BEFORE THE NATIONAL GREEN TRIBUNAL (EZ), KOLKATA

(Under Section 18(1) read with Sections 14 & 15 of National Green Tribunal Act 2010)

Application No. 93 of 2024 (EZ)

Ashish Kothari ….Applicant

v.

MoEFCC and Anr. …Respondents

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Certified to be true copies of the respective originals.
Dated on this the 11th day of November, 2024
Through

(MS 1421/2011)

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BEFORE THE NATIONAL GREEN TRIBUNAL (EZ), KOLKATA

MEMORANDUM OF APPLICATION

(Under Section 18(1) read with Sections 14 & 15 of National Green Tribunal Act 2010)

Application No. 93 of 2024 (EZ)

Between:

Ashish Kothari
S/o Rajni Kothari,
G1 Chaitraban Residency, Aundh,
Pune 411007
Email: yogeshwaranadv@gmail.com
Phone No. : 9566254546 ....Applicant

Vs.

1) The Ministry of Environment, Forest and Climate Change
Rep by its Secretary
Indira Paryavaran Bhavan ,Jor Bagh Road, New Delhi 110003
Email: mefcc.gov.in, Phone: +91-11-23014243

2) Andaman and Nicobar Islands Integrated Development Corporation Limited (ANIIDCO Ltd),
Rep by its Managing Director,
Vikas Bhawan, PB No.180, Port Blair,
Andaman & Nicobar Islands, India Pin – 744101
Phone : 236086, 234108, Email : aniidco@gmail.com …Respondent

REJOINDER FILED BY THE APPLICANT

I, Ashish Kothari S/o Rajni Kothari, residing at No. G1 Chaitraban Residency, Aundh, Pune 411007, solemnly affirm and sincerely state as follows,

1. I am the applicant herein. I am aware of the facts and circumstances of the case and competent to affirm this affidavit.

2. I have read the Counter Affidavits filed by the 1st and 2nd respondents in OA 93/2024 and wish to deny the contents of the same as false, except to the extent expressly admitted hereunder.

Reply to counter affidavit filed by 1st respondent - MoEF & CC

3. I submit that the first respondent has stated in paragraph 5 of their affidavit that the counter affidavit under reply is a common counter affidavit for OA 93 of 2024, OA 95 of 2024 and MA 23 of 2024.
4. The contents of paragraph 1 and 2 do not call for any reply. Paragraphs 3 and 4 pertain to orders of this Honourable Tribunal in the subject applications and do not call for any reply. The contents of paragraph 6 do not call for any reply.
5. In paragraphs 7, 8 and 9, the respondent has attempted to summarize the relief sought in the subject applications, which calls for no reply.
6. The contents of paragraph 10 and 11 are denied as false and it is submitted that this Honourable Tribunal in its judgement dated 03.04.2023, has held that there were unanswered deficiencies in the grant of the clearance dated 11.11.2022 and directed reexamination of the project in light of the issues raised in the appeal. The present proceedings emanate from the fact that the respondent MoEF&CC has failed to comply with the judgement as well as governing laws. The contention of the respondent that they had "*thoroughly ensured that the proposed construction project is permissible under the Island Coastal Regulation Zone Notification, 2019 (hereinafter referred to as the ICRZ Notification, 2019) and no part of the project was falling under the prohibited area of ICRZ IA*" is proven false by the recommendation of the A&N CZMA dated 08.07.2022 (please see page 103 of OA 93 of 2024). It is a matter of record that ICRZ 1A areas have been included within the project areas by the 2nd respondent and the 1st

respondent has miserably failed to act as a regulator despite ample evidence. It is futile for the 1st respondent to contend that ICRZ-1A areas are not a part of the subject project layout of the 2nd respondent. The 1st respondent in para 11 admits that project activities are prohibited in ICRZ-1A areas. Therefore, when the record clearly evidences the inclusion of ICRZ-1A areas, it is incumbent upon the 1st respondent to exclude these ecologically sensitive ICRZ-1A areas and protect them from any conversion. The lack of due diligence on the part of the 1st respondent is evident from the failure to even consider legal prohibitions whilst granting clearances to the 2nd respondent.

7. The contents of para 12 are surprising. The 1st respondent has referred to a letter dated 15.09.2022 from the Ministry of Home Affairs and has stated that in light of this letter, information pertaining to the airport component have not been disclosed in accordance with section 8(1)(a) of the RTI Act, 2005. However, the respondent has failed to disclose any information about the other components of the project, namely, the port, township and the power plant as well. In fact, even the proceedings of the High Powered Committee have not been put in public domain or filed along with the Counter Affidavit under reply.
8. The contents of paragraphs 13, 14, 15 and 16 pertaining to appeals filed against the clearance do not call for a reply to the extent that they are matters of record.
9. The contents of paragraphs 17, 18, 19 concern the constitution of the High Powered Committee by the 1st respondent. The 1st respondent has completely failed to disclose to the Honourable Tribunal that in the judgement dated 03.04.2023 at paragraph 33, the Hon'ble Tribunal had mentioned three aspects "by way of instance". It is evident from paragraph

17 that the 1st respondent is under a deliberate misconception that this Hon'ble Tribunal only directed examination of three aspects mentioned therein. A reading of the judgement dated 03.04.2023 makes it abundantly clear that the Hon'ble Tribunal clearly found violations and hence directed at para 33 that these "deficiencies" should be reexamined.

It is submitted that the 1st respondent thereafter defeated and frustrated the judgement of this Hon'ble Tribunal by constituting a High powered Committee vide OM dated 13.04.2023 and limiting the scope of enquiry of the HPC to examination of the three issues listed in para 19. The Terms of Reference issued to the HPC ensured that this process of re-examination would never address the issues raised in the appeal and the deficiencies noticed by the Hon'ble Tribunal.

Even the three truncated Terms of Reference issued do not accurately reflect the law or the issues raised. For example, the legal requirement for a comprehensive EIA i.e. an EIA based on 1 year or three seasons' baseline data collection is mandated by clause 8(i)(c) of the ICRZ Notification, 2019 and the OM dated 03.11.2009 issued by the MoEF&CC. However, for reasons best known to the 1st respondent, they have framed the ToR concerning data collection as though it is a requirement under the EIA Notification, 2006.

This subterfuge of the MoEFCC has frustrated the direction of the Hon'ble Tribunal, and it remains a fact that the EIA/other study reports based on which the clearances for the project were issued were not comprehensive EIAs based on three seasons' data. The reports forming part of the clearance process were based on the following study periods:

i. The EIA report is only a rapid EIA, based on one season's data. The EIA report states that it is based on baseline data collected from December 2020 to March 2021.

ii. The survey of ecology and biodiversity in the EIA report was conducted by one Prof. K.B Reddy between 14 and 22 December 2020, and primary survey of Leatherback turtles was done by Mr. Ravinder of Vimta Labs from 12 to 18 February 2021 (C3-73, Final EIA report).

iii. The ZSI report states that the baseline study was conducted during March 2021 (page 48 of the report).

iv. The WII report is based on baseline data collected between 14th and 19th April, 2021, with helicopter survey on 15th April and night survey at Galathea bay between 15th and 16th of April, 2021 (page 9 of the report).

Therefore, it is evident from the record that the clearances for this project were not based on comprehensive EIA reports, as required by law. Copy of the statement of the then Hon'ble Minister for Environment, Forests and Climate Change in the Lok Sabha, containing the definition of comprehensive EIA is annexed as **Annexure A5.**

10. It is surprising that the 1st respondent, who is the regulator entrusted with the solemn duty to ensure implementation of environmental laws, has chosen to ignore the applicable laws as well as the clear, unambiguous directions of this Hon'ble Tribunal. The subterfuge played by the respondent in the issuance of the ToR to the HPC effectively ensured that no other relevant environmental concerns raised and noticed by the Hon'ble Tribunal were considered by the HPC.

11. The contents of para 20 concern the proceedings of the HPC and it is evident from the averments in this paragraph that the deliberations were limited to the three truncated, factually incorrect ToR issued by the 1st respondent. The 1st respondent has not filed the Minutes of the Meetings of the HPC said to have been held on 18.04.2023, 02.05.2023 and 04.07.2023. The findings of the committee mentioned in paragraph 20 are evidence of the fact that relevant legal and scientific considerations have escaped the attention of the committee and none of the issues raised in the previous appeal which were directed to be considered by the Hon'ble Tribunal, have been considered.

i. From the averments in para 20(a) concerning the issue of corals, it is seen that the HPC has accepted the recommendations of the ZSI regarding translocation of 16150 coral colonies. It is submitted that the 1st respondent has not brought to the attention of the HPC that destruction of corals is a prohibited activity within ICRZ as per clause 3(i) of the ICRZ Notification, 2019. Therefore, the issue to be considered is the legality of the proposal. When the law prohibits the subject activity, it is of no avail whether ZSI submitted a study which was accepted by the committee. The HPC has failed to consider the impact the proposed translocation would have on the coral colonies and the associated biodiversity. In fact, on the impact of the other coral colonies, the HPC appears to have concluded that they would be monitored to analyze sedimentation work before any decision on translocation is taken. This decision is indicative of the lack of appreciation of the fact that the impact of the proposed activity on corals would be irreversible and it is not possible to undo the damage caused. It is necessary to note that the assertion that no coral colonies

were found in the proposed site of construction of the port in Galathea Bay is false. The respondent has failed to inform the HPC and this Hon'ble Tribunal that the areas earmarked for dredging to achieve the necessary draft for the port, areas selected for the discharge of dredged materials, etc. are all integral to the subject port's construction, and the presence of corals in these areas is admitted in the EIA report itself.

ii. In so far as 20(b) is concerned, it is seen that the HPC has observed that 1 season data as required under the EIA notification is sufficient based on the EIA guidance manual. As already submitted in para 10 above, the requirement of comprehensive EIA study is mandated under the ICRZ Notification, 2019 and the OM dated 03.11.2009 issued by the respondent. This fact was not brought to the notice of the HPC. The 1st respondent has effectively ensured that the opportunity to conduct exhaustive EIA studies as required by law was defeated. It is submitted that it is imperative to conduct Impact assessment studies for major port projects such as the present, by monitoring and collecting baseline data on marine and terrestrial environments over all seasons in the year, i.e. baseline data collected for three seasons. Only this would ensure that seasonal variations, especially with regard to dynamic marine environment is properly accounted for.

iii. In so far as para 20(c) is concerned, the 1st respondent and the HPC have failed to appreciate the fact that the presence of ICRZ 1A areas within the project layout was an admitted fact. The revised layout submitted by the 2nd respondent which was considered and recommended by the A&NCZMA on 08.07.2022 stand testimony to

the fact that a total of 7.07 sq km of the project area fell under ICRZ 1A. The port component admittedly contains 0.57 sq km and reclamation area of the port contains 0.06 sq km of ICRZ 1A, while the airport contains 0.60 sq km, the township for defense is spread across 0.81 sq km and the township over 5.03 sq km of ICRZ 1A areas. The respondents are estopped from now contending that the project layout does not contain any area classified as ICRZ 1A. The ICRZ notification categorically prohibits any of the above activities in or over ecologically sensitive areas classified as ICRZ 1A. Ecologically Sensitive Areas or features in the subject areas such as turtle nesting grounds (Galathea Bay, the site of the proposed port is listed as the largest leatherback turtle nesting ground in the country, and an important marine turtle habitat in the National Marine Turtle Action Plan 2021-26 published by the 1st respondent), nesting ground of birds (megapode nesting ground), corals and mangroves cannot be relocated. Any conversion of these areas would destroy them, rendering the area unfit to serve these ecological purposes. This is the reason the law places a complete prohibition on such projects or activities in ICRZ 1A areas.

The 1st respondent and the HPC have however chosen to direct the project proponent and the National Centre for Sustainable Coastal Management (NCSCM) to verify whether any areas for the port fall within ICRZ 1A areas. Firstly, there is no requirement for such verification as the presence of ICRZ 1A areas within the project area is a matter of record. Secondly, the direction to the NCSCM was

limited to the port area and not to the other components of the project.

Shockingly, it appears that NCSCM concluded that no part of the project area fell under ICRZ 1A based on interactions with the project proponent, ground truthing and clarification from the forest department. ICRZ classifications cannot change with a stroke of a pen. Ecologically sensitive areas like turtle nesting grounds, nesting grounds of birds, corals and mangroves do not vanish and their presence cannot be suppressed or denied by a mere report of a consultant. This entire exercise detailed in para 20(c) is a desperate attempt to provide non-existent legitimacy to the violations of the respondents.

It is seen from the averments in the Counter affidavit of the 2nd respondent at para 16 where it has been stated that *"…NCSCM observed that the construction of the port is not a permissible activity under CRZ 1A but under CRZ 1B area. The NCSCM, concluded, that no part of the project area is falling under CRZ 1A area."*

Therefore, the assertions of both, the 1st and 2nd respondents with regard to CRZ 1A areas is that NCSCM has concluded that CRZ 1A areas are not falling within the project layout. Assuming but not admitting that such vanishing of CRZ 1A areas is possible, the respondents ought to have stated the correct CRZ classification according to them. 0.66 sq km i.e. 66 hectares of ICRZ 1A areas are now claimed to be something else. If, according to the respondents,

these are classified as CRZ 1B (inter tidal zone) or CRZ IV, an explanation ought to have been provided. It is submitted that CRZ-1A areas cannot be converted to any other classification. Clause 2 (i) and 2(ii) of the ICRZ Notification, 2019 categorically states that the ICRZ 1 areas are environmentally most critical, and lists Ecologically Sensitive Areas and geomorphological features constituting ICRZ 1A. The respondent or any authority cannot whimsically alter the classification of these ecologically sensitive features or areas. The ICRZ Notification, 2019 in annexure IVA, clause 6 provides for the procedure for revision of ICRZ plans. If any alteration or reclassification is to be made to the approved CZMP, the procedure prescribed in the notification has to be adhered to strictly. In any case, overwhelming data in the form of the project proponent's own reports, peer-reviewed studies, Government of India publications and project reports are available to testify to the presence of the subject ESAs like turtle nesting grounds, nesting grounds of birds, corals, mangroves, etc., and even following the procedure prescribed in the notification would lead to the inescapable conclusion that these ecologically sensitive areas exist. The process followed by the HPC by relying on the report of the NCSCM has no statutory sanction and is vitiated.

Therefore, the entire proceedings before the HPC culminating in the acceptance of the report of NCSCM is vitiated. Interestingly, the MoEFCC has not produced or filed the report of the NCSCM along with its affidavit. The EIA reports of the 2nd respondent themselves contain irrefutable evidence of turtle nesting grounds and megapode nesting

areas, and corals and mangroves falling within the port layout. The conclusion of the HPC is thus contrary to the facts and the law and deserves to be rejected.

12. I submit that I had sent two representations along with annexures on 09.07.2023 and 05.09.2023 to the 1st respondent as well as the members of the HPC requesting a hearing before the HPC as well as consideration of all relevant issues. However, I received no reply and the entire proceedings of the HPC were conducted under the shroud of secrecy.

13. The contents of para 21, 22, 23 are denied as false and it is submitted that it is of no assistance to the respondents to cite a condition in the Environmental Clearance mandating adherence to the ICRZ notification, 2019 to contain that the project does not propose any construction in the prohibited ICRZ 1A areas. As pleaded above the presence of ICRZ 1A areas within the project layout is an admitted fact. The only legally permissible avenue is to exclude these areas from the project layout by revising it, so that these areas are left untouched. It is illegal and unconscionable to reclassify these admittedly ecologically sensitive areas protected as ICRZ 1A and contend that no such areas fall within the project layout. The following documents are filed as annexures with regard to Turtle nesting, Megapode nesting, Corals and Mangroves in the subject areas.

Turtle nesting

a. Form – 1 application filed by the 2nd respondent is annexed as **Annexure A6**.

b. Extract from the WII report on Turtles submitted by the 2nd respondent as part of the clearance process is annexed as **Annexure A7.**

c. Extracts pertaining to turtles from the EIA report submitted by the 2nd respondent is annexed as **Annexure A8.**

d. Copy of Notification of the Galathea bay sanctuary dated 15.09.1997 is annexed as **Annexure A9.**

e. Minutes of the National Board for Wildlife (NBWL) meeting held on 05.01.2021 is annexed as **Annexure A10.**

f. Study - Andrews, H. and Shanker, K. (2002). A significant population of Leatherback turtles on the Indian ocean. Kachhapa, Issue 6, p19 is annexed as **Annexure A11.**

g. Article by Harry V. Andrews et al. titled "Marine turtle status and distribution in the Andaman and Nicobar islands after the 2004 M9 quake and tsunami" published in Indian Ocean Turtle Newsletter Issue No. 4 (August 2006) is annexed as **Annexure A12.**

h. National Marine Turtle Action Plan, MoEF & CC, 2021- 2026 is annexed as **Annexure A13.**

Megapode (Bird) nesting grounds

i. Report of Wildlife Institute of India on the Megapode submitted by the 2nd respondent is annexed as **Annexure A14.**

j. Salim Ali Centre for Ornithology and Natural History (SACON)-Megapode Plan submitted by the 2nd respondent is annexed as **Annexure A15.**

k. Sankaran R. (1995a). The Nicobar megapode and other endemic avifauna of the Nicobar Islands-Status and Conservation. SACON Technical Report 2, 43 pp is annexed as **Annexure A16.**

l. Dekker, R. W. (2007). Distribution and speciation of megapodes (Megapodiidae) and subsequent development of their breeding. In Biogeography, time, and place: distributions, barriers, and islands (pp. 93-102). Springer, Dordrecht, is annexed as **Annexure A17.**

m. Sivakumar, K. (2010a). Impact of the 2004 tsunami on the Vulnerable Nicobar megapode Megapodius nicobariensis. Oryx, 44(1), 71-78 is annexed as **Annexure A18.**

n. Sankaran, R. (1995b). The distribution, status and conservation of the Nicobar Megapode Megapodius nicobariensis. Biological Conservation, 72(1), 17-25 is annexed as **Annexure A19.**

o. Sankaran, R., & Sivakumar, K. (1999). Preliminary results of an ongoing study of the Nicobar megapode Megapodius nicobariensis Blyth. Zoologische Verhandelingen, 327, 75-90 is annexed as **Annexure A20.**

p. Sivakumar, K. (2007). The Nicobar megapode: Status, ecology, and conservation: Aftermath tsunami. Technical Report. Wildlife Institute of India, Dehradun is annexed as **Annexure A21.**

q. Balasubramanian, P., Vijayan, L., & Sankaran, R. (2012). Monitoring post-tsunami coastal ecosystem recovery in the Nicobar Islands and developing site-specific restoration measures. SACON, Dept. of Environment & Forests, ANI. Final Report. 84 pp is annexed as **Annexure A22.**

r. Sivakumar, K., & Sankaran, R. (2012). Habitat preference of the Nicobar megapode Megapodius nicobariensis in the Great Nicobar Island, India. In Ecology of Faunal Communities on the Andaman and Nicobar Islands (pp. 251-262). Springer, Berlin, Heidelberg is annexed as **Annexure A23.**

s. Sivakumar, K. (2010c). Impact of tsunami on certain rare and threatened species of Nicobar group of Islands with special reference to the Nicobar Megapode Megapodius nicobariensis. In: Recent

Trends in Biodiversity of Andaman and Nicobar Islands. pp. 435-411 is annexed as **Annexure A24.**

Corals & Mangroves

t. Extracts pertaining to corals from EIA report is annexed as **Annexure A25.**
u. ZSI report on Corals is annexed as **Annexure A26.**
v. Map of mangroves submitted by the 2nd respondent is annexed as **Annexure A27.**
w. Maps showing CRZ IA areas submitted by the 2nd respondent with project layout overlaid are annexed as **Annexure A28.**

14. It is submitted that the willful and wanton violation and non-compliance of the judgement of the Hon'ble Tribunal dated 03.04.2023 is evident from the manner in which the 1st respondent has issued Terms of Reference to the HPC and conducted its proceedings. The entire exercise of revisiting the permissions issued has been reduced to a mere formality and rendered redundant by the conduct of the 1st respondent. The respondent is liable to be punished for non-compliance as prayed for in the applications filed.

15. The contents of para 24 are denied as false and it is submitted that the 1st respondent has not even filed the order by which the "competent authority" has classified the HPC report as confidential and privileged information. It is not within the remit of the 1st respondent to arbitrarily classify information as thus, to justify the denial of information under the RTI Act, 2005. In fact, it is seen from para 12 of the affidavit that vide letter

dated 15.09.2022, only the airport component was classified as a project of strategic importance. This contention of the respondent to justify the denial of information, or the failure to file the necessary proceedings before this Hon'ble Tribunal is liable to be rejected.

16. The contents of paragraph 25, 26, 27 and 28 are denied as false and are repetitions of submissions made earlier. It is prayed that the reply tendered above may be read as reply to the assertions in these paragraphs as well. It is denied that the 1st respondent has complied with the judgement of the tribunal in letter and spirit. The violation of law and non-compliance with the judgement of the Hon'ble Tribunal is a matter of record and the 1st respondent is liable to be punished as mandated by law.

17. The MoEFCC has failed to see that the principle of sustainable development requires development strictly in accordance with the law and empty rhetoric of claiming compliance with the law, whilst granting clearances in complete violation of the law does little to advance the rule of law or environmental good governance.

Reply to counter affidavit filed by 2nd Respondent - ANIIDCO

18. I have read the Counter Affidavit filed by the 2nd respondent dated 23.07.2024 and wish to deny the contents of the same as false except to the extent expressly admitted hereunder.

19. The contents of para 1 and 2 do not call for any reply as they are for information of this Hon'ble Tribunal. The contents of para 3,4, and 5 are denied as false and the 2nd respondent is put to strict proof of its allegations. It is unfortunate that a statutory authority has resorted to casting aspersions

on the applicant. The attempt of the 2nd respondent to make unfounded allegations as contained in para 5 ought to be deprecated.

20. The contents of para 6, 7, 8, 9, 10, 11, 12, 13 of the affidavit under reply are similar to the assertions made in the Counter Affidavit filed by the 1st respondent and in the interest of brevity and to avoid repetitions, it is prayed that the reply tendered above be read as reply to the assertions in these paragraphs as well.

21. The contents of para 14, 15, 16, 17, 18, 19 and 20 pertain to the proceedings of the HPC and are similar to the assertions made in the Counter Affidavit filed by the 1st respondent and in the interest of brevity and to avoid repetitions, it is prayed that the reply tendered above be read as reply to the assertions in these paragraphs as well. In para 16, the 2nd respondent admits that the NCSCM observed that the construction of a port is not a permissible activity under ICRZ 1A. And in para 20 it has been declared that "…*there is no requirement to exclude areas classified as the ICRZ 1A in the approved CZMP as the General and Specific Conditions stipulated in the EC letter were self- sufficient…*". The 2nd respondent thus admits that there are areas classified as ICRZ 1A in the approved CZMP, that are falling within the project area. They however seek to justify the non-exclusion of the same by contending that the conditions in the EC were self-sufficient. This contention is bereft of both logic and any legal basis. Having admitted that ICRZ 1A areas exist, it is incumbent on the respondents to ensure that they are excluded from the proposed project areas and the project is accordingly modified and clearances obtained.

22. The contents of para 21, 22, 23 and 24 are denied as false and it is submitted that the respondent has not responded to the contentions in the application. These averments do not call for any specific reply from the applicant and are generic.

It is therefore prayed that this Hon'ble tribunal may be pleased to allow the applications as prayed for in the interest of justice.

NOTARY ★ GOVERNMENT OF MAHARASHTRA ★ LAXMI ANANT PARANJAPE REGD. NO. 217 EXPIRY DATE 20/09/2025

Ashish Kothari

APPLICANT

VERIFICATION

I, Ashish Kothari, the applicant herein, do hereby verify that the contents in the above paragraphs are true to the best of my knowledge and based on legal advice and that I have not suppressed any material fact.

Date : 11 November, 2024

Place : Pune

Ashish Kothari

Signature of the Applicant

NOTARIAL NOTARIAL NOTARIAL NOTARIAL NOTARIAL

BEFORE ME

MP 11-11-24

L. A. PARANJAPE

NOTARY, STATE OF MAHARASHTRA

PUNE DISTRICT

Noted and Registered at Serial Number

24/24

GOVERNMENT OF INDIA

ANNEXURE A5 579

MINISTRY OF ENVIRONMENT, FORESTS AND CLIMATE CHANGE

LOK SABHA

UNSTARRED QUESTION NO: 6221

ANSWERED ON:05.05.2015

EIA FOR LOW MEDIUM EROSION

JAYSHREEBEN PATEL

(a) whether the State Government of Gujarat has requested the Union Government to make modification in the policy for low and medium erosion areas to have Rapid EIA instead of comprehensive EIA for getting environment and CRZ clearances which will result in early completion of new projects or expansion of projects;

(b) if so, the details thereof and the reaction of the Government thereto; and

(c) the time by which the proposal is likely to be finalized?

Will the Minister of ENVIRONMENT, FORESTS AND CLIMATE CHANGEbe pleased to state:-

ANSWER

MINISTER OF STATE (INDEPENDENT CHARGE) FOR ENVIRONMENT, FOREST AND CLIMATE CHANGE (SHRI PRAKASH JAVADEKAR)

(a) to (c) The Government of Gujarat requested to consider projects for Coastal Regulation Zone (CRZ) clearance in low and medium eroding coastal stretches based on rapid Environment Impact Assessment (EIA) instead of comprehensive EIA Report. The request could not be considered since a rapid EIA, which is based on one season data may not address all the environmental concerns. As per the procedure prescribed for seeking prior clearance under the CRZ Notification, 2011, all project proposals in stretches classified as low and medium eroding as well as stable coasts shall be accompanied by comprehensive EIA studies based on three season data. This requirement is uniformly applicable throughout the country. To conserve and protect such coastal stretches, promote development through sustainable manner, it is important that comprehensive EIA studies are carried out based on scientific principles and Environment Management Plans worked out accordingly before considering proposals in such stretches.

APPENDIX I

ANNEXURE A6

(See Paragraph-6)

FORM 1

Note : If space provided against any parameter is inadequate, Kindly upload supporting document under 'Additional Attachments if any' at the last part of the Form1. Please note that all such Annexures must be part of single pdf document.

(I) Basic Information

S.No.	Item	Details
	Is your project Comes under Notified Industrial Area	No
	Whether proposal involved violation of EIA notification	No
	Weather Consent to Establishment Obtained	N/A
	Upload copy of CTE	N/A
1.	Name of the Project/s	Holistic Development of Great Nicobar Island in Andaman and Nicobar Islands. Integrated development of International Container Transshipment Terminal (ICTT)-14.2 Million TEU along with Greenfield International Airport (4000 Peak Hour Passengers-PHP), Township & Area development and 450 MVA Gas and Solar based power plant in 16610 ha.
	Brief summary of project	Annexure-Brief summary of project
	Proposal Number	IA/AN/NCP/201159/2021
	Project Cost	75000 cr
2.	S. No. in the schedule	7(e) Ports, Harbours
	Project Sector	INFRA-1
3.	Proposed capacity/area/length/tonnage to be handled/command area/lease area/number or wells to be drilled	Integrated development of International Container Transshipment Terminal (ICTT)-14.2 Million TEU along with Greenfield International Airport (4000 Peak Hour Passengers-PHP), Township & Area development and 450 MVA Gas and Solar based power plant in 16610 ha. ha.
4.	New/Expansion/Modernization	New
5.	Existing Capacity/Area etc.	16610 ha.
6.	Category of project i.e. 'A' or 'B'	A
7.	Does it attract the general condition? If yes, please specify	Yes
	a)	Protected areas notified under the wildlife (Protection) Act, 1972
8.	Does it attract the specific condition? If yes, please specify	No
9.	Location of the project	Great Nicobar Islands
	Shape of the project land	Block (Polygon)
	Uploaded GPS file	Annexure-GPS file
	Uploaded copy of survey of India Toposheet	Annexure-Survey of india toposheet
	Plot/Survey/Khasra No.	The proposed Integrated development project consisting of International Container Transshipment Terminal (ICTT), International Airport, Ecotourism & Area Development and Power Plant will be

		development on an area of 16610 ha. of revenue and forest land in Great Nicobar Island
	Town / Village	Campbell Bay, Govind Nagar, Joginder Nagar, Vijay Nagar, Laxmi Nagar, Gandhi Nagar and Shastri Nagar.
	State of the project	Andaman and Nicobar

Details of State of the project

S.no	State Name	District Name	Tehsil Name
NIL			

10.	Nearest railway station along with distance in kms Nearest airport along with distance in kms	No railway station, 0 km Port Blair, 523 km
11.	Nearest Town/City/District Headquarters along with distance in kms	Campbell Bay , 0 km
12.	Village Panchayats, Zila Parishad, Muncipal Corporation, Local body (Complete postal address with telephone nos. to be given)	Campbell Bay, Govind Nagar, Joginder Nagar, Vijay Nagar, Laxmi Nagar, Gandhi Nagar and Shastri Nagar. Campbell Bay Tehsil Nicobar district Andaman & Nicobar Islands (UT)
13.	Name of the Applicant	Mohammed
14.	Registered Address	ANIIDCO Ltd Vikas Bhawan Port Blair
15.	**Address for correspondance:** Name of the Company Name of the Applicant Designation (Owner/ Partner/ CEO) Pin code E-mail Telephone No. Fax No. Copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency .	 ANDAMAN AND NICOBAR ISLANDS INTEGRATED DEVELOPMENT CORPOARTION Mohammed GeneralManager 744101 aniidco@gmail.com 03192-232098 03192-232501 Annexure-Uploaded Copy of documents in support of the competence/authority
16.	Details of Alternative Sites examined, if any. Location of these sites should be shown on a toposheet Uploaded details	Yes Annexure-Uploaded details
17.	Whether part of Interlinked projects?	Yes
18.	Whether separate application of Interlinked project has been submitted?	N/A
19.	If Yes, MoEF file number Date of submission	N/A N/A
20.	If No, Reason	N/A
21.	**Whether the proposal involves Approval/ Clearance under: if yes, details of the same and their status to be given** **(i)** Whether the proposal involves approval/clearance under the Forest (Conservation) Act,1980? Status **(ii)** Whether the proposal involves approval/clearance under the wildlife (Protection) Act,1972? **(iii)** Whether the proposal involves	 Yes Application for Forest Clearance yet to be submitted No Yes

	approval/clearance under the C.R.Z notification, 2011?	1X6
22.	Whether there is any Government Order/Policy relevant/relating to the site?	Yes
	Uploaded Order/Policy	Annexure-Uploaded order/policy
23.	Whether any Forest Land Involved?	Yes
	Area of Forest land Involved (hectares)	13075 ha (Forest land and Deemed forest) ha.
24.	Whether there is any litigation pending against the project and/or land in which the project is proposed to be set up?	No
	(a) Name of the Court	N/A
	(b) Name of the Sub court	N/A
	(c) Case No.	N/A
	(d) Orders/directions of the court, if any and relevance with the proposed project	N/A

(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, etc.)

S.No	Information/Checklist confirmation	Yes/No	Details there of (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)	Yes	There will be permanent change in landuse, land cover and topography due to development of ICTT, International Airport, Township & area development and power plant. About 16,610 ha of land will be converted into residential, commercial, institutional, etc. category
1.2	Clearance of existing land, vegetation and buildings?	Yes	Reclamation will be undertaken only for Port and Airport. Total reclamation will be 421 ha.Reclamation for Airport: 194 ha;Reclamation for Port: 227 ha;For construction of international airport site levelling, clearance of trees, shrubs & bushes are envisaged. The proposed airport site is inhabited by two settlements (Gandhinagar & Shastri Nagar), which need to be rehabilitated and resettled. In addition to above, some hills need to be cut and recontoured to curve out the runway for the airport.
1.3	Creation of new land uses?	Yes	As per the requirement of the Integrated Development projects the land use will be converted into commercial/institutional and residential category. For ICTT breakwaters, berths, Onshore storage areas along with utility buildings & support infrastructure will be developed. Similarly, for International Airport terminal building, runway, apron, taxi way, cargo and other general aviation facilities will be developed. Area development include construction of ecological centres, welcome centre
1.4	Pre-construction investigations e.g. bore houses, soil testing?	Yes	For ICTT Bathymetry, Seismic survey, Topography, Land and marine boreholes surveys are envisaged. Geotechnical Detailed soil investigation will be carried out for all the projects.
1.5	Construction works?	Yes	For ICTT construction of breakwaters, berths, dredging, reclamation, Onshore storage areas along with utility buildings & support infrastructure will be carried out. . For International Airport construction of terminal building, runway, apron, taxi way, cargo and other general aviation facilities. Topographical survey & Soil testing will be carried out. For township and area development project consists of commercial &residential complexes covering welcome centres, cultural centres, marinas

1.6	Demolition works?	Yes	Demolition works involved will be decided at a later date after the EIA study. However, the number of structures to be demolished will be at it minimum as not many structures exists in this area. Few settlements need to be rehabilitated and resettled. The area needs to be recontoured in order to make the land plain.
1.7	Temporary sites used for construction works or housing of construction workers?	Yes	Temporary sheds will be constructed for laborers during construction phase with all amenities to be provided such as water supply, fuel, sanitation etc., as per requirement.
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations and fill or excavations	Yes	For ICTT: Administration building, Operation Building, Canteen, Workshop, utility buildings will be provided apart from the open container yard for storage of containers. Cutting and filling will also be required to create the desired formation levels/ Finished Floor Levels. For International Airport : The proposed construction includes concrete & steel structures of various units. The topography within proposed airport site is having some hills.
1.9	Underground works including mining or tunnelling?	Yes	No tunnelling or mining activities is envisaged at present. However, construction work may involve some piling activities.
1.10	Reclamation works?	Yes	For IICT backup area will be mainly created by way of reclamation. Reclamation works are involved as airport jetty construction is also planned.
1.11	Dredging?	Yes	For development of ICTT dredging to the tune of 17.7 Mcum would be needed in initial phase. Dredging of channel/sea is planned under the proposal for construction of jetty within ICTT area. For Airport , Township and Power plant no dredging works involved.
1.12	Offshore structures?	Yes	As a part of development of ICTT Breakwaters, Berths, Jetty, Container & Multipurpose Cargo terminal. construction of Jetties, breakwater for Port & Harbour/Transhipment Terminal are proposed. For international airport Structures erecting approach lights etc may be required. For township & area development no offshore structures construction involved.
1.13	Production and manufacturing processes?	Yes	Commercial and institutional area is envisaged.
1.14	Facilities for storage of goods or materials?	Yes	Terminal yards for storage of cargo/containers and during construction temporary facilities will be provided to store construction materials. Open Storage Yard will be provided for container stacking, temporary storage for construction materials. Storage of HSD from DG sets and other equipment/ Machinery.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	Liquid Effluents treatment facilities such as ETP & STP will be constructed. Solid waste: • Non-Hazardous Waste: Metal/steel scrap, Wooden chips etc. • Municipal solid waste: Collection, segregation and management of solid waste as per Municipal solid waste management rules 2010 (as amended) • Hazardous waste: Lubricants, waste oil, paints, compressed gases, and varnishes etc.The Hazardous wastes will be handled as per Hazardous Management Rules 1989 (as amended).
1.16	Facilities for long term housing of operational workers?	Yes	Housing facilities shall be provided for the permanent workers with all amenities like internal roads, water supply, power supply, educational facilities, medical facilities & green areas/ green belts as per the development plan of the Island. Staff quarters will be constructed for the operational workers. Residential areas proposed under the development shall have dedicated housing for workers.
1.17	New road, rail or sea traffic during construction or operation?	Yes	New roads will be required to developed to connect the construction site to the labour camps & existing habitation areas. BRT/LRT is envisaged. The construction material will be sourced mainly transported through sea route. For airport an approach road shall be developed connecting the main road and settlements. Further, a connecting road shall be developed for

			~~138~~ terminal which is located in 10 km. There will be likely increase in sea traffic during the construction phase.
1.18	New road, rail, air water borne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	Yes	ICTT along with associate infrastructure & access roads to power plant will be developed. Presently, the area is connected by helicopters & sea route only. New air route will be proposed to connect the Airport with other cities. As part of proposed development all transportation infrastructure required for operations of a township will be planned. Apart for roads, bridges, MRT, bus depots there will be a dedicated international airport, port, marina/jetty also part of the project.
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	Yes	Not envisaged for ICTT. However, for airport project the existing road leading to Shastri Nagar may require major diversions.
1.20	New or diverted transmission lines or pipelines?	Yes	Laying of new power transmission lines will be required. There are no major transmission lines to be impacted by proposed development
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	Yes	For ICTT breakwaters will be constructed but it is unlikely to affect any changes in the existing water courses. Detailed hydrodynamic modelling studies and marine dispersion modelling studies will be carried out. Though all efforts shall be to ensure conservation of natural water channels, streams etc but if required for development of critical infrastructure, few channels may be realigned/ diverted or engineered.
1.22	Stream crossings?	No	Stream and drains will be conserved but wherever there will be a need to cross the stream, suitable measures shall be adopted conserving the natural course of the stream.
1.23	Abstraction or transfers of water from ground or surface waters?	Yes	Surface and sea water will be tapped. Desalination plant will be built for sea water. A reservoir will be built to supply drinking water to all the projects.
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	No	There may be some alterations in the natural drainage pattern due to the proposed development and proposed land use changes. But all efforts shall be to ensure maximum conservation of all existing natural water channels. No water channel shall be blocked. For ICTT reclamation and grading of the project site will be carried out in such a way that the natural drainage and runoff will not be affected. The design will take into consideration any such requirements.
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	During construction phase personnel and material will be transported through sea route. It will be difficult to find labours from the Island. Hence it may require transporting personnel and material from the mainland. The new approach road leading to the site will be utilized for the transportation of material and personal in addition to the sea routes and helicopter routes.
1.26	Long-term dismantling or decommissioning or restoration works?	No	Not Applicable
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	Not Applicable
1.28	Influx of people to an area in either temporarily or permanently?	Yes	During construction stage, stay of construction labourer's (expected to be about 2000 no.) are expected on a temporary basis during initial phase. During operation stage, port employees (about 4200 nos. in ultimate stage along with their families) are expected to stay on a permanent basis. Local people will be given opportunity, if local labour is available. However, it is unlikely to have enough workforce from the island. Hence, skilled and unskilled workforce shall be utilized.
1.29	Introduction of alien species?	No	Only local plant species will be used for Greenbelt development/ plantation/ landscaping.
1.30	Loss of native species or genetic diversity?	No	The core forest areas are conserved and not in the project area.

			any additional loss of native species or genetic diversity due to the activities envisaged in the project can only be ascertained through EIA study and the nature of non-forestry activity which is otherwise part of FC proposal.
1.31	Any other actions?	Yes	All native species within the island protected areas shall be conserved

