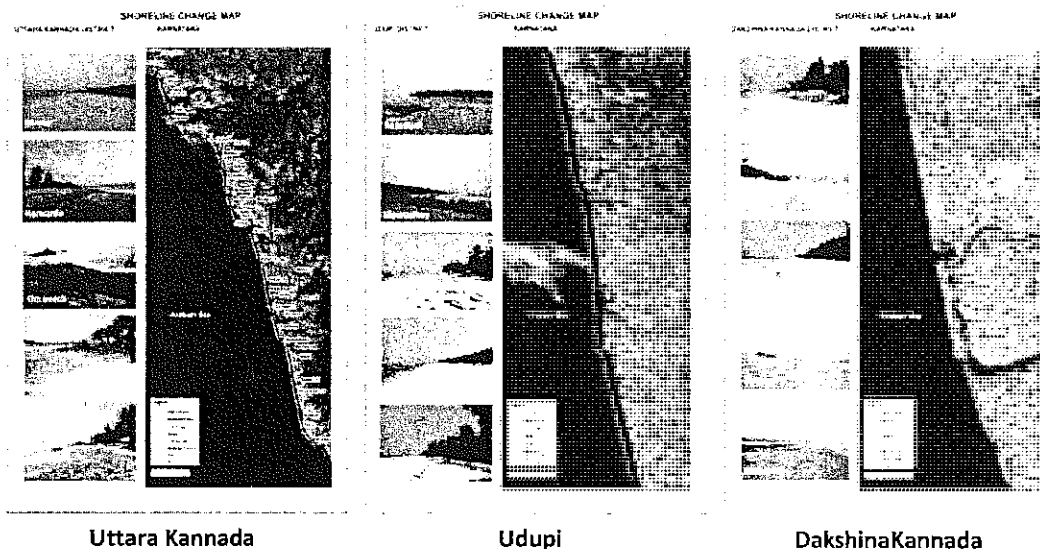
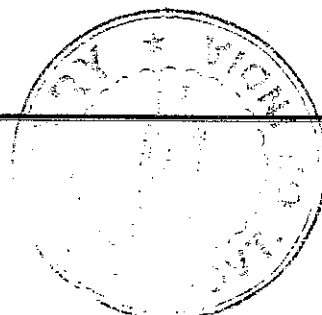


Figure 20: Coastal district of Karnataka



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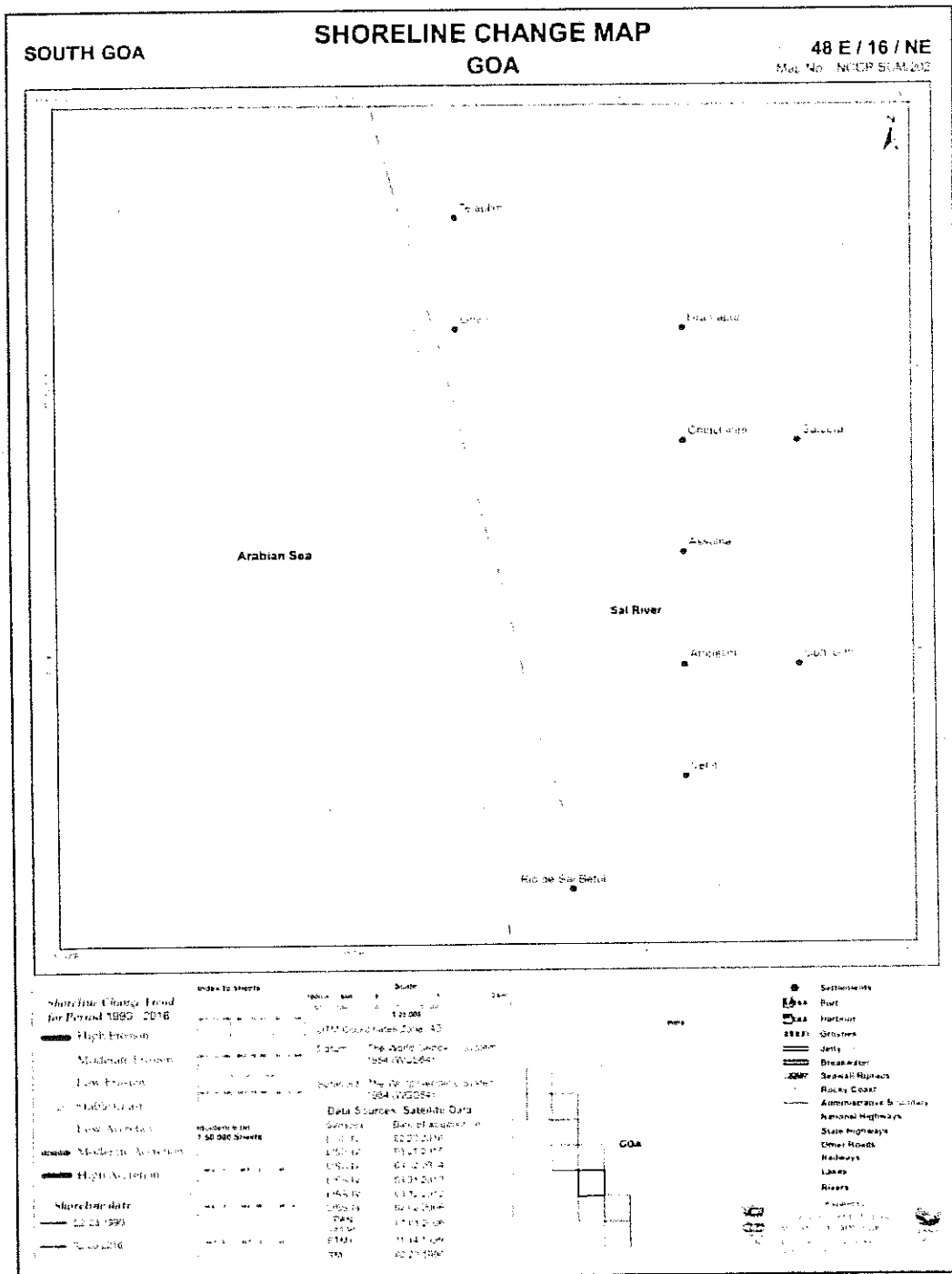


Figure 21: 1:25,000 scale map of South Goa district, Goa.