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)	Yes	The proposed ICTT will be constructed in undeveloped vacant land. No agricultural land involved. For the airport project, the total land required for the project including land area for the project affected families will be about 1039 Ha, out of which approximately 556 Ha will be required for the proposed airport in present phase. Land identified for the proposed airport is partly vacant and single crop agricultural land. Township and power plant will be developed in eastern and southern sid
2.2	Water (expected source & competing users) unit: KLD	Yes	For ICTT - 1.7 MLD water during operation stage will be sourced from the surface water and seawater. For Airport - 1 MLD will be met from Galathea river, other surface sources and desalination if required. Necessary permission needs to be obtained. For the overall integrated development, including the Port, Airport, Power plant and Township, the total water demand is 160MLD. For Power Plant a Desalination plant may be constructed at a later stage.
2.3	Minerals (MT)	No	Not Applicable
2.4	Construction material – stone, aggregates, sand / soil (expected source – MT)	Yes	The construction material such as Stone Aggregate, sand, cement, structural steel, brick and bitumen will be brought through ships from east coast of India of from neighbouring countries.
2.5	Forests and timber (source – MT)	No	No timber from the forest will be utilized for construction. However, to promote sustainable materials for construction of tourism facilities like huts, boardwalk, viewing points use of timber from outside island may be considered.
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT),energy (MW)	Yes	For the overall integrated development, including the Port (ICTT), Airport, Power plant and Township, the total power demand is 450MVA.
2.7	Any other natural resources (use appropriate standard units)	No	Not Applicable

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	Yes	For ICTT, storage & handling of hazardous wastes will be handled with sufficient inventory shall be maintained at all times as per norms for fuel storage. Measures will be adopted to ensure that hazardous substances are identified and stored & used only as per safety regulations. Requirements as listed in the Risk assessment report part of the EIA studies shall be strictly

			applied For Airport, used oil from the DG sets will be given to authorized recyclers. HSD about 1800 KL 10 for days
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	Not envisaged
3.3	Affect the welfare of people e.g. by changing living conditions?	Yes	The proposed integrated development Project will create employment during construction stage and. during operation direct and indirect jobs are anticipated. The project will create direct and indirect employment opportunities for the local population and overall development of the area. There will be a positive change with regard to the welfare of the people. Tourism and national security will also get big boost.
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.	No	The proposed holistic integrated project development activities near the habitation of Shompen and Nicobaries Tribes will be avoided.
3.5	Any other causes	No	Not Applicable

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	Yes	For ICTT 50% of dredge spoil (about 8.85 Million cum) will be used for reclamation. In addition, about 23.4 Million cum of site grading material would also be utilised for reclamation in initial phase. For International Airport, the earth work and other waste will be used for leveling within the project boundary only. Rest of the material will be used for leveling of low lying areas and Construction purposes and for green cover /landscaping purposes.
4.2	Municipal waste (domestic and or commercial wastes)	Yes	During the construction and operational phase of the project, collection and handling of domestic solid waste would be done in line with the provisions of the Municipal Solid Waste Rules 2016 (as amended). This will be handled as per guidelines The wastes generated like Kitchen waste, Metal scrap and empty metal drums of Non-hazardous materials Paper and wood scrap, Empty plastic containers of non-hazardous materials etc. will be handled as per the MSW rules.
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)	Yes	Used oil and other wastes will be stored in closed drums and be transferred to authorised re-processors. Measures will be adopted to ensure that hazardous wastes (Like fuel, lube, grease etc.) are identified and stored and used only as per safety regulations. requirements as listed in the Risk assessment report part of the EIA studies shall be complied. They will also be handled only by authorized waste handlers.
4.4	Other industrial process wastes	No	Not Applicable
4.5	Surplus product	No	Not Applicable
4.6	Sewage sludge or other sludge from effluent treatment	Yes	3 STPs of as per the requirement of the initial phase and development phase will be constructed. The sludge generated from the Sewage Treatment Plant will be used as manure for greenbelt development. ETP effluents will be recycled and reused . Sludge to given Authorised recyclers
4.7	Construction or demolition wastes	Yes	Construction wastes to the extent possible will be utilised within the respective project premises. Construction waste would be segregated and whatever is saleable would be sold to authorized buyers and rest would be either used for filling up of low lying areas and development of internal road or would be disposed off

			using suitable measures. In addition, unsuitable dredge material will be disposed in suitable offshore location identified through dredge disposal model studies.
4.8	Redundant machinery or equipment	No	All the Redundant machinery or equipment will be taken out of the site after construction
4.9	Contaminated soils or other materials	No	Soil contamination if happens accidently will be remediated.
4.10	Agricultural wastes	No	The agriculture wastes such as horticulture waste, such as dried leaves, flowers etc. shall be utilized as manure
4.11	Other solid wastes	No	Not Applicable

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	Yes	During construction phase of integrated development projects emission from diesel operated machines, transport vehicles are envisaged. DG sets will be operated only during emergency, which generate gaseous emissions of SO2 and NOx. Typical SO2 and NOx emissions would be about 45-50 mg/Nm3 and 15-20 mg/Nm3 respectively. Vehicles having valid PUC will be used. Appropriate measures for reducing emissions will be followed. During operational phase emissions from ships, fugitive emissions
5.2	Emissions from production processes	No	Commercial and Institutional entities will be set up
5.3	Emissions from materials handling including storage or transport	Yes	Emissions from ships, vehicles during transportation and operational phase is envisaged. MARPOL convention protocol will be used. Adequate pollution control measures will be taken during storage and handling of material. Regular inspection, barriers at the perimeter of storage materials, proper maintenance of vehicles etc. The details of the emissions and control measures will be provided in EIA report. Fugitive emissions are envisaged from material handling and transportation areas
5.4	Emissions from construction activities including plant and equipment	Yes	During construction of Integrated development projects, particulate matter will be emitted during construction activities which are mostly confined to project areas. The gaseous emissions like oxides of nitrogen and CO will be emitted during transportation
5.5	Dust or odours from handling of materials including construction materials, sewage and waste	Yes	Dust due to handling of Construction material during construction phase Dust due to cargo handling Odour from Sewage Treatment Plant (STP) Dust suppression measures will be proposed, and the details will be provided in the EIA report
5.6	Emissions from incineration of waste	No	Not Applicable
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	Not Applicable
5.8	Emissions from any other sources	No	Not Applicable

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	Yes	During construction phase operation HEMM, Cranes, Heavy vehicles movement, erection and welding activities will be the main source of noise. Minor welding activities involved at site would generate some noise. Some emission of light due to welding activities and noise generation due to construction activities may be there during construction phase. However, these noise levels will be confined to work zone levels. During Operational phase in ICTT noise from the vessels will be the main source
6.2	From industrial or similar processes	No	Not Applicable
6.3	From construction or demolition	Yes	During construction plant machinery and vehicles bringing man and material will be main source of noise. Noise will occur from operation of construction equipment like loaders, tippers, bull dozers etc. and demolition activities. Sophisticated equipment will be used. Noise enclosure will be provided. Personnel Protection Equipment will be provided to workers during construction activities. Maximum cumulative noise shall be varying from 85 – 90 dB (A). No demolition works involed
6.4	From blasting or piling	Yes	Piling of berths will be carried out under controlled manner. Efficient and latest piling technique will be used for keeping the noise level low. Workers would be provided with Personnel Protection Equipment (PPE). In case of blasting, anticipated noise level shall be above 100 dB(A). However controlled blasting will be adopted.
6.5	From construction or operational traffic	Yes	Movement of construction equipment such as Excavators, Dumpers, Compressors and trucks will result in high noise levels during construction phase. Care will be taken to control the noise levels within the standards and necessary mitigation measures will be followed.
6.6	From lighting or cooling systems	No	Not Applicable
6.7	From any other sources	No	Not Applicable

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	Yes	Spills are unlikely to occur during normal operations, as the cargo in ICTT will be handled using mechanised cargo handling systems. In the event of accidental spills of cargo during transfer from / to the ships, Soil and groundwater remediation activity will be undertaken as per the requirement. The potential risks on land include accidental spillage of diesel, surface & sub-surface contamination due to spillage of diesel, lube oil and other hazardous material.
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	Yes	All waste will be appropriately treated. Treated water will be recycled and used in green area development or treated waste to the stipulated standards will be discharged to the sea. Sewerage water generated will be treated in STP and treated effluent will be used for non potable purposes such as flushing, washing, greenbelt development/ plantation etc. No wastewater/ effluent will be discharged outside the premises.
7.3	By deposition of pollutants emitted to air into the land or into water	Yes	Fugitive emissions due to cargo handling can build up the air pollutant concentrations. Oil spills, ship wastes can impact the marine waters if not controlled. Emission control norms and spill

			contingency shall be adhered to in all the cases. The EIA study will address the impacts and mitigation measures.
7.4	From any other sources	No	Not Applicable
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	Construction activities would be a short term activity & risk of long term build-up of pollutants in the environment is not envisaged There will not be any process emissions. The emissions are envisaged from air traffic, vehicular traffic and from DG sets which will be operated only during emergency. The facility will be developed with adequate open spaces & green belt/cover. Thus, long term build-up of pollutants is not envisaged. All will be well within the standards stipulated by SPCB/CPCB.

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	Yes	The exact quantity of storage will be identified during the EIA study. All regulatory permissions will be taken for fuel storage. All risks will be identified, and appropriate mitigations will be implemented by the contractor during construction and operation. Oil spill contingency plan will be prepared and implemented Coordination with local disaster management teams will be established. The fuel oil will be stored and will be handled in a safe manner as prescribed by statutory authorities.
8.2	From any other causes	Yes	There is a possibility of construction/ operational accidents. However, all the possible precautions will be taken during construction and operation phases. Regular due-diligence will be undertaken to check the compliance. In order to prevent risks emanating from handling of cargo from the ships, the entire operation is carried out in a controlled manner with STS Cranes.
8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?	Yes	Site falls under seismic Zone V and cyclone and tsunamis prone. All structures will be designed to make them earthquake and cyclone resistant. Flooding: No flooding has been taken place in past decade as per the available secondary data. Landslide: The proposed integrated development project sites are located on a comparatively flat terrain. Hence, no land sliding is envisaged. Cloud burst: As per the available secondary data, cloud burst occurred in 2020 in Andaman and Nicobar Islands.

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.) ◦ housing development ◦ extractive industries ◦ supply industries	Yes	Development of ICTT will boost Indian economy as the dependency on other International Transshipment terminals will be reduced. It will also pave way for the economic development & holistic development of the Great Nicobar Island. The construction of international airport will be carried out to fulfil the requirement of project and facilities will be extended to public to public to the possible extent. The township and area development project will enhance the development of the region

	○ Other		
9.2	Lead to after-use of the site, which could have an impact on the environment	No	No significant impact envisaged. The air and vehicular traffic is expected to increase.
9.3	Set a precedent for later developments	Yes	Proposed project provides better connectivity with rest of the country. This will enhance tourism and commercial investment, which result in direct and indirect employment.
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	Not envisaged beyond the planned sub-project concepts as per approved master plan for the island. The cumulative impacts of all the projects will be addressed in the EIA/EMP report.

(III) Environmental Sensitivity

S.No	Areas	Name/Identity	Aerial distance (within 15km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Yes	1. Galathea National Park (107.103 sq. km) 2. Campbell Bay National Park (391.751 sq. km) 3. Biosphere reserve (732.798 sq. km) (The notified areas of Galathea National Park, Campbell Bay National Park and Biosphere Reserve is 110 sq. km, 426.23 sq. km and 885 sq. km respectively. However, on account of reconciliation of area of Great Nicobar Island by SoI vide letter dated 01.09.2020, there is revision in the area of Galathea National Park, Campbell Bay National Park and Biosphere reserve.
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Yes	1.Forest area 2.Great Nicobar Biosphere Reserve 3.CZ area as per ICRZ 2019.4.Galathea Bay and some of the other beaches are turtle nesting ground.5. Occasionally Coral Reefs are present. 6.Mangroves are present in some patches of the island on the coast. 7.Rivers -Alexandria ,Dogmar,Amritkaur,Jubilee,Galathea 8.Water bodies:Andaman Sea, Campbell Bay, Mata Taruwa Bay,Pemayya Bay near Pulobaha, Nanjappa Bay near Pulo Bekka,Galathea River or Dak Kea,Dak Aleh,Dak Ubho,Dak Tolai,Dak Air,Dak Thena
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Yes	There are a number of rare and endemic flora and a large number of endemic and endangered species of fauna. Reportedly, 11 species of mammals, 32 species of birds, 7 species of reptiles and 4 species of amphibians. Turtle Nesting sites and Megapode nesting sites may be impacted
4	Inland, coastal, marine or underground waters	Yes	Rivers • Alexandria • Dogmar • Amritkaur • Jubilee • Galathea
5	State, National boundaries	Yes	Nil within the study area
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	No	Access to the beach, sea, as well as to the tropical forest through facilities like roads, paths etc is available.
7	Defence installations	Yes	Near Galathea Bay and Campbell bay
8	Densely populated or built-up area	No	There are seven revenue villages. Campbell bay (Rajiv Nagar), Govind Nagar, Joginder Nagar, Vijayanagar, Lakshmi Nagar, Gandhi Nagar & Shastri Nagar.
9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Yes	The project site include 5 primary Schools (Shastri Nagar, Laxmi Nagar, Jetty Bazar, Rajiv Nagar, Govind Nagar), Secondary school, Government senior Secondary School at Campbell bay. 3 Hospitals: 1 PHC at Campbell Bay (G/N), 2 PHC at Gandhi Nagar. 4 Places of worship:

		145	Ayyappa temple, Shiv mandir, Hanuman temple & Temple at Aiport site.
10	Areas containing important, high quality or scarce resources.(ground water resources,surface resources,forestry,agriculture,fisheries,tourism,minerals)	No	Availability of fresh water is a scarce resource in the island. Groundwater is saline. All water samples for the project area have been collected as part of EIA baseline monitoring and shall be provided in the EIA report. The area is thickly forested and is a high quality resource
11	Areas already subjected to pollution or environmental damage.(those where existing legal environmental standards are exceeded)	No	Nil within the study area
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) similar effects	Yes	Site falls under seismic Zone V and cyclone prone as per BIS IS 1893 Part -I:2002. The project site has highest risk of suffering earthquakes (seismic zone-V), vulnerable to tsunamis and susceptible to Floods. Some of the coastal stretches along the western and eastern end is erosion prone. As per the available secondary data, cloud burst occurred in 2020 in Andaman and Nicobar Islands.

(IV) Proposed Terms of Reference for EIA studies

1	**Uploaded Proposed TOR File**	Annexure-TOR file
2	**Uploaded scanned copy of covering letter**	Annexure-scanned copy of covering letter
3	**Uploaded Pre-Feasibility report(PFR)**	Annexure-PFR
4	**Uploaded additional attachments(only single pdf file)**	Annexure-Additional attachments

Additional Attachments, if any
Attached File
NITIAayogletter
FCA
ADS Letter
ADS Letter

Essential Detail Sought:

Sno.	EDS Letter	Remarks	Date of EDS
1.	Eds Letter	The correction have been made as per the instruction received	15 Mar 2021
2.	NA	The proposal is examined. Most of the establishments are planned on the eastern side. The western side should also be explored for establishments and submitted. Alternate sites for establishment of container Transshipment port, airport etc may also be explored and submitted. Existing environmental settings of the area shall be presented including the ecologically sensitive areas like turtle nesting grounds, corals, etc. Availability and supply of drinking water and water requirement for the project, construction material availability and supply shall be explored and submitted.	09 Mar 2021

Additional Detail Sought : NIL

(V) Undertaking

I hereby give undertaking that the data and information given in the application and enclosures are true to be best of my knowledge and belief and I am aware that if any part of the data and information found to be false or misleading at any stage, the project will be rejected and clearance given, if any to the project will be revoked at our risk and cost.

V.(i)	**Name of Applicant**	Mohammed
	Designation	GeneralManager
	Name of Company (Applicant Name should not be given here)	ANDAMAN AND NICOBAR ISLANDS INTEGRATED DEVELOPMENT CORPOARTION
	Address	ANIIDCO Ltd Vikas Bhawan Port Blair

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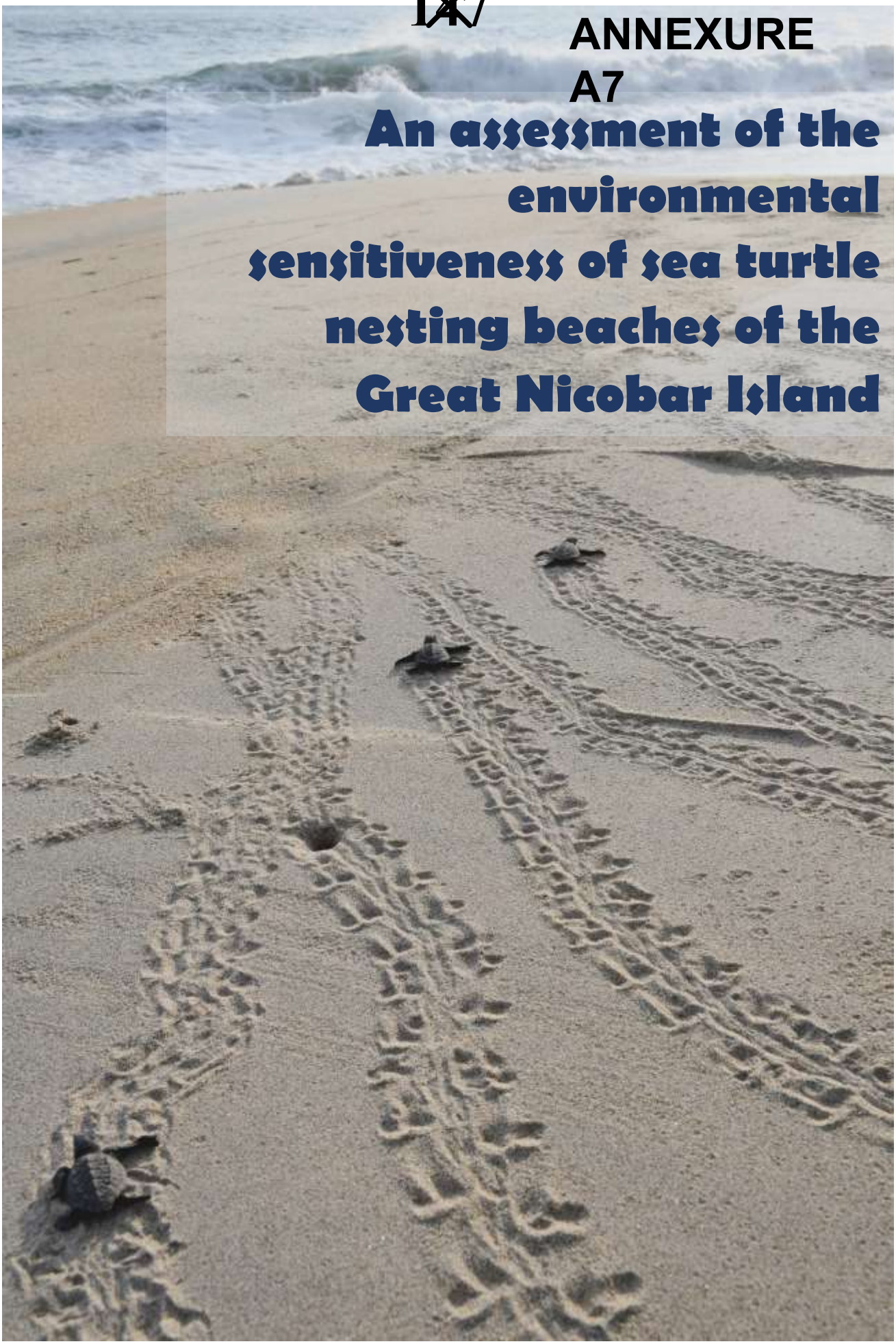
ANNEXURE
A7

An assessment of the environmental sensitiveness of sea turtle nesting beaches of the Great Nicobar Island



An assessment of the environmental sensitiveness of sea turtle nesting beaches of the Great Nicobar Island

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Research Fellow

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WILDLIFE INSTITUTE OF INDIA

Disclaimer
The secondary information presented in the document are sourced from published literatures, WII, ZSI and A &N Forest Department. WII acknowledges all concerned for the same.

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

Acknowledgment

I would like to acknowledge Shri Jitendra Narain, Chief Secretary of Andaman and Nicobar Islands, Shri Kulanand Joshi, Managing Director, Ms. Anjali Sehrawat, Executive Director, Shri Mohd Pervaiz, General Manager, Shri Saji Samuel, Senior Manager of ANIIDCO, Deputy Commissioner of Nicobar District, Assistant Commissioner of Nancowry, Block Development Officer of Campbell Bay for their supports during this study.

My sincere thanks to Dr Dhananjai Mohan, Director, Wildlife Institute of India for his ineffable guidance, encouragement and support to complete this task on time.

I am grateful to all officials from the Forest Department especially Shri S.K. Bhandari PCCF (CRZ&FC), Shri P. Subramaniyam, APCCF (A&V), Shri Thomas Verghese, DFO (Campbell Bay) and other staff of the Forest Department for their help during the survey. Special thanks to Thiru P. Subramaniyam, APCCF who accompanied me in the field, walked all beaches and nearby forests, and also helped me to collect field data.

I am thankful to the Coast Guard Commandant and his team at Campbell Bay for their help to conduct this survey in the difficult inclement weather condition and saving our life from the big waves, and providing two speed boats with smaller boats to approach beaches. I am also thankful to the Captain and crew members of 'MV Long Island' for helping us in the survey.

I am thankful to the National Helicopter Carrier India – Pawan Hans for helping us to conduct the reconnaissance survey with help of a helicopter.

Last but not the least, I thank Mr Sagar Rajpurkar, Research Fellow, Wildlife Institute of India for helping me in the survey and meticulously assisting me to collect all required field data.

- **K. Sivakumar**

Contents

Introduction

The Andaman and Nicobar Islands in the Bay of Bengal arch from Arakan Yoma in Mayanmar in the north to Sumatra in Indonesia in the south. The Andaman group has more than 325 islands (21 inhabited) covering 6,408 sq km, and the Nicobar group has over 23 islands (12 inhabited) with an area of 1,841 sq. km. Nicobars are one of the four biodiversity hotspots of India. The Nicobar Islands can be subdivided into three distinct subgroups; the south lies the Great Nicobar group consisting of two islands over 100 km^2 in area, nine islets less than five km^2 in area, and a few rocks. Great Nicobar, Little Nicobar, Kondul and Pilo Milo are inhabited. Meroe, Treis, Trax, Menchal, Megapod, Cabra and Pigeon are uninhabited islets. The shore line of Nicobar Islands are endowed with varied landscapes such as rocky shore, sandy beaches, backwaters, bays, lagoons, mangrove forests and coral reefs. To the interior most of the islands have undulating terrain with the main ridges running north-south, falling steeply and irregularly on both sides to the floor of the Bay of Bengal and the Andaman sea. The Great Nicobar groups is significantly more hilly than the Nancowry group, with the hight peak, Mt. Thullier at 670 MSL.

The soil shows considerable variability from heavy clay, loams, gravelly loams, sandy loam and sand. The depth of soil depends on the slope, with deep alluvial deposits often found along the lower reaches of the creeks. The soil lacks humus due to continuous leaching by heavy rainfall.

Four Islands in the Nicobar group have areas protected as wildlife preserves, and all islands are tribal reserves. Tillanchong and Batti Malv islands are Wildlife Sanctuaries. Great Nicobar has two National Parks (536 km^2) and is also a Biosphere Reserve (885 km^2), whose core areas are the National Parks.

The vegetation and the floristic composition of the Car Nicobar group, Nancowry and Great Nicobar groups of islands differ from one another. In general the vegetation of the Nicobar Islands can be classified into six groups: Marine vegetation, beach vegetation, tidal mangrove forest, inland evergreen forests, patches of deciduous forest and grass land and open vegetation. The beach forests or the dune forests are restricted to the beaches of fine calcareous sand which stretch along the shores. Creepers that mark the beginning of beach vegetation are *Ipomoea per-caprae, Vigna retusa, Ischaemum muticum, Phyla nodiflora* and herbs like *Acalypha indica* etc. *Scaevola frutescens* is the immediate successor to these plants. *Tournefortia argentina* is a large shrub with silvery pubescent leaves and is very common in Great Nicobar Island.

Pandanus leram, Pandanus tectorius and *Pandanus furcatus* grow luxuriantly in this coastal forest.

Mangrove forests are found in patches of varying sizes in most islands. The dominant species present in this mangrove forests are *Rhizophora mucronata*, *Bruguiera gymnorrhiza*, *Excoecaria agallocha, Carallia brachiata, Sonneratia acida, Timonius jambosella* and *Nipa fruticans*.

The Great Nicobar Island, which is located between 6o45' N - 7o15' N, and 93°38' E - 93°55' E. The total area of the island is 973 km^2 with five perennial rivers and five hill ranges. The highest point is Mt Thullier (670 MSL). South Bay or Galathea Bay is located near to the Indira Point, which is the southernmost point of India.

The island is exposed to both south-west and north-east monsoons, with an average rainfall of 200 cm. The bulk of the rainfall comes during the southwest monsoon, and the wettest months are August to November, while the driest months are February and March when less than 5 cm of rainfall is received. The climate is humid, tropical-coastal due to its proximity to the equator. The average temperature varies from 25.5°C and 34.4°C. The average relative humidity is 80.8% and seldom goes below 70%. The islands get northeast wind from November to January and southwest from May to October. Cyclones sometimes bring huge devastation, endangering life.

Two groups of indigenous communities inhabit Great Nicobar. The Shompen, who now number less than 150, are a semi-nomadic tribe who inhabit the forests of the central uplands. It is probable that they were pushed into inaccessible areas by the Nicobarese who have several settlements along the coast. The Nicobarese constitute the largest tribal group in the islands.

The Government's vision for holistic development of Great Nicobar Island, which inter alia envisages the sustainable development of Great Nicobar Island, including setting up of Transhipment Port, Airport and a Township. The project is of strategic importance and also significant from the points of view of National Security.

Sea turtles and their habitats in Nicobars

Five of the seven species of marine turtles found worldwide are reported to occur in Indian coastal waters, of these, four species such as Leatherback, Green sea, Olive Ridley and Hawksbill, nests along the coastline of Andaman and Nicobar islands (Sivakumar, 2002; Namboothri el al. 2012). Andaman and Nicobar Islands have some of the best nesting beaches and foraging grounds for marine turtles in India. A proportion of world's Leatherback turtle population migrates every winter to the off coast of Little Andaman, Little Nicobar and Great Nicobar islands. Most importantly on the beaches of Galathea, Dagmar (Casuarina Bay) and Alexandria in Great Nicobar Island as well as on the beaches of Little Nicobar and Little Andaman. The Leatherback turtle nesting population in Andaman and Nicobar islands forms one of the four large colonies in Indo-Pacific region. Leatherback turtles that nest on the beaches of Andaman Nicobar Islands migrate up to Australia and Africa on either side.

Increased egg predation by wild pigs, domestic and feral dogs, hunting and incidental capture of turtles and fishery related mortality have been widely reported in the islands. Therefore, the Forest Department has already identified all-important sea turtles nesting beaches of islands and continuously monitoring these beaches with a Special Sea Turtle Monitoring and Protection Force (STPF). Andaman administration has also banned sand mining in all turtle nesting beaches in the region. Feral dogs, which pose a great risk to the survival of turtles, were also monitored and regulated. Artificial hatcheries have been established at several nesting sites to protect nests from predation. Further, the department is successful in getting supports of communities and other stakeholders in conservation of sea turtles and their habitats in islands.

In Nicobar district, both Little and Great Nicobar Islands are historically well known for the nesting of leatherbacks. In the Great Nicobar Island, there are nine important turtle nesting beaches, of these, Galathea Bay is one of the three important nesting sites of Leatherback turtles, other two being Casuarina Bay and Alexandria Bay (Sivakumar, 2002). Other beaches are used by multiple species of turtles. Sporadic nesting of leatherback was also reported from Anderson Bay and Shashtri Nagar (ANIFD). About 150 to 500 Leatherback turtles nest at Galathea Bay every year. The 2004 tsunami has adversely affected this species and its nesting areas. But after few years, the species could bounce back that indicates that this species has a good resilience and adaptability for the changes, provided their habitats are protected.

Objective and Background

The Government's vision for holistic development of Great Nicobar Island, which inter alia envisages the sustainable development of Great Nicobar Island, including setting up of Transhipment Port, Airport and a Township. The project is of strategic importance and also significant from the points of view of National Security.

In this context, ANIIDCO after having a meeting with Additional Secretary (UT), MHA, vide its letter No.1-1552/ANIIDCO/Projects/2020-21/1275, dated 9th April, 2021, and with reference to 260th Meeting of EAC of MoEF&CC, had requested WII to undertake a study to assess the environmental sensitivity of the project to suggest most suitable location for the Port. In this context, WII has agreed making a recee inspection visit to the area to study the critical wildlife habitat at Galathea Bay and other parts of Great Nicobar to understand the area and the issues and set the future course of action subject to minutes of the 260th Meeting of EAC, MoEF&CC that was held on 5-6 April, 2021.

In this context, WII has carried out a **rapid assessment** study to understand the biological or ecological significance of five sites identified by ANIIDCO for the port. This study was conducted with aim of assessing the current status of important turtle nesting beaches with special focus on sea turtles especially leatherback. Study was also aimed to assess the status of megapodes and dugong habitats along these beaches.

Methodology

1. In the Andaman and Nicobar islands, the main nesting season for sea turtles is from November to March, therefore, this survey was largely based on sign surveys especially surveying the number of old tracks and nests laid in the season, and also secondary data collected by the Forest Department and other agencies and literature. This survey was carried out from 14th to 19th April, 2021 to understand the current status of beaches with respect to sea turtles nesting in the Great Nicobar Island. Aerial surveys were also carried out using a helicopter for reconnaissance and then all selected beaches visited by foot with six persons and a drone for the detailed survey.

2. Aerial survey. The entire coasts of Great Nicobar Island was surveyed using a helicopter on 15th April, 2021 to select the important beaches for detailed surveys by foot. Helicopter flew at the slower speed at the altitude of 500 m. Based on this survey, Anderson Bay (Joingdar Nagar), Vijay Nagar, Laxmi Nagar, Gandhi Nagar, Shashtri Nagar, Galathea Bay, Pemayya Bay, Alexandria Bay and Casuarina Bay were chosen for further detailed survey. These beaches were chosen largely due to its length and width, and historical reporting of sea turtles nests in these beaches that was based on literature and Forest Department's records. There were also several smaller but potential beaches that are conducive for turtle nesting were seen between Pemayya Bay and Alexandria along the west coast, and between Campbell Bay and Laful along east coast of the Great Nicobar Island.

3. Drone survey: A drone with a special application was used to study the beach profile, geomorphology of the bay, inter-tidal profile and locating old nests. Land-cover of surroundings of the beaches was also studied using the drone. Minimum two flights were made at over each beach at the height of 100 m. Further, one more flight was exclusively used for locating old nests at the height of 50 m. Geo-coded images of drone was later analysed for calculating the beach length, width, inter-tidal width, slope of the beach from the low-tide line. Drone was also used to check the presence of seagrass beds (and dugongs) and coral reefs in the bay areas. Drone also helped us to locate a leatherback nesting at the night on 15th April, 2021 at the Galathea

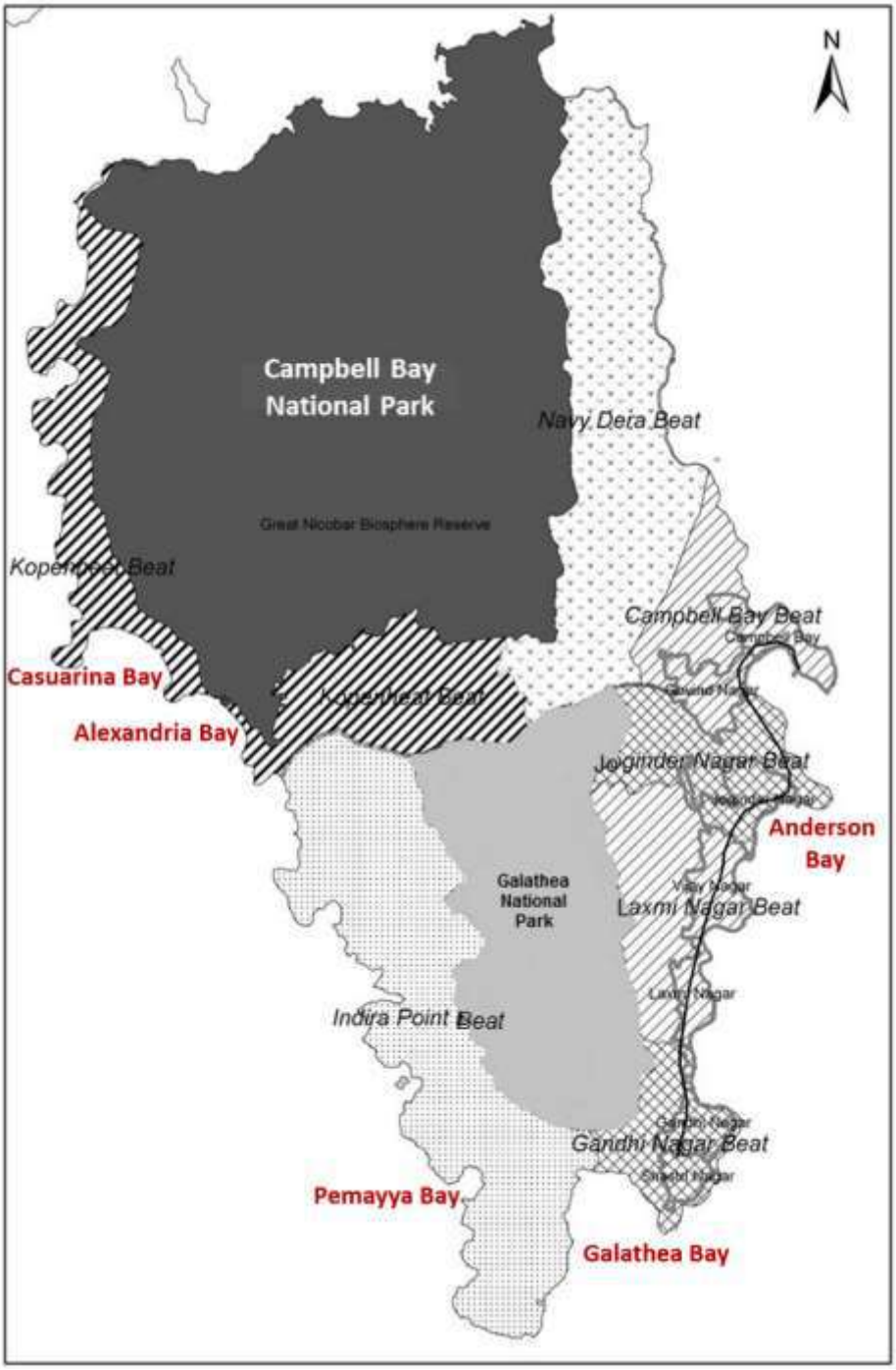
Bay and subsequently, we could observe the entire nesting behaviour of that turtle for about two hours.

4. Foot survey: All selected beaches were surveyed by foot with help of a six members team. Entire beach was walked for locating the old nests of sea turtles and recorded. Old tracks of turtles were identified at species level whenever it could possible. Presence of predators based on indirect evidences were also collected. Soil samples were collected while doing surveys. Beach width and inter-tidal width were measured manually at selected points to reconfirm the drone data. Nearby, coastal forest was surveyed for the presence of megapode mounds. Assessment of abundance of seagrass beds in the bay area using drone was also done. All the beaches were approached from sea with help of the Coast Guard boats and their team members.

5. Night survey: On 15th and 16th April, 2021, the entire Galathea Bay beach was surveyed for sea turtle nestings. Only one leatherback turtle laid eggs on 15th April, 2021 at 11.05 PM. Wild pigs were seen during the night hours on the beaches.

6. Soil grain-size analysis: Soil samples were collected from all nesting beaches to understand the relationship between soil texture profile and species that used for nesting. At each sampling point, soils weighing about 100 grams were collected at high tide line, turtle nesting area and in-between these two points. Multiple sampling points at each beach were fixed at equal distances. Collected samples were air-dried and analysed at the Wildlife Institute of India. A weighed sample of soil material was separated through a series of sieves with progressively smaller openings ((0.13mm, 0.25mm, 0.5mm, 1mm, 2mm). Particle size distribution was determined by weighing the material retained on each of the sieves and dividing these weights by the total weight of the sample. A correction was made for the moisture content of the sample and all calculations were based on dry weight.

Map 1. Important Sea Turtle Nesting Areas of Great Nicobar Island. Casuarina Bay, Alexandria Bay and Galathea Bay are largely used by the Leatherback. Pemayya Bay and Anderson Bay used by multiple species including Leatherback.



Results and Discussion

1. A total of nine beaches viz. Anderson Bay, Vijay Nagar, Laxmi Nagar, Gandhi Nagar, Shashtri Nagar, Galathea Bay, Pemayya Bay, Alexandria Bay and Casuarina Bay (Dagmar) were chosen based on aerial survey for the detailed assessment on the ground. It was found that all these beaches had signs of turtle nesting. Of these, Galathea Bay, Anderson Bay, Pemayya Bay, Alexandria Bay and Casuarina Bay were used by the Leatherback turtles. But, high intensity of turtle nests of leatherback found in Alexandria, Casuarina and Galathea bays (**Table 1 & 2**). Sporadic nesting of leatherbacks on the Pemayya and Anderson bays was also recorded during this survey. However, both Pemayya and Anderson bays were also observed with nesting other species of turtles in high numbers especially the green sea and hawksbill.

2. In 1991-92, more numbers of leatherback turtle nests laid in Alexandria Bay (N=343 nests) than Dagmar Bay (N=171 nests) and the Galathea Bay (N=158 but in 1993-94, leatherback nests reported only from the Galathea Bay (N=237) (**Namboothri, et al., 2012**) (**Table 2**). Further, the Forest Department could establish the turtle monitoring hut just after the tsunami but there was no reporting of Leatherback from 2005 to 2010 at Galathea. The first reporting of leatherback turtle nesting in the Galathea Bay was in 2011, when 146 nests reported (**Namboothri, et al., 2011**) but Jadeja et al. (2016) claimed the first reporting of leatherback nests after tsunami that was in 2015 (**Jadeja, et al., 2016).** Since 2004, beaches along west coast of the Great Nicobar were not monitored for turtle nests till February, 2016. Therefore, it would be difficult to confirm whether the leatherback used other beaches of Great Nicobar for nesting during this 6 years period, when they were not laid eggs at the Galathea Bay. In 2016, more number of leatherback laid in the Galathea Bay than Dagmar and Alexandria. Variations in the nests laid by the leatherback between years could be due to variations in the environmental settings or conduciveness of the beaches for nesting as leatherback known to be having the poor nest site fidelity. It may change the nesting site

temporarily if the environmental settings of the beach is not favourable for nesting (**Kelly et al., 2014)**.

3. Leatherbacks are known to distribute nests up to 460 km apart within a nesting season in Florida, USA (**Kelly et al., 2014**). Therefore, the Leatherbacks appears to have adopted a regional rather than a local optimum for nesting, possibly due to their poor nesting beach fidelity and the frequent erosion and degradation of their nesting beaches (**Kamel and Mrosovsky, 2004; Kelly et al., 2014**). Indian Institute of Science, Dakshin Foundation and ANET have earlier tagged 10 leatherbacks using satellite transmitters from the Little Andaman and monitored for their movements from 2011 to 2014. Of these, one turtle that laid eggs at Little Andaman was observed laying eggs in February, 2021 on the beach of the Galathea Bay, Great Nicobar by ZSI Team (**pers: C. Sivaperuman, ZSI**) that reiterate the weak nesting site fidelity of Leatherback as well as it reveals that the leatherback may distribute nests in different places between years.