True Copy

[Signature]
Advocate

TRUE COPY
[Signature]
Zaman Ali
Advocate, High Court

ANNEXURE A-15

F. No. 12-10/2021-IA.III
Government of India
Ministry of Environment, Forest and Climate Change
IA-III Section (CRZ)

633

Indira Paryavaran Bhawan,
Jor Bagh Road,
New Delhi - 110003
Dated: 29th September, 2021

To,

The Member Secretary,
Maharashtra Coastal Zone Management Authority,
Environment & CC Department,
15th Floor, New Administrative Building,
Mantralaya, Mumbai-400 032, Maharashtra

Subject: Coastal Zone Management Plans of Mumbai City and Mumbai Sub-Urban in the State of Maharashtra as per CRZ Notification, 2019-regarding.

Sir,

This has reference to letter No. MCZMA 2021/CR 6/TC 4, dated 09/06/2021 furnishing therein the Coastal Zone Management Plans (CZMPs) of Mumbai City and Mumbai Sub-Urban in the State of Maharashtra, drawn as per the provisions of the Coastal Regulation Zone (CRZ) Notification, 2019.

2 The National Coastal Zone Management Authority (NCZMA) in its 43rd meeting held on 16/08/2021 has recommended the CZMPs of Mumbai City and Mumbai Sub-Urban District of Maharashtra for approval as per CRZ Notification, 2019. NCZMA further decided that the CZMP of Mumbai City and Mumbai Sub-Urban Districts shall also include the ESZ, if any, and revise the CZMP accordingly, if required. NCZMA also decided that the activities/projects prohibited in the notified ESZ falling within approved CZMP, if any, shall remain prohibited in that area.

3 In this regard, it is to state that based on recommendation of the NCZMA, the Ministry of Environment, Forest and Climate Change hereby conveys its approval of the CZMPs for the Mumbai City and Mumbai Sub-Urban in the State of Maharashtra subject to the following:

- (i) The CZMP of Mumbai City and Mumbai Sub-Urban Districts shall also include the ESZ, if any, and CZMP shall be revised accordingly, if required, after due approval of Ministry
- (ii) The activities / projects prohibited in the notified ESZ falling within approved CZMP, if any, shall remain prohibited in that area.
- (iii) The CZMPs of Mumbai City and Mumbai Sub-Urban based on the provisions of CRZ Notification, 2019 are signed by all concerned and copy of the same is made available in the website of MCZMA in public domain.

[Handwritten signature]

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4. Further, it is to inform that all proposals in Mumbai City and Mumbai Sub-Urban, received henceforth for CRZ Clearance shall be considered as per CRZ Notification, 2019 only. However, pending proposal under CRZ notification 2011, if any, may be considered at the discretion of project proponent.

5. This issues with the approval of the Hon'ble Minister, EFCC.

Yours faithfully,



(Dr. H. Kharkwal)
Additional Director &
Member Secretary (CRZ)

Copy to:

1. The Addl. Chief Secretary, Government of Maharashtra, Department of Environment, Room No. 27, 2nd Floor, Mantralaya, Mumbai-400 032, Maharashtra.
2. The APCCF (C), MoEF&CC Regional Office (WCZ), New Secretariat Building, Civil Lines, Nagpur, Maharashtra.
3. The Director, National Centre for Sustainable Coastal Management, Anna University, Chennai, Tamil Nadu-600025.
4. Office copy / Guard file.



(Dr. H. Kharkwal)
Additional Director &
Member Secretary (CRZ)

TRUE COPY

Zaman Ali
Advocate, High Court

Pdp

**IN THE HIGH COURT OF JUDICATURE AT BOMBAY
ORDINARY ORIGINAL CIVIL JURISDICTION**

PUBLIC INTEREST LITIGATION NO. 28 OF 2021

Vanashakti & Anr.

.. Petitioners

Versus

Union of India & Ors.

.. Respondents

Mr. Venkatesh Dhond, Senior Advocate with Mr. Akash Rebello,
Mr. Zaman Ali i/by Mr. Zaman Ali for petitioners.
Mr. Parag A. Vyas i/by A. A. Ansari for respondent no.1-UOI.
Mr. Milind More, Addl. Govt. Pleader for respondent no.2-State.
Ms. Sharmila Deshmukh for respondent no.3-MCZMA.

**CORAM: DIPANKAR DATTA, CJ &
M. S. KARNIK, J.**

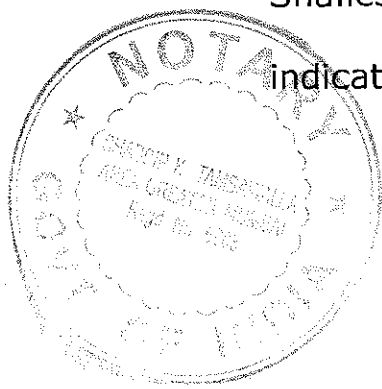
**HEARD ON: OCTOBER 7, 2021
ORDER ON: OCTOBER 8, 2021**

ORDER: [Per DIPANKAR DATTA, CJ.]:

1. The first petitioner is a public trust registered under the Bombay Public Trust Act, 1950. The second petitioner is a Director of the first petitioner.
2. By instituting this writ petition dated March 25, 2021 ~ in the Public Interest Litigation jurisdiction of this Court ~ the petitioners have mounted a challenge to a notification bearing

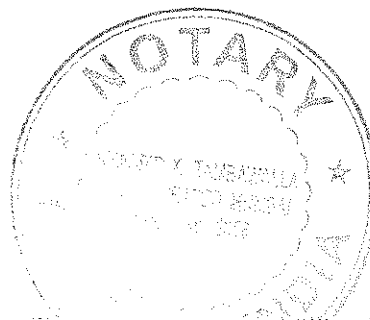
no. G.S.R 37 (E) dated January 18, 2019 (hereafter "the impugned notification") issued by the Ministry of Environment, Forest and Climate Change (hereafter "the Ministry") in exercise of powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (hereafter "the Environment Act"). Such notification purports to supersede the Coastal Regulation Zone Notification 2011 (hereafter "the 2011 Notification") bearing no. S.O. 19(E) dated January 6, 2011.

3. Recitals in the impugned notification would reveal that the Ministry had received representations from various coastal States and Union Territories, besides other stakeholders, regarding certain provisions in the 2011 Notification related to management and conservation of marine and coastal ecosystems, development in coastal areas, eco-tourism, livelihood options and sustainable development of coastal communities, etc., together with requests to address the concerns related therewith. Pursuant thereto, the Ministry constituted a Committee under the Chairmanship of Dr. Shailesh Nayak to examine various issues and concerns as indicated hereinabove and to recommend appropriate changes



in the 2011 Notification. The report submitted by the Nayak Committee was examined by the Ministry in consultation with various stakeholders. This led to issuance of a draft Coastal Regulation Zone Notification 2018 which was hosted in the website of the Ministry on April 18, 2018 seeking comments and suggestions from all concerned. After considering the objections and suggestions, as received, the impugned notification was issued with a view to conserve and protect the unique environment of coastal stretches and marine areas, besides livelihood security to the fisher communities and other local communities in the coastal areas and to promote sustainable development based on scientific principles taking into account the dangers of natural hazards and sea level rise due to global warming, and the areas specified therein were declared as Coastal Regulation Zone (hereafter "the CRZ").

4. The impugned notification is challenged on the ground that some of its provisions are manifestly arbitrary and violative of Article 14 of the Constitution, as well as violates the right to live in a healthy environment, and consequently violates the right to life of citizens protected by Article 21. It is further claimed that the reasoning for enacting many of the changes



leading to the CRZ have no nexus with the object sought to be achieved. Also, the impugned notification contains provisions which are reenactment of provisions earlier struck down as unconstitutional by the Supreme Court or have been read down by the Supreme Court in earlier judgments. The main prayer in the writ petition is for declaring the impugned notification illegal and *ultra vires* Articles 14 and 21 of the Constitution, and to declare that the 2011 Notification continues to be valid and binding. It has also been prayed that the respondents may be restrained from acting further on the basis of the impugned notification and for a direction on them to act in accordance with the 2011 Notification. There are alternative prayers. Reading such prayers, one gets the impression of the petitioners feeling aggrieved by bits and pieces of the impugned notification and have prayed that parts of certain provisions may be declared arbitrary, illegal and *ultra vires*. If the prayers are granted, the effect thereof would result in deletion of such bits and pieces from the impugned notification.

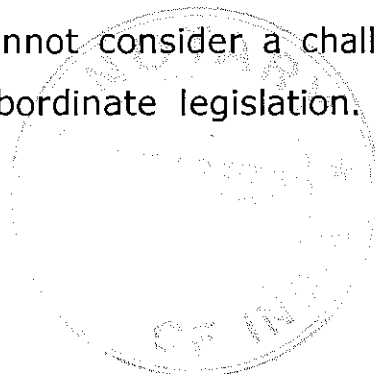
5. At the out-set, Mr. Dhond, learned senior advocate for the petitioners, was called upon to satisfy us that this writ petition touching upon environmental issues is maintainable before this

Court having regard to the remedy available to the petitioners before the National Green Tribunal (hereafter "the Tribunal") under the National Green Tribunal Act, 2010 (hereafter "the NGT Act").

6. While attempting to satisfy us that the writ petition is maintainable, Mr. Dhond has advanced the following four contentions: -

(a) Section 15 of the NGT Act, dealing with relief, compensation and restitution and section 16 thereof, providing for appellate jurisdiction, would not stand in the way of entertaining and trying this writ petition. The only provision under the NGT Act which may seem to have some relevance in the present case but not barring a writ petition touching environmental issues is section 14. The jurisdiction of the Tribunal under Section 14 relates to resolution of civil disputes; however, since the prayer of the petitioners is to strike down a subordinate legislation as unconstitutional, the Tribunal under section 14 would have no such power. This is because this Court has consistently taken a view that the Tribunal cannot hear a challenge to the constitutional vires of legislation or a subordinate legislation.

(b) The Hon'ble Supreme Court has held that a statutory tribunal not constituted under Article 323A or Article 323B of the Constitution cannot consider a challenge to the vires of legislation/subordinate legislation. It therefore



matters not whether the challenge is under section 14 or section 16 of the NGT Act. The legislature cannot confer jurisdiction that it is not permitted by the Constitution to confer.