4. Increased egg predation by wild pigs, domestic and feral dogs, hunting and incidental capture of turtles and fishery related mortality have been reported in the islands. Therefore, the Forest Department has already identified all-important sea turtles nesting beaches of islands and continuously monitoring some of these beaches with a Special Sea Turtle Monitoring and Protection Force (STPF). Andaman administration has also banned sand mining in all turtle nesting beaches in the region. Feral dogs, which pose a great risk to the survival of turtles, were also monitored and regulated. Artificial hatcheries have been established at several nesting sites (Galathea Bay, Gandhinagar, Vijay nagar and Anderson Bay) to protect turtle eggs predation to enhance nesting success. Further, the department is successful in getting support of communities and other stakeholders in conservation of sea turtles and their habitats in island especially at Anderson Bay, Shashtri Nagar, Gandhi Nagar and Vijay Nagar.

5. Beaches of Galathea Bay is one of the three important nesting sites of Leatherback turtles in Great Nicobar Island, others being at Casuarina Bay and Alexandria Bay (**Sivakumar, K. 2002**). About 150

to 480 Leatherback turtles nest at Galathea Bay every year (ANIFD). The 2004 tsunami has adversely affected this species and its nesting areas. But after few years, the species could bounce back, which indicates that this species has a good resilience and adaptability for the changes, provided their habitats are protected. The information on the post Tsunami use of the other two beaches i.e. Casuarina Bay and Alexandria Bay was not available perhaps owing to lack of monitoring,

6. Soil analysis has revealed that all nine beaches are conducive for sea turtles to nest (**Mortimer, 1990; Kamel and Mrosovsky, 2004; Behera et al., 2013; Kelly et al., 2014)**. However, Casuarina, Alexandria and Galathea beaches had more fine sands than other beaches. These three beaches had more similarities with respect to soil texture, inter-tidal flats, slope and connectivity with perennial rivers and these environmental settings are largely preferred by leatherback to nest in larger numbers (**Table 3**). Pemayya bay, Anderson Bay, Gandhi Nagar and Shahstri nagar bays had moderate slope with moderate inter-tidal flats that are seems to be more conducive environmental settings for other turtle species to nests.

7. Status of threat especially the nest predation was assessed at high level in all beaches that was concurrence with the similar observations made earlier by Swaminathan et al, **(2017)**. Wild pigs were the main predators on the beaches of Casuarina, Alexandria, Pemayya and Galathea but domestic and feral dogs were major predators observed on the other beaches (**Table 3**). More than 85% of nests laid by the leatherback were predated that brought down the success rate of leatherback's nests about 15%, which is a very serious issue that needs to be addressed immediately.

8. Megapode nest mounds were found along the beaches of Casuarina (N=4), Alexandria (N=2), Pemayya (N=2), Galathea (N=1) and Anderson(N=1) (**Map 2 and Table 1**).

9. This short term survey could not find the presence of seagrass beds in the bay areas of these nine beaches. Therefore, the occurrences of dugong in these bays was doubtful.

10. Except the Galathea Bay, coral reefs were found near the all nesting beaches (**Map 2 and Table 1**). But, composition and qualities of these reefs were not studied during this survey owing lack of expertise and to shortage of time.

Table 1. Distribution of sea turtles nests, megapode and dugong at the important beaches/bays of the Great Nicobar.

	Anderson Bay	Vijay Nagar	Laxmi Nagar	Gandhi Nagar	Shashtri Nagar	Galathea Bay	Pemayya Bay	Alexandra Bay	Casuarina Bay
Leatherback	√	√	√	√	√	√	√	√	√
Green Sea	√	√	√	√	√	√	√	√	√
Olive Ridley	√	√	√	√	√	√	√	√	√
Hawksbill	√	√	√	√	√	√	√	√	√
Megapode	√	X	X	X	X	√	√	√	√
Dugong	X	X	X	X	X	X	X	X	X
Coral reefs	√	√	√	√	√	X	√	√	√

Photo: A leatherback turtle covering her nest after laying eggs on 15th April, 2021 in the Galathea Bay, Great Nicobar Island (Photo by K. Sivakumar)

Map 2. Critical wildlife habitats along coastal areas of the Great Nicobar Island (Source: WII, ZSI & Forest Department)

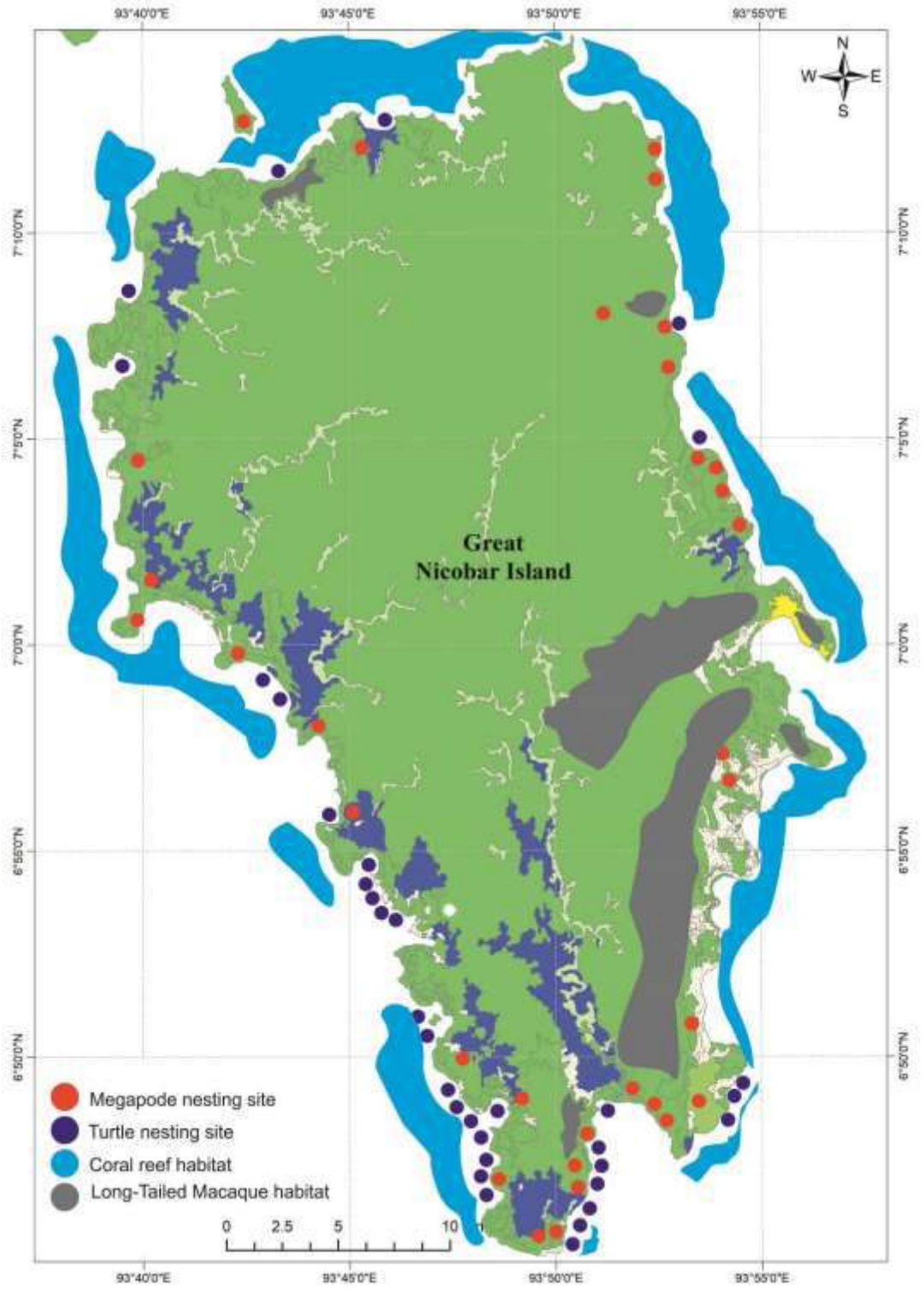


Table 2. Status of Leatherback turtle nests at the important beaches/bays of the Great Nicobar.

Year	Anderson Bay	Vijay Nagar	Laxmi Nagar	Gandhi Nagar	Shashtri Nagar	Galathea Bay	Pemayya Bay	Alexandria Bay	Casuarina Bay
1991-92*	-	-	-	-	-	158	-	343	171
2000-01**	-	-	-	-	-	524	-	866	362
2015-16#	-	-	1	-	-	412	-	66	166
2016-17##	4	-	0	-	4	90	-	-	-
2017-18##	4	-	0	-	0	182	-	-	-
2018-19##	4	-	1	-	0	203	-	-	-
2019-20##	11	-	0	-	0	483	-	-	-
2020-21##	4	-	0	-	0	484	-	-	-

**Namboothri, N., A. Swaminathan & K. Shanker. 2012. A compilation of data from Satish Bhaskar's sea turtle surveys of the Andaman and Nicobar islands. Indian Ocean Turtle Newsletter 16: 4-13.*

***Andrews, H.V., S. Krishnan & P. Biswas. 2006. Distribution and status of marine turtles in the Andaman and Nicobar Islands. In: Marine Turtles of the Indian Subcontinent (eds. Shanker, K. & B.C. Choudhury), pp. 33-57. Universities Press, Hyderabad. India.*

#Swaminathan, A., S. Thesorow, S. Watha, M. Manoharakrishnan, N. Namboothri and M. Chandi. 2017. Current status and distribution of threatened leatherback turtles and their nesting beaches in the Nicobar group of islands. Indian Ocean Turtle Newsletter 25:12-18

Forest Department, Andaman and Nicobar Islands

- Not monitored/surveyed either by Forest Department or by any other experts or organization, but signs of turtle nesting were recorded during this study. Attempt was not made to calculate the total number of nests laid for this season based on existing tracks/nests signs.

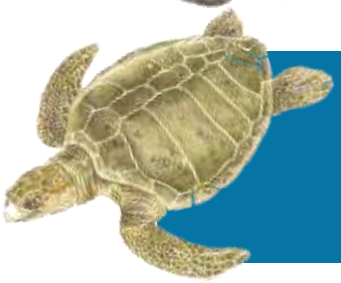
Table 3. Profile of important sea turtle nesting beaches of the Great Nicobar on 14th – 19th April, 2021. Galathea Bay, Casuarina Bay and Alexandria Bay had more fine sands than other beaches.

Beach Profile	Anderson Bay	Vijay Nagar	Laxmi Nagar	Gandhi Nagar	Shashtri Nagar	Galathea Bay	Pemayya Bay	Alexandra Bay	Casuarina Bay
Length	3.5 km	2.8 km	2.4 km	2.5 km	1.2 km	4.5 km	3.0 km	3.2 km	4.2 km
Avg Beach Width*	16 m	15 m	12 m	15 m	15 m	23 m	18 m	20 m	24 m
Beach Slope	Moderate	Steep	Steep	Moderate	Moderate	Gradual	Moderate	Gradual	Gradual
Intertidal Flats width	120 m	40 m	55 m	110 m	120 m	370 m	145 m	360 m	375 m
Sand grain size (2.0 mm)	0.21%	0.26%	0.28%	0.17%	0.29%	0.09%	0.12%	0.11%	0.09%
Sand grain size (1.0 mm)	0.18%	0.18%	0.17%	0.18%	0.16%	1.14%	0.12%	1.14%	1.12%
Sand grain size (0.5 mm)	0.21%	0.14%	0.11%	0.18%	0.18%	3.16%	0.08%	4.11%	3.18%
Sand grain size (0.25 mm)	0.26%	0.21%	0.31%	0.21%	0.22%	3.47%	0.49%	3.48%	3.45%
Sand grain size (0.13 mm)	0.45%	0.15%	0.25%	0.25%	0.36%	1.18%	0.15%	1.12%	1.09%
Perennial Freshwater	-	-	-	-	-	Yes	-	Yes	Yes
Predation	High (Feral dogs)	High (Feral dogs)	High (Feral dogs)	High (Feral dogs)	High (Feral dogs)	High (Wild Pigs and dogs)	High (Wild Pigs)	High (Wild Pigs)	High (Wild Pigs)

* high tide line to vegetation line on 14-19 April, 2021

Leatherback:

- A total of 484 nests recorded in 2020-21
- One of the three important nesting sites of Leatherback turtles in Great Nicobar Island.
- Old signs of five nests of leatherback observed western side of Galathea and one nest on the eastern side of the Galathea river mouth on 15-16 April, 2021. Nesting of one turtle observed on 15th April, 2021 .

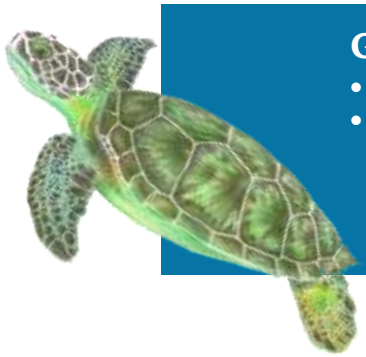


Olive Ridley:

- This species reported to be nesting in the Galathea Bay but there was no record of number of nests laid in the recent past.
- A total of 1182 nests recorded in 9 monitoring years, during 1991-92, 1998-2005 and 2012-13

Hawksbill:

- A total of 17 nests recorded in 2000-2001.
- There was no record of number of nests laid in the recent past.

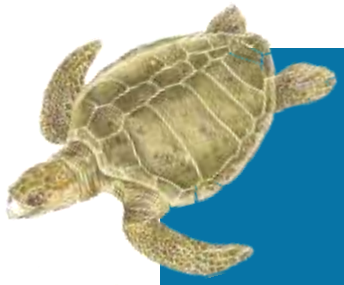


Green Sea:

- Three nests recorded in 1998-99.
- There was no record of number of nests laid in the recent past.

Leatherback:

- Maximum number of nests laid in 2000-01 (N=362) but this beach was not regularly monitored.
- There was no monitoring of this beach for last five years.
- One of the three important nesting sites of Leatherback turtles in Great Nicobar Island.
- Old signs of seven nests of leatherback observed on 18th April, 2021.

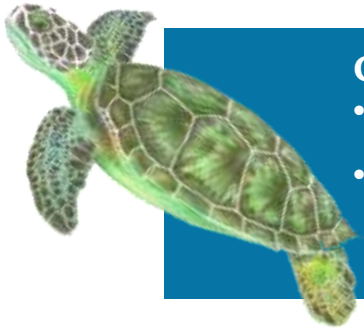


Olive Ridley:

- This species reported to be nesting in this each but there was no record of number of nests laid in the recent past.
- A total of 57 nests recorded in 2000-01
- Old signs of one nest observed probably of Olive Ridley.

Hawksbill:

- There was no record of number of nests laid in the recent past.
-



Green Sea:

- There was no record of number of nests laid in the recent past.
- Old signs two nests observed on 18th April, 2021

Leatherback:

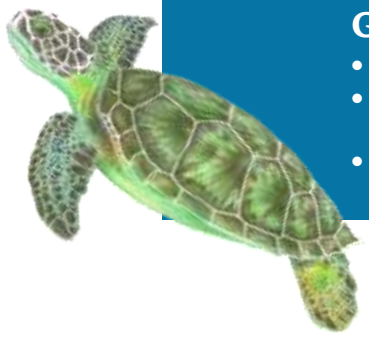
- Maximum number of nests laid in 2000-01 (N=866),which was the highest number of nests reported from any beaches of Andaman and Nicobar islands for leatherbacks but this beach was not regularly monitored.
- There was no monitoring of this beach for last five years.
- One of the three important nesting sites of Leatherback turtles in Great Nicobar Island.

Olive Ridley:

- This species reported to be nesting in this beach but there was no record of number of nests laid.
- A total of 163 nests were recorded in 2000-01.
- Old signs of two nests observed during this survey

Hawksbill:

- There was no monitoring of nesting of this species in the past.
- But, it was reported that this species use this beach for nesting

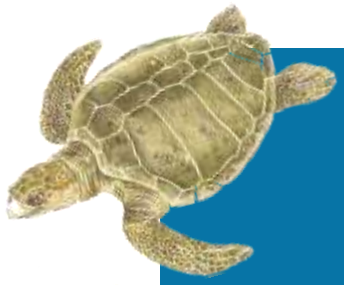


Green Sea:

- Three nests recorded in 1998-99.
- There was no record of number of nests laid in the recent past.
-

Leatherback:

- This beach became more conducive for sea turtles to nest just after tsunami.
- This beach was never monitored in the past.
- Old signs of six nests of leatherback observed on 18th April, 2021.

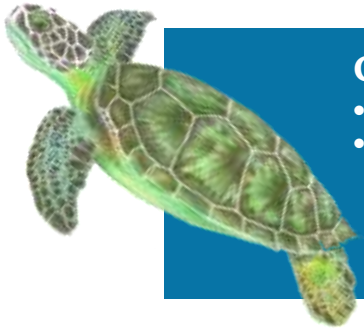


Olive Ridley:

- Old signs of seven nests observed probably of Olive Ridley.
- This beach was never monitored for sea turtles nests in the past as it has became more condusive for turtles after tsunami

Hawksbill:

- There was no record of number of nests laid in the recent past.
- Old signs of two nests probably of this species observed during this survey.

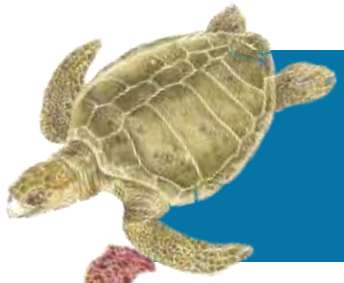


Green Sea:

- Old signs 11 nests observed on 18th April, 2021
- Highest number of nests of Green sea turtles reported from this beach during this survey.

Leatherback:

- Maximum number of nests laid in 2019-20 (N=11), but average of four nests reported every year in the recent past.
- There was no old signs of turtles seen during this survey but two nests were protected inside the artificial hatchery that was managed by the Forest Department.



Olive Ridley:

- About 20 to 70 turtles laid nests every year from 2017 to 2021. Maximum of 71 nests reported in 2017. Forest Department collect the eggs and protect inside the artificial hatchery.

Hawksbill:

- There was no record of number of nests laid in the recent past. But, local people confirmed the sporadic nesting of this species in larger number after tsunami. Further, fishermen confirmed that this species feeds in the adjoining coral reefs

Green Sea:

- Green sea turtles were also reported from this beach Old signs of two nests observed during this survey.

Conclusion & Recommendations

1. In the Great Nicobar Island, a total of nine beaches have been identified as important turtle nesting beaches, of these, five beaches such as Galathea Bay, Casuarina Bay, Alexandria Bay, Pemayya Bay and Anderson Bay were assessed as the most important beaches for sea turtles (**Table 2 & Map 1**). Galathea Bay, Casuarina Bay and Alexandria Bay are important for Leatherback turtles and other two beaches i.e. Anderson Bay and Pemayya Bay were assessed as good for nesting of multiple species especially green sea, hawksbill and olive ridley turtles.

2. Megapode mounds were found along the beaches of Casuarina, Alexandria, Pemayya, Galathea and Anderson bays (**Table 1 & Map 2**).

3. This short term study could not find any dugongs and their seagrass habitats in these five bays during the survey.

4. Except the Galathea Bay, nearby areas of all other important turtle nesting beaches have coral reefs (**Table 1 & Map 2**).

5. Therefore, this rapid assessment study may conclude that all five sites are ecologically or biologically significant sites especially for sea turtles, and may be equally environmentally sensitive for any changes due to development. Coral reefs were not found nearby areas of Galathea bay but it was found in nearby areas of all other bays.

6. Intensity of Leatherback turtle nesting varied between beaches located at Galathea Bay, Casuarina Bay and Alexandria Bay, and it was also varied between years. More number of leatherback turtles laid nests in Alexandria Bay than in Casuarina and Galathea Bay in 1991 and 2001. But in 2015, the Galathea Bay was estimated with higher number of leatherbacks nests (Table 2). There was no reporting of nests from the Galathea Bay between 2004 and 2011.

Just after tsunami, beaches of Galathea Bay were not conducive for turtle to lay eggs as it was inundated and swampy (**Sivakumar, 2010a & 2010c**).

7. There was no monitoring of sea turtles along the west coast including the beaches of Casuarina and Alexandria bays, therefore, it would be difficult to confirm whether leatherback turtles used these beaches for nesting from 2005 to 2011, when they have avoided the Galathea Bay. But, higher numbers of leatherback turtle tracks were seen on the beaches of Casuarina, Alexandria and Pemayya bays during this rapid assessment.

8. Leatherbacks are known to change the nesting sites depending upon the conduciveness and safety of the beaches. A leatherback turtle that laid eggs in the Little Andaman before 2014 was observed laying eggs in the Galathea Bay in February, 2021 that might be due to poor nest site fidelity of this species (**Kamel and Mrosovsky, 2004; Kelly et al., 2014)**. Therefore, it is equally important to monitor, protect and conserve beaches of Casuarina and Alexandria beaches for the long term conservation of leatherback in Andaman and Nicobar Islands.

9. Further, three beaches such as Casuarina, Alexandria and Galathea were observed having more finer soils, and with gentle slope of inter-tidal flat that might probably be helping the gigantic leatherback to reach shore and lay eggs here conveniently. More similarities were also seen in the soil texture of these three beaches with smaller granules. But, other beaches comparatively had larger soil-granules.

10. In overall, more than 85% of leatherback turtle nests were known to be predated in the Great Nicobar (**Swaminathan et al, 2017**) possibly by wild predators such as wild pigs and water monitor lizard especially in Casuarina Bay, Alexandria Bay, Pemayya Bay and Galathea Bay, and domestic and feral dogs in other beaches (**Sivakumar, 2010b**). Therefore, the success rate of leatherback

turtle nests in the Great Nicobar was less than 15% (**Swaminathan et al, 2017**) that needs to be addressed immediately. There is a lot of scope to enhance the success rate of nests up to 90% with a turtle conservation planning.

11. Pemayya Bay, Anderson Bay, Shastri Nagar, Laxi Nagar, Gandhi Nagar and Vijay Nagar bays and nearby areas were observed with coral reefs and mangroves. These beaches were used by multiple species of sea turtles largely by Green sea, Olive Ridley, Hawksbill and fewer leatherbacks. Of these, except Pemayya Bay that is located at west coast, all other beaches are with revenue or private parties, therefore, the beaches located along east coast between Shashtri Nagar and Campbell need to be managed with participation of local communities.

12. Now, the Government's has a vision for holistic development of Great Nicobar Island, which inter alia envisages the sustainable development of Great Nicobar Island, including development of an International Transhipment Terminal. In this context, the Government of Andaman and Nicobar Islands and the Government of India has identified the South Bay (Galathea Bay) as most conducive location for the International Transhipment Terminal as it is of national importance owing to strategic and security reasons.

13. In this context, WII strongly urge the concerned authorities to develop and implement a mitigation plan to facilitate leatherback and other turtles to continuously nest in the Great Nicobar Islands including in the beaches of Galathea Bay for which the connectivity between the Galathea River and the Bay should be ensured.

14. Further, beach between Indira Point and Galathea Bay was also observed with sporadic nesting of leatherback two decades ago (**Sivakumar, 2002**), is now observed with more nests that also needs to be secured and conserved as part of the mitigation measures.

15. Mitigation Plan should also facilitate the establishment of a research centre for marine biodiversity of islands with more focus on sea turtle conservation.

16. WII urge the authorities to establish the camps at Kopenheat, Alexandria and Casuarina bays to monitor and protect the nests of leatherback turtles from predators, which is the most critical conservation action required immediately.

17. Further, the mitigation plan should facilitate the long term conservation of sea turtles in Andaman and Nicobar Islands especially in the Great Nicobar and Little Nicobar islands. The long-term conservation plan is required to monitor, protect and conserve sea turtles and their habitats without disturbing the livelihoods of people especially the indigenous communities of the islands, but that needs to be prepared after a detailed EIA study as envisaged by the EAC of MoEF&CC in its 260th Meeting. In addition, we suggest that that EIA study should also include the satellite tracking of few leatherback turtles from Galathea, Casuarina and Alexandria beaches to understand their movements and nest site fidelity that are critical for the development of mitigation measures.

18. WII has very limited expertise to conduct EIA study covering all aspects of ToR provided by EAC of MoEF&CC in its 260th Meeting as they are very vast and include areas where WII has no expertise., Therefore, this study may be assigned to the Zoological Survey of India as they have a Regional Centre at Port Blair with required expertise and logistics. Further, ZSI has already assessing the status of biodiversity in connection with this project for considerable time. WII would be willing to provide the technical inputs to ZSI to conduct EIA study, if required.

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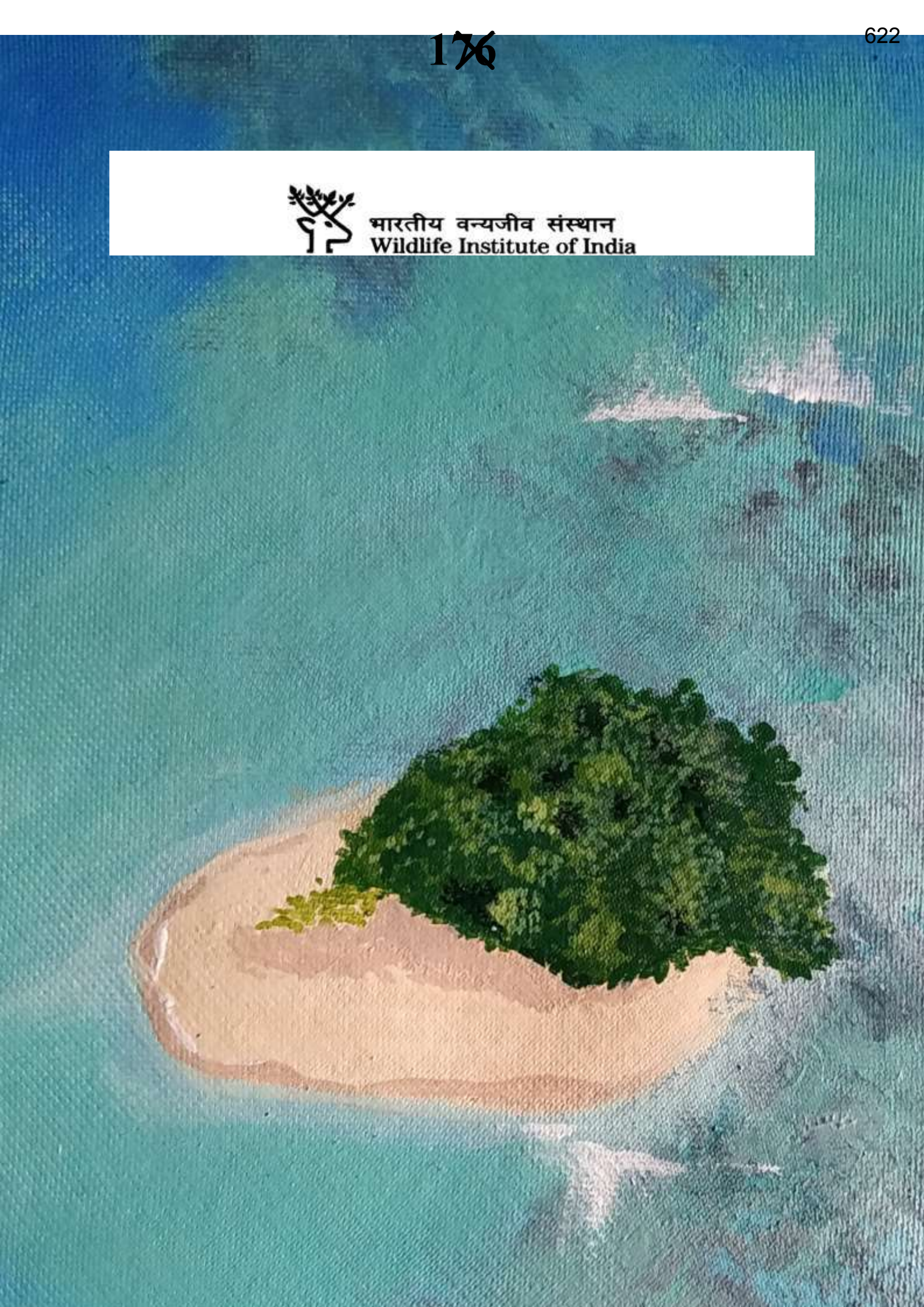
भारतीय वन्यजीव संस्थान
Wildlife Institute of India

COMPREHENSIVE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR

HOLISTIC DEVELOPMENT OF GREAT NICOBAR ISLAND IN ANDAMAN AND NICOBAR ISLANDS INCLUDING INTEGRATED DEVELOPMENT OF INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL (ICTT)-14.2 MILLION TEU ALONG WITH GREENFIELD INTERNATIONAL AIRPORT (4000 PEAK HOUR PASSENGERS-PHP), TOWNSHIP & AREA DEVELOPMENT AND 450 MVA GAS AND SOLAR BASED POWER PLANT IN 16610 HA. GREAT NICOBAR ISLANDS, IN NICOBAR DISTRICT

FINAL EIA REPORT

Project Proponent

Andaman and Nicobar Islands Integrated Development Corporation Ltd (ANIIDCO),

(A Government undertaking)

March 2022

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71 species of birds, 26 species of reptiles, 10 species of amphibians, and 113 species of fish have been reported. The region also harbours endemic and endangered species of fauna. To date, 11 species of mammals, 32 species of birds, 7 species of reptiles and 4 species of amphibians have been found to be endemic. Of these, the well-known species are Crab-eating Macaque, Nicobar Tree Shrew, Dugong, Nicobar Megapode, Serpent Eagle, saltwater crocodile, marine turtles and Reticulated Python.

The area harbours coral reefs. These reefs are present around the island with varied thickness and diversity. The corals were severely affected due to 2004 tsunami. In 2008, due to rise in sea water temperature, significant number of corals were bleached all over the world; the corals of Nicobar Island also experienced bleaching. However, the exact quantity of coral bleaching has not been estimated. The corals generally exist along the rocky coastal stretches. The island has plates of dead and live corals. In few areas, new coral recruits were also observed. As a part of the EIA study for this development, Zoological Survey of India (ZSI) has surveyed the area and the final report is attached as an Attachment 1 to this EIA report.

Along the coastal beaches of the Nicobar Island, Leatherback and Olive Ridley turtles are known to nest. The tsunami of 2004 modified the coastal morphology significantly and the turtles stopped visiting the beaches for nesting. However, with the passage of time, some turtles have returned for nesting.

Megapode nesting sites can be seen in various places around the island. Megapodes are mainly solitary birds that do not incubate their eggs with their body heat as other birds do but bury them in mound consisting of decaying vegetation. The megapods before tsunami mainly used to nest near to the shores. However, as the shoreline got modified after the tsunami, there has been a tendency amongst the megapods to nest away from the shores. ZSI has conducted a short-term study on the megapode nesting sites as a part of the EIA. However, a long-term study on megapode has been initiated by ZSI.

Hydrodynamics at Galathea bay (Post construtrion)

The tide and wind induced flow fields during flood and ebb tides on a spring tidal day in case of with port facilities is shown in **Figure-2.10**. During the flood tide, the direction of flow is towards northwest at the entrance and inside the bay. The magnitude of current speed is observed as 0.03 m/s. Similarly, it is observed that during ebb tide, the magnitude of current speed is observed as 0.02 m/s and the current direction is towards southeast.

The tide and wind induced flow fields during flood and ebb tides on a neap tidal day in case of with port facilities is shown in Figure-2.10. During the flood tide, the direction of flow is towards northwest at the entrance and inside the bay. The magnitude of current speed is observed as 0.02 m/s. Similarly, it is observed that during ebb tide, the magnitude of current speed is observed as 0.01 m/s and the current direction is towards southeast.

Effect on Hydrodynamics

The hydrodynamic model was undertake as described above. The model suggests sedimentation due to the construction of the port berths and the break water. Due to the construction of break waters and berths, the area will be cut-off from the wave action which brings sediments, to the bay. However, the low also tides takes away some of the sediments back to the sea. This natural process will be affected due to construction of the port. There will be sedimentation around the breakwaters and the berths is given in Figure-2.10**.** No erosion is expected as per the model. Therefore, there will be no erosion on the beach especially on the western flank of the bay where the leatherback turtles breed. As per the model results there will be sedimentation of around 0.04m/yr on the western beach. Therefore, the beach is likely to be widened over long period giving more space for breeding to the turtles.

The sedimentation process may affect the Galathea river mouth to some extent. Though the model does not suggest any sedimentation, over time there could be some deposits on the fan of the Galathea mouth. This area needs to be dredged periodically to the keep the mouth open so that the salinity of the estuary maintained.

The hydrodynamic model shows that the current speeds is relatively low showing less than 0.2 m/s. There is no significant change in the flow field outside the Galathea Bay before and after the construction. Due to the construction of proposed port and associated facilities, there is only a minor change in current speed inside the Galathea Bay.

of *Casuarina* plantation, beach vegetation, *Pandanus* lining and mangrove vegetation including *Nypa*palm swamp. The inland vegetation consists of low land swamp and mainly evergreen hill forests with very few deciduous elements comprising of tall straight trees with closed canopy formation. About 600 plant species of different groups are known from the biosphere reserve, of which 10% are being indigenous and found nowhere else in the world.

Kailash Chandra (1999) states that the interesting and endemic species of higher animals of Great Nicobar Biosphere Reserve include the Nicobar crab-eating monkey, Nicobar fruit-bat, Nicobar flying fox, Nicobar tree-shrew among mammals; and Nicobar serpent eagle, South Nicobar-Megapode, Nicobar quill, Nicobar pigeon, Nicobar cuckoo-dove, Nicobar parakeet, white bellied swiftlet, Nicobar kingfisher, Nicobarmyna, Nicobar sun-bird etc. among the birds. The other interesting fauna belonging to amphibians and reptiles are - Nicobar tree frog, Nicobar toad. Nicobarese tree skink, water monitor lizard, Daniel's forest lizard, worm lizard, Nicobar water snake, reticulated python, leather - back sea turtle, green sea turtle, Hawk's bill turtle, Olive Ridley turtle, south east Asian box turtle, estuarine crocodile ete. Among the invertebrates. Coconut crab and endemic insects including butterflies are also found in Great Nicobar Island.

Study area

Quick primary survey of the Ecology and biodiversity of the Great Nicobar Island was carried out by Prof.K.B Reddy, Retired Professor of Ecology and Environmental Sciences and a Functional Area Expert (FAE) in Ecology &Biodiversity and Soil Conservation (Category A) of the Vimta Labs Ltd., Hyderabad during December 2020 (14 to 22 December 2020). Primary survey of Leatherback Turtles was done by Mr. Ravinder of Vimta Labs during 12 to 18 February 2021.

The study area comprises of the west coast of Great Nicobar Island from Campbell Bay to the Indira point and Galathea River mouth in the southern part. It includes all revenue villages and areas approachable and accessible on both sides of the road. Many areas along the coast were not even approachable by sea. Similarly, thick forest vegetation with impenetrable shrubs and climbers was not accessible without clearing the vegetation and making the way. The hills are steep, slippery and totally covered by multi-storeyed vegetation. Whenever we could gain entry through some opening into the dense / thick forest, visibility was poor; humidity was high; soil was wet and slippery on account of intermittent sharp showers every day, invisible streams of water under thick carpet of dead leaves and twigs. Added to the problem was biting insects including mosquitoes. Further, when one tries to look upwards to find out what tree it is, it is not just one but many. Most trees are overgrown by heavy climbers and the tree-trunks are covered by epiphytes including mosses, lichens, epiphytic ferns and Orchids. There was no threat of venomous snakes as they do not occur in the Island. It was impossible to use any measuring devices like tape to make any quadrat in the forest vegetation. Hence, intensive survey was carried out on both sides of the Campbell -Indira Point for four days. It is about 45 Km and the entire stretch was survey 8 times in four days. However, towards the sea side (western side of

the road) most of the area was accessible but the soil was swampy, and vegetation was thick except in the commercial plantations of Coconut and Areca Nut. Under the guidance of a range officer sent by the D.F.O., we could reach the midst of the Campbell Bay National Park (CBNP). Observations about the Avifauna were made from the bird watching point. We had a couple of detailed discussions with the local D.F.O., who extended full cooperation without which the survey would not have been complete. Every day from 6.00 AM to 8.00, we used to cover one part of the Campbell Bay and in 6 days, Team had covered the entire Campbell Bay through the morning survey on foot. During the morning survey, Team interacted with traders, teachers, fisherman and local residents about different aspects relating to wildlife, cultivation, conflicts with wildlife and issues relating to Ecology. This detailed survey yielded many species of plants that were not reported or recorded earlier. During this period, we could count the numbers of Crab eating macaques in different groups in different parts.

During the survey, Teamhad covered a cross section of the CBNP, buffer zone of the Galathea National Park, Areas frequented by Salt water Crocodiles, Mangrove plantations in four different areas, Galathea River Estuary, breeding grounds of the Leatherback Turtles, all villages and coastal areas apart from the forest areas. According to the maps of the forest department, most part of the area towards the west of the Campbell – Indira Point road is a revenue land though there are forests. Towards the east of the road is mostly forest but in many areas the road passes either through either the forest or revenue land only.

Based on the field visit experience briefly mentioned above, there were some limitations to the survey. It is a rapid reconnaissance type of survey and it was not intensive except in non-forest residential areas. As most plant species were not in flowering and could only be seen from some distance either because of height of the trees or because of lack of access, for correct identification of the species, hence, the list provided by forest department as well as the data from different scientific publications were referred and compared with site observations. Nomenclature, where required was updated and hence the names of some species are at variance from the earlier reports. With such practical difficulties, in spite of the sincere effort made there could be a few minor errors. Based on our site observations, it appears that what is uncovered so far is not complete and what is hidden may be even more valuable. Thus, in spite of the best efforts, the survey within the dense forests was feasible only to a limited extent. Hence, the survey was carried out covering the entire stretch from Campbell Bay to Galathea River mouth on both sides of the road covering all accessible areas for seven days from 15th through 21st December 2020. There was no place which was not explored on both the sides of the road. In addition, team had gone in to the Campbell Bay National Park through the west-east road up to the bridge on Galathea River accompanied by a forest officer. The survey covered a stretch of 12 Km within the CBNP. The area included the bird watching point and the watch tower in Campbell Bay National Park (CBNP). The west -east coast road is more like a cart track and it is motorable to a limited extend. It is mainly designed by the CBNP authority for monitoring purposes. The following observations are made on the basis of the survey and the interaction with the

Figure-3.38: Mangrove Plantations Developed After Tsunami

Vegetation and flora of the buffer zone or the Nicobar biosphere reserve.

The archipelago of Andaman and Nicobar Islands holds fascination for its unique features in marine diversity, endemic fauna and flora, and green tropical evergreen forest. There are large number of protected areas viz, Biosphere reserve found nowhere else in the world biosphere reserves, National Parks, Wildlife Sanctuaries and Tribal reserve, for the conservation of unique biodiversity and protection of primitive aboriginals. In this context, it may be mentioned that the Andaman and Nicobar Administration on 25th January 2021 (vide Andaman and Nicobar Gazette No.15 dt.25-1-2021) denotified the Galathea National Park, which was earlier proposed as the Wildlife Sanctuary for protection of Turtle breeding grounds. The proposed wildlife sanctuary was not notified in time and it lapsed consequently, the situation changed after the extensive damage and destruction owing to thee tsunami of 2004. Over a period of time, the Leatherback turtles started returning to Great Nicobar for breeding, but they have moved to the western side as shown in Fig 1. In accordance with the denotification proposal, the Wildlife Institute of India (WII) and the Nicobar Development Authority are exploring workable alternative to ensure that the turtles are not subject to any stress owing to the proposed integrated development.