(c) The challenge to a statute/subordinate legislation is not a 'civil dispute' and hence the Tribunal is not clothed with the power or jurisdiction to examine it and strike down the statute.

(d) Without prejudice to the above, in the present matter, certain issues arise under the Maharashtra Regional and Town Planning Act, 1966 (hereafter "the MRTTP Act") inasmuch as the impugned notification effectively grants additional FSI (Floor Space Index) which is a matter which falls under the Development Control Regulations framed under the MRTTP Act. The writ petition, therefore, includes an issue that is incapable of being decided by the Tribunal.

7. In support of the proposition that the Tribunal has no power to strike down subordinate legislation, reliance has been placed on the Division Bench decision of this Court in **Central India Ayush Drugs Manufactures Association, Nagpur vs. State of Maharashtra**, reported in (2017) 1 Mh. L.J. 526. Reliance has also been placed on an unreported decision dated May 8, 2013 of another Division Bench of this Court in PIL No. 49 of 2013 [**Parshuram Uparkar vs. Union of India**]. In the

latter decision, law has been laid down on similar lines that the Tribunal has no power to examine the vires of a provision and strike it down. As to what would constitute a civil dispute, reference has been made to the decision of the Supreme Court in **Techi Tagi Tara vs. Rajendra Singh Bhandari & Ors.**, reported in (2018) 11 SCC 734. The decision in **Tamil Nadu Pollution Control Board vs. Sterlite Industries**, reported in (2019) 19 SCC 479, has also been relied on where, on interpretation of the decision in **L. Chandra Kumar vs. Union of India**, reported in (1997) 3 SCC 261, the Supreme Court has held that only a statutory tribunal constituted under Article 323A or Article 323B would have the power to strike down a legislation/subordinate legislation; and environment not being a subject enumerated under Articles 323A or 323B, an environmental tribunal deriving power from a legislative enactment, as distinguished from the Constitution, cannot strike down legislation on the anvil of it being in violation of Constitutional provisions.

8. It has also been contended, without prejudice to the aforesaid submissions, that the present matter would involve certain issues under the MRTP Act and such issues would be

incapable of being decided by the Tribunal. The contention advanced is that the Tribunal not having any specialized expertise to deal with issues pertaining to urban and town planning, this Court ought to exercise its jurisdiction. In this connection, once again the decision in **Parshuram Uparkar** (supra) has been relied on.

9. We have not considered it necessary to call upon the respondents to answer the contentions of Mr. Dhond.

10. Power conferred on the High Courts by Article 226 of the Constitution is very wide. Article 226 in terms does not place any limit on the Court's power. However, writ remedy being discretionary, the power has to be exercised judiciously bearing in mind certain self-imposed restrictions propounded by authoritative decisions of the Supreme Court. A writ court may decline interference if an alternative, efficacious and speedy remedy is available to the petitioner who approaches it with a grievance that his legal right has been infringed. This is not based on any rule of law, rather it is based on a rule of policy, convenience or discretion. There are four exceptions carved out by the Supreme Court and if any one of such exceptions is present in a particular case, the writ court may not to hesitate

to entertain the plea. However, here we are not concerned with an alternative remedy available to the petitioners in the sense that they can choose between two remedies made available by law. On the contrary, a remedy seems to be available to them under the NGT Act; and if we hold that the petitioners' plea is such that it can be entertained and decided by the forum created by the NGT Act, which also provides an appellate remedy before the Supreme Court on any one of the grounds mentioned in section 100 of the Code of Civil Procedure, it would seem to us that the NGT Act instead of providing an alternative remedy, provides the first remedy to an aggrieved party who seeks to raise a substantial question relating to environment; and after such remedy is exhausted, he may explore further remedies as law would provide. Apart from this, delay or laches in seeking redress before the writ court is one of the other restrictions based whereon a plea, howsoever meritorious, may not be entertained. We propose to proceed bearing these in mind.

11. The impugned notification has been issued by the Central Government in exercise of power conferred by section 3. Since sub-section (1) and clause (v) of sub-section (2) of section 3

are the provisions upon invocation of which the impugned notification has been issued in the manner required by sub-section (3), we consider it proper to reproduce the same hereunder for facility of convenience: -

3. Power of Central Government to take measures to protect and improve environment.—(1) Subject to the provisions of this Act, the Central Government shall have the power to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution.

(2) In particular, and without prejudice to the generality of the provisions of sub-section (1), such measures may include measures with respect to all or any of the following matters, namely:—

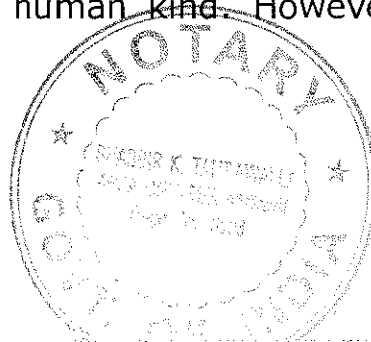
(v) restriction of areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards;

(3) The Central Government may, if it considers it necessary or expedient so to do for the purposes of this Act, by order, published in the Official Gazette, constitute an authority or authorities by such name or names as may be specified in the order for the purpose of exercising and performing such of the powers and functions (including the power to issue directions under Section 5) of the Central Government under this Act and for taking measures with respect to such of the matters referred to in sub-section (2) as may be mentioned in the order and subject to the supervision and control of the Central Government and the provisions of such order, such authority or authorities may exercise the powers or perform the functions or take the measures so mentioned in the order as if such authority or authorities had been empowered by this Act to exercise those powers or perform those functions or take such measures.

12. Bare reading of the aforesaid provisions would reveal that

section 3 empowers the Central Government to take all such measures, as it deems necessary or expedient for all such purposes as is referred to in sub-section (1) as well as in the various clauses of sub-section (2) including clause (v). It is with a view to implement the mandate of the Environment 1986 Act that the Central Government, upon superseding the 2011 Notification, has proceeded to issue the impugned notification. There can be no dispute that the Central Government has been placed in a position of trust by the people, who have expressed their will through their elected representatives leading to the relevant enactment, to ensure that no activities are allowed which ultimately can lead to unscientific and unsustainable development, and ecological destruction. Indeed, if there be a failure on the part of the Central Government to do so, it would be the duty of the Courts to scrupulously try to protect the ecology and the environment.

13. Till 2010, the Constitutional courts were approached either in its Public Interest Litigation jurisdiction or the "Green Bench" entrusted to hear environmental matters for resolution of disputes touching environmental issues and to address concerns for the benefit of human kind. However, with the



introduction of the NGT Act, which received the assent of the President of India on June 2, 2010, a new forum opened up where environmental issues could be tried and decided. The preamble of the NGT Act reads as follows:-

"An Act to provide for the establishment of a National Green Tribunal for the effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources, including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto".

14. In terms of section 3 of the NGT Act, the Tribunal has been constituted which has a retired Judge of the Supreme Court of India as its Chairman. The Tribunal also comprises of, *inter alia*, expert members and the qualifications for appointment as expert members are engrafted in sub-section (2) of section 5 of the NGT Act.

15. Section 14 of the NGT Act, which is the main provision falling for our consideration, reads as follows: -

14. Tribunal to settle disputes. - (1) The Tribunal shall have the jurisdiction over all civil cases where a substantial question relating to environment (including enforcement of any legal right relating to environment), is involved and such question arises out of the implementation of the enactments specified in Schedule I.



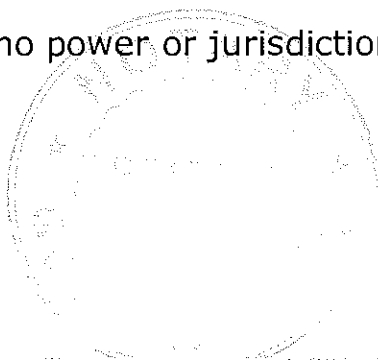
(2) The Tribunal shall hear the disputes arising from the questions referred to in sub-section (1) and settle such disputes and pass order thereon.

(3) No application for adjudication of dispute under this section shall be entertained by the Tribunal unless it is made within a period of six months from the date on which the cause of action for such dispute first arose:

Provided that the Tribunal may, if it is satisfied that the applicant was prevented by sufficient cause from filing the application within the said period, allow it to be filed within a further period not exceeding sixty days."

16. Section 15 of the NGT Act provides for relief, compensation and restitution to the victims of pollution and environmental damage. Section 16 has vested the Tribunal with appellate jurisdiction. These two sections do not create any hurdle for the petitioners.

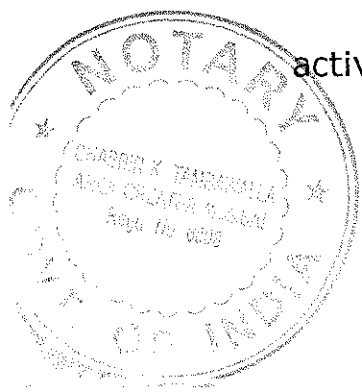
17. The Environment Act figures in Schedule-I of the NGT Act. Therefore, for the purpose of the present case, the plain meaning of sub-section (1) of section 14 is that the Tribunal shall have the jurisdiction to hear a civil case raising a substantial question relating to environment (including enforcement of any legal right relating to environment) subject, of course, to such question arising out of implementation of the Environment Act. The contention advanced before us is that the Tribunal cannot entertain a challenge to the impugned notification because it has no power or jurisdiction to declare a



delegated legislation unconstitutional or *ultra vires*. Let us now consider how far such contention is acceptable.

18. The first question that would necessarily fall for our consideration is, whether the impugned notification is a delegated legislation? The answer, for the following reasons, cannot but be in the negative.

19. We have read the terms of the impugned notification as well as the provisions, which are the source of its origin. Section 3 empowers the Central Government to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of environment and preventing, controlling and abating environmental pollution by restricting areas in which any industries, operations or processes or classes of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards. By the impugned notification, not only has the CRZ been declared but it proceeds to provide for areas requiring special consideration under the CRZ, prohibited activities and regulation of permissible activities within the CRZ, Coastal Zone Management Plan, CRZ clearance for permissible and regulated activities, etc. It has been notified with other measures for the



general information of the public. In effect, these are measures which are geared towards implementation of the Environment Act.