According to Kailash Chandra (1999), the southern-most point of the Islands, as well as of India, lies at Pygmalian point (renamed as Indira Point) of Great Nicobar. Out of the 24 islands in the Nicobar group, Great Nicobar is the largest island situated at about 482km South of Port Blair and about 145 km North of Sumatra (Indonesia). The island covers an area of l045 sq. km, of which 885 sq. km area is protected under the Nicobar Biosphere Reserve. It houses the Campbell Bay National Park (CBNP) and the Galathea National Park (GNP). These

Table-3.34: List of Mammals Reported from the Nicobar Biosphere Reserve

Scientific Name	Common Name	Category	IUCN /WPA
Sus scofa nicobaraensis	Nicobar Wild Pig	Pig	En / NL
Macaca fascicularis umbrosa	Nicobar crab eating macaque	Macaque	En / VU / I
Tupaia nicobarica	Nicobar Tree shrew	Rodent	En / EN / NL
Crocidura nicobarica	Nicobar spiny shrew	Rodent	En / CR / NL
Rattus busrescans	Nicobar rat	Rodent	En /NE / NL
Rattus palmarum	Palm rat	Rodent	En /VU / NL
Rattus pulliventer	Nicobar rat	Rodent	En /NE / NL
Scotophilus khulii	Asiatic lesser house bat	Bat	LC/ NL
Miniopterus australis pusillue	Bent winged bat	Bat	LC/ NL
Traphozous saccolaimus crassus	Blyth's ponch bearing Bat	Bat	LC/ NL
Pteropus melanotus tytleri	Blyth's flying fox	Bat	En / VU / NL
Eonycteris spelaea	Down bat	Bat	LC / NL
Hippasideros falvus	Fulvus leaf nosed bat	Bat	LC / NL
Rhinalophus affinis	Intermediate horse-show bat	Bat	LC / NL
Hippasiderap ternicobasulae	Little Nicobar leaf-nosed bat	Bat	NE / NL
Hippasiderap diademo nicobarensis	Nicobar leaf nosed bat	Bat	En / LC / NL
Hippasiderap ater	Dusty leaf-nosed bat	Bat	LC / NL
Cynopterus bakhtiar scherzer	Lesser Nicobar Short-nosed Fruit bat	Bat	En / NE / NL
Scotophilus kuhli	Lesser Yellow bat	Bat	NE / NL
Cynopterus sphinx	Short-nosed fruit leaf	Bat	LC / NL
Pipistrellus coromandra	Indian Pipistrelle	Bat	LC / NL
Pipistrellus comortae	Nicobar pipistrelle	Bat	En / NE / NL
Pteropus funlus	Nicobar flying fox	Bat	En / EN / NL
Miniopterus pusillus	Nicobar long-fingered bat	Bat	En / LC / NL

En= endemic, EN=endangered, CR = Critically endangered, LC=Least Concern, NL=Not listed, NE = Not evaluated, VU=Vulnerable

Reptiles from The Great Nicobar Island

A total of 26 reptiles have been reported by different investigators from the Great Nicobar Island. The list includes three non-venomous snakes, Marine turtles, Salt water crocodile (*Crocodylusporosus*), Water monitor lizard (*Varanus salvator*) Geckos and house lizards.Giant Leatherback Turtles (*Dermochelys coriacea*), Hawksbill turtle (*Eretmochelys imbricata*), Olive Ridley Turtle (*Lepidochelys olivacea*) and Green Sea turtle (*Chelonia mydas*) and Malayan Box Turtle (*Cuoraamboinensis*). Nicobar Islands had India's best nesting beaches for three species of marine turtles – Hawksbill, Green seaturtle and world's largest sea turtle, the Leatherback (*Dermocheleys coriacea*) prior to the tsunami of 2004. The nesting population of Leatherback turtles in Nicobar used to exceed 1,000 individuals and hence it had global importance.

Snakes are represented by Reticulated Python (*Python reticulatus*), Nicobar cat snake (*Boiga wallachi*) and Humayun's Bronzeback (*Dendrelaphishumayuni*). Among the lizards, the notable species are- Daniel's long tailed Agama, Nicobar Bent Toed Gecko (*Cyrtodactylusrubidus*) and Smiths' giant gecko (*Gekkosmithii*).

Cosymbotus platyurus	---	Gecko	LC / IV
Cyrtodactylus rubidus	Curltailed Gecko	Gecko	LC / IV
Cyrtodactylus rubidus	Nicobar Bent Toed Gecko	Gecko	En / LC / IV
Cyrtodactylus rubidus	Nicobar Bent Toed Gecko	Gecko	En / LC / IV
Gehyra mutilate	Spotted Gecko	Gecko	LC / IV
Gekko smithii	Smiths' giant gecko	Gecko	/ LC / IV
Hemidactylus frenatus.	House-gecko	Gecko	LC / IV
Hemiphyllodactylus typus typus	--	Gecko	LC / IV
Phelsuma andamanense	Andaman Day Gecko	Gecko	En / LC / IV
Ptychozoon kuhli	Flying Gecko	Gecko	LC / IV
Chelonia Mydas	Green Turtle	Marine turtle	EN /I
Cuora amboinensis	Malayan Box Turtle	Marine turtle	VU /
Dermochelys coriacea	Leatherback Turtle	Marine turtle	CR /I
Eretmochelys imbricate	Hawksbill Turtle,	Marine turtle	CR /I
Lepidochelys olivacea	Olive Ridley Turtle	Marine turtle	VU / I
Varanus salvator	Water monitor lizard	Monitor lizard	LC / I
Dasia nicobarensis.	Tree Skink	Skink	En /LC / IV
Dasia olivacea	Tree Skink	Skink	LC / IV
Mabuya andamanensis	Andaman Skink	Skink	LC / IV
Mabuya multifasciata	Lined Skink	Skink	LC / IV
Mabuya rudis	Skink	Skink	LC / IV
Mabuya rugifera	Brown Skink	Skink	LC / IV
Mabuya tytleri	Tytler's Skink	Skink	En / LC / IV
Sphenomorphus Quadrivittatum	---	Skink	LC / IV
Sphenomorphus maculatum	---	Skink	LC / IV
Boiga wallachi	Nicobar cat snake	Snake	En / LC / IV
Boiga wallachi	Nicobar cat snake	Snake	En / LC / IV
Dendrelaphis humayuni	Humayun's Bronzeback	Snake	LC / IV
Ptyas mucosus	Rat Snake or Dhaman	Snake	LC / IV
Python reticulatus	Reticulated Python	Snake	NT/ I

Amphibians from Great Nicobar Island

In spite of heavy rainfall, long moist spell and dense forest vegetation, amphibian diversity of Great Nicobar Island is poor. A total of 10 species of amphibians have been reported from the island including the endemic Nicobar Tree Frog (*Polypedatesinsularis*), Red eared frog (*Hylaranaerythraea*), Cricket Frog (*Acris gryllus*) and the Indian Toad (*Duttaphrynusmelanostictus)*

Reticulated python (*Python reticulatus*): Though this species was reported all over the Great Nicobar Island and young ones were commonly seen in the lowland forests (coastal region) during 1996-98 (Sivakumar, 2000) but, during this survey after spending 42 field days there was no single record of python in this group of islands especially in the lowland forests which have been badly destroyed by the tsunami.

Sea Turtles:

A survey of literature starting from Bhaskar& Rao (1992) about the status of marine turtles in general and Leatherback in particular reveals the following:

Nicobar Island provides an ideal nesting habitat for primarily four species of marine turtles: the leatherback turtle, hawksbill turtle, green sea turtle and Olive Ridley turtle. All of these have been declared endangered by the IUCN

Leatherback (*Dermochelyscoriacea*),Green (*Chelonia mydas)*,Hawksbill (*Eretmoch elys imbricata*) and Olive Ridley (*Lepidochelys olivacea*) nest on the beaches of the Nicobar group of islands in the Bay of Bengal. Great Nicobar, the southern-most and the largest in the group, supports all four species of sea turtles, with a high abundance of Leatherback nests. The popular Leatherback nesting beaches on this island are situated at the mouths of Galathea, Alexandria and Dagmar Rivers. Other sea turtles also nest at these beaches.

Andaman Nicobar Environment Team (ANET), Centre for Ecological Sciences (CES), Indian Institute of Science (IISc), Andaman and Nicobar Forest Department and Dakshin has developed a long-term monitoring and conservation programme for sea turtles of the Andaman and Nicobar Islands, in particular for leatherback turtles.

The southeast coast of the island attracts all four species for nesting, with green sea turtles having the highest abundance. The dune forests of Great Nicobar are restricted to the beaches of fine calcareous sand, which stretch along the shores. The southern beach, located 3 km south of Galathea River, is free from tribal settlements. However, indigenous people use this beach for fishing and turtle hunting. The northern and southern beaches are 4 km and 5 km length respectively and they are the main nesting grounds on the eastern side of the island. The northern beach was highly used by the leatherback turtles with fewer green sea turtles, hawksbills and Olive Radleys.

Apart from human predation, dogs were found to be the major predators of turtle eggs. Though the Nicobar Pigs are suspected to cause damage to the nests, eggs and the hatchlings, there was no proof of predation.

Recommendations of the standing committee of the National Board for Wildlife (NBWL)

The standing committee of the National Board for Wildlife (NBWL) considered the issue of status of the Galathea Bay Wildlife Sanctuary at its meeting held on

5thJanuary 2021. After discussions, the Standing Committee decided to recommend the Proposal with the recommendations of WII, CWLW and directed that a Comprehensive Management Plan may be prepared and followed by the Andaman & Nicobar Administration for conservation and protection of Leatherback turtles in Great Nicobar islandalongwith the Wildlife Institute of India and the project proponents. The Andaman and Nicobar Islands Administration was directed to bring more areas under conservation of leatherback turtles.

Sivakumar (2002) did a commendable work on theMegapods of Great Nicobar discussed status of sea turtle nesting on the southern beaches of Great Nicobar island and the conservation implications. He states that four species of sea turtles, namely, leatherback (*Dermochelys coriacea*), Green (*Chelonia mydas)*, Hawksbill (*Eretmochelys imbricata*) and Olive Ridley (*Lepidochelys olivacea*) nest on the beaches of the Nicobar group of islands in the Bay of Bengal. Great Nicobar, the southern-most and the largest in the group, supports all four species of sea turtles, with a high abundance of Leatherback nests. The popular Leatherback nesting beaches on this island are situated at the mouths of Galathea, Alexandria and Dagmar Rivers. Other sea turtles also nest at these beaches. However, the other beaches where turtles breed have not been studied well. According to the above, the River mouths of Galathea, Alexandria and Dagmar Rivers are popular Leatherback nesting beaches on this island. Hence, Team cannot think of shifting the proposed port to the mouth of Alexandria and Dagmar Rivers.

According to Jadeja et al (2016), the west coast of Galathea Bay, Great Nicobar Island, was previously a significant nesting site for leatherback turtles despite pressure from anthropogenic activities and natural predators. The nesting population has the potential to recover from disturbance resulting from the 2004 Indian Ocean tsunami, as human all settlements have gone and the region is, therefore, free of anthropogenic predation and light pollution which might affect nesting turtles. However, there is still predation of turtle nests by Nicobari pigs. Bhaskar (1994) also concluded that wild pigs were the chief predator of sea turtle eggs and hatchlings in this area, followed by the water monitor lizard (*Varanus salvator*), which was sighted during the current survey. Predation by pigs may have increased since the tsunami, as human settlements may have deterred individual animals or controlled population numbers. A program to control pig numbers or protect turtle nests from pigs could help re-establish sea turtle populations at this site. There is no pre-tsunami substrate analysis from Galathea Bay with which to compare our results, but future substrate analysis may indicate changes as beaches re-stabilise.

Primary survey of the sea turtles nesting grounds during February 2021 by the team members of the Vimta Labs recorded the presence of 34 sea turtle crawls on the Great Nicobar Island towards northwest of Galathea Bay and 45 sea turtle crawls on the Trinket and Tillanchang islands. A couple of new nests were found (**Figure-3.340**) along the Northwestern part of the Galathea Bay of the Great Nicobar Island. Northern part of the Galathea Bay was known for leatherback turtle nesting till 2004 but it was severally damaged during the Tsunami of 2004.

However, southern beach has improved for the turtle nesting. Pigs and monitor lizards were observed eating turtle's eggs on most of the beaches.

Conclusion: Based on the brief information given above, it is evident that the Leatherback Turtle breeding grounds need additional protection and proper management. The responsibility of preparing the plan lies with the project proponent in coordination with all the relevant Agencies/Departmentsto ensure that the proposed projects including the proposed port do not pose any additional direct and indirect threat to the large Marine Turtles.

For 8 to 10 years after the destruction of the major breeding grounds during the Tsunami of 2004, leatherbacks didn't return to use the erstwhile breeding grounds. They are slowly returning to the new grounds and also using new areas. This shows that they are resilient and can adapt to changes. More details are expected from the WII which is entrusted with the responsibilityof developing mitigation, remediation and alternate plans for conservation of Leatherback breeding grounds.

Figure-3.40: Leatherback Turtles (*Dermochelys Coriacea)* Caught onCamera During Night While Laying Eggs During February 2021.

Nicobar megapode (*Megapodius nicobariensis):*

With respect to the Nicobar megapode, the present study takes in to account the pioneering work of Sankaran and Sivakumar beginning from 1995. Tillanchong is an unfamiliar name for many. Uninhabited except for a police post holds the largest surviving populations of the endemic Nicobar Megapode (*Megapodius nicobariensis*), It is also a protected sanctuary and an Important Bird Area (Islam and Rahmani, 2004). According to Dr.AsadRahmani of the Bombay Natural History Society (BNHS), and the local Andaman and Nicobar forest department,

Figure-3.42: Fishes and Prawns caught by a local man fromastream near Laxmi Nagar

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Marine ecological study by Zoological Survey of India (ZSI)

ZSI has undertaken a study "The Holistic Development in Great Nicobar Island and Conservation of Island Faunal Diversity" for AECOM. The complete report of ZSI is attached with this report as **Attachment-I**.

The report lists all Phytoplankton, Zooplankton, Corals, macrobenthos, Sponges, Hydrozoans, Molluscs, Crustaceans and Echinoderms among the invertebrates, and Fishes among vertebrates in great detail. The report states that the Crab-eating macaque, Giant robber crab, Megapode, Leatherback turtles and Olive Ridley turtle are the representative fauna of Great Nicobar Island. Based on the primary and secondary data, a map showing the Ecologically sensitive areas around the Great Nicobar Island has been prepared and it is shown in **Figure-3.43.**

project to suggest most suitable location for the Port. In this context, WII conducted a rapid assessment study to review the critical wildlife habitat at Galathea Bay and other parts of Great Nicobar to understand the area and the issues and set the future course of action subject to minutes of the 260th Meeting of EAC, MoEF&CC that was held on 5-6 April, 2021.

In this context, WII has carried out a rapid assessment study to understand the biological or ecological significance of five sites identified by ANIIDCO for the port. This study was conducted with aim of assessing the current status of important turtle nesting beaches with special focus on sea turtles especially leatherback. Study was also aimed to assess the status of megapodes and dugong habitats along these beaches.

The complete report of WII is attached with this report as **Attachment-II**.

3.10 Demography and Socio-Economics

This section presents the demographic and socio- economic conditions prevailing in Great Nicobar Island in Andaman and Nicobar Islands.

3.10.1 Methodology Adopted for the Study

The methodology adopted for the study mainly includes primary survey, review of published secondary data (District Census Statistical Handbooks-2011 and Primary Census Abstract of Census-2011) with respect to population, population density, household size, sex ratio, social stratification, literacy rate and occupational structure. Available and development of physical infrastructure like road transport facilities, drinking water supply, drainage facilities, electrical facilities and social infrastructure like educational facilities, health facilities, community development, opportunities local people in contractual works in the are presented in **Chapter-8.**

3.10.1.1 History of Great Nicobar Island

Great Nicobar is the southernmost and largest of the Nicobar Islands of India, north of Sumatra. The existence of the Nicobars has been known from the time of Ptolemy onwards but the place is having a long unwritten history. The inhabitants had been in touch with the outer world through the trade of copra. However, the entry of the modern world into their lives started after the famous Vasco-da-gama voyage to India.

The impact of World War II and consequent Japanese occupation of the Islands from 1942-45 caused a great upheaval in the mind of the people. After a brief period of British repossession, the islands achieved independence as an integral part of the Republic of India on 15th August 1947, because they have been part of the old British Empire of India. John Richardson was ordained as Bishop in 1950. He also represented the Andaman and Nicobar Islands as a nominated Member of Parliament for the first time. Thus, he became a modern architect of Nicobarese society.

Leatherback nesting at Galathea Bay:

The western flank of the Galathea Bay is one of the nesting sites for the Leather back turtles. ZSI did a study for GNI development project with specific reference to leather back turtles. As per the ZSI data a total of 255 nests were monitored and estimated that 114 individuals nested during the season between November 2003 and February 2004 and during November 2004, 137 leatherbacks were encountered with 84 nesting (Andrews et al., 2006). In Galathea bay, nesting, egg laying and hatchling are more for Leatherback turtle compared to the other regions of Great Nicobar Island. In current year, estimation of the number of hatchlings is not completed; hence the number is not mentioned. The number of nesting, eggs laid, and number of hatchlings have been increasing over past four years. The number of hatchlings increases at a rate of 21 % from 2018 to 2019 while it increases at a rate of 147 % from 2019 to 2020 (Table 16).

During the period 2004-05, the number of nesting was very less (84 nos.) due to anthropogenic and natural threats which caused negative impact on leatherback turtles. The last five years data shows that, there is an increase in the number of nesting and egg laid in Great Nicobar Island. Comparative account of estimated number of nestings of leatherback turtles with the available published information is presented in Table 3. The nesting population believe to have recovered from disturbance resulting from the 2004 Indian Ocean tsunami, as human all settlements have gone and the region is, therefore, free of anthropogenic activities and light pollution which affect nesting turtles. The nesting leatherback populations of this species has also shown an increase in the trend in Galathea Bay. It is estimated that the succession rate of hatchlings of leatherback turtle are 59% in 2018; 60% in 2019 and 63.5% in 2020. The hatchling process has not completed for this year and hence not enumerated and presented.

The port design was initially given by WAPCOS where the port was located on the western flank of the Galathea Bay. AECOM, due to nesting of leather back turtles in the western side of the bay moved the port to the eastern flank where leatherback nesting is not known. The design of the port and the breakwater was modified to accommodate the nesting of leatherback turtle on the western flank. The breakwater was also designed in a way so that the turtles can entre to the nesting site without any hinderance.

The ZSI mentioned in their report that sea turtles are global species and they are known to nest on the sandy beaches in the close proximity to existing and operational coastal facilities globally. Several ports and jetties exist on the eastern and western coast of India (Haldia, Dhamra, Paradeep, Nuagarh, Visakhapatnam, Kakinada, Ennore, Tuticorin, Cochin, Goa, Ratnagiri, Veraval, Diu, and Jafrabad) and despite of these coastal facilities, sea turtles continue to nest in close proximity to the establishments. Here are some examples of existence of major Ports and sea turtle nesting habitats along the east coast of India.

The Dhamra port, in Odisha coast is located about 13 km away from the famous mass nesting beaches of olive ridley turtles, the Gahirmatha Marine Sanctuary in

a straight line. It falls along the extremely important and fragile zone of Northern boundary of Bhitarkanika National Park. This major deepwater port facility at Dhamra, dredged nearly 19 km-long approach channels, aside from land-raising and construction activities on land. The port at Dhamra envisages building of 13 berths, mechanized loading and unloading and an entry channel from North side. The port is one of the largest on the east coast of India with the ability to handle Cape size vessels (180,000 tonnes) and dredged a 19 km long channel through the sea with a draft of 18 m. While obtaining of the environmental clearance, one of the most pressing concerns was on turtles (dredging, lighting, shipping, ballast water discharge, current changes and their impacts, noise pollution, impacts from an expanding local population, ancillary development) as well as other impacts on the ecosystem of the area, on Bhitarkanika National Park and on Gahirmatha Marine Sanctuary. The Dhamra port is fully operational and there is no impact known on sea turtle nesting at Gahirmatha and adjoining areas where sporadic nesting takes place.

Paradip is one of the major ports of India in the east coast commissioned after independence situated in the mouth of Mahanadi and there are sporadic nesting sites along both side estuary and are not known to be impacted by port activities.

The Kakinada Sea Ports Limited (KSPL) is situated near the Hope Island and Coringa Wildlife Sanctuary and sporadic nesting of sea turtles have been occurring in Hope Islands and Sacramento uninterruptedly.

Similarly, the Kolkata Port Trust is a riverine port in the city of Kolkata and is the oldest operating port in India and there is a deep-water dock at Haldia Dock Complex, Haldia. There are number of Cargo ships handled at this port and impact to marine life including sea turtles due to ship movement is not known.

Mitigation Measures with respect to Galathea Bay ecology:

ZSI has also suggested several mitigation measures that needs to be followed to ensure minimum disturbance to the nesting of the leatherback turtles.

(1) Dredging of immediate offshore bottoms as well as shallow estuarine habitats

Reef restoration and coral relocation due to coastal development and/or dredging, are among the most common reasons for transplantation. Dredging activities in the nearshore waters of the developmental projects during the construction phase will apparently destroy the corals and coral beds, but transplantation is a worldwide solution which could be easy executed in Great Nicobar island in alternate suitable offshore habitats. Successful coral reef restoration has previously been accomplished by ZSI in Gulf of Kachchh and the transplanted corals had >90% survival and effectively transformed into a functional coral reef. Towards this, the developers should support with suitable funding.

Similarly, although the offshore congregation of leatherback turtles and other species of turtles are not known to occur in and around Galathea, however as a precautionary measure, installation of a deflector on the drag-head to push the

turtles (any species) out of the path of the dredger along with an observer programme to detect any such entrainments is solution to minimize casualties in the offshore waters during dredging for navigational channel for the port. A pilot study is needed for this and towards this, the developers should support with suitable funding. The same practice has been recommended by the IUCN to Dharma Port Corporation Limited.

As per the WII study (Attachment II); the variations in the nests laid by the leatherback between years could be due to variations in the environmental settings or conduciveness of the beaches for nesting as leatherback known to be having the poor nest site fidelity. It may change the nesting site temporarily if the environmental settings of the beach are not favourable for nesting (Kelly et al., 2014). 3. Leatherbacks are known to distribute nests up to 460 km apart within a nesting season in Florida, USA (Kelly et al., 2014). Therefore, the Leatherbacks appears to have adopted a regional rather than a local optimum for nesting, possibly due to their poor nesting beach fidelity and the frequent erosion and degradation of their nesting beaches (Kamel and Mrosovsky, 2004; Kelly et al., 2014). Indian Institute of Science, Dakshin Foundation and ANET have earlier tagged 10 leatherbacks using satellite transmitters from the Little Andaman and monitored for their movements from 2011 to 2014. WII report mentioned that "one of these, turtle that laid eggs at Little Andaman was observed laying eggs in February, 2021 on the beach of the Galathea Bay, Great Nicobar by ZSI Team (pers: C. Sivaperuman, ZSI) that reiterate the weak nesting site fidelity of Leatherback as well as it reveals that the leatherback may distribute nests in different places between years".

Leatherback turtles generally nests on the western flank of the Galathea bay. The nests have also been reported by ZSI on western and eastern beaches of the GNI. The Galathea area where the turtles nest have been kept untouched of the development activity. In addition, ZSI have suggested the following to ensure that there is no disturbance to the turtles during the nesting seasons:

i. stoppage of night construction work during the nesting season of the Leatherbacks,
ii. modification of lighting in the port area,
iii. reduction of underwater noise etc as suggested by ZSI has been adopted for the project. All these measures will be adopted for the project.

Not much of work has been undertaken to understand the movement pattern, nesting fidelity of the leatherbacks. Detailed long-term study, including the satellite tagging, have been suggested. Adequate budgetary provisions have also been kept as a part of the Monitoring (Chapter 6).

(2) Translocation of corals

As per the ZSI report, no coral exists in the bay portion of the Galathea Bay. However, some coral were found on the eastern flank near the peninsular part. These patches of coral are not in the port construction area. However, coral colonies, if affected, due to the construction of the project at the proposed transhipment areas and dredging channels, to be translocated in suitable place where the similar environment as well as topographic features prevails in the Great Nicobar Island.

(3) Land based construction activities

Roads are an integral part of the transport system for the proposed developmental projects. However, before initiating project planning for wildlife habitat connectivity, the first step in avoiding impacts from road construction on wildlife populations and their habitats is to consider alignment that can prevent conflicts, particular for the species like Nicobar Megapode, Coconut Crab and Long-Tailed Macaque of Nicobar Island. If the impacts cannot be avoided, then mitigation is an alternative. Appropriately designed and suitably located culverts of varying sizes, underpasses and fences provide effective mitigation to overcome barrier effects of roads (Rajvanshi et al. 2007).

Similarly, civil constructions near the sandy area where there is possibility of basking of saltwater crocodiles and nesting of turtles should be avoided as much as possible during breeding/nesting season especially November to February. The shoreline protection to be of any defensive measures used to protect areas from inundation, the effects of waves on structures, beach erosion, salinity intrusion, and the loss of natural resources (Witham, 1990). However, it should be ensured that these structures should not impact for approach of turtles to the beach. Reclamation if any should be done, after the civil work is completed, replacing with sand of similar nature (grain size, organic content) to that which was dodged out, thereby maintaining the suitability of the beach for future use by turtles for this area for nesting.

(4) Lighting

Artificial illumination on the beach can affect the sea turtle nesting and hatchlings. Compared to any other kinds of coastal development, light pollution is probably one of the problems that can be solved with relative easy, if committed for conserving sea turtles. Using a smaller number or lower wattage of lights; repositioning, shielding, redirecting, lowering, or recessing fixtures are some of the available options for reducing illumination to the beach. Sea turtles are less affected by red, yellow, and low-pressure sodium-vapor lights, and therefore can be substituted with these lights. Where possible, use sodium vapour lamps or other light sources.

(5) Long term monitoring

Monitoring of wildlife especially displaced due to dredging of seabed and clearing of forests should be monitored on a long-term basis. The shifting of crocodiles if required to an alternate site need regular vigilant for maintaining the gene pool and viable populations for future. Similarly, the monitoring of leatherback turtle migration and movement and nesting intervals in different beaches of Great Nicobar will ensure future survival of the species, at least nesting in nearby beaches of Galathea. For this, periodic monitoring of sea turtle nesting should be carried out by a scientific agency with credibility on coastal and marine faunal study. A suitable corpus on a long-term basis should be integral part of the EMP

towards research in support of wildlife species especially towards their conservation by the developers, as part of the Corporate Social Responsibility, species specific EMP could be drafted accordingly by a recognized national agency of repute with experience in Island ecosystem monitoring and submit to the developers. Towards this, the developers should support with suitable funding.

(6) Tracking of wildlife through Radio Telemetry and Satellite Telemetry studies

Radio telemetry and by using advanced molecular tools viz. e-DNA and phylogeny of displaced species viz. Nicobar Megapode, Coconut Crab and Long-Tailed Macaque of Nicobar Islands may be an effective tool, being much on their biology and behaviour is unknown and these studies may be able to guide towards developing suitable strategies for their future survival. Similarly, Satellite telemetry of at least 100 leatherback turtles, e-DNA and phylogeny of leatherback turtles from Great Nicobar Island will reveal many facets on their biology and behaviour by which one can understand other alternate sites for leatherback turtle conservation based on environmental, ecological and economic considerations in a long-term basis. Towards this, the developers should support with suitable funding.

During the construction and operation, there is a possibility that Megapod mounds may reduce. ZSI has initiated a long-term study of the Nicobar megapods. If the study concludes that megapods are getting affected and their nests are getting reduced due to the project activity, translocation of megapods, could be considered.

(7) Disposal of dredged soil

During the construction phase, the dredged soil to be disposed as per the international dredged soil disposal guidelines in which the area should have minimum of 200 m depth and free from coral reefs, sea mount etc. This will be helpful to maintain the water quality in the nearshore region,

(8) Temporary halting of onshore and offshore activities

Construction phase is generally considered as the destructive phase of the project. Therefore, during the construction phase offshore activities to be halted to the possible extent especially during November to February the period in which the Nicobar Megapode, Coconut Crab and Long-Tailed Macaque of Nicobar Islands as well as Leatherback turtles nesting reported. All the activities during the construction phase to be suspended during night hours which will pave a movement of turtles for nesting and other wildlife for their feeding, breeding and roosting.

(9) Reduction of underwater noise pollution

The main sources of underwater noise pollution are shipping, dredging, and seismic surveying. Measures to reduce the noise from shipping vessels include modifying propellers and/or hulls and performing regular maintenance,

4.2.2.2 During Construction Phase - Mitigation Measures

The roads which will be used for rock material transport will be widened and strengthened. Similarly the harbours used for rock/material transport will be strengthened. The necessary budgetary provision will be added to the civil construction contract. To mitigate impacts from transportation of construction material, existing roads will be strengthened wherever necessary.

- Temporary approach roads may be developed with prior permission from competent authority
- Trucks with construction material susceptible for fugitive suspension will be covered
- Transportation management will be adopted for movement of dumpers transporting quarry stones and construction materials and traffic will be regulated
- Vehicles deployed will conform to emission norms (air/noise) of CPCB and have valid Pollution Under Control (PUC) certificates
- Dumpers and trucks will comply with standards for exhaust emissions and noise levels
- All vehicles used will be in good condition with all valid number plates and documents. Older than 15 year vehicles will not be allowed to use in any of the construction sites
- Worker camps will be adequately equipped with necessary facilities such as water supply, power supply, wastewater collection, solid waste collection and sanitation, fuel supply, etc.
- Domestic wastes generated from worker camps will be collected properly treated and disposed after complying with the norms stipulated by statutory authorities
- No bore-wells will be driven to meet the water requirements to avoid impacts on groundwater resources
- All these will be part of the Contractors Quarry Management Plan to be prepared and approved with the help of the supervision of consultants
- Off-shore construction activities to be halted to the possible extent especially during November to February the period in which the Nicobar Megapode, Coconut Crab and Long-Tailed Macaque of Nicobar Islands as well as Leatherback turtles nesting are reported

If there are any accidental spillages of hazardous substances on soil that may pose the risk of contaminating run off, such areas will be immediately remediated as per international practices.

4.2.3 Potential Impact During Operation

During operation phase, soil pollution may happen if solid and liquid waste not managed properly. Flooding may happen if drains are not properly maintained. The details are discussed below.

4.2.3.1 Discharges from Ships on Land

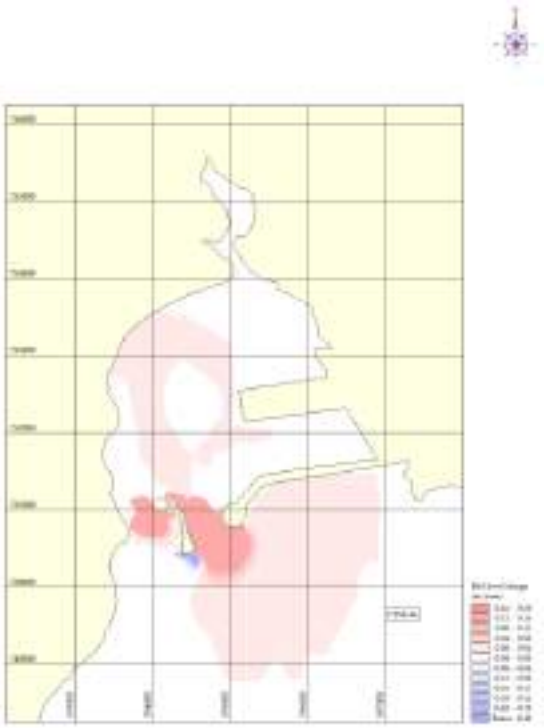
maintenance dredge quantity in the fishing harbour and proposed port due to the construction of the breakwater of proposed port. The results obtained from these simulations were analysed and are discussed in the following sections.

4.4.1.2 Effect on Hydrodynamics

The hydrodynamic model was undertaken as described above. The model suggests sedimentation due to the construction of the port berths and the break water. Due to the construction of break waters and berths, the area will be cut-off from the wave action which brings sediments, to the bay. However, the low also tides take s away some of the sediments back to the sea. This natural process will be affected due to construction of the port. There will be sedimentation around the breakwaters and the berths (figure given below). No erosion is expected as per the model. Therefore, there will be no erosion on the beach especially on the western flank of the bay where the leatherback turtles breed. As per the model results there will be sedimentation of around 0.04m/yr on the western beach. Therefore, the beach is likely to be widened over long period giving more space for breeding to the turtles.

The sedimentation process may affect the Galathea river mouth to some extent. Though the model does not suggest any sedimentation, over time there could be some deposits on the fan of the Galathea mouth. This area needs to be dredged periodically to the keep the mouth open so that the salinity of the estuary maintained.

Figure-4.3: Effects of hydrodynamics



4.7.1.2 Impact due to Dredging and Reclamation - Noise

Dredging is likely to occur 24 hours a day, seven days per week. While dredging activities will generate noise from a variety of sources, the primary sources of equipment noise would include the cutter suction dredger itself, with its associated pumps and generators and the tugboats used to position the dredger. Other equipment such as the crew boats and survey boats would not contribute substantially to the noise associated with the dredging activities. Additionally, noise will be generated by onshore plant used to spread the dredged materials and to assemble and periodically relocate pipelines. Generally speaking, a weighted noise intensity from working engines at the noise source shall not exceed a continuous level above approximately 120 dB(A).

Underwater noise: Seawater is an efficient medium for sound propagation, particularly low frequency sound and therefore marine life over a wide area could be potentially affected. Underwater noise during the port construction will result from the equipment that are used for underwater activities, such as dredging, reclamation or the construction of the bund wall, piling and ship movements. The noise and vibrations generated by the underwater activities can potentially be transmitted to considerable distances through the water and hence cause negative impacts on the marine mammals. Conditions that determine the transmission of noise emissions and vibrations are current pattern and strength and the hydrological/geomorphologic circumstances. The day to day terminal activities such as vessel loading / unloading, container handling, etc. will cause additional underwater noise emissions. These are however not expected to be significant.

Noise - Mitigation Measures

- Where necessary, noise emissions should be minimised and controlled through the application of techniques which may include installation of sound barriers
- Optimising dredging activity and duration
- As per ZSI, the main sources of underwater noise pollution are shipping, dredging, and seismic surveying. Measures to reduce the noise from shipping vessels include modifying propellers and/or hulls and performing regular maintenance, vibrationally isolating machinery, implementing ship speed restrictions and incentivizing the use of fewer, larger vessels etc. These measures should be the part of the approval process while allowing the ship to enter GNI-ICTT.
- As per ZSI recommendations, the off-shore maintenance dredging activity needs to be halted between November and February which is the nesting /breeding season for the leatherback turtles.

4.7.2 Impact Due to Port Operation

Impacts during operations mainly will result from the port terminal activities such as vessel loading/unloading, container handling and access road/rail

loosening of the topsoil generally causes soil erosion. However, such impacts will be confined to the project site.

If any reticulated python / snakes, are encountered, the same will be reported to the forest department for relocation in other suitable habitats.

4.2.8 Impact on Aquatic Ecology

The power plant is located near to the Galathea River mouth. The mouth of the river widens and shallows near the eastern edge of the power plant boundary. The runoff from construction area may lead to a short-term increase in suspended solids and decrease in dissolved oxygen near the discharge point in receiving water body, that is, the Galathea river mouth. This may lead to a temporary decrease in the photosynthetic activity of Phyto-planktons, rise in conditions and food chain modification. However, since the river is shallow at this part of the river, the decrease in photosynthetic activity will be marginal.

Mitigation Measures:

All the effluents from the construction area shall be treated and recycled to minimize the above impact.

No untreated effluent from the construction site will be dispose outside the project boundary without treatment.

Impact on Marine Environment

There will be no major impact on the marine fauna as the proposed power plant will be developed on land which is about 1.5 km from the Galathea river mouth.

The western flank of the Galathea beach where the leatherback turtle nests, is about 1.5 km from the edge of the power plant boundary and is separated by sporadic dense for forest and riverine vegetation. Therefore, the power plant construction will have no deleterious impact on the nesting of the leatherback turtles.

Major construction activities are envisaged on-shore which would not disturb the marine ecology. These impacts would be temporary in nature.

Fishing& Ferrying activities

Rarely some fishing activity goes on at the Galathea river mouth. Shompen often visit the northern part of the river which is about few km from the plant boundary, for drinking water. The drinking water source, since it is on the upper stretches of the river, will not be affected due to the construction of the project.

Construction Workers Camp - impacts & mitigation measures:

- The following data is to assess the impact of labour colonies and suggest suitable remedial measures so that the construction of the project could be managed with minimum damage to the environment.

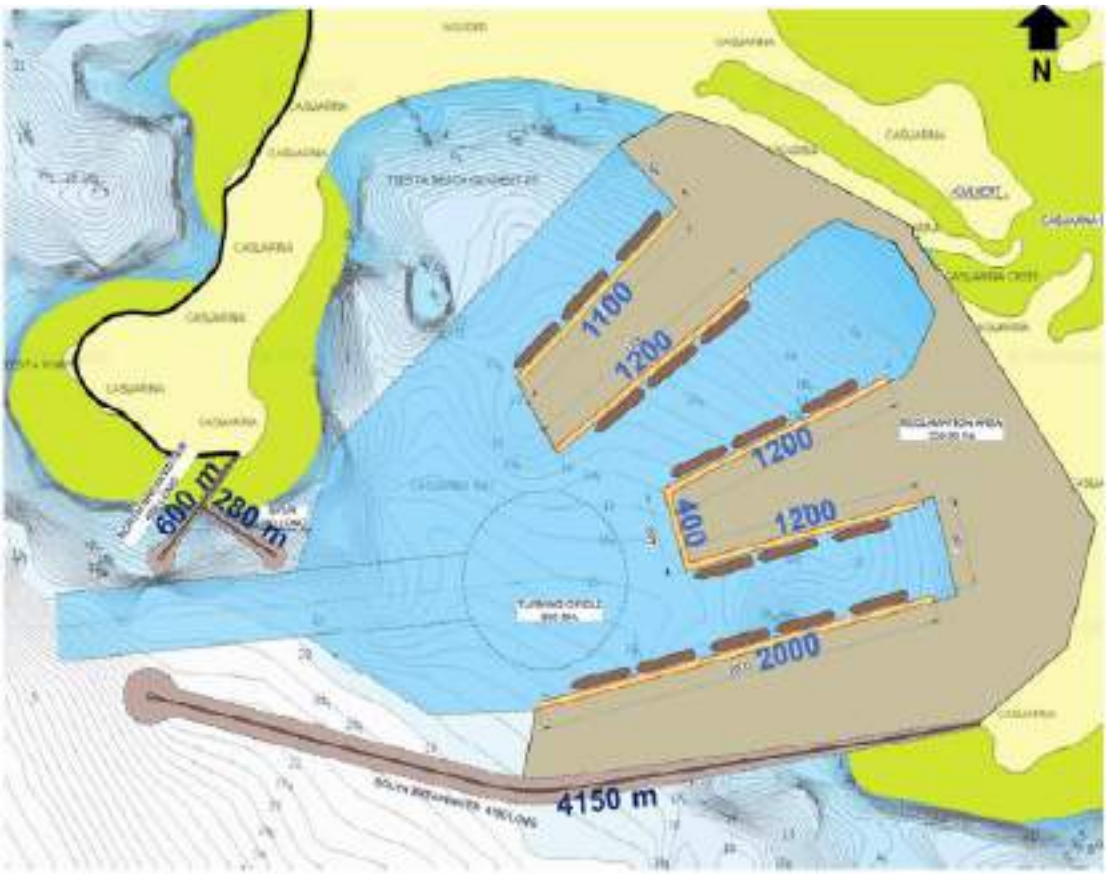
5.2.2 Alternative Site 2 – Casuarina Bay

The site is near to the Shompen habitation. Further, this area falls outside the project area of 166.1 sq km. Part of site falls under ICRZ Zone 1A. The site also has leatherback turtle nesting sites. However, the nesting of the turtles was not monitored till recently. The site offers adequate Harbour area, but it would involve slightly higher dredging as compared to site 1, which eventually leads to higher risk of involving rock dredging.

Two breakwaters of length 4.150 km and 0.88 km respectively provide round the year wave tranquility. The port would be developed in phased manner and the berths would be added as per the traffic growth.

The indicative layout of the container Transshipment port is presented in **Figure-5.3**.

Figure-5.3: Casuarina Bay Location – Alternative Site-2 (Layout)



5.2.3 Alternative Site 3 – Anderson Bay

The site is in a creek just south of Campbell Bay. The area of the creek is very much limited and therefore lot of hill cutting would be needed to create the required harbour area. Further, the entire site is relatively exposed to the sea and thus would require longer breakwaters. The site is close to the habitation near Campbell Bay. Part of the site falls under ICRZ Zone 1A. This site also having leatherback and other sea turtle nesting sites.

Two breakwaters of length 4.00 km and 1.660 km respectively provide round the year wave tranquility. The port would be developed in phased manner and the berths would be added as per the traffic growth.

The indicative layout of the container Transshipment port is presented in **Figure-5.4.**

Figure-5.4: Alternative Site-3: Anderson Bay (Layout)

ZSI recommendation on the Galathea Bay site for ICTT

Technical Reason: Based on the thorough scrutiny and examination, Galathea Bay is selected for the ICTT as it was considered as the best site in terms of distance from the international sea route (nearly 40 km away), lesser risk of rock dredging, lesser requirement of reclamation of land to develop onshore storage facilities and lower cost, required availability of natural breakwater, no requirement of hill cutting to use the land, remoteness of habitation and tribal population. Some environmental challenges are investigated for all the proposed sites and Galathea Bay has some ecological and environmental issues like some portion of the designated area is falling under ICRZ Zone 1A; the presence of 117 species of scleractinian corals along with the live coral cover of 17.46%, 8 species of holothurians, saltwater crocodile (Crocodylus porosus Schneider, 1801) in adjoining Galathea River along with mangrove patches, predominant nests of vulnerable leatherback turtle Dermochelys coriacea (Vandelli, 1764), 3 species of marine mammals are sighted, 14 breeding pairs along with 7 active mounds of endemic Nicobar Megapode Megapodius nicobariensis abbotti (Oberholser, 1919), and the Long-Tailed Macaque Macaca fascicularis umbrosus (Miller, 1902). These issues are required to be address with a proper ecological restoration program and recommendations which are illustrated in this report. Prediction of Environmental Impacts, Envisaged Benefit of the Project, Evaluation for Alternate Sites, Environmental Management Plan, Mitigation Strategies in Marine Environment at Proposed Project Sites, and Recommendations are given in details in the report for the proposed 14.2 Million TEU (Twenty Feet Equivalent Unit) ICTT Port, (main project), Airport (4,000 Peak hour passenger, Category 4F), Township and Area Development for 14,960 Ha and Power Plant (405MVA Gas +Diesel) (Additional 45 MVA from solar power will be included in total power generation).

Ecological Reason: Sea turtles are global species and they are known to nest on the sandy beaches in the close proximity to existing and operational coastal facilities globally. Several ports and jetties exist on the eastern and western coast of India (Haldia, Dhamra, Paradeep, Nuagarh, Visakhapatnam, Kakinada, Ennore, Tuticorin, Cochin, Goa, Ratnagiri, Veraval, Diu, and Jafrabad) and despite these coastal facilities, sea turtles continue to nest in close proximity to the establishments. Some examples of existence of major Ports and sea turtle nesting habitats along the east coast of India are illustrated below.

Dhamra port, in Odisha coast is located near the famous mass nesting beaches of Olive Ridley turtles, the Gahirmatha Marine Sanctuary in a straight line. It falls along the extremely important and fragile zone of Northern boundary of Bhitarkanika National Park. While obtaining of the environmental clearance, one of the most pressing concerns was on turtles (dredging, lighting, shipping, ballast water discharge, current changes and their impacts, noise pollution, impacts from an expanding local population, ancillary development) as well as other impacts on the ecosystem of the area, on Bhitarkanika National Park and on Gahirmatha Marine Sanctuary. The Dhamra port is fully operational and there is no impact known on sea turtle nesting at Gahirmatha and adjoining areas where sporadic nesting takes place.

10	Environmental Management Cell/ Unit	Environmental Management Cell /Unit of the existing projects department to ensure implementation and monitoring of environmental safeguards.	Responsibilities and roles will be decided before the commencement of work.	During construction phase		-	The cost of the environmental management cell will be included in the project cost
11	Ecology	Flora and Fauna for the whole development and adjacent area will be monitored. Ecological monitoring as suggested by ZSI. For long term understanding of the leatherback turtle, Megapode nesting, ZSI suggest Radio telemetry and by using advanced molecular tools.	Health of the flora and fauna. Loss/ proliferation of Coral and other marine flora and fauna. Leatherback and other turtle species change of nesting behaviour. Satellite tracking of Turtles and Megapodes	Once in a year	Total GNI Developme nt site with special reference to Galathea Bay, Pamaya Bay, Joginder nagar beach.	190	
12	Changes in Coastline/Sho re line	Coastal structure like breakwater, Berth, Jetty, etc. might cause sedimentation/ erosion and needs to be monitored	Continuous monitoring of shoreline with the help of high-resolution satellite imageries during construction and operation phase.	Once a year	Total coastline of the developmen t area	100	
13	Public information system	Installation of ten display boards at various locations to inform the public on the air quality met conditions and Tsunami predictions. Similar information will be displayed to the key public officers.	Temperature, Humidity, Air quality index, probable Tsunami	Continuous	Along the Central spine road and Administrati ve buildings	70	It's a one-time cost
14	Socio-Economics	Regular monitoring of implementation of the proposed rehabilitation and resettlement under LARR act 2013.	All socio-economic parameters with respect to LARR act 2013	Once in 6 months till the R&R process is completed	Project area	20	

6.4.2 Monitoring Schedule during Operation Phase

During operational stage, continuous air emissions from aircrafts, GSE, traffic, powerhouse, wastewater treatment, non-hazardous solid waste and hazardous used oily wastes are expected from airport project and continuous air emissions from gas engine exhausts, wastewater treatment plant, brine water from desalination plant, hazardous used oily wastes are expected. The following attributes which merit regular monitoring based on the environmental setting and nature of project activities are listed below:

6	Marine Water Quality	Marine Water quality monitoring near the outfall point. Marine water quality at the work phase and adjacent areas	Parameters such as pH, Temperature, Conductivity, TSS, TDS, BOD, DO, MPN Coliform Iron and Heavy metals (Hg, Cd, Cr, Pb, Zn, As, Cu) Physico chemical properties including sediments	Quarterly Once a month during working period	Marine water quality at 3 locations once in 3 months Atleast 6 points	5 50	
7	Ecology	Flora and Fauna for the whole development and adjacent area will be monitored. Ecological monitoring as suggested by ZSI. For long term understanding of the leatherback turtle nesting, ZSI suggest Radio telemetry and by using advanced molecular tools. A long-term study to understand the migration pattern of the birds in and around GNI.	Health of the flora and fauna. Loss/ proliferation of Coral and other marine flora and fauna. Leatherback and other turtle species change of nesting behaviour. Satellite tracking of Turtles. Through long-term study the migration routes, locations and duration of the migratory birds will be observed.	Once in a year	Total GNI Development site with special reference to Galathea Bay, Pamaya Bay, Joginder nagar beach.		
8	Emergency preparedness, such as fire fighting	Fire protection and safety measures to take care of fire and explosion hazards, to be assessed and steps taken for their prevention.	Mock drill records, on site emergency plan, evacuation plan.	Once a month	-		
9	Solid waste management	Compliance with the MSW Rules, and the Hazardous & other Wastes (Management and Transboundary Movement Rules).	Comprehensive Waste Management Plan should be in place and available for inspection on-site.	Once in a month	All labour colonies and construction sites	5	Cost is included in the construction cost.

3	Ecology	Turtle nesting sites are observed on the Western flank of Galathea Bay.	Currently no development has been planned at the western flank of the Galathea Bay i.e. location of turtle nesting sites. As per WII study, the variations in the nests laid by the leatherback between years could be due to variations in the environmental settings or conduciveness of the beaches for nesting as leatherback known to be having the poor nest site fidelity. During the breeding seasons i.e. between November to February construction activities on the offshore to be halted	SPV	10	including 200lacs for radio tagging of turtles, 100lac for megapode monitoring and 100lac for crocodile and other endanger species

Zoological Survey of India (ZSI) has undertaken a marine ecological study in Eastern, southern and south western part of GNI.

Wildlife Institute of India (WII) has carried out a rapid assessment study to understand the biological or ecological significance of five sites identified for the port. This study was conducted with an aim of assessing the current status of turtle nesting beaches with special focus on leatherback turtles. Study was also aimed to assess the status of megapodes and dugong habitats along these beaches.

GNI consists of Tidal Swamp Forest (Mangrove Forest), Littoral Forest (Beach Forests), Low level Evergreen Forests (Coral Reef Forests), Tropical Evergreen Forests (True Tropical Forests), Southern hill-top evergreen forests and fern breaks. The members of the families Euphorbiaceae, Rubiaceae, Arecaceae, Orchidaceae, Cyperaceae, Poaceae and Annonaceae show high representation in GNI. The distinct flora of the area can be visualized by the fact that the genera *Otenthera* and *Astronia* of Melastomataceae, *Cyrtandromea* of Scrophulariaceae, *Cyrtandra* of Gesneriaceae, *Stemonurus* of Icacinaceae, *Rhopaloblaste* from Arecaceae and *Spathoglottis* of Orchidaceae and many more species are endemic to these areas. A total of 330 species of fauna are recorded from the Campbell Bay National Park area including 28 species of mammals (including 3 marine mammals), 97 species of birds, 23 species of reptiles, 10 species of amphibians, 52 species of butterflies, 24 species of odonates, 20 species of spiders and 76 species of aquatic Hemipterans.

Social Environment

The information on socio-economic aspects of the study area has been compiled from secondary sources, which mainly include census data of 2011. The salient features of the demography and socio-economic profile are as follows:

- Total population is 8,367.
- There are no scheduled castes (SC)
- There are 1,324 persons scheduled tribes (ST)

The percentage of male literates to the total literates of the study area works out to be 63.70%. The percentage of female literates to the total literates, which is an important indicator for social change, is observed to be 36.30% in the study area as per 2011 Census records. Total work participation rate in the project study area is 45.91%. The distribution of workers by occupation indicates that the non-workers are the predominant population. There are 237 number of Shompen and 1087 number of Nicobaries within the Great Nicobar Island.

11.5. Anticipated Environmental Impacts and Mitigation Measures

The proposed integrated development projects will result in certain environmental impacts during construction and operational phases

11.5.1. International Container Transshipment Terminal

During construction phase changes in land use/land cover may change and the topography may change. Due to construction activity and soil compaction/ consolidation, it may cause loss of vegetation, tree cover & soil pollution.

No quarrying is proposed to be carried out in GNI. All the quarry material will be transported from either the main land or from Indonesia depending on the quality of the material and economic feasibility.

During operational phase of ICTT, it is proposed that there will be not be any dusty cargo, dry bulk cargo such as coal, iron ore or hazardous cargo, etc. Hence, direct impact on water due to cargo handling will be insignificant. If no care is taken, the marine water may get polluted as a result of release of contaminants into the marine system. The contaminants include leakage/ spill of oil in port and its surrounding area. As a mitigation measure, no untreated water will be discharged either during the construction or operation phase of the project.

It is proposed that the Port operator will prepare a spill prevention, control, and counter measure plan which will be consistent with the IMO Manual on Oil Pollution Section II – Contingency Planning. All the ship related waste with a potential to cause pollution to the marine environment will be disposed according to the guidelines stipulated by the MARPOL Convention.

As mentioned earlier, the western flank of Galathea Bay has leatherback turtle nesting sites. In order to ensure that turtles are not disturbed during the nesting seasons (between November and February) no offshore construction activity will be undertaken to the extent possible. This is in line with as per ZSI recommendations. Considering that these turtles are sensitive to light, ZSI has recommended low pressure sodium lighting in the port area for minimum disturbance to the turtles. ZSI has also recommended the reduction of underwater noise for minimal disturbance to leatherback Turtles. ZSI has also recommended, long term satellite tacking of leatherback turtles.

Galathea port area does not have any coral reefs. However, few Sporadic coral reefs are reported on the eastern peninsula part from the work area, if impacted, the same may be replanted in a suitable area. Adequate financial provisions have are being kept for the coral replantation work as contingency.

11.5.2. Greenfield International Airport

The activities that take place during construction phases of airport project inlcude levelling of site, construction and erection of main airport structures like terminal building, aprons, runway, construction of blast pads at extreme ends of runway, provision of runway shoulders, for aerodrome reference code. There are impacts on land use, soil, air quality, ecology, demography and socio-economics, access roads and public expectation due to these activities.

Environmental impacts associated with the operation of the project will be minimized by implementing the key design and planning strategies,.

Exhaust emissions from vehicles and equipment deployed during the construction phase also result in marginal increase in the levels of SO_2, NO_2, PM, CO and unburnt

ANDAMAN AND NICOBAR ADMINISTRATION .
DEPARTMENT OF ENVIRONMENT AND FOREST

ANNEXURE A9

N O T I F I C A T I O N

Port Blair, dated the

NO. CWLW/WL/3 /798

Whereas the Wildlife Advisory Board, Andaman and Nicobar Islands has recommended to declare [redacted] NICOBAR to be the Wildlife Sanctuary for protection and propagation of the Giant Leatherback Sea Turtle.

And whereas the Lieutenant Governor (Administrator), Andaman and Nicobar Islands considers that the aforesaid area, which is a Protected Forest under the Indian Forest Act, 1927 (Act 16 of 1927) is of adequate ecological, faunal, floral, geomorphological, natural and Zoological significance for the purpose of protecting, propagating or developing Wildlife or its environment.

Now, therefore, in exercise of the powers conferred by Sub-section(1) of section 10 read with clause(29) of section 2, of the Wildlife (Protection) Act, 1972(Act 53 of 1972) the Lieutenant Governor(Administrator), Andaman and Nicobar Islands hereby declarees his intention to constitute the aforesaid protected Forest area, the situation and limits of which are specified in the schedule given below, to be "Galathea Bay Wildlife Sanctuary" for the purpose as aforesaid.

S C H E D U L E

Area:

11.44 Sq.Km. approximately at Great Nicobar Island in the A & N Islands.

Description of boundary:

North:

Starting from the 38 Kilometre milestone point ($6^0 48' 12"$ North latitude and $93^0 53' 00"$ East longitude) on the North-South road (Campbell Bay to Indira Point) & then follows the road towards Indira Point, crosses Galathea river & continues following the road upto point 'A' situated between milestone-43 & 44 Km at $6^0 48' 57"$ North latitude and $93^0 51' 12"$ East longitude.

Contd.....2/-

West:

Starting from point 'A' situated between milestone .43 Km and 44 Km at 6°48'57" North latitude and 93°51'12" East longitude on North South road and then follows the road towards south direction passing near Chingeh village to the 47 Km.milestone point at 6°47'18" North latitude and 93°51'40" East longitude.

South:

Starting from the 47 Km milestone point at 6°47'18" North latitude and 93°51'40" East longitude and then follows a direction/bearing over the sea to meet at Kwangtung point at 6°47'30" North latitude and 93°52'36" East longitude.

East:

Starts from Kwangtung point at 6°47'30" North latitude and 93°52'36" East longitude and thence running all along the sea coast after which it follows the nullah in a north westerly direction to meet the .38 Km milestone point at 6°40'12" North latitude and 93°53'00" East longitude.

Sd/-
(ISHWARI PRASAD GUPTA)
LIEUTENANT GOVERNOR

By order and in the name of Lieutenant Governor.

S.R.MEHTA 12.9.97.
Secretary
Environment & Forests

Copy to:-

1. The Manager, Government Press, Port Blair with the request to publish the above notification in the extra ordinary gazette .100 copies of this gazette notification may please sent to this office for official use.
2. The Judicial Secretary, A & N Administration, Port Blair.
3. The PCCF, A & N Islands, Port Blair.
4. The Inspector General of Police, A & N Islands, Port Blair.
5. The Dy. Commissioner (Nicobar District), Port Blair for complying with formalities as required under the Wildlife (Protection) Act, 1972.
6. The Hindi Officer, A & N Administration with the request to send the Hindi version of above Notification to the Manager, Govt. Press, Port Blair for issue simultaneously in the Extraordinary Gazette of the Administration.
7. All Head of Departments, A & N Islands.
8. ALL DCF'S / CF'S, DFO'S.

ANNEXURE A10

F.No.6-161/2020 WL
Government of India
Ministry of Environment, Forest and Climate Change
(Wildlife Division)

2nd Floor, Jal Wing,
Indira Paryavaran Bhawan,
Jor Bagh Road, Aliganj,
New Delhi – 110003.

Dated: 22nd January,2021

To
All Members
Standing Committee of NBWL.

Sub: Minutes of 60th Meeting of the Standing Committee of National Board for Wild Life- reg.

Sir / Madam,

Kindly find enclosed copy of the Minutes of 60th Meeting of the Standing Committee of National Board for Wild Life held on 5th January, 2021 under the chairmanship of Hon'ble Minister of Environment, Forest and Climate Change, Government of India.

Yours faithfully,

(Surender Gugloth)
Scientist 'D'
Email: ddwlmef@gmail.com

Encl: As above

Distribution:

1. Secretary, MoEF&CC
2. DGF&SS, MoEF&CC
3. ADGF(WL), MoEF&CC
4. ADGF(FC), MoEF&CC
5. ADGF (PT) and Member Secretary, NTCA
6. Director/IGF, PE Division, MoEF&CC
7. Director, WII, Dehradun
8. Director, GEER Foundation, Gandhinagar, Gujarat
9. Prof. R. Sukumar, Member, NBWL
10. Dr. H.S. Singh, Member, NBWL
11. Secretary, Environment, Forest, Science and Technology Department, Govt. of Andhra Pradesh.

Copy to:

1. PS to Hon'ble MoEF&CC
2. PS to Hon'ble MoSEF&CC
3. PPS to DGF&SS, MoEF&CC
4. PSO to Addl.DGF(WL), Sr.PPS to IGF(WL)
5. Additional Chief Secretary / Principal Secretary / Secretary, Forest Department, Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Maharashtra, Rajasthan, Telangana, Uttarakhand, Uttar Pradesh;
6. PCCF & HoFF, Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Maharashtra, Rajasthan, Telangana, Uttarakhand, Uttar Pradesh;
7. Chief Wild Life Warden, Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Maharashtra, Rajasthan, Telangana, Uttarakhand, Uttar Pradesh.

MINUTES OF 60th MEETING OF THE STANDING COMMITTEE OF NATIONAL BOARD FOR WILD LIFE HELD ON 05 JANUARY, 2021

The 60th Meeting of the Standing Committee of National Board for Wild Life was held on 05 January, 2021 through Video Conference and chaired by the Hon'ble Minister for Environment, Forest & Climate Change. List of participants is placed at **ANNEXURE-I**.

The Hon'ble Chairman welcomed all the participants to the 60th Meeting of the Standing Committee of National Board for Wild Life and asked the Member Secretary to initiate the discussions on the Agenda Items.

AGENDA ITEM No.1

60.1.1 Confirmation of the minutes of the 59th Meeting of the Standing Committee of National Board for Wild Life held on 5th October, 2020.

The Member Secretary stated that the minutes of the 59th meeting of the Standing Committee of National Board for Wild Life held on 5th October, 2020 were circulated on 19th October, 2020 amongst all the Members of the Standing Committee.

He stated that the comments / suggestions have been received from Dr. H. S. Singh, Member through e-mail dated 5th January, 2021 requesting for reconsideration of his proposal regarding the exemption of NPV in cases of relocation of villagers from buffer areas and wildlife corridors to other forest areas.

Secretary, MoEFCC informed that the framing of rules for Forest (Conservation) Act, 1980 is under active consideration of the Ministry and this issue will be taken care while finalization of these Rules. The same was welcomed and accepted by Dr. H.S. Singh.

Decision Taken: Based on the discussions held, the Standing Committee decided to confirm the minutes of the 59th meeting.

AGENDA ITEM No.2

(Action Taken Report)

60.2.1 Proposal for use of 98.59 ha of reserve forestland from Saleki proposed reserve forest which is a part of Dehing Patkai Elephant Reserve for

60.3.2 WP (C) No. 13056/2020 (F) - Manikandan T. Vs. MoEF & CC & Ors. And W.P. (C) No. 4280/2020 (H) – Betty Biju Vs. MoEF & CC & Ors.- High Court of Kerala at Ernakulam [File No. 6-160/2020WL]

60.3.3 WP (C) No. 7211/2020 (B) - Denson K.S. Vs. UOI & Ors- High Court of Kerala at Ernakulam [File No. 6-159/2020WL]

The Member Secretary informed the Standing Committee that the Principal Secretary, Environment Department, Government of Kerala has requested to place the matters before the Standing Committee of the National Board within a period of one week as directed by the Kerala High Court for consideration vide letters dated 21.10.2020. As per the normal procedure for consideration by the Standing Committee, the proposals should be received through proper channel with the recommendations of the State Chief Wild Life Warden, State Board for Wild Life and State Government.

Decision Taken: Based on the discussions held and documents submitted, the Standing Committee decided to return the proposals and requested the State Government of Kerala to submit the proposals as per the established guidelines and procedures.

60.3.4 De-notification of Megapode Sanctuary, Andaman and Nicobar Islands [File No. 6-132/2020WL]

The Member Secretary briefed the Standing Committee and stated that the proposal for de-notification of Megapode Sanctuary has been submitted by Office of Principal Chief Conservator of Forests (Wild Life), Andaman and Nicobar Islands. During the mega earthquake and Tsunami which occurred in December, 2004, the Megapode Island has been submerged in the sea and there is no existence of the island post Tsunami. He further stated that Nicobar Megapode is a terrestrial bird which nests on ground.

The Member Secretary informed the Standing Committee that views of Wildlife Institute of India were taken and they have suggested that the submergence of island now does not serve any purpose for the conservation of Nicobar Megapode.

Decision Taken: After discussions, the Committee decided to recommend the proposal and suggested that conservation measures shall be taken for the Nicobar Megapode in other islands with the help of Wildlife Institute of India.

60.3.5 Denotification of Galathea Sanctuary (Only intention to declare as sanctuary notified), Andaman and Nicobar Islands [File No. 6-

135/2020WL]

The Member Secretary briefed the Standing Committee and stated that Andaman and Nicobar Islands administration had notified intention to declare Galathea Bay as sanctuary for an area of 11.44 sq. km. vide notification dated 15.09.1997 under section 18 (1) of the Wild Life (Protection) Act, 1972. Proclamation notification for initiating acquisition proceedings was issued by the Collector on 14.10.1997. The acquisition proceedings have not been completed and final notification for the sanctuary has not yet been issued. Now, the Andaman and Nicobar Islands has submitted de-notification proposal for the Galathea Bay Sanctuary for which intention to declare as sanctuary alone was notified.

The proposal has been recommended by Chief Wild Life Warden and Andaman and Nicobar Islands Administration. The State Board for Wild Life, Andaman and Nicobar Islands have also recommended the proposal.

Secretary, MoEFCC stated that Andaman and Nicobar Islands Administration had sought clarification from the Ld. ASG who opined that de-notification of Galathea Sanctuary is not needed as the notification regarding intention to declare Galathea Bay as sanctuary isand void because rights were not settled within 2 years. Ministry had also sought clarification from the Ld. Solicitor General regarding the validity of the notification for intention to declare Galathea Bay as Sanctuary. However, the Ministry is of the opinion that the notification for intention to declare Galathea Bay as Sanctuary does not lapse even though the rights have not been settled. Therefore, the Ministry has decided to place the proposal before the Standing Committee to take a decision on this de-notification proposal of Andaman and Nicobar Administration.

Comments from the Wildlife Institute of India (WII) were sought and the Director, WII has opined that the concerned authorities develop and implement a mitigation plan to facilitate leather back and other turtles to continuously nest for which the connectivity between the Galathea River and the Bay should be ensured. The mitigation plan needs to be developed through a detailed study so that marine turtles continue to nest on the beaches near the Galathea Bay during both construction as well as operational phases of the International Shipment Project.

The provisions of CRZ should be enforced in the area. The concerned authorities should secure and conserve all other important turtles nesting areas of Andaman and Nicobar Islands with enhanced protection/conservation measures through appropriate legal/administrative means and through a Management Plan.

Dr. Sukumar, Member opined that there should be a management plan for conservation and nesting of Leatherback Turtles.

Decision Taken: After discussions, the Standing Committee decided to recommend the proposal with the recommendations of WII, CWLW and directed that a comprehensive management plan may be prepared and followed by the Andaman and Nicobar Administration for conservation and protection of Leatherback Turtles in Great Nicobar Islands along with the Wildlife Institute of India and the project proponents. The Andaman and Nicobar Islands Administration shall bring more areas under conservation of leatherback turtle.

AGENDA No. 4

60.4.1 Amendments in minutes of meeting of Standing Committee [File No. 6-182/2017 WL(pt)]

The Member Secretary briefed the Standing Committee and stated that the proposal for diversion of 13.27 ha forestland from Valmiki Tiger Reserve for construction of NH-28B was recommended by the Standing Committee in its 46th meeting held on 8th December, 2017 subject to the conditions and mitigation measures imposed by the State Chief Wild Life Warden and the NTCA. One of the conditions imposed by Chief Wild Life Warden while recommending the proposal was that the traffic- worthy maintenance of the earlier used access road segment (approximately 5 km) inside the sanctuary shall be limited to the extent of 2 years from the grant of permission. However, work could not be carried out in the given period as informed by the Chief Wild Life Warden and requested amendment in this condition for permission to use the existing road for 2 more years.

The State Board for Wild Life recommended the proposal in its meeting held on 13.08.2020 to extend the period for two years.

Decision taken: After discussion, the standing committee decided to recommend the proposal to extend the period for two years with a condition that no further request for extension shall be entertained.

AGENDA No.5

(Fresh Proposals Falling Inside / Outside the Protected Area)

60.5.1 Proposal for diversion of 6.82 ha. of forestland in Kadapa Range in Kadapa Division for laying of 16" dia VDPL pipeline route from Vijayawada in Andhra Pradesh and Dharmapuri in Tamil Nadu passing

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ANNEXURE A11

A significant population of Leatherback turtles in the Indian ocean

Harry Andrews[1] & Kartik Shanker[2] &
1- Andaman and Nicobar Islands Environmental Team/ Centre for Island Ecology, Madras Crocodile Bank Trust, Post Bag- 4, Tamil Nadu- 603 104, South India.
2- Wildlife Institute of India, PO Box 18, Chandrabani, Dehradun 248001. India.

The global decline of leatherbacks has received much attention in recent times, including predictions of extinction in the near future (Spotila *et al*. 2000). Spotila *et al.* (1996) dismiss the population of leatherbacks in the Indian ocean as minor and also state that they may be under the gravest threat along with Pacific populations. We evaluated the status of marine turtles in the Andaman and Nicobar islands in the context of the Indian ocean, using data from recent surveys (Andrews *et al.*, 2001).

These surveys indicate that past estimates of nesting from the Indian ocean, particularly the Andaman and Nicobar islands, may have underestimated populations. In fact, surveys conducted 10 years apart at Galathea, Great Nicobar do not indicate a decline in the population (Tiwari, 1991; Bhaskar, 1993, Andrews *et al*, 2001).

During 2000-01, a total of 1690 nests were counted on Great Nicobar island (Andrews *et al.* 2001) Dividing by 5 (average annual clutch frequency) and multiplying by 2.5 (average remigration interval) yields a population estimate of 845 adult females for Great Nicobar island. Similarly, we estimate a minimum of 82 adult females for Little Nicobar island (Bhaskar, 1993 counted 165 nests on the southwestern coast). These are very conservative estimates, since Bhaskar (1993) did not cover all leatherback nesting beaches in Little Nicobar and Andrews *et al*. (2001) only surveyed the west coast of Great Nicobar towards the end of the season. Andrews *et al.* (2001) estimate another 150 individuals for the Andaman islands and other islands in the Nicobar group.

It would therefore appear that the population of adult female leatherbacks using the Andaman & Nicobars islands exceeds a 1000 individuals. Spotila *et al*. (1996) list just three other colonies in the world with more than 1000 individuals. Hence this island group, Great Nicobar Island in particular, should be considered one of the major colonies for leatherbacks in the world. These rookeries along with those in Sri Lanka, also increase the significance of the Indian ocean region for leatherback turtles.

Apart from egg predation by feral dogs and pigs (and occasional predation on adults by saltwater crocodiles), these populations currently seem to be in little danger of precipitous declines. We therefore find no evidence to support the claims of Spotila *et al.* (1996) with regard to leatherback turtles in the Indian ocean. The large Nicobar populations and moderate Andaman and Sri Lankan populations should certainly be carefully monitored, since an increase in developmental activities and commercial fishing could well cause sudden declines in these populations.

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ANNEXURE A12

Marine turtle status and distribution in the Andaman and Nicobar islands after the 2004 M 9 quake and tsunami

Harry V. Andrews, M. Chandi, Allen Vaughan, John Aungthong, Saw Aghue, Saw Johnny, Saw John and S. Naveen

Andaman and Nicobar Islands environment Team
Madras Crocodile Bank Trust/Centre for Herpetology
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Introduction

The pre tsunami status and distribution of the leatherback turtle (*Dermochelys coriacea*), hawksbill turtle (*Eretmochelys imbricata*), green turtle (*Chelonia mydas*) and olive ridley (*Lepidochelys olivacea*) in the Andaman and Nicobar islands has been documented over the last two decades (see Bhaskar, 1979, 1993; Sivasundar & Devi Prasad, 1996), Andrews (2000), Andrews & Shanker, 2002 and Andrews *et al.* (2006). Bhaskar (1993) and Andrews *et al.* (2006) have also discussed the historical records of marine turtles in these islands. Bhaskar & Andrews (1993) formulated an action plan for the four species in the islands.

The leatherback and hawksbill populations nesting in the Andamans and Nicobars are the largest for India and most important for the Northern Indian Ocean region. The leatherback nesting population in the Nicobar islands was one of the few colonies that exceeds over 1000 nesting individuals in the Indo-Pacific, and hence of global significance (Andrews & Shanker, 2002). Andrews & Tripathy (2004) and Andrews *et al.* (2006) recorded 30 nesting sites in North Andamans, 27 in Middle Andamans, 21 in South Andamans, six sites in Little Andaman Island and 26 sites in the Nicobar group.

The 26th December 2004 *M* 9 quake caused the subsidence of the Nicobar Islands and areas around South Andaman Island, besides an upheaval, by an average of 1 m, on Little Andaman Island, northwestern South Andaman, entire Middle and North Andaman Islands including Landfall Island. The subsidence of the Nicobars and South Andaman Island by an average of 1 m caused high tides reaching inland and flooding of coastal lowlands. In the Nicobars, being just north of Sumatra, coastal habitats in all the 23 islands have been affected, and beaches and coastal habitats have been swept away. The impacts and ecological changes in both island groups have been discussed in detail by Andrews (2005), Sankaran (2005), Andrews & Vaughan (2005) and by Jayaraj & Andrews (2005).

Methods

Observations and assessments of the coastal habitats and beaches, and reef flats were conducted by ground surveys. Areas and islands were assessed with a local inboard, dugout canoe (Andaman dungi). Reef flats were observed onshore and offshore. In Great Nicobar Island, surveys were conducted by ground and helicopter surveys and in central Nicobars by boat and on foot. Some areas of South Andaman Island were surveyed over land. Beaches were surveyed on foot during the mornings and evenings to count turtle nests and tracks; tracks/crawls were categorized as fresh, (crawls with visible flipper marks), and old (those with either only the nest excavation mound and or faint tracks visible). The data recorded were counts made on a single walk (on occasion to and fro) along a beach to ascertain the presence or absence of turtle nesting activity, and species visiting the beach. Off shore sightings were also recorded and surveys were conducted during January-April 2005 and during January-March 2006. Two field camps were started during the second week of October 2005, for monitoring nesting, at Cuthbert Bay, north east of Middle Andaman Islands and at Rutland Island, on Jahaji beach, on the southern side of the island.

Results

Middle and North Andaman Islands

During January–April 2005 and January– March 2006, the beaches on South Reef, Interview, North Reef, Snark, Point, Paget, Reef, West, Landfall and East islands were surveyed (Fig: 1). There was very little changes to the beaches on these islands but due to the upheaval of reef flats, many nesting beach areas have become inaccessible for turtles. The reef flats on the northern, western and the southern sides of South Reef Island, extend for roughly about 2 km². Six nests of hawksbills were recorded during the 2005 survey on this island. The beaches on the south west coast and north eastern side of Interview Island have become inaccessible for turtles to nest due to reef flat upheaval. The beach on the south west coast of Interview Island used to be one of the most favoured nesting beaches for green turtles (Bhaskar, 1984; Andrews *et al.*, 2001). The sea grass bed on the north of Interview Island at Brasse Point had been swept away; however regeneration of small tufts, 3-4 cm high, was observed. Over 10 green turtles and three hawksbills of different size classes were sighted in this bay (Andrews & Vaughan, 2005).

Beaches on North Reef Island, on the north western and eastern sides, have minimal changes; however the beach on the south eastern side has built up. Due to exposed reefs to an extent of 4.5 km², marine turtles do not have access to these beaches for nesting and this was evident as no tracks or nests were found on these beaches. Two plastrons of green turtles were found on the west coast and no evidence was available to conclude the cause of death. However, 22 sightings of green turtles around the island, off shore and among deeper reefs, were recorded (Andrews, 2005). During the 2006 survey, a few under nourished green turtles were seen trapped in tide pools and lagoons created due to reef upheaval. The reef flats on the western, southern and eastern side of Latouche Island were also exposed and eight green turtles and three hawksbills were sighted off North reef Island.

The exposed reef flats along the northeastern side, the northern, eastern and the southern sides of West Island, is estimated to be 4.5 km². Reefs, 2- 4 m deep, were observed on the eastern and southern sides of Snark and six green turtle nests and nine tracks and four hawksbill nests were found on Snark Island. Beaches on the southern sides of Snark Island have changed very little. Due to the upheaval of reef flats, turtles do not have access to the beaches on the eastern and western sides of Point, Paget, West, Landfall and East Islands (Fig. 1). On Flat Island, no signs of nesting were observed during the 2005 season; however during the 2006 survey, two green turtle nests and one hawksbill nest were recorded. Opposite Flat Island on the main island of Middle Andaman, a beach and spit cover the coast where rocky shoal and coral reef abut the passage between Flat Island and the main island. A single hawksbill nest was recorded on this beach in 2006.

Very minor changes have occurred to beaches along the western and eastern coasts of Middle Andaman Island (Fig. 2). Most beaches were swept away only partially and high tides reached the forest though subsequently in 2006 new beach deposits were observed. These beaches include, from the south western side, Foul Bay, Tanmuguta, Yadita and Robert Bay; and on the eastern coast, Cape Vestal, Paikat Bay, Woteng and Cuthbert Bay Turtle Sanctuary. Green turtles and olive ridleys were nesting up to April 2005 at Paikat Bay, Woteng and at Cuthbert Bay.

ANET monitored turtle nesting trends during early January 2005 at Cuthbert Bay Turtle Sanctuary. After the tsunami, six green turtles were encountered and two nested. Of the 94 olive ridleys encountered, 65 nested and the one leatherback encountered also nested. Nesting on this beach ceased by 27th April 2005. During the following nesting season, October 2005 to March 2006, 118 olive ridleys were encountered and 109 nested, 16 green turtles were encountered of which eight nested and two leatherbacks were encountered, but did not nest.

Ritchie's Archipelago and South Andamans

During March 2005, eight green turtle and three olive ridley nests were counted on Middle Button Island. Eleven green turtle and six olive ridley nests were observed on Inglis/East Island. During the 2006

survey, 21 green turtles and 3 leatherbacks were found to have nested on North Button Island. Along the South Andamans, the Madhuban Beach east of South Andaman, along Mount Harriet National Park, north of Port Blair, was surveyed during 2005 (Fig. 3). Old and fresh tracks and nests of two species of turtles, green turtles and three olive ridleys, were recorded. However, these nests could not have survived as they were being flooded during high tides.

During the 2005 survey, it was observed that the beaches on east and west Twin islands, Rutland, North and South Cinque and South Brother Islands were partially swept away and the high tide reached the forest line. The sand bar along the south western side of North Cinque was swept away by the tsunami and currently a sand bar has formed and the beach has built up. Very minor impacts on coastal forests were observed on all these islands, including Boat, Hobday, Redskin and Tarmugli Islands. There was no evidence of nesting on these islands after the tsunami in 2005.

During the last monitoring programme by ANET, between October 2005 and March 2006, the team on Rutland Island encountered 44 green turtles, of which 22 nested, and 19 olive ridleys, of which 17 nested; of the 10 hawksbills encountered, three nested and of the 12 leatherbacks that emerged on the beach, 10 nested. During November 2005, one leatherback and two green turtle nests were recorded on North Cinque Island and there was no evidence of nesting on South Cinque. During the same month, three hawksbill nests and one green turtle nest were observed on east Twin Island and nine hawksbills and four green turtle nests on west Twin Island. A second survey of the same islands conducted during March 2006 resulted in six green turtle, three hawksbill and one olive ridley nest on east Twin Island, and three green turtle, six hawksbill and four olive ridley nests on west Twin Island.

Little Andaman Island

The three major sea turtle nesting beaches surveyed during March 2005, West Bay, South Bay on the west coast and Butler Bay on the eastern coast, were all affected. These beaches were washed away partially and submerged during the high tide. There was no evidence of turtle nesting on these beaches in 2005, but observations and indications during the 2006 survey suggest significant visitation and nesting by turtles, especially leatherbacks and that these beaches are reforming. Two other large beaches were formed after the tsunami, one starting at the northern side off the mouth of Jackson Creek measuring a length of 5 km (Fig. 4). Turtle tracks and nests of three species, green turtles (four nests), olive ridleys (three nests) and leatherback (two nests), were recorded from this beach. Another 2 km long beach had formed, situated 4 km south of Jackson Creek and four nests of green turtles and two olive ridley nests were found on this beach.