20. We need not burden this order with any discussion on what delegated legislation is. Suffice to say, the petitioners are laboring under a misconception that the impugned notification is a law brought into force by the Central Government in exercise of the power of delegated legislation conferred by the Environment Act. Far from it, we see the impugned notification as one which is a statutory order of the Central Government made in pursuance of what is called in Administrative Law as 'administrative delegation'. A legislature may confer upon an administrative authority not only the power to make rules and regulations to carry out the purposes of a statute but also the power to apply the law to particular cases by making orders in exercise of the statutory power. So far as the validity of such orders themselves are concerned, they are subject to the doctrine of *ultra vires* and must, therefore, be within the limits set by the statute. Sections 6 and 25 specifically empower the Central Government to make rules in respect of all or any of the matters referred to in section 3 and for carrying out the

purposes of the Environment Act, respectively. Pertinently, the Environment (Protection) Rules, 1986 have been framed by the Central Government in exercise of power conferred by sections 6 and 25 of the Environment Act. These rules, being delegated legislation, are distinct and different from the statutory order made under section 3. The impugned notification not having been issued in exercise of the rule making power of the Central Government, cannot be seen as a product of delegation legislation in the sense it is understood in Administrative Law. This being our conclusion as to the nature of power that was exercised to bring into existence the impugned notification, all the cited decisions have no application.

21. The real concern of the petitioners is that the measures brought about by the impugned notification are insufficient to prevent unscientific and unsustainable development, and ecological destruction, and it is claimed that they are not intended to protect life. The phrase "substantial question relating to environment" appearing in sub-section (1) of section 14 has been defined in clause (m) of sub-section (2) of section 1 of the Environment Act. It reads as follows:

(m) 'substantial question relating to environment' shall include an instance where, -

(i) there is a direct violation of a specific statutory environmental obligation by a person by which, -

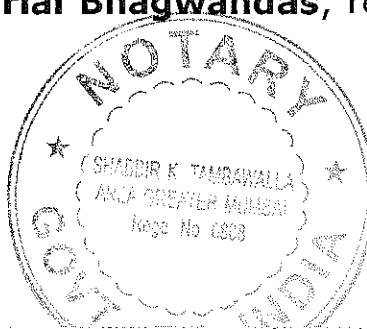
(A) the community at large other than an individual or group of individuals is affected or likely to be affected by the environmental consequences; or

(B) the gravity of damage to the environment or property is substantial; or

(C) the damage to public health is broadly measurable;
(ii) the environmental consequences relate to a specific activity or a point source of pollution;"

All the concerns that the petitioners have urged do stand covered by 'substantial question relating to environment', and would also include an attempt to enforce their legal rights in the pursuit of protecting the environment; therefore, their plea is squarely covered by section 14(1) of the NGT Act.

22. Next, we proceed to deal with the contention that challenge to a statute/subordinate legislation is not a 'civil dispute'. We feel, this contention has been urged to be rejected. One has to really torture a case of the present nature so that it does not fit into a 'civil case'. The Tribunal has been vested with powers that are normally vested with civil courts. A remedy of appeal to the Supreme Court is provided by section 22 on grounds as mentioned in section 100 of the Code of Civil Procedure. It would not be inapposite at this stage to remind ourselves of what the Supreme Court observed in **S.A.L. Narayan Row vs. Ishwarlal Bhagwandas**, reported in AIR



1965 SC 1818, on different kinds of proceedings. A passage from such decision, providing useful guidance, is quoted below:

"8. *** The expression 'civil proceeding' is not defined in the Constitution, nor in the General Clauses Act. The expression in our judgment covers all proceedings in which a party asserts the existence of a civil right conferred by the civil law or by statute, and claims relief for breach thereof. A criminal proceeding on the other hand is ordinarily one in which if carried to its conclusion it may result in the imposition of sentences such as death, imprisonment, fine or forfeiture of property. It also includes proceedings in which in the larger interest of the State, orders to prevent apprehended breach of the peace, orders to bind down persons who are a danger to the maintenance of peace and order, or orders aimed at preventing vagrancy are contemplated to be passed. But the whole area of proceedings, which reach the High Courts is not exhausted by classifying the proceedings as civil and criminal. There are certain proceedings which may be regarded as neither civil nor criminal. For instance, proceeding for contempt of court, and for exercise of disciplinary jurisdiction against lawyers or other professionals, such as Chartered Accountants may not fall within the classification of proceedings, civil or criminal. But there is no warrant for the view that from the category of civil proceedings, it was intended to exclude proceedings relating to or which seek relief against enforcement of taxation laws of the State. The primary object of a taxation statute is to collect revenue for the governance of the State or for providing specific services and such laws directly affect the civil rights of the tax-payer. If a person is called upon to pay tax which the State is not competent to levy, or which is not imposed in accordance with the law which permits imposition of the tax, or in the levy, assessment and collection of which rights of the tax-payer are infringed in a manner not warranted by the statute, a proceeding to obtain relief whether it is from the tribunal set up by the taxing statute, or from the civil court would be regarded as a civil proceeding. The character of the proceeding, in our judgment, depends not upon the nature of the tribunal which is invested with authority to grant relief, but upon the nature of the right violated and the appropriate relief which may be claimed. A civil proceeding is, therefore, one in which a person seeks to enforce by appropriate relief the

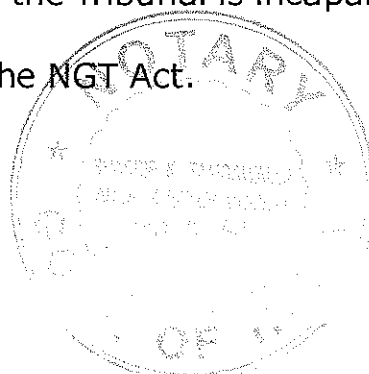
alleged infringement of his civil rights against another person or the State, and which if the claim is proved would result in the declaration express or implied of the right claimed and relief such as payment of debt, damages, compensation, delivery of specific property, enforcement of personal rights, determination of status etc."

(emphasis supplied)

We say no more.