During the 2006 survey, an older member of the Onge community remarked that they (the Onge from Dugong creek) had gone turtle hunting along the shore and off the mouth of Dugong Creek, after many of their women told them that they wanted to eat turtle meat. The men went out along the shore and to sea returning with a few green turtles and the women were disappointed as the turtles were lean and did not have any fat and meat. They then realized that the sea grass beds were damaged and the sea turtles did not have much to eat. The women then told the men that despite their hunger to taste sea turtles, it would be better to wait and allow the sea grass to grow so that sea turtles could feed themselves before they became food for the Onge; since then they have not hunted.

Great Nicobar and areas in the central Nicobar group of islands

The Nicobar Islands were surveyed during January – February 2005. The entire coastal area and habitats have been completely affected and destroyed impacting all coastal flora and fauna and affecting some of the mega species. In the Galathea area and the entire South Bay, the tsunami wave had gone inland to a distance of almost 1.5 km. This had destroyed all the beaches, mangroves and the entire coastal habitat of South Bay, including the areas around the light house at 51 km. Debris, consist of fallen trees, plastics, timber and other flotsam from the sea drift on to the land at each high tide. The high tide line reached the hill slope upto the forests; existing coastal trees, mangrove species and other

coastal flora are drying up. During the month of April 2006, it was reported that the coasts along western Great Nicobar Island had regressed further due to continued wave action and erosion (R. Sankaran *pers. comm*). The same effect was observed on the west coast of Little Nicobar Island and islands in the central group and on Car Nicobar Island.

The most affected sea turtle nesting beaches along the east coast of Great Nicobar are the Galathea beach and the beach stretch from 47-51 km (along the north – south road), and along the west coast are areas near the Alexandria and Dagmar Rivers, Rekoret and Renhong. Beaches along Little Nicobar west coast and Katchal Islands and those areas on Great Nicobar Island were prime sea turtle nesting beaches and these have been washed away. In Great Nicobar Island in South Bay, two beaches are forming, one at 43 km and at the other at 45.5 km(along the north – south road). Hawksbills and olive ridleys were observed nesting at these two beaches. However these nests were destroyed as these beaches flood at high tide. Beach deposition had taken place toward the end of 2005 from Indira Point, the southern most tip of Great Nicobar Island, to Inhingloi on the west coast. The beaches on the west coast and North eastern coast of Little Nicobar Islands were impacted; however leatherback nesting was observed up to March 2005 along the west coast at Muhincohn beach (M. Chandi, *pers. comm.*).

Recommendations

Currently no major management or conservation effort, apart from continuing sea turtle monitoring and awareness programs, is required for the Andaman and Nicobar Islands. The sea turtle beaches that have been affected will re-form after a few monsoons and other new beaches will form in the next two to three years; this will require monitoring as marine turtles will find new nesting beaches. However, the next five years will be crucial and intensive surveys and monitoring will be required to quantify nesting trends, populations and the nesting beaches forming along the islands.

Coastal planting and restoration programmes are currently not required and mangroves and *Casuarina* plantations may not protect from tsunamis. There is also no need for creating wind breakers, as there are other native littoral species (other than *Casuarina*) that can be used to reduce erosion along coast. Natural regeneration and succession of species of flora are underway that could be affected by undue human intervention. In the absence of adequate information on natural resilience and succession, human interference should be minimised. There is also an urgent need for surveys of sea grass beds to quantify impacts and extent. The growth and regeneration of sea grass beds have implications for sea turtles that rely on them for food. Further, a GIS based analysis is required to derive the actual extent of beach and reef flat loss, besides remapping the entire Andaman and Nicobar Islands and its topography.

There is an urgent need to review fisheries practices around the islands and fishing zones. Fishing should be restricted to only 5 km offshore from the high tide line of all islands. During the past several years, surveys by ANET have observed and recorded drowning and entanglement in gill nets and drifting ghost nets, leading to death of sea turtles in significant numbers. Awareness generation and enforcement of no fishing zones in vulnerable regions are required. A plan of action needs to be urgently formulated and immediately implemented for removal of feral and domestic dogs from the Andaman and the Nicobar Islands, as they predate on eggs of turtles and also on nesting turtles.

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the Madras Crocodile Bank Trust/ Centre for Herpetology are thanked, as always for all their continued support. Mr. Rasheed Yusuf and the Tribal Council in the Nicobars are acknowledged, as always, for their valuable support, hospitality and assistance. The Coast Guard and the Navy are acknowledged for their help and support with logistics in the Nicobar Islands.

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Figure: 1. North Andaman Islands

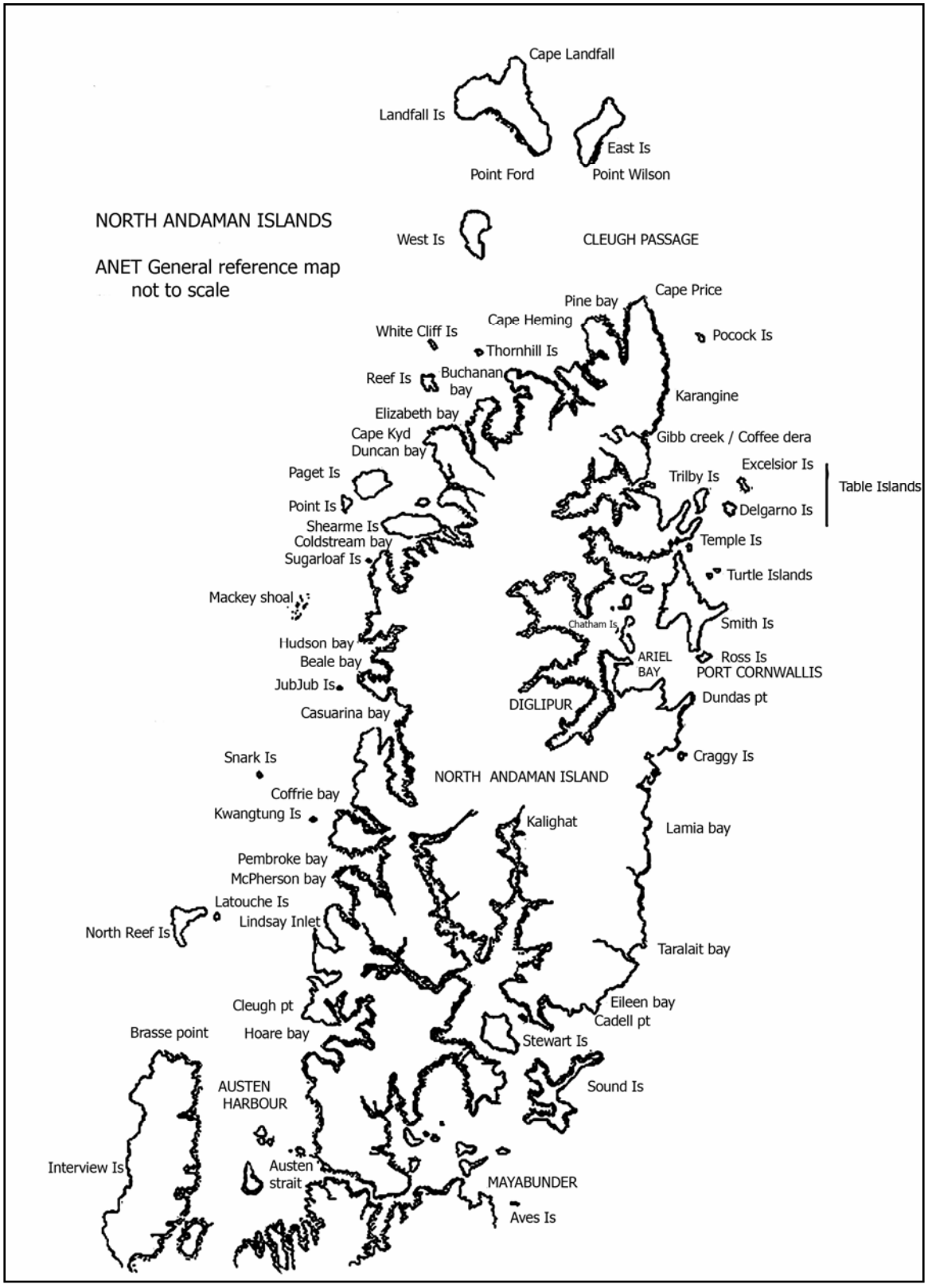


Figure: 2. Middle Andaman Islands

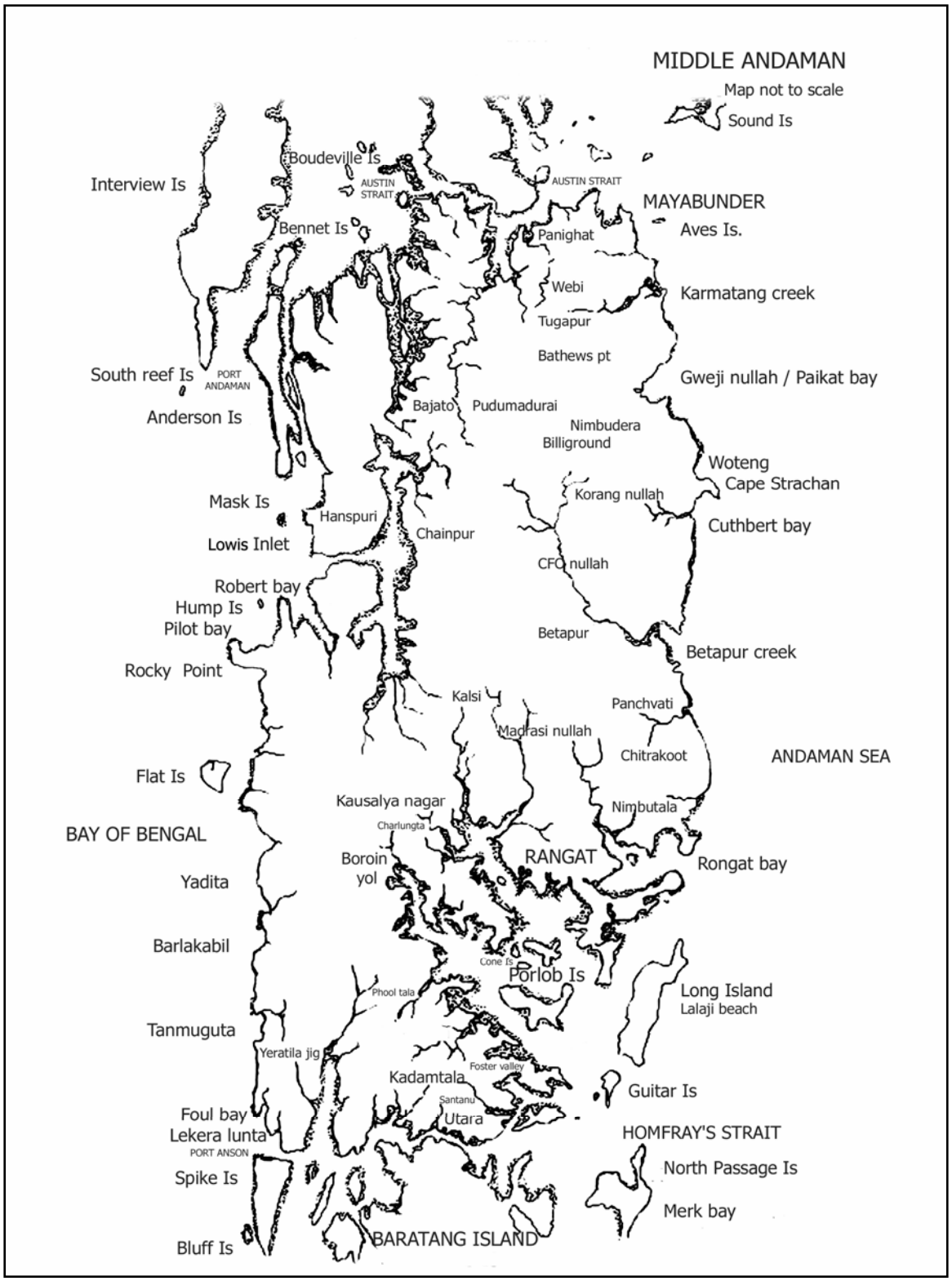


Figure: 3. South Andaman Islands and Ritchie's Archipelago

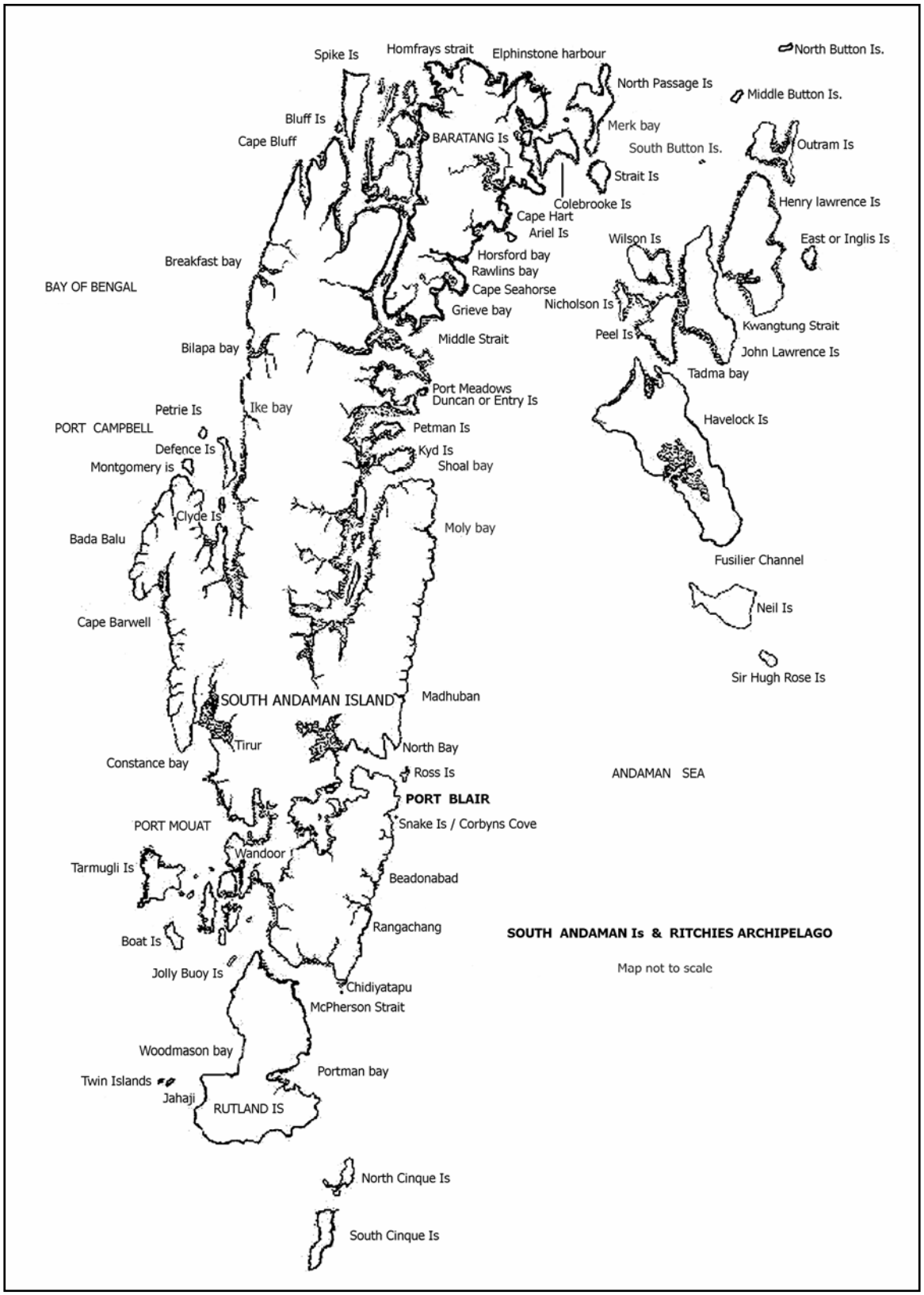
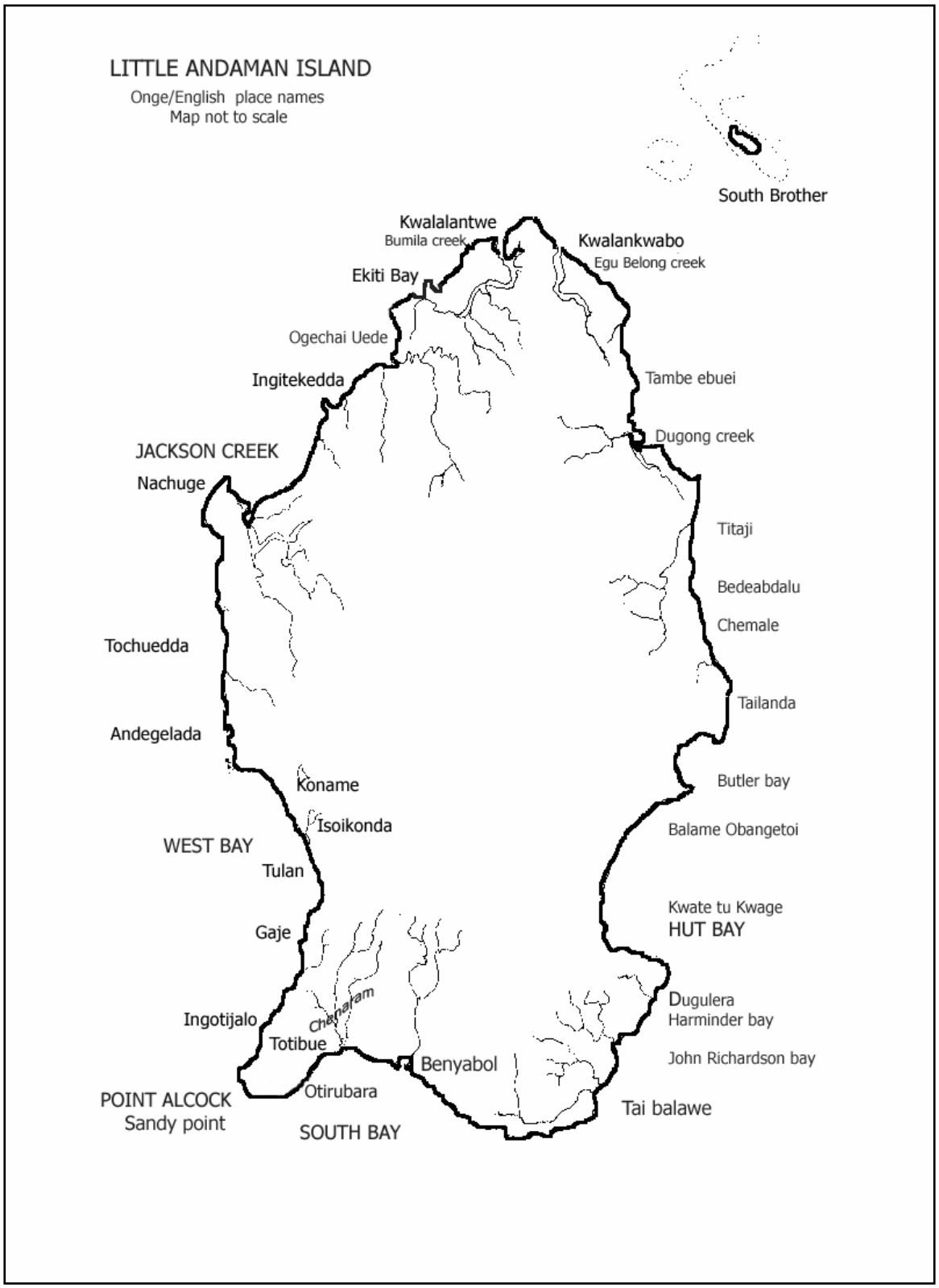


Figure: 4. Little Andaman Island



सत्यमेव जयते

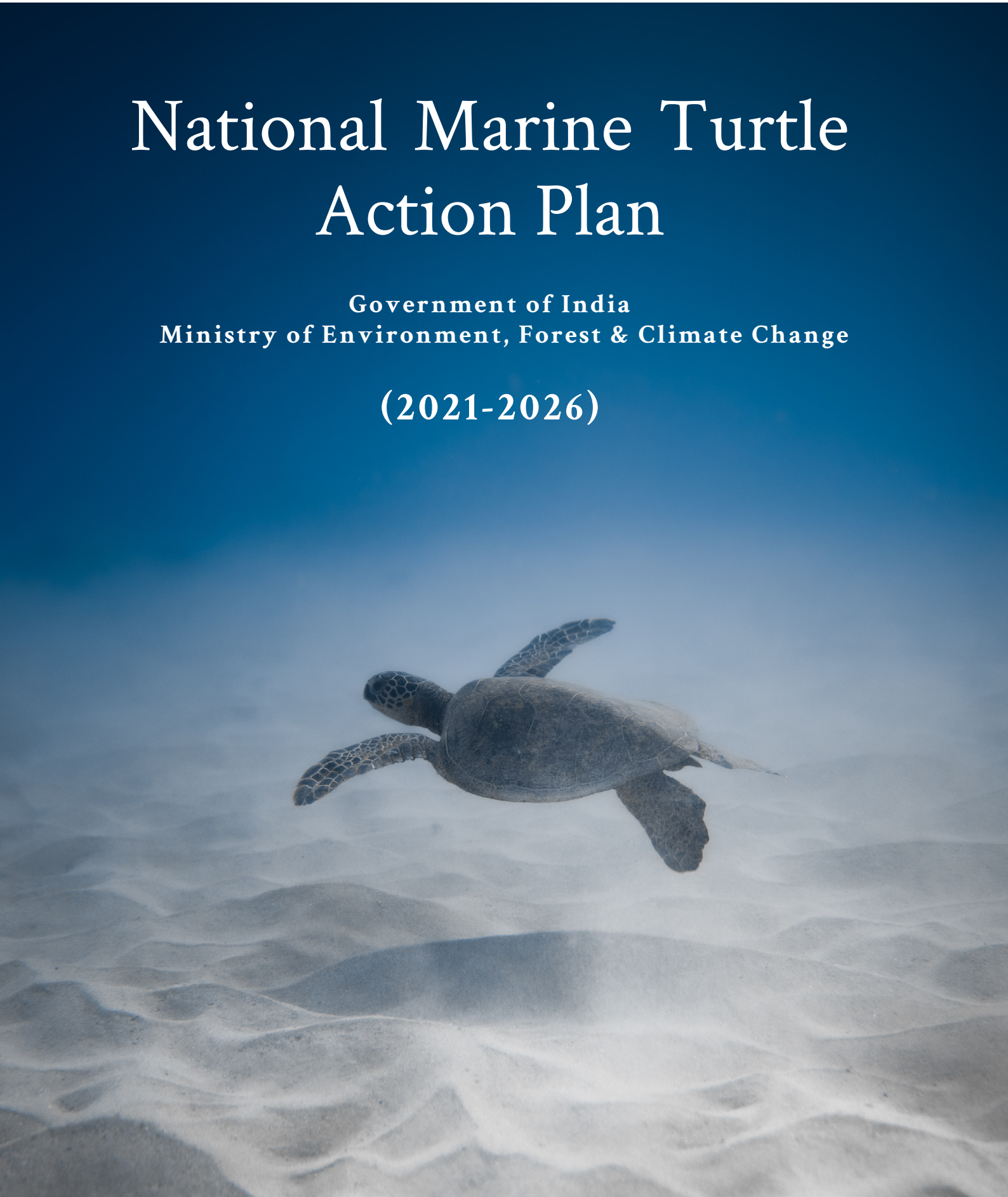
Ministry of Environment, Forest and Climate Change

ANNEXURE A13

National Marine Turtle Action Plan

Government of India
Ministry of Environment, Forest & Climate Change

(2021-2026)



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National Marine Turtle Action Plan

Government of India
Ministry of Environment, Forest & Climate Change

(2021-2026)

मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन,
सूचना एवं प्रसारण और
भारी उद्योग एवं लोक उद्यम
भारत सरकार

MINISTER
ENVIRONMENT, FOREST & CLIMATE CHANGE,
INFORMATION & BROADCASTING AND
HEAVY INDUSTRIES & PUBLIC ENTERPRISES
GOVERNMENT OF INDIA

प्रकाश जावडेकर
Prakash Javadekar

MESSAGE

India is blessed with its rich and varied biodiversity. We have always taken pride in conserving this natural heritage. Our marine biodiversity is no exception to this. Marine Turtles have always captured our imagination and has been conserved since the ages. Marine Turtles are considered to be flagship species in various marine habitats such as coral reefs, sea grass meadows, sandy beaches, etc.

Besides being home to one of the largest congregations of nesting of the Olive Ridley Turtles, five species of marine turtles are found in India. These species found in Indian waters have been listed in the Schedule-I of the Wild Life (Protection) Act, 1972 and therefore, accorded very high protection status. Considering the importance of conservation of marine turtles, the Ministry had included marine turtles as one of the 22 species for taking up focussed conservation programme under the Centrally Sponsored Scheme- Development of Wildlife Habitats.

I am happy to note that the Ministry has now prepared a 'National Marine Turtle Action Plan' through an extensive consultative process with relevant stakeholders. This Action Plan focuses on reducing threats, conserving critical habitat, exchanging scientific data, increasing public awareness and most importantly emphasizes on a participatory approach in conservation of marine turtles and its habitats. The Action Plan will enable the stakeholders to perform their roles in a coordinated manner and take effective measures for the conservation of marine turtles.

I am confident that this 'National Marine Turtle Action Plan' will provide a fresh impetus to work towards conserving these magnificent species and their habitats and provide them with safe havens for their future and for a healthy planet.

With best wishes.

Date: 19.01.2021

(Prakash Javadekar)

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ई–मेल/E-mail: minister-efcc@gov.in

Babul Supriyo
Union Minister of State
Ministry of Environment, Forest & Climate Change
Government of India

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बाबुल सुप्रियो
केन्द्रीय राज्य मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
भारत सरकार

MESSAGE

Marine turtles play a variety of ecological roleslike controlling prey populations, supporting coastal vegetation through their hatchlings etc.in maintaining healthy marine habitats.They are key indicators of healthy marine habitats.

Numerous direct and indirect pressures arising from various factors adversely impact marine turtle populations and their habitat. This includes man made factors such as pollution, habitat destruction, bycatch, etc. and also includes natural disasters such as tsunamis, cyclones, hurricanes and storms. With a view to conserve marine turtles, associated species and their habitats, the Ministry of Environment, Forest and Climate Change, Government of India has prepared this "National Marine Turtle Action Plan, 2021-2026" with a vision to create a viable and healthy marine ecosystem for marine turtles and associated species through a coordinated and participatory mechanismto ensure long term survival of marine turtles.

The National Marine Turtle Action Plan, 2021-2026 would be implemented at the National and State Government level with the following objectives:

a. Reduce direct and indirect causes of marine turtle mortality;
b. Protect, conserve and rehabilitate marine turtle habitats;
c. Improve understanding of marine turtle ecology and populations through research, monitoring and information exchange;
d. Increase public awareness of the threats to marine turtles and their habitats, and enhance public participation in conservation activities;
e. Enhance national, regional and international cooperation.

I wish all the best for the successful implementation of the "National Marine Turtle Action Plan, 2021-2026".

(Babul Supriyo)

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Background

India has a vast coastline of more than 7,500 km, of which, about 5,400 km belong to Peninsular India and about 2,000 km to the Andaman, Nicobar, and Lakshadweep Islands, and with an EEZ (Exclusive Economic Zone) of 2.02 million sq. km. Five species of sea turtles are found in Indian waters. The marine biodiversity including marine turtles in India is one among the richest in the Indian Ocean.

Marine turtles have a major influence on the structure and function of marine biodiversity and play an important role in shaping the behavior and life history traits of prey species and predators that is critical for the sustainability of fisheries in the region. Factors like climate change, unsustainable resource use, marine litter and pollution affect marine turtles and their habitats.

Constitution of India recognizes the need to protect wildlife that include marine life and their environment. The provision under Article 48 A mandates the state to protect, safeguard and improve the environment with the corresponding duty under Article 51 A (g) to the citizen to protect and improve the natural environment. This clearly supports the need to carry out all necessary steps to not only protect but also improve the marine environment.

Marine turtles play a variety of ecological roles for maintaining healthy marine habitats like controlling prey populations, supporting coastal vegetation through their hatchlings etc. Their presence is an indicator of healthy marine ecosystems and provide a source of revenue for local communities through tourism. Marine turtles thus present themselves as a key indicator of healthy marine habitats and an opportunity for conservation of associated species.

Goal

1. **Conserve** Species, their habitat and reduce negative impacts on survival of marine turtles;

2. **Improve** the understanding of marine turtles and their habitats, through a coordinated mechanism;

3. **Promote** Awareness and Education on conservation of marine turtles and their habitats;

4. **Enhance** livelihoods of coastal communities through promoting sustainable ecotourism;

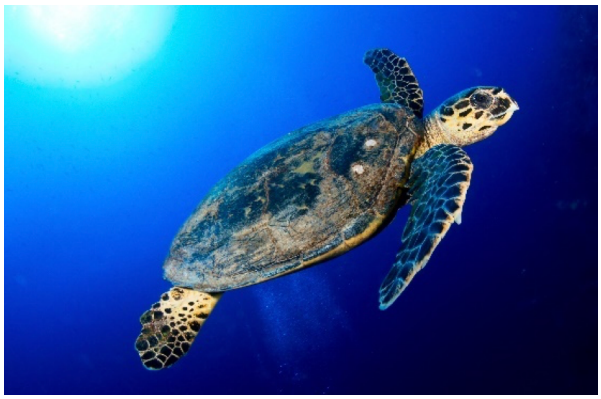
5. **Increase** national, regional and international cooperation on marine turtle conservation.

Vision

Create a viable and healthy marine ecosystem for marine turtles and associated species through a coordinated and participatory mechanism to ensure long term survival of marine turtles.

Mission

The Action Plan aims to conserve marine turtles and their habitats for maintaining a healthy marine ecosystem.



Clockwise: Hawksbill turtle, Olive ridley turtle, Green turtle, Loggerhead Sea Turtle (Wikimedia commons), Leatherback turtle (Dakshin foundation)

Marine Turtle Action Plan

The Indian coastal waters supports five species of sea turtles found worldwide. These are the Olive ridley *(Lepidochelys olivacea)*, Green *(Chelonia mydas)*, Hawksbill *(Eretmochelys imbricata)*, Leatherback *(Dermochelys coriacea)* and Loggerhead *(Caretta caretta)*. These five species of sea turtles that occur in Indian coastal waters are protected under Schedule I of the Wildlife (Protection) Act, 1972.

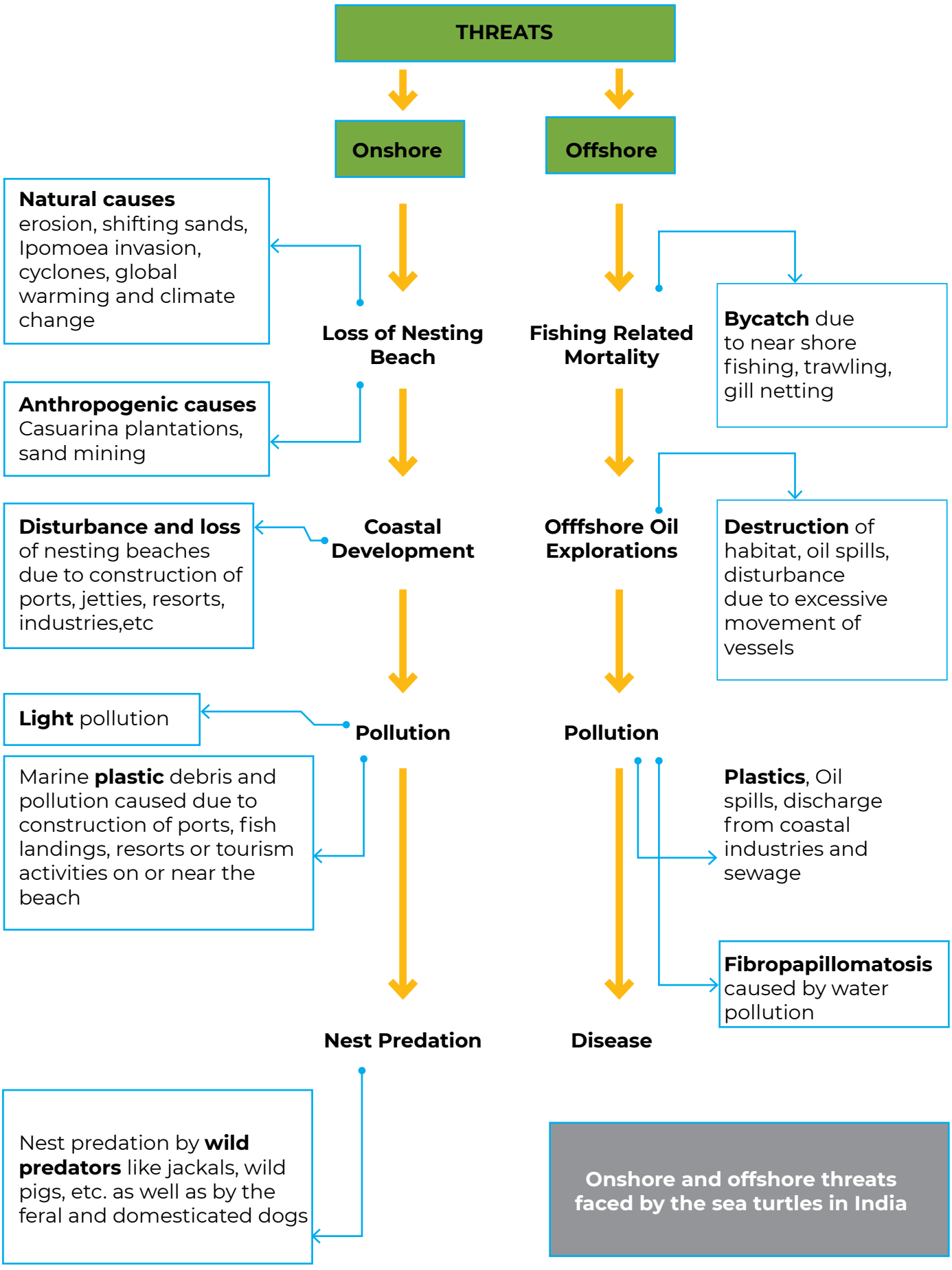
India is home to the largest known nesting population of olive ridley turtles. Except Loggerhead turtles, the remaining four species (Leatherback, Hawksbill, Green and Olive ridley turtles) nest along the Indian coastline and islands of India. About 40,000 to 11,00,000 turtles nest every year on the beaches of India. Number of turtles nesting varies between years and the success of sporadic nests have been observed to decline due to predations and habitat degradation.

Numerous direct and indirect pressures arising from various factors adversely impact marine turtle populations and their habitat. This also includes natural disasters such as tsunamis, cyclones, hurricanes and storms.

With a view to conserve marine turtles in India, various measures have been adopted by the Ministry of Environment, Forest and Climate Change, Government of India, the coastal State/ UT Governments, civil society organizations, experts and local communities. India has identified all its important sea turtle nesting habitats as 'Important Coastal and Marine Biodiversity Areas' of India and included in the Coastal Regulation Zone (CRZ) -1.

With a view to conserve marine turtles, associated species and their habitats, the following action plan is proposed to be adopted at the National and State Government level.

a. To reduce direct and indirect causes of marine turtle mortality, the possible threats to marine turtle populations and their habitats are to be identified, documented and best practice approaches to mitigate those threats to be implemented. It is proposed to undertake management of oceanic marine plastic debris and coastal clean-up for enabling the survival of marine turtles.