23. In **Techi Tagi Tara** (supra), the Supreme Court has held, in the context of the NGT Act that a 'dispute' would be the assertion of a right or an interest or a claim met by contrary claims on the other side. Based on the aforesaid guidance provided by the Supreme Court, we hold that the case laid by the petitioner before us, if the same had been laid before the Tribunal, would partake the character of a 'dispute' if the respondents had chosen to contest the same by countering it. There is absolutely no merit in the contention advanced and, thus, it stands rejected.

24. This takes us to the last contention. It is the petitioners' claim that changes brought about in the CRZ by the impugned notification would amount to a modification of a substantial nature in the Development Control Regulations under the MRTTP Act and this is an issue which the Tribunal is incapable to decide in view of the provisions of the NGT Act.

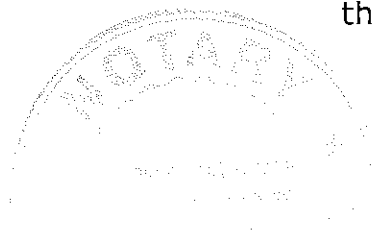


25. We would preface our discussion while dealing with this contention by referring to the decision of the Supreme Court in **Mantri Techzone (P) Ltd. vs. Forward Foundation**, reported in (2019) 18 SCC 494. This decision is not only relevant for the contention under consideration but also as regards interpretation of the several provisions of the NGT Act resulting in conferment of wide and extensive powers on the Tribunal in relation to environmental issues (paragraphs 40 to 46). The Court, upon recording that the NGT Act is a beneficial legislation held that:

"46. *** An interpretation that is in favour of conferring jurisdiction should be preferred rather than one taking away jurisdiction."

While considering section 33, it was held as follows:

"47. Section 33 of the Act provides an overriding effect to the provisions of the Act over anything inconsistent contained in any other law or in any instrument having effect by virtue of law other than this Act. This gives the Tribunal overriding powers over anything inconsistent contained in the KIAD Act, the Planning Act, the Karnataka Municipal Corporations Act, 1976 (the KMC Act); and the Revised Master Plan of Bengaluru, 2015 (RMP). A Central legislation enacted under Entry 13 of Schedule VII List I of the Constitution of India will have the overriding effect over State legislations. The corollary is that the Tribunal while providing for restoration of environment in an area, can specify buffer zones around specific lakes and waterbodies in contradiction with zoning regulations under these statutes or RMP."



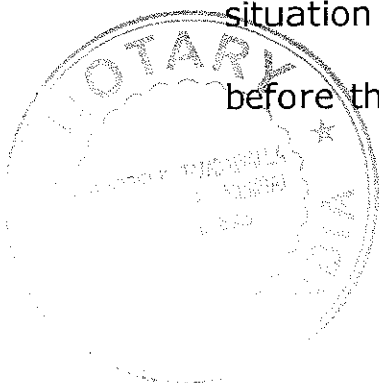
26. In view of the pronouncement that the NGT Act would override State legislations, any planning law has to yield to the former. Equally, section 24 of the Environment Act provides that the provisions thereof and the rules or orders made therein shall have effect notwithstanding anything inconsistent therewith contained in any enactment other than the said Act. The MRTP Act, if it contains any provision inconsistent with the Environment Act, must yield to the latter. Even otherwise, if there is direct violation of a specific statutory environmental obligation by a person affecting the community at large or likely to affect such community, the Tribunal may step in and pass such order as is warranted for settling the dispute.

27. We now propose to assign our own reasons as to why the contention under consideration does not appeal to us to be acceptable.

28. The Tribunal's jurisdiction to deal with environmental issues is so wide and expansive that literally speaking, 'everything under the sun' raising substantial question relating to environment can be dealt with by it. It would matter little that in its pursuit to further the objects for which the Tribunal has been brought into existence as well as to ensure protection

of environment and conservation of forests and other natural resources including enforcement of any legal right relating to environment, any other enactment is required to be considered. So long as the basic question remains the same, i.e, the Tribunal is either approached or is duty bound to secure proper implementation of the enactments specified in Schedule I of the NGT Act and a substantial question in relation thereto arises, and the decision of the Tribunal on such question would beneficially impact the environment, merely because in the process of decision making the Tribunal may be required to consider provisions of any other enactment would not denude it of its fundamental and predominant task of taking decisions that would advance the object of the Schedule I enactments as also to secure the ends of justice in any particular case. We may refer in this connection to rule 24 of the National Green Tribunal (Practice and Procedure) Rules, 2011 framed by the Central Government.

29. There is one final reason for which we are not persuaded to accept the contention of Mr. Dhond. There could be a situation that the impugned notification is also under challenge before the Tribunal on the first two contentions raised by the



petitioners, as noted above, in an application under section 14 of the NGT Act. If this writ petition were entertained, which raises the fourth contention also, as noted above, the Court would be tasked to decide the first two and the fourth contentions on its own merits. The Tribunal also being in *seisin* of the first two contentions, there would always be a possibility of conflicting opinions being rendered by this Court and the NGT in respect of the same subject matter of challenge which, in our opinion, would be absolutely undesirable.

30. Regard being had to the wide contours of the Tribunal's powers to address all concerns pertaining to environment, it would not be appropriate for us to entertain this writ petition on the specious ground that issues relating to the MRTP Act may also incidentally arise for consideration of the Tribunal. If such issue arises, the Tribunal has to decide the same bearing in mind that it being a creature of the NGT Act, environmental interest is of paramount consideration and it has to decide accordingly.