Onshore and offshore threats faced by the sea turtles in India

b. Protection, conservation and rehabilitation of marine turtle habitats is key for long term survival of marine turtles. Towards meeting this objective, areas of critical habitat such as migratory corridors, nesting beaches, inter-nesting and feeding areas to be identified and managed, while degraded marine turtle habitats are to be rehabilitated.

c. In order to improve the understanding of marine turtle ecology and populations, studies on marine turtles and their habitats targeted towards conservation and management through research, monitoring and information exchange to be taken up through involvement of scientific institutes and universities. It is proposed that proper exchange of scientific and technical information and expertise among scientific institutions, civil society and other agencies is ensured, in order to develop and implement best practice approaches to conservation of marine turtles and their habitats.

d. People's participation is imperative for successful conservation interventions. It is therefore envisaged to increase awareness of marine turtles and their habitats, conservation needs and threats, amongst the wider public to enhance public participation in conservation activities. Setting up of turtle conservation clubs at taluk or district or state levels, declaration of marine turtle day, conduct special events related to marine turtle conservation are few activities proposed in this direction. In addition, developing alternate livelihood opportunities and better fishing practices for local communities to be encouraged for active participation in conservation efforts that also generate livelihoods like eco-tourism (e.g. turtle tourism). All relevant stakeholders, including local communities should be involved in planning and implementation of conservation and management measures.

e. National, regional and international cooperation is an integral part of marine turtle conservation. The existing mechanisms for cooperation at the sub-regional level to be strengthened to enhance coordination in management of turtle habitats. A web-based information resource for marine turtle conservation to be developed, besides creating networks for cooperative management of shared populations, within or across sub-regions, and, where appropriate. Adequate and regular training on marine turtle conservation and management techniques to relevant agencies, individuals and local communities to be provided through identified scientific institutes.

f. To strengthen law enforcement activities, a coordinated effort to be taken up amongst relevant stakeholders

Important Marine Turtle Habitats in India

State	Important Turtle Habitats (Catchment District)	Remarks / Clarification	Major Threats
Odisha	Rushikulya river (Kandhamal and Ganjam)	Mass nesting ground of Olive Ridley	Erosion, Nest predation, plastic pollution, light pollution and bycatch
Odisha	Gahirmatha river (Kandhamal and Ganjam)	Mass nesting ground of Olive Ridley	Erosion and Nest predation, bycatch
Odisha	Devi River (Jagatsinghpur, Puri)	Sporadic mass nesting ground of Olive ridley	Nest predation, plastic pollution, light pollution, plantation and bycatch
Andaman & Nicobar Islands	Galathea bay, Indira point, Hingloi, Alexandria, Dagmar, and Renhongbeaches (Great Nicobar Island)	Largest Leatherback turtle nesting ground in India	Nest predation
Andaman & Nicobar Islands	Bahua, Muhincohn and Kiyang beaches (Little Nicobar Island)	Leatherback, Green, Hawksbill and Olive ridley	Nest predation and bycatch
Andaman & Nicobar Islands	West Bay, Jackson Creek beaches (Little Andaman Island)	Leatherback nesting ground, currently largest in the Andaman group	Nest predation and bycatch
Andaman & Nicobar Islands	Cuthbert Bay, (Middle Andamans)	Leatherback, Green, hawksbill, and Olive ridley	Nest predation
Andaman & Nicobar Islands	South Reef Island, (Middle Andamans)	Best hawksbill turtle nesting ground in India	Nest predation
Lakshdweep Islands	Lagoons of Lakshdweep Islands (Agatti, Kadmat, Kavaratti and other islands)	Foraging ground of Green turtle	Erosion, over grazing, conflict with fishermen, nest predation and bycatch
Lakshdweep Islands	SuhelilIsland, (Lakshadweep)	Olive ridley / Hawksbill / Green turtle nesting ground (sympatric habitat for three species)	Erosion and bycatch
Andhra Pradesh	Godavari River Mouth (Sacramentoshoal, East Godavari)	Very high sporadic nesting of Olive ridleys (approx. 500 to 1000/year),	Nest predation, plastic pollution, light pollution, habitat degradation and bycatch
Andhra Pradesh	Kapasukuddi (Bahuda river mouth), Nagavali, Bamsadhara (Srikakulam)	High sporadic nesting of Olive ridleys	Nest predation, plastic pollution, light pollution, habitat degradation and bycatch
Andhra Pradesh	Beaches along Krishna River and Penneru river mouth (Nellore)	Moderate sporadic nesting of Olive Ridley	Nest predation, plastic pollution, light pollution, habitat degradation and bycatch

Important Marine Turtle Habitats in India

Puducherry	Nallavadu,Pannithittu, Narambi and Moorthikuppam villages (Puducherry) and beaches around Arasalar River (Karaikal)	High sporadic nesting of Olive Ridley	Nest predation, by-catch, erosion, habitat degradation, plantation, plastic and light pollution
Tamil Nadu	Gulf of Mannar Biosphere Reserve (Thoothukkudi and Ramanathapuram)	Foraging ground of green and Olive ridley, good seagrass beds	Nest predation, plastic pollution, habitat degradation, poaching, bycatch
Tamil Nadu	Chennai coast, (northern Tamil Nadu)	Sporadic nesting ground of Olive ridley turtles with conservation programmes from 1973	Nest predation, by-catch, plastic pollution, light pollution, egg poaching, habitat degradation
Gujarat	Western Saurashtra coast, Gujarat (Junagadh, Jamnagar and Porbandar)	Green and -Olive ridley turtle nesting grounds	Nest predation, by-catch, plastic pollution, habitat degradation
Maharashtra	Sindhudurg Coasts (Raigad and Ratnagiri)	Sporadic nesting of Olive ridley and Green	Nest predation, bycatch, plastic pollution, habitat degradation
Goa	Galgibaga beach (South Goa)	Sporadic nesting of Olive Ridley	Nest predation, by-catch, plastic pollution, lighting, tourism, habitat degradation

Marine Turtle Action Plan

Objective 1. Reduce direct and indirect causes of marine turtle mortality

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
1.1 Identify and document the threats to marine turtle populations and their habitats	a) Collate and organise existing data on threats to marine turtle populations b) Establish baseline data collection and monitoring programmes to gather information on the nature and magnitude of threats c)Determine those populations affected by incidental capture in fisheries, and other sources of mortality	MoEF&CC, State/UT Forest and Fisheries Departments, WII, ZSI, CMFRI, NCSCM, IISc, FSI, NIOT, ICMAM, ANCOST, Universities, State level research institutions, NGOs etc.	All coastal States and UTs	To be initiated in 2021; to be repeated every 5 year thereafter
1.2 Determine and apply best practice approaches to minimising those threats to marine turtle populations and their habitats	1.2 Determine and apply best practice approaches to minimising those threats to marine turtle populations and their habitats	Erosion and Nest predation, bycatch State/ UT Forest and Fisheries Departments MoEF&CC and MoES, WII	All coastal States and UTs	To be initiated in 2021 and to be continued thereafter

Objective 2. Protect, conserve and rehabilitate marine turtle habitats

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
2.1 Establish necessary measures to protect and conserve marine turtle habitats	a) Identify areas of critical habitat such as migratory corridors, nesting beaches, inter-nesting and feeding areas. b) Designate and manage protected/ conservation areas, sanctuaries or temporary exclusion zones in areas of critical habitat, or take other measures (e.g. modification of fishing gear, restrictions on vessel traffic) to remove threats to such areas c) Develop incentives for adequate protection of areas of critical habitat outside protected areas d) Undertake assessments of the environmental impact of marine and coastal development and other human activities that may affect marine turtle populations and their habitats e) Manage and regulate within each jurisdiction the use of beaches and coastal dunes, for example location and design of buildings, use of artificial lighting, and transit of vehicles in nesting areas f) Monitor and promote the protection of water quality from land-based and maritime pollution, including marine debris, that may adversely affect marine turtles g) Strengthen the application of existing bans on the use of poisonous chemicals and explosives in the exploitation of marine resources. h) Mainstream the turtles and their habitats conservation into the production sectors with active participations of industrial sectors including financial supports from their CSR Fund.	State/UT Forest and Fisheries Departments and MoEF& CC	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
2.2 Rehabilitate degraded marine turtle habitats	a) Re-vegetate, where appropriate, frontal dunes at nesting beaches, with indigenous flora as far as possible, in order to provide visual barriers to coastal development and to restore appropriate beach temperature regimes b) Remove casuarinas from the important nesting beaches c) No plantation on Sand Dune d) Remove debris that impedes turtle nesting and hatchling production e) Enhance recovery of degraded coral reefs f) Enhance recovery of degraded mangrove and seagrass habitats	MoEF&CC, State/UT Forest Departments, NGOs etc	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in FY 21-22 and to be continued thereafter

Objective 3.Improve understanding of marine turtle ecology and populations through research, monitoring and information exchange

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
3.1 Conduct studies on marine turtles and their habitats targeted to their conservation and management	a) Conduct baseline studies or gather secondary information on marine turtle populations and their habitats b) Initiate and/or continue long-term monitoring of priority marine turtle populations in order to assess conservation status c) Characterise genetic identity of marine turtle populations d) Identify migratory routes through the use of tagging, genetic studies and/or satellite tracking e) Carry out studies on marine turtle population dynamics and survival rates f) Conduct research on the frequency and pathology of diseases of marine turtles g) Promote the use of traditional ecological knowledge in research studies h) Review periodically and evaluate research and monitoring activities	MoEF&CC, State/UT Forest and Fisheries Departments, ICMAM, WII, IISc, NIOT,/ANCOST, ZSI, CMFRI, CMLRE, NIO, SAC, Universities, NGOs	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and end by 2022
3.2 Conduct collaborative research and monitoring	a) Identify and include priority research and monitoring needs in National and sub-regional action plans b) Conduct collaborative studies and monitoring on genetic identity, conservation status, migrations, and other biological and ecological aspects of marine turtles	MoEF&CC, State/UT Forest and Fisheries Departments, ICMAM, WII, IISc, IISER, NIOT,/ ANCOST, ZSI, CMFRI, CMLRE, NIO, SAC, NGOs	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
3.3 Analyse data to support mitigation of threats and to assess and improve conservation practices	a) Prioritise populations for conservation actions b) dentify population trends c) Use research results to improve management, mitigate threats and assess the efficacy of conservation activities (e.g. hatchery management practices, habitat loss, etc.)	MoEF&CC, State/UT Forest and Fisheries Departments, ICMAM, WII, IISc, IISER, NIOT,/ ANCOST, ZSI, CMFRI, CMLRE, NIO, SAC, NGOs	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter
3.4 Exchange information	a) Standardise methods and levels of data collection and adopt or develop an agreed set of protocols for inter alia monitoring of nesting beaches, feeding ground studies, genetic sampling, and collection of mortality data b) Determine the most appropriate methods for information dissemination c) Exchange at regular intervals scientific and technical information and expertise among nations, scientific institutions, non-governmental and international organisations, in order to develop and implement best practice approaches to conservation of marine turtles and their habitats d) Disseminate traditional knowledge on marine turtles and their habitats for conservation and management e) Compile on a regular basis data on marine turtle populations of regional interest	MoEF& CC, State/UT Forest and Fisheries Departments, IOSEA, BOBP, ICMAM, CSIR, WII, IISc, IISER, NIOT,/ ANCOST, ZSI, CMFRI, CMLRE, NIO, SAC, NGOs	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter

Objective 4. Increase public awareness of the threats to marine turtles and their habitats, and enhance public participation in conservation activities

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
4.1 Establish public education, awareness and information programmes	a) Setting up of turtle clubs at taluk or district or state levels b) Declaration of National Marine Turtle Day may be coinciding with mass nesting season c) Collect, develop and disseminate education materials d) Establish community learning / information centres e) Develop and implement accurate mass media information programmes f) Develop and implement guidelines for hatchery programmes for conservation and environmental education g) Develop and conduct focused education and awareness programmes for target groups (e.g. policy makers, teachers, schools, fishing communities, media) h) Encourage the incorporation of marine turtle biology and conservation issues into school curricula i) Organise special events related to marine turtle conservation and biology (e.g. Turtle Day, Year of the Turtle, symposia, Track-a-turtle)	MoEF&CC, State/UT Forest and Fisheries Departments and NGOs	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
4.2 Develop alternative livelihood opportunities for local communities to encourage their active participation in conservation efforts	a) Identify and facilitate alternative livelihoods (including income generating activities) that are not detrimental to marine turtles and their habitats, in consultation with local communities and other stakeholders. Undertaking turtle based tourism programme like Turtle Festival b) Bring in ecotourism (turtle tourism) and interpretation centres in an organized fashion.	MoEF& CC, State/UT Forest and Fisheries Departments, ICSF, NGOs	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter
4.3 Promote public participation	Involve stakeholders, and local communities in particular, in planning and implementation of conservation and management measures Encourage the participation of Government institutions, non-governmental organisations, the private sector and the general community (e.g. students, volunteers, fishing communities, local communities) in research and conservation efforts Implement, where appropriate, incentive schemes to encourage public participation (e.g. T-shirts for tag returns, public acknowledgement, certificates) National Marine Turtle Seminar needs to be conducted annually to review the entire issues related to conservation of marine turtles in India.	MoEF&CC, State/UT Forest and Fisheries Departments, NGOs	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter

Objective 5. Enhance national, regional and international cooperation

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
5.1 Enhance mechanisms for cooperation and promote information exchange	a) Develop regional database of relevant information in relation to marine turtles conservation and management b) Identify and strengthen existing mechanisms for cooperation at the sub-regional level c) Develop/strengthen a website and/or newsletter to facilitate networking and exchange of information d) Develop/strengthen a web-based information resource for marine turtle conservation (including data on populations, nesting, migration, on-going projects) e) Create a directory of experts and organisations concerned with marine turtle conservation f) Develop networks for cooperative management of shared populations, within or across sub-regions, and, where appropriate, formalise cooperative management arrangements g) Cooperate where possible in the establishment of transboundary marine protected areas using ecological rather than political boundaries h) Develop a streamlined format for reporting and exchanging information (through the IOSEA MoU) on the state of marine turtle conservation at the national level i) Creation of network of NGO's in supporting forest departments marine turtles conservation. For example, coordination with Turtle Action Group (TAG) etc.	MoEF&CC, State/UT Forest and Fisheries Departments and NGOs	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
	j) Encourage IOSEA MoU signatory States that have not already done so to become Parties to the Convention on Migratory Species (CMS) k) Establish relationships with regional fisheries bodies with a view to obtaining data on incidental capture and encourage them to adopt marine turtle conservation measures within EEZs and on the high seas	MoEF&CC, State/UT Forest and Fisheries Departments and NGOs	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter
5.2 Strengthen and improve enforcement of conservation legislation	a) Review domestic policies and laws to address gaps or impediments to marine turtle conservation b) Cooperate in law enforcement to ensure compatible application of laws across and between jurisdictions (including through bilateral/multilateral agreements and intelligence sharing) c) Include turtle breeding/foraging habitats as important marine habitat. d) Constitution and Periodic review on the National Marine Turtle Action Committee e) State Level Marine Turtle Action Committee under the chairmanship of the Chief Secretary. f) Development of compensation schemes for loss of fishing gear due to incidental capture of marine turtles. g) Promotion of TED and by-catch reduction policy and smart gear use. h) Establishment Marine Biodiversity Cell to implement various conservation action plans related to marine biodiversity including marine turtles i) Mapping and monitoring of important turtle nesting sites in context with CRZ	MoEFCC, State/ UT Forest and Fisheries Departments	All coastal States and UT especially those important sites mentioned in this action plan.	To be initiated in 2021 and to be continued thereafter

Government of India
Ministry of Environment, Forest & Climate Change

COMPREHENSIVE CONSERVATION PLAN

Long-term monitoring and conservation of the endemic Nicobar Megapode (*Megapodius nicobariensis*) in the Nicobar archipelago

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

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Project duration: Ten years (October 2022 - September 2032)

Implementing agencies: Wildlife Institute of India
Andaman & Nicobar Forest Department

Budget: The budget requirement for the proposed 10-year Nicobar Megapode Conservation Plan is Rs. 22,02,08,878/- (Rupees Twenty-two crore two lakh eight thousand eight hundred seventy-eight only). The budget requirement across the two implementing agencies is presented below:

S. No	Agency	Phase 1 (Oct 2022 – Sep 2027)	Phase 2 (Oct 2027 – Sep 2032)	Total
1	WII	Rs. 7,43,66,788	Rs. 5,90,40,090	Rs. 13,34,06,878
2	A & N Forest Department	Rs. 7,03,80,000	Rs. 1,64,22,000	Rs. 8,68,02,000
Total		**Rs. 14,47,46,788**	**Rs. 7,54,62,090**	**Rs. 22,02,08,878**

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Background

The Nicobar archipelago that is also part of the Sundaland global hotspots of biodiversity represents one among the rich biodiversity locations in the globe with high endemism. These tropical islands have provided ambient situations for the evolution of number of endemic plants and animals. The Nicobar Megapode is one such evolutionarily interesting endemic bird that occurs in the Nicobar archipelago. The Nicobar Megapode is primarily inhabits the coastal forests and builds incubation mounds for their breeding. The populations of these mostly coastal dwelling birds have under gone a severe decline over the past two decade, primarily due the impacts of the devastating 2004 Indian Ocean tsunami and the subsequent habitat loss due to land drowning. Over 70 % of the population of Nicobar megapode was lost after the 2004 mega-disaster, which resulted in uncertainty over the future of this species. Reports have suggested that the population of the species remained more or less stable after the initial loss, however, it is largely understood that any further disturbance would severely impact the natural recovery of the species and drive the species to the brink of extinction. Recently the Integrated Development of Wildlife Habitats (IDWH) program of the MoEF&CC has recognized the conservation need of this species and included it in the list of top priority species for conservation and management. The Nicobar Islands that host the Nicobar Megapodes are also a strategic location for India, hence mega-developmental projects in the Islands were gaining momentum in the recent time. Especially, the international transhipment and the township projects in the Great Nicobar Islands envisioned by the NITI Aayog, pose a significant challenge to balance conservation and development. In this background, as per the recommendation of the Expert Appraisal Committee of the MoEF&CC, the Forest Department of the Andaman & Nicobar Islands has invited Wildlife Institute of India to prepare a management plan to monitor and conserve Nicobar Megapodes for 10 years. This proposed comprehensive management plan therefore includes objectives that will help in understanding the broader ecology of the Nicobar Megapode, which can contribute to design Island/site specific management interventions that will be critical for the long-term survival of the species.

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1. Introduction

Tropical islands host disproportionately rich biodiversity and endemism for their area compared to mainland regions of the world. The geographical isolation of islands coupled with less anthropogenic influence allowed the evolution of a multitude of organisms that are often unique to an archipelago (ie. Endemic) or specific to a particular site/Island (ie. Point endemism). The inherent biological significance means most of the tropical islands are either part of the global hotspots of biodiversity or part of other protected area network. The Nicobar archipelago in the Bay of Bengal is one such example with high endemism (13% of plants, >20 % of birds, reptiles and amphibians) therefore is rightly recognised as a part of the Sundaland global hotspots of biodiversity.

The avifaunal diversity in the Nicobar archipelago has a number of evolutionarily important and threatened species. The Nicobar Megapode *Megapodius nicobariensis* which is endemic to the Nicobar archipelago is one such evolutionarily unique bird. Unlike most bird species the members of the genus *Megapodius* build incubation mounds within which they lay their eggs. The eggs are buried in the mounds along with organic matter, and the heat generated by the decomposition of organic matter act as an external source of heat until the eggs are successfully hatched.

Megapodes belong to the family Megapodiidae, which comprises of six genera and 19 species. Taxa of Megapapodiidae are commonly referred to as scrub fowl (Macrocephalon, Megapodius, Eulipoa); brush-turkeys (Alectura, Aepypodius, Talegalla), or mallee fowl (Leipoa). Megapodes are chicken-like birds with notably large feet. Instead of using body heat to directly incubate eggs, megapodes passively incubate eggs. In addition to building incubation mounds where the heat generated by the decomposition of organic matter was used to incubate the eggs, some megapodes place their eggs in shallow pits or burrows to be warmed geothermally or with sun-warmed sand. Upon hatching, the feathered chicks, dig out from under the mound (or emerge from the burrow) and are able to forage, walk, run and fly. Parental care of emergent chicks has not been observed (Dyke, et al., 2003). Species of the genus *Megapodius* are found in Australia, New Guinea and surrounding islands, eastern Indonesia, and the Philippines. Three species occur further away on Niuafo'ou Mariana and Palau islands, and the Nicobar Islands (Fig. 1). The highest diversity of both genera and species is found in New Guinea and Australia (Jones et al. 1995). Apart from the malleefowl which lives in the

semi-arid mallee habitat of southern Australia, all species prefer moist tropical forest. Many megapode species use coastal areas for breeding, either by burying their eggs in the sand or by building their mounds close to the shore (Dekker 1995).

Having the nearest congener species about 1600 km part in the Sulawesi Island, the distribution of megapodes in the Nicobar Islands remain an evolutionary puzzle. Reports suggests that the species might have historically had a continuous distribution but eradicated or out competed in many of its distribution range (eg. Andaman Islands) due to the presence/colonization by large predators (eg. civet cats). Thus, the current population of this species that is restricted to 15 Islands in the Nicobar archipelago, is considered to be a relict population. Unlike the adjacent archipelagos, the large mammalian predators are absent in the Nicobar archipelago, which also reasoned for the existence of Nicobar Megapode in the Nicobar archipelago (Sankaran 1995).

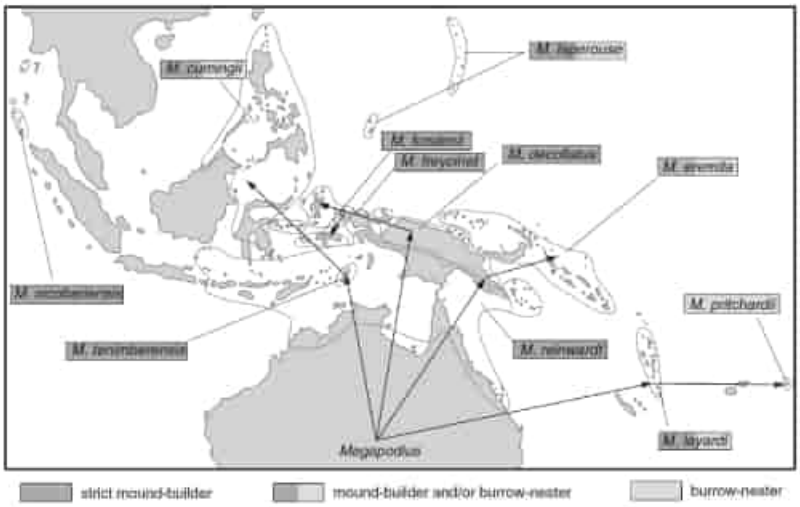

Fig. 1: Global distribution and radiation of the Genus *Megapodius* (Source: Dekker, 2007).

The Nicobar Megapode have two subspecies namely *Megapodius nicobariensis abbotti* distributed in the islands south of the Sombrero Channel (Great Nicobar, Little Nicobar, Kondul, Menchal, Treis, Meroe, Cubra, and Pilo Milo) and *M. n. nicobariensis* distributed in the Islands north of the Sombrero channel (Camorta, Trinkat, Nancowry, Katchall, Teressa, Bompoka and Tillanchong) (Sivakumar 2007; Balasubramanian et al. 2012). The first detailed

study on this bird estimated the population from the Great Nicobar Island as around 780 breeding pairs (Dekker 1992). Later, Sankaran (1995) estimated the overall population of both the subspecies to be between 2322 – 4062 breeding pairs based on the first ever-extensive survey across all the islands where the species was distributed. The *M. n. abbotti* population was estimated as 1698 – 2972 breeding pairs of which 90 % is confined to Great Nicobar and Little Nicobar; while the *M. n. nicobariensis* population was estimated as 624 – 1092 breeding pairs, of which around 80 % are restricted to Katchall, Nancowry and Teressa.

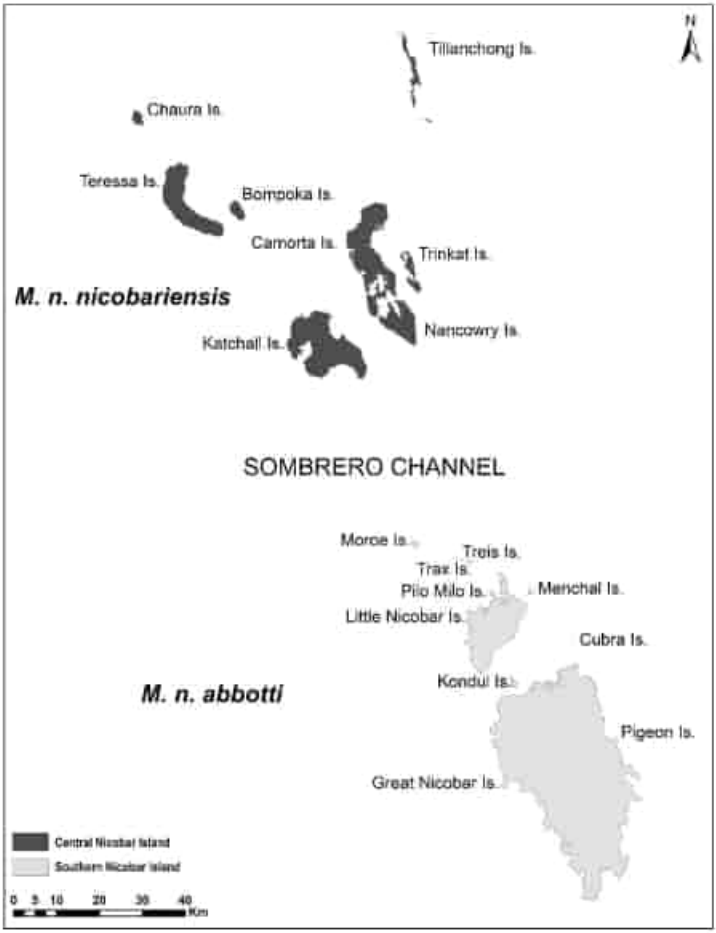

Fig. 2: The currently known distribution range of the two Nicobar Megapode subspecies

Habitat loss and hunting were perceived to be the major threats for the species (Sankaran 1995, Sivakumar 2003). Past reports have suggested that the species has become locally extinct from Pilo Milo, Kondul, Chaura, and Car Nicobar due to indiscriminate hunting and conversion of coastal forests (ie. The primary habitat of this species) to coconut plantations (Sankaran 1995). While the habitat loss is a gradual process and often reversible, the stochastic events can play a detrimental role in maintaining bird populations especially in the insular island systems. The 2004 Indian Ocean tsunami is one such stochastic event that severely affected the coastal biodiversity of the Nicobar archipelago. Among the coastal fauna, the Nicobar Megapode was the worst affected species by the 2004 Indian Ocean tsunami with a severe population decline of over 70 % across its distributional ranges. It is noteworthy that over 95% of incubation mounds of this endemic bird was located within 100 m from the coastal line (Sankaran 1995, Sivakumar 2007), and the tsunami waves have often reached more than a 1000 m inland in the Nicobar archipelago. Moreover, the land drowning related to the coastal subsidence in Nicobar archipelago resulted in severe loss of flat coastal forests (sometimes exceeding 500 m inland) that were prime habitat for the Nicobar Megapode. The post-tsunami estimates carried out in 2006 (Sivakumar, 2007) suggest that only around 395-790 breeding pairs are left in the wild. A subsequent study carried out between 2009 – 2011 has estimated the population to be 376 – 752 breeding pairs (Balasubramanian et al. 2012). Base on these two studies, it is largely assumed that the population of the Nicobar Megapode have become stable after the major decline induced by the tsunami.

2. Knowledge gap

Though the previous studies have provided information on the population estimates and the general ecology of the species, yet, most of the baseline information that are critical for improving the general understanding of the species and visualizing an effective management plan is highly lacking.

- ***Population estimation***: Only a few studies have documented the distribution and population of this species across its distributional range (Sankaran 1995; Sivakumar 2007; Balasubramanian et al. 2012). The methodologies used in these studies were also varied. Although Sankaran (1995) and Sivakumar (2007) have used similar approach, however, their methodologies were not identical. For example, Sivakumar (2007) has surveyed

specific location across the archipelago and included the entire width of the coastal littoral forest (sometime exceeding 500 m from the coasts) available in a particular sampling site to survey and estimate the population. While Sankaran (1995) has included only 100 m width of the coastal littoral forests to estimate the population of the megapode. Moreover, these two studies have categorized the coastal areas based on the judgement of the observer as (i) suitable coastal habitats, and (ii) unsuitable coastal habitats for the megapode. The length of the coastal area surveyed in both the habitat categories along with the active mounds encountered were then extrapolated to the overall length of suitable and unsuitable coastal area available in the Nicobar archipelago to derive the population estimation. As such, this may be a crude way to distinguish and estimate suitable and unsuitable coastal areas, therefore, extrapolating the results to the entire length of the coastal areas may add some error in the overall estimation of the megapode population. With the advancement of mapping tools and the availability of high-resolution satellite imageries this methodology have a high scope for refinement. Moreover, the recent information available on the population of the Nicobar megapode (Balasubramanian et al. 2012) have not strictly considered the methodologies used in either of the previous studies and also the sampling effort was comparatively much lesser (one fourth) compared to the previous studies. Therefore, the recent argument of the Nicobar Megapode population being stable after the tsunami induced large-scale decline needs to be revisited.

- Another cause for concern is that all the previous studies have estimated the population of Nicobar Megapode present only in the coastal littoral forests. It is noteworthy that about 20 % of the Nicobar Megapode population is expected to live in the interior forests, which contribute to about 72% of area in the whole Nicobar archipelago (Dekker & McGowan 1992). The two available baseline studies that provided the population estimate of these birds have either inadequately sampled the interior forests or excluded it in their survey. Therefore, the interior forests are needs to be systematically surveyed to understand and estimate the overall Nicobar Megapode population.

- ***General ecology***: A detailed site specific study along the coastal areas of the Galathea Bay in Great Nicobar have revealed critical first-hand information about the behaviour, breeding ecology, diet and habitat utilization of *M. n. abbotti* (Sivakumar, 2003). A similar information for the subspecies *M. n. nicobariensis* is lacking and this subspecies comparatively have a high anthropogenic pressure (eg. hunting, conversion of habitat, etc.)

compared to *M. n. abbotti*. Except few observations, nothing is known about the bird populations that are living in the interior forests. Moreover, how the habitat features are interacting and shaping the meagpode population is either poorly understood or unexplored. This information's will be critical to predict how the species will respond to various factors including the envisioned developmental projects in the Nicobar Islands.

- The 2004 Indian Ocean tsunami has set a finite timeline to understand how the coastal ecosystem recover naturally. The coastal littoral forests that are prime habitat of the Nicobar Megapode have undergone drastic transformation since tsunami. Most the coastal vegetation was lost after the tsunami, and a study conducted between 2009-2011 have characterised the successional vegetation in the coastal forests (Prabakaran & Paramasivam 2014). In general, the recovery of vegetation is expected to have positive effect on the Nicobar Megapode, because (i) this species prefer sites with moderately dense canopy cover (60-90 % canopy) to build their mounds (Sankaran, 1995), and (ii) vegetation colonization/recovery will result in high litter fall that can facilitate the increase in the diversity and density of soil organism (eg. insects, molluscs, nematodes etc.) that form a major source of food for the omnivorous megapode. It is noteworthy that the 2006 survey by Sivakumar (2007) has documented that most of the coastal forests had less than 30 % canopy cover. Therefore, investigating how the recovery of vegetation influence the recovery of megapode population become highly necessary to understand not only the overall population recovery of Nicobar Megapode but also to understand how quickly the population can recover in the event of habitat restoration following any large-scale damage to the habitat.

- ***Dispersal & meta-population dynamics***: Meta-populations describe populations structured into interconnected demes with local turnover dynamics of extinction and recolonization. Population turnover can have a strong impact on the distribution of genetic diversity within and among demes and thus on the evolution of populations (Slatkin, 1977; Wade and McCauley, 1988). This is because turnover often leads to genetic bottlenecks during colonization ('founder events') and because extinction limits the lifetime of individual demes and therefore the time during which subsequent gene flow can equalize allele frequencies. Therefore, in most cases, turnover is expected to increase genetic differentiation compared to similarly structured populations without turnover (Whitlock and McCauley, 1990) and this effect is most pronounced when the number of colonizers is small,

when local populations are large, and when migration rates are low and spatially restricted (Whitlock and McCauley, 1990). In the Nicobar archipelago, it is more likely that the large islands may be acting as a source population and the smaller islands may be acting as sink populations. The disappearance of Nicobar Megapode from Kondul, Pilo Milo, and Cabra followed by re-sightings in 2011 is supplementing this above statement. The same may also be true to the subspecies *M. n. nicobariensis*. Therefore, it is likely that the population in different islands though geographically isolated, yet maintaining the genetic connectivity. Therefore, an understanding of population dynamics, reproductive sources and sinks, and dispersal pathways among the islands will help prioritize the allocation of scarce resources for managing the Nicobar Megapode populations, including the subspecific populations.

- ***Predation pressure***: The impact of introduced predators (eg. dogs, cats, etc.) and the natural predators (eg. raptors, monitor lizard etc.) on the breeding success and population of the Nicobar megapode is not known. Except for few anecdotal reports of domestic dogs chasing adult birds and monitor lizards excavating the incubation chambers to predate on the eggs (Sivakumar, 2000), no quantitative information is available to suggest the magnitude of the predation pressure. It is expected that with the increase in human population the densities of introduced predators may also increase; therefore, understanding the predation pressure exerted by the introduced predators will significantly contribute to the future management of Nicobar Megapode.

- ***Local Community interactions***: The Nicobar Megapode is locally considered by the Nicobarese indigenous community as a symbol of love due to their strong pair bonding during the breeding season. In addition, the bird is believed to have medicinal properties; therefore, indiscriminate hunting of this bird is traditionally controlled in the Nicobarese society, which is exempted from the Indian Wildlife protection act, 1972. However, the post-tsunami resource crunch and the socio-economic dynamics of the Nicobarese have diluted the traditional rules and taboos. Therefore, the hunting pressure on these birds are expectedly have become higher in the recent decades. In addition, most the Nicobarese now inhabit the interior forest unlike during the pre-tsunami time when they lived along the coastal areas. This is expectedly increased the pressure on the bird population residing in the interior forests. Therefore, understanding the perspectives of the Nicobarese community in conserving and managing the Nicobar Megapode population become significant for the long-term survival of the species.

The above account provides an overall perspective regarding gaps in the current understanding of the endemic Nicobar Megapode. It is clear that any rapid change in the coastal habitat might further affect the populations of Nicobar Megapode. Therefore, a holistic understanding of the Nicobar Megapode population, nesting ecology, dispersal and ranging pattern, genetic structure will be imperative for long-term conservation and management of this endemic bird. In this context, this comprehensive conservation plan proposed will focus on three major aspects: (i) enhancing the scientific understanding of the population and the general ecology of this unique bird, (ii) capacity building of front-line forest staff and local communities in order for long-term monitoring and management of the Nicobar Megapode populations, and (iii) create awareness and establish community conservation reserves to secure megapode populations. The first phase of the conservation plan (First five years: 2022 – 2027) therefore will primarily be focused on generating scientific information and creating awareness among various stakeholders; while the second phase (Second five years: 2027 – 2032) will focus on implementing necessary site-specific interventions to manage and enhance the population of Nicobar Megapode. The detailed activities proposed in the first phase of this project is elaborated below; while, a brief account of proposed activities to be executed during the second phase is provided in Section 6.

3. Aim & objectives

The overall aim of the proposed conservation plan is to bridge existing knowledge gaps for the effective conservation and management of the Nicobar megapode through a robust scientific and stakeholder participation approach.

The specific objectives are as follows:

1. To standardize population estimation techniques for the Nicobar Megapode across its distributional range so as to help in understanding population trends of the species over time (long-term).
2. To determine the role of habitat features in structuring megapode populations within and across islands

3. To understand nesting patterns of the Niocobar Megapodes across ecological gradients and document potential factors that influence their reproductive success
4. To understand fine-scale movements and ranging patterns of Nicobar Megapodes within and across islands using advance technology.
5. To investigate dispersal, colonisation and meta-population dynamics of Nicobar Megapode populations across the islands
6. To undertake threat assessments to the Megapode populations due to natural and anthropogenic drivers through vulnerability and risk mapping.
7. To create awareness among local communities on the Nicobar Megapode and assist in the identification and establishment of Community Conservation Areas (CCA's).
8. To conduct capacity-building programs for local stakeholders including personnel of the forest department, defence, other line agencies and local communities for the effective conservation of Nicobar Megapodes

4. Methodology

Objective 1: Long-term monitoring of Nicobar Megapode populations

The Nicobar megapode is shy and cryptic birds and therefore difficult to see them in the forest whereas nesting mounds are stationary, inanimate and represent breeding signs, the easiest way to estimate and monitor a megapode population is by counting the number of active mounds (Sankaran, 1995). The coastlines of the 15 islands of Nicobar on which the species was reported in will be surveyed for mounds using a standardized survey protocol (Sankaran, 1995). To estimate the total number of active mounds the coastline of each island will be divided into suitable and unsuitable coastal habitat for mound building based on the field surveys of the vegetation and satellite remote sensing tools. Variable width transects of 10–600 m will be used to count all the mounds present within a surveyed area (the low lying coastal littoral forests are of varying width). Transect length and distance between transects will be determined by island size but it will be uniform for an island (Sivakumar, 2010). The mean length of a transect will be 2 km but in some islands, the entire coast will be surveyed if the total coastline is < 2 km. The census will be carried out with seven observers walking at 20-m intervals parallel to the shore; for transects > 140 m wide be walked the transect more than once to cover the entire width. The interior forests of Great Nicobar, Little Nicobar, Camorta, Katchal and Teressa

islands will also be surveyed, with 1-km transects of 140 m width and 1 km long. The interior forests will be divided into 2 sq. km. or 5 sq. km. grids based on the preliminary survey. Accordingly, adequate number of grids will be surveyed with the above-mentioned methodology to estimate the interior forest population. The total number of active and abandoned mounds, mound size, type of mound etc. will be recorded. The overall area of the island will be categorized into (i) coastal areas suitable for megapode, (ii) coastal areas unsuitable for megapode, and (iii) interior forests. High-resolution satellite images will be used for this classification. Sampling effort for estimating the population will be accordingly designed. Additionally, we will also attempt other population assessment methodologies (eg. mark re-capture) on a trial basis to understand the suitability and standardize a better population estimation technique for the Nicobar Megapode.

Objective 2: Role of habitat features in determining the population

Data on the habitat preference (eg. vegetation, canopy cover, substratum, food resource availability, distance in relation to the coast and human settlement, slope etc.) of the bird for foraging and mound building will be collected using standardized protocols used by Sivakumar (2003). Additionally, drone survey will be conducted for the fine scale mapping of the Megapode primary habitats.

Objective 3: Breeding and nesting ecology

Based on the survey mentioned in objective 1, mounds representative of various ecological gradients (eg. coastal forest, interior forest, steep slopes, ridges, flat terrain etc.) will be identified for focused surveys. The mounds will be categorized as Type A, Type B, Type C as per the classification followed by Sankaran (1995) and Sivakumar (2007). The identified mounds within each broader ecological category will be monitored for usage by megapode, composition of mound material, clutch size, predation, environmental factors (eg. temperature, moisture, decomposition rate in incubation chambers) and breeding success. Methodologies followed by Sivakumar (2003) will be adopted for data collection. Camera traps will be deployed in selected number of mounds to understand the predation pressure, frequency of mound visits by the breeding pair, usage of the mound by different birds, and other relevant behaviours associated with breeding and general ecology of the bird.

Objective 4: Ranging pattern

A select number of individuals from both the subspecies representative of coastal forest and interior forest will be studied to understand the fine scale movement, ranging pattern and habitat utilization of the Nicobar Megapode. Advanced tools such as appropriate GPS tags, GIS, etc. will be used for data collection and data processing.

Objective 5: Dispersal and meta-population dynamics

Capture-mark-recapture method is one of the important methods to determine dispersal of individuals. A select number of birds will be colour tagged for the behavioural study (eg. pair dynamics, mating, nest defence, feeding, etc.). Along with it, a proportionate population of the Nicobar Megapodes will be tagged using aluminium rings. Bird-ringing studies can provide a wide range of data types to aid in understanding wide range of aspects related to the bird demography and movement, and in many cases these data are not available without the capture and marking of individual birds. Any record of a ringed bird, either through recapture and subsequent release, or on the occasion of its final recovery as a dead bird, will tell us much about its life. This technique is one of the most effective methods to study the biology, ecology, behaviour, movement, breeding productivity and population demography of birds.

The data on re-sightings of the marked birds will be collected and compiled over the course of the study period to understand the dispersal pathways. Additionally, biological samples such as feather, blood, tissue from dead birds etc. will be collected for the genetic analysis to determine the genetic connectivity within and among different populations. DNA sequence data for mitochondrial genes will be generated for phylogeography and phylogenetic analysis. For population genetics study, nuclear microsatellite loci available for pythons will be used. The GenBank sequence data will also be utilized to compare the DNA sequences available for other megapodes from neighboring countries. Meanwhile, blood samples of a select number of birds will be collected for screening for the prevalence of various diseases.

The idea of the genetic work is to understand how isolated each of these populations in terms of their genetic structure. This will help in prioritizing the management of critical populations and if a need arises, this will assist in the introduction of birds from the most diverse populations into the least or poorly structured ones.

Objective 6: Vulnerability and risk assessment in relation to natural and anthropogenic drivers

The various drivers of change across the megapode habitats and populations will be assessed during the population surveys. Some targeted drivers namely, predation pressure, anthropogenic interference, land use change, disease prevalence, linear infrastructure, vegetation change, loss of habitat due to sea level rise etc. will be considered for data collection. The data will be compiled and processed with GIS tools for risk mapping. The vulnerability of each population and Islands will be derived by using latest ecological modelling tools.

Objective 7 & 8: Engagement of stakeholders in establishing community conservation reserves and effective conservation guidelines

- Structured and semi-structured questionnaire surveys will be conducted to understand the general perspective of the Nicobarese community towards biodiversity conservation in general and Nicobar Megapode conservation in particular.
- Awareness building activities related to the conservation and management of Nicobar Megapodes will be conducted for the local stakeholders (Local community, Forest department, schoolchildren and other line agencies).
- The outcomes of the population assessment, genetic study and threat mapping will be used to identify potential sites for the establishment of community conservation areas. Consultation meetings will be conducted with the tribal chairman, village captains and the nicobarese community at each of the identified locations for establishing the community conservation reserves.
- The frontline forest staff will be provided training on the population assessment techniques, data processing and other relevant aspects related to the conservation and management aspects.

5. Expected Outcomes

- Population estimation of Nicobar Megapode and population trend across all the Islands on an annual basis
- Standardised protocol for long-term population monitoring
- Habitat and diet requirement of Nicobar Megapode
- Baseline information on the breeding strategies, breeding success, and nest site preferences of Nicobar Megapode
- Identifying the genetic diversity and genetically distinct populations
- Magnitude of genetic flow and dispersal within and between Islands
- Habitat suitability models developed considering current drivers and future scenarios
- Risk assessment and vulnerability mapping with regard to various drivers
- Identified sites for establishing community conservation reserves for in-situ conservation
- Capacity developed among front-line forest staff on population monitoring techniques, data collection and compilation
- A volunteer network of local community members to carry forward the conservation and monitoring of the species.

6. Project Phase II (2027-2032)

The Phase II of this conservation plan will focus mostly on building up the scientific knowledge gained from Phase I and incorporate these findings in developing effective site-specific actions for the conservation of Nicobar Megapode. The activities listed are proposed to be taken up during the second phase:

- Annual population assessment surveys as per the standardized protocol developed during Phase 1.
- Formalization and establishment of Community Conservation Areas (CCA)
- Visualization and implementation of establishing new protected area network for the conservation of Nicobar Megapode based on the outcomes of Phase I. The visualization and planning of the PA will be done by WII in consultation with local community and Forest department. While the forest department will process the recommendations for implementation and notification of new PA network.

- Implementation of site-specific habitat management interventions by the Forest Department in consultation with WII.
- Assessment of the efficacy of CCA, new PA network, and site-specific interventions in improving/conserving the population of Nicobar Megapode. As and when required, develop course correction measures for improving the efficacy of the overall program.
- Strengthening the research wing of the forest department by conducting special training programs on using advanced scientific tools for data collection and analysis.

7. References

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Work plan (Phase I: October 2022 – September 2027)

S. No.	Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Recruitment of project staff and creating necessary infrastructures for the project																				
2	Procurement of equipment's																				
3	Refining the research methodologies and training of project personnel																				
4	Population estimation – Field data collection																				
5	GPS Tagging, habitat mapping, and monitoring movement																				
6	Bird ringing and collecting dispersal data																				
7	Habitat utilization and behaviour data collection																				
8	Nesting, and breeding ecology data collection																				
9	Sample collection and genetic analysis																				
10	Disease screening																				
11	Vulnerability and threat mapping																				
12	Awareness and capacity building activities																				
13	Consultation on Community Conservation Reserves																				
14	Report writing and submission																				

Work plan (Phase II: October 2027 – September 2032)

S. No.	Activity	Year 1				Year 2				Year 3				Year 4				Year 5			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Recruitment of project staff																				
2	Population estimation – Field data collection																				
3	Bird ringing and collecting dispersal data																				
4	Establishment of CCA																				
5	Designing new PA network																				
6	Implementing site-specific management action																				
7	Assessing the efficacy of project outcome and implementation of management action.																				
8	Awareness and capacity building activities																				
9	Report writing and submission																				

Budget (A): Phase I (October 2022 – September 2027): Detailed budget required for activities implemented by WII

S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
A. Salary and wages									
1	Project Associate-I	Population assessment and habitat and nesting Ecology (@ 31,000+HRA for first 2 years; 35,000+HRA afterward)	1	431520	431520	487200	487200	487200	2324640
2	Project Associate-I	Habitat modeling, mapping, and Movement ecology (@ 31,000+HRA for first 2 years; 35,000+HRA afterward)	1	431520	431520	487200	487200	487200	2324640
3	Project Associate-I	Dispersal and Population genetics component (@ 31,000+HRA for first 2 years; 35,000+HRA afterward)	1	431520	431520	487200	487200	487200	2324640
4	Project Assistant	Outreach and capacity-building activities (@20,000+HRA)	2	556800	556800	556800	640320	640320	2951040
5	Fieldworker	Assisting in fieldwork and base camp maintenance	2	501120	501120	501120	501120	501120	2505600
6	Field Assistant	Population Assessment (@500/day x 60 days x 6 members)	6	180000	180000	180000	180000	180000	900000
7	Field Assistant	Data collection on habitat ecology and ranging pattern (@500/day x 240 days x 2 members)	2	240000	240000	240000	240000	240000	1200000
B. Travel expense									
8	Air and ship travel	WII HQ to Field sites by PI's and project personnel @ 50000/person	10	500000	500000	500000	500000	500000	2500000
9	Vehicle hiring	Local movement of project staff during field data collection	-	500000	500000	500000	500000	500000	2500000

S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
10	Boat (Engine Dingi)	Purchasing boat for the frequent inter-Island movement for field surveys	2	5000000	0	0	0	0	5000000
11	Fuel and maintenance of the boat	For the frequent inter-Island movement for field surveys	-	1000000	1000000	1000000	1000000	1000000	5000000
C. Equipment									
12		GPS	5	100000	0	0	0	0	100000
13		Rangefinder	5	200000					200000
14		Compass	5	100000					100000
15		Workstation for HQ	1	500000	0	0	0	0	500000
16		Desktop computer for base camp	1	200000	0	0	0	0	200000
17		Laptops	4	500000	0	0	0	0	500000
18		Temperature data loggers	10	200000	0	0	0	0	200000
19		Nest temperature data loggers	100	200000	0	0	0	0	200000
20		Drone	2	600000	0	0	0	0	600000
21		Software & satellite imageries		500000	0	0	0	0	500000
22		Deep freezer	1	50000	0	0	0	0	50000
23		Projector	1	100000	0	0	0	0	100000
24		GPS tags 50 @ Rs. 300000/unit	50	15000000					15000000
25		Bird Rings & Patagial tags	100	200000					200000
26		Camera traps @ 30000/unit	50	1500000	0	0	0	0	1500000
27		Camera	3	300000	0	0	0	0	300000
28		Minor equipment and field gears		200000	200000	200000	200000	200000	1000000
D. Molecular & Disease investigation									
29		Genetic study		1000000	1000000	1000000	1000000		4000000
30		Disease prevalence study			500000	500000			1000000

S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
E. Accommodation									
31	Base camp establishment & maintenance	Two base camps one each in Kamorta and Great Nicobar island (Project Proponent ANIIDCO will construct the Research station/base camps and hand it over to WII)	2	300000	300000	300000	300000	300000	1500000
F. Training, Outreach & Awareness									
32		Stakeholder meetings		500000	500000	500000	500000	500000	2500000
33		Capacity building workshops		500000	500000	500000	500000	2000000	4000000
34		Awareness programs		500000	500000	500000	500000	500000	2500000
35		Contingency (2% of the budget)		6,60,450	1,65,450	1,68,790	1,60,460.80	1,70,461	13,25,611
		Total		3,36,82,930	84,37,930	86,08,310	81,83,501	86,93,501	6,76,06,171
		Institutional charge @10%		33,68,293	9,23,304	9,44,318	9,01,837	9,57,011	67,60,617
		Grand Total		**3,70,51,223**	**93,61,234**	**95,52,628**	**90,85,337**	**96,50,511**	**7,43,66,788**

* Salaries are calculated based on the guidelines provided by the Department of Science and Technology

Budget (B): Phase I (October 2022 – September 2027): Details of budget required for activities implemented by the Forest Department of Andaman and Nicobar Islands

S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
A. Salary and wages									
1	Fieldworker (Daily rated Mazdoor)	Manpower to monitor Megapode populations (Preferably Nicobarese)	8	1000000	1000000	1000000	1000000	1000000	5000000
B. Travel Expense									
2	Procuring boat	Mechanized engine Dingi for the inter-island movement	3	7500000	-	-	-	-	7500000
3		Boat Maintenance	-	500000	500000	500000	500000	500000	2500000
4	Fuel charges	Patrol important nesting sites	-	1000000	1000000	1000000	1000000	1000000	5000000
C. Accommodation									
5	Research station establishment and maintenance	Two research stations one each in Campbell Bay and Kamorta*	2	30000000	500000	500000	500000	500000	32000000
6	Establishment and maintenance of camps	To establish megapode monitoring camps in Little Nicobar, Great Nicobar west coast, and Tarassa Island	3	15000000	500000	500000	500000	500000	17000000
7		Contingency (2% of the budget)	-	1100000	70000	70000	70000	70000	1380000
		Total		**5,61,00,000**	**35,70,000**	**35,70,000**	**35,70,000**	**35,70,000**	**7,03,80,000**

* Two research stations (one each in Campbell Bay and Kamorta) with office space and accommodation facilities for 10 members (Two double occupancy rooms, and one dormitory: approx. 1200 sq. ft.) will be constructed and maintained by the Forest Department. The research station will be handed over to WII in 2023 for ten years until the completion of the project in 2032. After the project, WII will hand over the Research station to Forest department. It is visualized that the Forest department will use the Research station to facilitate future research activities in the region. This facility will also be used by other project researchers also like the team involved with the Leatherback turtle study, Saltwater Crocodiles, mangroves, and coral reef component.

Budget (C): Phase II (October 2027 – September 2032): Details of budget required for activities implemented by WII

S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
A. Salary and wages									
1	Project Scientist-I	A senior researcher is required for the overall co-ordination of the project (@ 56000+HRA; 5% increase at every 2 years)	1	779520	779520	818496	818496	859416	4055448
2	Project Associate-I	Population assessment, nesting and movement Ecology (@ 31,000+HRA for first 2 years; 35,000+HRA afterwards)	1	431520	431520	487200	487200	487200	2324640
3	Project Assistant	Outreach and capacity building activities	2	556800	556800	556800	640320	640320	2951040
4	Fieldworker	Assisting in field work and base camp maintenance	2	501120	501120	501120	501120	501120	2505600
5	Field Assistant	Population Assessment (@500/day x 60 days x 6 members)	6	180000	180000	180000	180000	180000	900000
6	Field Assistant	Data collection on habitat ecology and ranging pattern (@500/day x 240 days x 1 member)	2	120000	120000	120000	120000	120000	600000
B. Travel Expense									
7	Air and ship travel	WII HQ to Field sites by PIs and project personnel	10	500000	500000	500000	500000	500000	2500000
8	Vehicle hiring	Local movement of project staff during field data collection	-	500000	500000	500000	500000	500000	2500000
9	Fuel and maintenance of the boat	For the frequent inter-Island movement for field surveys	-	1000000	1000000	1000000	1000000	1000000	5000000
C. Equipment									
10		GPS tags 30 @ Rs. 300000/unit	30	9000000	-	-	-	-	9000000
11		Other major equipment	-	2000000	2000000	0	0	0	4000000
12		Minor equipment and field gears	-	200000	200000	200000	200000	200000	1000000

S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
D. Accommodation									
13	Base camp running cost & maintenance	Maintenance of base camps at Kamorta and Great Nicobar	2	300000	300000	300000	300000	300000	1500000
E. Training, Outreach & Awareness									
14		Stakeholder meetings	-	500000	500000	500000	500000	500000	2500000
15		Capacity building workshops	-	500000	500000	500000	500000	2000000	4000000
16		Awareness material's	-	500000	500000	500000	500000	500000	2500000
17		Contingency (2% of the budget)	-	3,51,379.20	1,71,379.20	1,33,272.32	1,34,942.72	1,65,761.12	9,56,734.56
		Total		1,79,20,339	87,40,339	67,96,888	68,82,079	84,53,817	4,87,93,463
		Institutional charge @10%		17,92,034	8,74,034	6,79,689	6,88,208	8,45,382	48,79,346
		Anticipated increase of 10% cost by 2028		19,71,237	9,61,437	7,47,658	7,57,029	9,29,920	53,67,281
		Grand Total		**2,16,83,610**	**1,05,75,810**	**82,24,235**	**83,27,315**	**1,02,29,119**	**5,90,40,090**

Budget (D): Phase II (October 2027 – September 2032): Details of budget required for activities implemented by the Forest Department of Andaman and Nicobar Islands

S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
A.	**Salary and wages**								
1	Nature Educator	To assist FD in conducting nature awareness programs for local people (@35,000/month basis for five years)	1	420000	420000	420000	420000	420000	2100000
2	Field worker (Daily rated Mazdoor)	Monitoring the Megapode population and implementing site-specific intervention	8	100000	100000	100000	100000	100000	500000
B.	**Travel Expenses**								
3	Boat expenses	Boat Maintenance	-	-	500000	500000	500000	500000	500000
4	Fuel	Fuel charges	-	-	1000000	1000000	1000000	1000000	1000000
C.	**Accommodation**								
5	Maintenance of camps	Research station and megapode monitoring camps in Little Nicobar, Great Nicobar west coast, and Teressa Island. Including furniture and infrastructure facilities.	5	1000000	1000000	1000000	1000000	1000000	5000000
		Contingency (2% of the budget)	-	64400	64400	64400	64400	64400	322000
		Total		**32,84,400**	**32,84,400**	**32,84,400**	**32,84,400**	**32,84,400**	**1,64,22,000**

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1	**Project Title**	**Comprehensive Plan for Nicobar Megapode Conservation in the Nicobar Archipelago**
2	**Project Location**	Nicobar Archipelago
3	**Implementing Agency**	 Salim Ali Centre for Ornithology and Natural History (SACON), Anaikatty Post, Coimbatore Tamil Nadu 641108, India www.sacon.in
4	**Implementing Partners**	Forest Department, Andaman and Nicobar Islands
5	**Funding**	Andaman and Nicobar Islands Integrated Development Corporation Ltd. (ANIIDCO)
6	**Project period**	Ten years
7	**Proposed Project Cost**	SACON: Rs. 11,57,14,625.00 ForestDepartment: Rs. 6,64,00,000.00 **Total Project Cost: Rs. 18,21,14,625.00** Rupees eighteen crores twenty-one lakhs fourteen thousand six hundred and twenty-five only.

Title of the Proposal: Comprehensive Plan for Nicobar Megapode Conservation in the Nicobar Archipelago

Rationale of the Project:

The Government of India has set a plan for holistic development of the Great Nicobar Islands in the Andaman and Nicobar Islands by creating International Container Transhipment Terminal (ICTT), Greenfield International Airport, Township and Area Development, and Power Plant. The select site for this project is the coastline on the eastern, southern, and western sides of the Great Nicobar Island (Figure 1) which is a strategic location being on the International sea route.

Figure 1. Holistic developmental project area in Great Nicobar

The Great Nicobar Islands having many endemic and threatened animals, is part of one of the biodiversity hotspots in the world i.e., 'Sundaland'. Strengthening the protected area network emphasized considering the high biodiversity and endemism of these islands (Sankaran 1995a; Mathur and Padalia 2006). The Nicobar megapode *Megapodius nicobariensis* (Figure 2) is one of the threatened species that are endemic to these islands. The Nicobar megapode ranks first in vulnerability score among all the megapodes in the globe (Radley et al. 2018) which emphasizes its conservation importance, therefore protection and conservation of the species are also the primary goals of the country. As the proposed project site is one of the primary habitats of the Nicobar megapode with a sizable population of them, therefore it is pertinent to have a comprehensive plan to ensure its conservation in these islands. To achieve this goal the proposal is prepared for ten years titled 'Comprehensive Plan for Nicobar Megapode Conservation in the Nicobar Archipelago'.

Figure 2. Photo of Nicobar megapode (Photo by Dhritiman Mukherjee)

Background

Nicobar megapode distribution: The family Megapodiidae consists of 22 species in seven genera (Winkler et al. 2020), largely confined to islands in Australia, New Guinea, and surrounding islands, eastern Indonesia, the Philippines, and the Nicobar Islands (Dekkar, 1992). The habitat destruction, the introduction of predators, and over-exploitation of eggs led nine of them to a threatened status (Jones, 1989). Nicobar Megapode (*Megapodius nicobariensis*) is also known as Nicobar Scrubfowl and is endemic to the 15 islands of Nicobar Archipelago, India (BirdLife International 2021). Two subspecies are recognized i.e., megapodes in Car Nicobar (Teressa,

Bompoka, Tillanchong, Camorta, Trinkat, Katchall, Nancowry is *Megapodius nicobariensis nicobariensis* and in south Nicobar (Meroe, Treis, Menchal, Little Nicobar, Great Nicobar, Kondul, Megapode Island and Trax) is *Megapodius nicobariensis abbotti* (Sankaran 1995b; Sivakumar 2007) (Figure 3). After the 2004 tsunami, the occurrence of megapodes in Megapode Island and Trax is not known, however, Zaibin and Pramod (2011) reported the sighting of a pair of megapodes on Cubra or Kabra Island in May 2009, and also sighting of a bird on Pilo Milo in May 2011. Nicobar megapode is listed as 'Vulnerable' due to its restricted distribution range and highly vulnerable to anthropogenic as well as catastrophic factors (Birdlife International, 2021), and listed under Schedule-I of the Indian Wildlife Protection Act (1972).

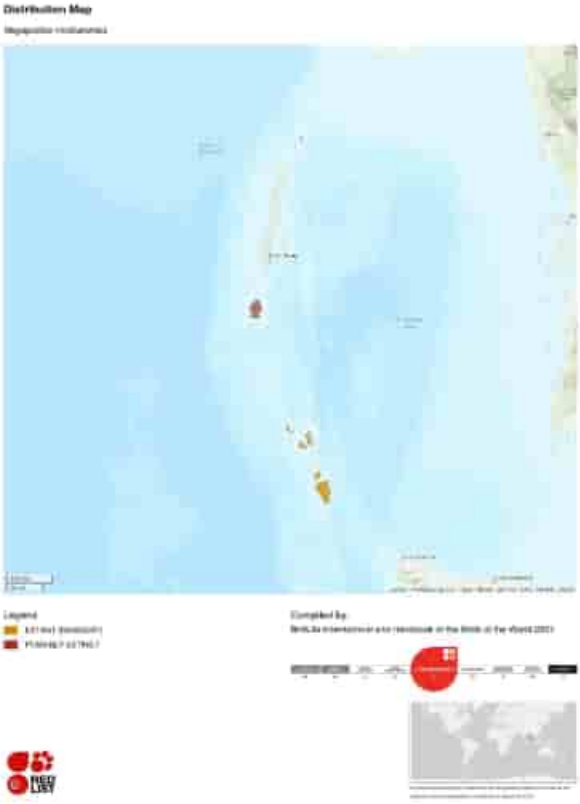

Figure 3. Distributaion map of Nicobar megapode in IUCN RedList

The population of megapodes in the Nicobar Islands has been evaluated over a regular span of time. An estimated population of ~400 megapodes on Great Nicobar was reported in 1988 (Anon, 1988). A subsequent survey by Dekkar (1992) revealed an estimated population of ~780 breeding pairs on the Great Nicobar coast. Due to the lack of population data at the subspecies level, Sankaran (1995b) initiated a population assessment on all islands of the Nicobar Archipelago. He surveyed 15 islands including nine islands of *M. n. abbotti* and six islands of *M. n. nicobariensis*. The estimated population of *M. n. abbotti* was 3400 to 6000 pairs and of *M. n. nicobariensis* was 1200 to 2100 breeding pairs.

2004 tsunami waves severely damaged the coastal habitats which is a potential nesting habitat of megapodes in Nicobar. The survey in 2006 (Sivakumar 2009) revealed a drastic decline of 75% in the megapode population in Great Nicobar, Little Nicobar, Katchal, Nancowry, and Camorta, and reported an estimated population of 788 breeding pairs. The survey in 2010 revealed that the population is stable and it ranged between 376 and 752 breeding pairs (Zaibin and Pramod, 2011). Jasmine and Sivakumar (2015) on the opinion that the megapode population is on recovery phase in these islands.

Megapode mounds: Nicobar megapode is a mound nesting bird thus the population estimates are made by assessing the number of active mounds of the Nicobar megapode (Sankaran 1995b). Nicobar megapode mounds are categorized into three types by Dekker (1992): Type A- mounds are built on an open area and away from the trees, Type B- built against the buttress or stem of a large tree, and Type C- built against / around / under /over a dead tree. The mounds are built in sand, sandy loam, and loam-moist where they lay the eggs (Sivakumar and Sankaran 2012a). Most of the mounds are recorded up to 200 meters from the coastline (Sankaran 1995b; Sivakumar and Sankaran 2012a). The height of the mound varied from 10 cm to 2.1 m, and the circumference from 7 m to 45 m (Sankaran 1995b). The active mounds are recognized by signs of fresh digging by the megapodes, otherwise, checking the status of soil as compact or hard as inactive, and loose and easily penetrable with a stick as active mounds. The selection of the location of mounds was highly associated with *Pandanus* species and also dominated by *Macaranga* and *Dracaena* species that are highly used by megapodes both dray and wet seasons and for breeding and foraging (Sivakumar and Sankaran 2012a). Although, the Nicobar megapodes are recorded in the interior forests of these islands, but most of the populations of the species are confined to the coastal

habitat which indicates the coastal habitat up to 200 meters (Sankaran 1995b) is very important from the point of conservation and management for the species.

Population assessment techniques: As most of the mounds are up to 200 m from the coastline, Sankaran (1995b) followed the parallel walk (modified belt transect) by two observers maintaining the 50 m between them, along the coastline but maintaining 50 away from the coastline. However, Sivakumar (2009) conducted a survey with seven observers walking parallelly maintaining a distance of 20 meters along the coastline (20 meters from the coastline). During the walk, a careful search was made for the active and inactive mounds and recorded the length of the transect, number of active mounds, the distance of the mound from the beach, and characteristics of the mound. This suggests the variable width belt transect or sweep sampling has been used in the earlier population assessments.

Social organization and behavioral ecology: Nicobar megapode is primarily a monogamous bird species, however, temporary pair bonds, change in a partner, and extra pair copulation is reported (Sivakumar and Sankaran 2012b). More than 70% of the population are found to be in pairs and the rest of them will be unpaired solitary individuals. Although they exhibit territoriality, overlap in the range is obvious since many pairs (65% of the mounds) use the same mound for nesting. Further, the dominance ranking of the individuals is highly dynamic with less consistency. A maximum of 16 eggs in a single mound was counted, however, the number of eggs in a mound is dependent on the mound size, and the hatchling success was ~77% (Sivakumar and Sankaran 2012b). Few individuals are reported to using of multiple mounds for egg laying. Megapode lay their eggs between February and May. Sivakumar and Sankaran (2005) reported their major diet composition that includes cockroaches, snails, beetles, ants, grasshoppers, hermit crab, lizards, and some vegetative material and seeds of *Macaranga peltata*, this indicates that the species is omnivorous in their diet.

The above body of literature reveals that the studies after 2004 are only occasional population surveys that indicate changes in the population size. Although few of these surveys show a recovery in population size of the megapodes following the population decline due to the 2004 tsunami, it is difficult to conclude the population responses of the species to the changes in the habitat conditions. Further, the basic understanding of the Nicobar megapode is from the study

before the 2004 tsunami, and the information on their behavioral ecology is highly limited to understanding their ecological responses to changing conditions. Therefore the need for the study towards conservation of the Nicobar megapode and its habitat was conceived based on the land use change proposed on the Great Nicobar Island for the interlinked projects with the below-listed objectives.

Objectives

1. Standardise a population monitoring protocol to assess the Nicobar megapode
2. Assess the population and distribution of the Nicobar megapode to identify the important populations
3. Spatio-temporal monitoring of the select populations of Nicobar megapode in the proposed project site and undisturbed habitats
4. Identify the critical breeding habitats of the Nicobar megapode for habitat prioritization
5. Study the breeding ecology of the Nicobar megapode in the proposed project site and undisturbed habitats to strategies for future interventions
6. Monitor the movement pattern of the Nicobar megapode to understand landscape level habitat use, dispersal ability, and colonization
7. Understand the genetic diversity of Nicobar megapode populations
8. Assess the threats to Nicobar megapode to provide site/island-specific interventions
9. Develop and implement a participatory conservation model through capacity building and awareness
10. Develop and implement a relocation and captive managemnet plan for the Nicobar megapode population in the proposed project site

Methods

Population monitoring protocol, population assessment, and identify the important populations:

Although Nicobar megapode is recorded from the forest areas, but the major population is confined to the coastal forests up to 200 m from the coastline. Suitable habitat for each Island

having the Nicobar megapode will be marked on the GIS platform. Depending on the length or area available on each island, length-area will be selected for sampling for the population assessment.

Sankaran (1995b) and Sivakumar (2009) followed a modified belt transect of variable width with multiple observers to detect the megapode mounds. The mounds will be categorized into three types small, medium, and big that is based on the circumference, height, and the number of openings. The number of lines (a minimum of three and a maximum of seven lines) for the parallel walk will be tested to standardize the field protocol to estimate the mound (active and inactive, and the size of the mound) density. Once the field protocol is standardized, the same will be implemented in all the islands.

The camera traps will be fixed for a minimum of five mounds for each type of mound to estimate the number of birds using the mound. Keeping the mean density per mound in each mound type, and the mound density, the population will be estimated in sampled area, which will be extrapolated to the entire suitable habitat available on each island. The population assessment will be made at the beginning of the project and the five years interval. Keeping the suitable habitat, the population size, and vulnerability of its habitat, the important megapode populations for long-term monitoring and also for conservation will be prioritized.

Spatio-temporal monitoring:

Spatio-temporal monitoring of the megapode population will be done at the project site, while only the population monitoring will be done in the undisturbed adjoining a suitable habitat to the project site for comparison. The Spatio-temporal monitoring of megapode in the project site and population monitoring of the adjoining suitable habitat will be carried out for every alternative year of ten years of project duration to understand the population dynamics and response to human interventions.

The geospatial map of the project site will be taken on the GIS platform. Since the major population of megapode is recorded up to 200 m from the coastline, then keeping the 50 meters of buffer to the suitable habitat, a 0.25 km^2 grid cell is found to be a minimum sampling unit to assess the spatial occupancy of the megapode. Therefore, a 0.25 km^2 grid cell will be overlaid on

the project site to understand the occupancy of the species. In each sampling unit, various field methods will be used that include standardized field propotoacl to detect the megapode mound, and if we can not detect the mound in some of the grid cells then call playback method will be used to find the occurrence of the species. Since the megapode is a territorial bird, often they make calls to advertise their presence to communicate to other conspecifics, thus the call playback method might help in finding the birds in sampling grid cells. In each grid detection history of the megapode will be created. For each grid cell habitat parameters and geospatial variables will be documented to relate to the occurrence of the megapode. The monitoring of this over the period will help in the understanding of the responses of birds to changing habitat conditions due to developmental activities.

Breeding ecology:

Habitat parameters of megapode mounds will be recorded and characterized. Of them, 25 to 30 active mounds will be selected, and the mound structure, the number of birds using the mound, and environmental parameters like humidity and temperature will be monitored every month for the entire project period. Temperature and humidity will be monitored using the data logger.

About 30 birds in the select active mounds in the project site, the undisturbed site, and relocated sites will be selected and marked. The multiple camera traps will be deployed with both image and video configurations for each select mound, and also periodic monitoring of the nests/mound will be done. In some of the mounds, the observations will be made by the observers with the focal animal sampling technique, and inter-bird interactions. In each mound, egg clutches will be marked and monitored for hatchling success.

After eggs are laid in the mound, parental care is almost absent in the Nicobar megapode (Sivakumar 2009). Thus, the experimental relocation of megapode eggs will be done to examine the hatchling success in the relocated sites to understand the possible intervention in the project site.

Movement pattern:

The movement pattern, habitat use, and dispersal will be monitored using satellite telemetry on 10 to 15 birds in each undisturbed site and project site. After birds are selected for long-term

monitoring, those birds will be trapped with the support of a local or forest department veterinary doctor. The appropriate solar-powered satellite transmitters (5 to 9.5 g) will be fitted on the bird, and also they will be ringed and released in the same locations. The tagged birds will be monitored using the satellite tracking system.

During the project implementation, birds may have to be relocated to a suitable site. Few of the relocated birds also will be fitted with the satellite transmitters and ring them to understand their adaptability to cope with the new location. This would help in developing the relocation and ex-situ conservation plan.

Genetic diversity:

Understanding the genetic difference between the two subspecies is important to highlight the importance of the populations of each subspecies. Further, the relatedness of the individuals between the islands would help in understanding the dispersal pattern and capability of colonization. Thus, the blood samples will be collected from the Nicobar megapode individuals, on various selected islands, while captured for fixing of the satellite transmitters. The collected blood samples will be further processed in the laboratory for their genetic spectrum.

Threat assessment:

The natural and anthropogenic threats to the Nicobar megapode and its habitats will be opportunistically recorded during the various studies planned in the project. Apart from the developmental projects, hunting of birds by local people, egg collection, destruction of the eggs, or consumption by other animals like monitor lizard, pig, dogs, and macaques will be monitored in the project site, relocated site, and undisturbed habitat.

Awareness, Education, and Capacity building:

The awareness material (movie/posters/brochures/calenders) will be developed to educate people about the species its habitat and its conservation importance. Training programs/seminars/workshops will be organized to train the Andaman and Nicobar Forest Department staff for population monitoring and nest monitoring. Motivated local people will also be trained and involved in the population and nest monitoring exercise.

Relocation and captive management:

When habitat conversion is unavoidable, securing the existing population from the project site is inevitable. Using the information from various aspects of its population, social organization, movement pattern, habitat selection, and behavioral ecology the appropriate relocation and ex-situ plan will be prepared. A large temporary enclosure will be developed at the site that exactly resembles its habitat. The enclosure will be of a closed system with a chainlink mesh to secure the birds inside. The vegetation in the enclosure includes coastline vegetation dominated by *Pandanus* species and *Macaranga peltata*. However, these enclosures will be used for the birds until they are shifted to appropriate suitable habitats in the wild. If birds are found injured or unable to relocate to the wild, those birds will be kept for restoking in captivity. The mound will be created to provide an alternate facility for nesting/keeping the eggs until they hatch. If there is a failure in such an experiment of relocating eggs to artificial mounds, then the incubation facility will be created.

Workplan

Activities/objectives	Years									
	1	2	3	4	5	6	7	8	9	10
Standardize the population monitoring protocol										
Assess the population and distribution of the Nicobar megapode										
Spatio-temporal monitoring of the select populations of Nicobar megapode										
Identify the critical breeding habitats of the Nicobar megapode										
Study the breeding ecology of Nicobar megapode										
Monitor the movement pattern of the Nicobar megapode										
Understand the genetic diversity										
Assess the threats to the Nicobar megapode										
Develop a participatory conservation model										
Implement a participatory conservation model										
Relocation and captive management plan for the Nicobar megapode population										
Submission of the progress report										
Submission of the Final report										

Expected Output

- Identified critical populations and habitats for conservation
- Setting the regular population monitoring team including the Forest Department personnel
- Documented the breeding ecology of the species

- Understood the movement pattern of the species
- Resolved taxonomic confusion to focus on essential populations
- Implemented the Participatory Conservation Model
- Identified site/island-specific threats to the species
- Establishment of the relocation and captive management plan
- Disseminateded the information to educate local people

Expected Outcome

- Conservation of Nicobar megapode by securing their population and its habitat
- Relocation of megapode birds from the project site
- Standardised a Population Monitoring Protocole
- Staderdised the ex-situ conservation and relocation methods for Nicobar megapode
- Developed a Participatory Conservation Model

Budget Summary for ten years (SACON component):

Head	Y-I	Y-II	Y-III	Y-IV	Y-V	Y-VI	Y-VII	Y-VIII	Y-IX	Y-X	Total
Manpower	2473560	2473560	2640600	2640600	2640600	1075200	1075200	1075200	1075200	1075200	**18244920**
Equipment	8065000	0	0	4600000	0	0	0	0	0	0	**12665000**
Travel	3000000	3000000	3000000	3000000	3000000	1060000	1060000	1060000	1060000	1060000	**20300000**
Satellite data	0	8320000	8320000	8320000	8320000	0	0	0	0	0	**33280000**
Meeting/ Workshop	100000	100000	100000	100000	100000	100000	100000	100000	100000	100000	**1000000**
Others	1565000	3065000	1065000	1065000	1085000	495000	495000	495000	495000	515000	**10340000**
Contingency	760178	847928	756280	986280	757280	136510	136510	136510	136510	137510	**4791496**
Overhead	2394560	2670973	2382282	3106782	2385432	430006	430006	430006	430006	433156	**15093209**
Total	**18358298**	**20477461**	**18264162**	**23818862**	**18288312**	**3296716**	**3296716**	**3296716**	**3296716**	**3320866**	**115714825**

SACON: Rupees eleven crores fifty-seven lakhs fourteen thousand six hundred and twenty-five only.

Budget for Forest Department in support of the Megapode project:

SN	Items	Total for ten years
1	Establishment of Research stations near the project site	10000000
2	Establishment of Research stations at Campbell Bay	10000000
3	Jeep to carry out the fieldwork	1300000
4	Jeep maintenance and driver	5000000
5	Speed Boat	8500000
6	Speed boat annual maintenance and wages for the boat captain	12000000
7	Rescue centre/ex-situ conservation enclosure	12000000
8	Manpower for rescue centre or ex-situ conservation enclosure-02 Nc.	3600000
9	Annual maintenance of enclosure	4000000
	Total	66400000

Forest Department: Six crores and sixty-four lakhs only.

Detailed budget: Budget for Phase-I (First Five years for SACON)

SN	Items	Unit Cost	Amount	Year I	Year II	Year III	Year IV	Year V	Total
1	**Manpower**	31000+16% HRA /month	Per month			35000+16% HRA/month			
	Junior Research Biologist -3 Nos	35960/40600	107880/ 168000	1294560	1294560	1461600	1461600	1461600	6973920
	Field Assistant - 6 Nos	16000/month	96000	1152000	1152000	1152000	1152000	1152000	5760000
		Insurance 250/month /person	2250	27000	27000	27000	27000	27000	135000
	Subtotal			**2473560**	**2473560**	**2640600**	**2640600**	**2640600**	**12868920**
2	**Equipment**								
	Temperature and humidity data logger -10 nos	30000	300000	300000	0	0	0	0	300000
	Binocular - 5 Nos	40000	200000	200000	0	0	0	0	200000
	GPS - 10 Nos	30000	300000	300000	0	0	0	0	300000
	Satellite Image	250000	250000	250000	0	0	0	0	250000
	Digital sound recorder- 2	120000	240000	240000	0	0	0	0	240000
	Sattelite transmitter - (2X20=40)	230000	4600000	4600000	0	0	4600000	0	9200000
	Capturing Net -5	10000	50000	50000	0	0	0	0	50000
	Laser range finder-3	35000	105000	105000	0	0	0	0	105000
	Spotting scope-3	80000	240000	240000	0	0	0	0	240000
	Camera traps - 40 nos	22000	880000	880000	0	0	0	0	880000
	Laptop - 5 Nos	100000	500000	500000	0	0	0	0	500000
	Printer with scanner-2	50000	100000	100000	0	0	0	0	100000
	Digital SLR Camera - 5 Nos	60000	300000	300000	0	0	0	0	300000
	Subtotal			**8065000**	**0**	**0**	**4600000**	**0**	**12665000**
3	**Travel**								
	Investigators 2– (6 trips per year) - field	50000	300000	300000	300000	300000	300000	300000	1500000
	Investigators 2- (2 trips per year) - review meeting	50000	100000	100000	100000	100000	100000	100000	500000
	Research Personals (2 trips per person/year)	30000	200000	200000	200000	200000	200000	200000	1000000
	Field Travel - by jeep and boat (only fuel charges)		200000	2400000	2400000	2400000	2400000	2400000	12000000
	Subtotal			**3000000**	**3000000**	**3000000**	**3000000**	**3000000**	**15000000**
4	**Satellite data access and process**	416000	1250000	0	**8320000**	**8320000**	**8320000**	**8320000**	**33280000**
5	**Meeting/Workshop**			**100000**	**100000**	**100000**	**100000**	**100000**	**500000**
6	**Others**								

	Maintenance of Base camps (2 nos)	15000	30000	360000	360000	360000	360000	360000	1800000
	Consumables (stationaries, minor field equipmnnt, and other accessories)			200000	200000	200000	200000	200000	1000000
	Consumables (Memory cards for the camera traps, batteries, data storage systems)			500000	500000	500000	500000	500000	2500000
	Consumables (sample collection for genetic aspects and laboratory charges)			500000	2000000	0	0	0	2500000
	Printing of reports and disseminiation of materials			5000	5000	5000	5000	25000	45000
	Subtotal			**1565000**	**3065000**	**1065000**	**1065000**	**1085000**	**7845000**
7	Contingency (5%)			760178	847928	756280	986280	757280	4107946
	Total			15963738	17806488	15881880	20711880	15902880	**86266866**
8	Institutional charges (15%)			2394560	2670973	2382282	3106782	2385432	12940029
	Grand Total			**18358298**	**20477461**	**18264162**	**23818662**	**18288312**	**99206895**

Detailed budget: Budget for Phase-II (Second Five years for SACON)

SN	Items	Unit Cost	Amount	Year VI	Year VII	Year VIII	Year IX	Year X	Total
1	**Manpower**	35000+16% HRA/month	Per month						
	Senior Research Biologist -1 No	40600	40600	487200	487200	487200	487200	487200	2436000
	Field Assistant - 3 Nos	16000/ month	48000	576000	576000	576000	576000	576000	2880000
		Insurance 250/month/ person	1000	12000	12000	12000	12000	12000	60000
	Subtotal			**1075200**	**1075200**	**1075200**	**1075200**	**1075200**	**5376000**
2	**Travels**								
	Investigators 2- (6 trips per year) - field	50000	300000	300000	300000	300000	300000	300000	1500000
	Investigators 2- (2 trips per year) - review meeting	50000	100000	100000	100000	100000	100000	100000	500000
	Research Personal (2 trips per person/year)	30000	60000	60000	60000	60000	60000	60000	300000
	Field Travel - by jeep and boat (only fuel charges)		50000	600000	600000	600000	600000	600000	3000000
	Subtotal			**1060000**	**1060000**	**1060000**	**1060000**	**1060000**	**5300000**

3	**Meeting/Workshop**			**100000**	**100000**	**100000**	**100000**	**100000**	**500000**
4	**Others**								
	Maintenance of Base camps (2 nos)	10000	20000	240000	240000	240000	240000	240000	1200000
	Consumables (stationaries, minor field equipment, and other accessories)			50000	50000	50000	50000	50000	250000
	Consumables (batteries, data storage systems)			200000	200000	200000	200000	200000	1000000
	Printing of reports and dissemination of materials			5000	5000	5000	5000	25000	45000
	Subtotal			**495000**	**495000**	**495000**	**495000**	**515000**	**2495000**
5	**Contingency (5%)**			136510	136510	136510	136510	137510	683550
	Total			2866710	2866710	2866710	2866710	2887710	14354550
6	**Institutional charges (15%)**			430006.5	430006.5	430006.5	430006.5	433156.5	2153182.5
	Grand Total			**3296716.5**	**3296716.5**	**3296716.5**	**3296716.5**	**3320866.5**	**16507733**

Budget for the Forest Department in support of the Megapode project

SN	Items	Unit Cost	Amount	Total for ten years
1	Establishment of Research stations near the project site	10000000	10000000	10000000
2	Establishment of Research stations at Campbell Bay	10000000	10000000	10000000
3	Jeep to carry out the fieldwork	1300000	1300000	1300000
4	Jeep maintenance and driver	500000/year	500000	5000000
5	Speed Boat	8500000	8500000	8500000
6	Speed boat annual maintenance and wages for the boat captain	1200000/year	1200000	12000000
7	Rescue centre/ex-situ conservation enclosure	12000000	12000000	12000000
8	Manpower for rescue centre or ex-situ conservation enclosure-02 No.	15000/month/person	30000/month	3600000
9	Annual maintenance of enclosure	400000/year	400000/year	4000000
	Total			66400000

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