31. We are also minded to observe that no Court ought to interfere in respect of matters over which the Tribunal has jurisdiction, or else the very purpose for enactment of the NGT

Act would stand defeated. The Tribunal, having regard to its constitution, would be better equipped to deal with all points of law and facts, which could be intricate, with the expert assistance that is available at its level.

32. The discussion must end by quoting paragraph 40 of the decision of the Supreme Court in **Bhopal Gas Peedith Mahila Udyog Sangathan vs. Union of India**, reported in (2012) 8 SCC 326, reading as follows:

"40. Keeping in view the provisions and scheme of the National Green Tribunal Act, 2010 (for short "the NGT Act") particularly Sections 14, 29, 30 and 38(5), it can safely be concluded that the environmental issues and matters covered under the NGT Act, Schedule I should be instituted and litigated before the National Green Tribunal (for short "NGT"). Such approach may be necessary to avoid likelihood of conflict of orders between the High Courts and NGT. Thus, in unambiguous terms, we direct that all the matters instituted after coming into force of the NGT Act and which are covered under the provisions of the NGT Act and/or in Schedule I to the NGT Act shall stand transferred and can be instituted only before NGT. This will help in rendering expeditious and specialised justice in the field of environment to all concerned."

(emphasis supplied)

33. We, therefore, reject this contention too.

34. There is one other reason why we feel disinclined to entertain the writ petition. The impugned notification is dated January 18, 2019. The writ petition has been presented on March 25, 2021. There is no explanation offered for the belated

approach. True it is, the entire nation was in a state of disarray from March 23, 2020 but the first wave in Mumbai started receding from November, 2020. This period could count for exclusion and not the rest. The delay is, thus, unreasonable.

35. For the reasons aforesaid, we decline interference. The writ petition is dismissed. No costs.

36. Since we have been informed that the Coastal Zone Management Plan has been finalized during the pendency of the writ petition, we grant liberty to the petitioners to pursue their remedy before the Tribunal in accordance with law.

(M. S. KARNIK, J.)

(CHIEF JUSTICE)

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Zaman Ali
Advocate, High Court

ANNEXURE A-17

ITEM NO.47

COURT NO.7

SECTION IX

660

S U P R E M E C O U R T O F I N D I A RECORD OF PROCEEDINGS

Petition for Special Leave to Appeal (C) No. 20495/2021
(Arising out of impugned final judgment and order dated 08-10-2021
in PIL No. 28/2021 passed by the High Court of Judicature at
Bombay)

VANASHAKTI & ANR.

Petitioner(s)

VERSUS

UNION OF INDIA & ORS.

Respondent(s)

(IA No. 163051/2021 - EXEMPTION FROM FILING C/C OF THE IMPUGNED
JUDGMENT)

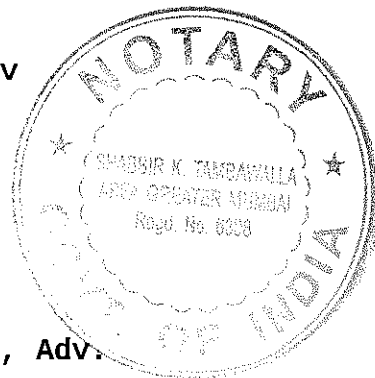
Date : 30-09-2022 These matters were called on for hearing today.

CORAM : HON'BLE MR. JUSTICE M.R. SHAH
HON'BLE MR. JUSTICE KRISHNA MURARI

For Petitioner(s) Mr. Santosh Paul, Sr. Adv.
Mr. Zaman Ali, Adv
Mr. A. Karthik, AOR
Mr. Sriharsh N Bundela, Adv.
Mr. Maithrya Shetty, Adv.
Mr. Arsh Khan, Adv
Mr. Vedant Mishra, Adv.
Mr. Akshay Kumar, Adv.

For Respondent(s) Mr. Tushar Mehta, SG
Ms. Aishwarya Bhati, ASG
Ms. Swarupama Chaturvedi Adv
Ms. Swati Ghildiyal Adv
Ms. Ruchi Kohli Adv
Ms. Shagun Thakur, Adv.
Ms. Srishti Mishra, Adv.
Mr. G.S Makker , AOR

Mr. Nachiketa Joshi, Adv.
Mr. Sidharth Dharamadhikari, Adv.
Mr. Aaditya Pande, Adv.



UPON hearing the counsel the Court made the following
O R D E R

In the facts and circumstances of the case, the High

Court has rightly relegated the petitioners to approach the
National Green Tribunal (NGT) as number of technical issues arise
which can very well be dealt with by the NGT are involved.

contd..

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- 2 -

Therefore, it is appropriate that the petitioners approach the NGT, as observed by the High Court. The Special Leave Petition stands dismissed.

However, it is observed that if the petitioners approach the NGT within a period of four weeks from today, the proceedings be considering in accordance with law and on its own merits without raising the issue with respect to limitation.

All the contentions and defences which may be available to the respective parties are kept open to be considered by the NGT in accordance with law and on its own merits.

Pending application(s), if any, stand disposed of.

(NEETU SACHDEVA)
ASTT. REGISTRAR-cum-PS

(NISHA TRIPATHI)
ASSISTANT REGISTRAR



TRUE COPY
Zaman Ali
Zaman Ali
Advocate, High Court

BEFORE THE NATIONAL GREEN

TRIBUNAL, WESTERN BENCH

SITTING AT PUNE

ORIGINAL APPLICATION

NO. OF 2022

BETWEEN:

Vanashakti & Anr.

...APPLICANTS

Versus

State of Maharashtra & Ors.

...RESPONDENTS

ORIGINAL APPLICATION

Dated this day of October, 2022

ZAMAN ALI

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