IN THE HON'BLE NATIONAL GREEN TRIBUNAL,

EASTERN ZONE, KOLKATA BENCH

IN

APPEAL NO. 29 OF 2022

IN THE MATTER OF:

Conservation Action Trust... Appellant

Vs.

Ministry of Environment, Forest
and Climate Change & Andaman Nicobar
Island Integrated Development Corporation Ltd.(ANIIDCO).. Respondents

AND

IN

APPEAL NO. 30 OF 2022

IN THE MATTER OF:

Conservation Action Trust & Anr ...Appellant

Vs.

Ministry of Environment, Forest
and Climate Change & Andaman Nicobar
Island Integrated Development Corporation Ltd. (ANIIDCO).. Respondents

AND

IN

APPEAL NO. 31 OF 2022

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Ministry of Environment, Forest
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Island Integrated Development Corporation Ltd. (ANIIDCO).. Respondents

IN

APPEAL NO. 32 OF 2022

IN THE MATTER OF:

Ashish Kothari ...Appellant

Vs.

Ministry of Environment, Forest
and Climate Change & Andaman Nicobar
Island Integrated Development Corporation Ltd. (ANIIDCO).. Respondents

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Vs.

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Ministry of Environment, Forest
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Counter Affidavit On Behalf of Respondent No. 2 and 3 in Appeal No. 29 of 2022 and Respondent 2 in Appeal No. 30, 31 and 32 of 2022

I, Mohammed Pervaiz, S/o Shri C. Mohammed, aged 54 years, resident of Foreshore Road, Haddo, Port Blair do hereby solemnly affirm and state as under:

1. I am working as General Manager (Projects), ANIIDCO. I have been authorized to swear and affirm the present counter affidavit for and on behalf of the answering respondent.

2. I am fully conversant with the facts and circumstances of the case from records maintained in the office. I have read and understood the contents of the appeals and as such competent to swear the present affidavit.

3. At the very outset, I deny each and every allegation and/or averment and/or submission made in the Appeals save and except those that are specially admitted hereinafter.

4. I state that the Appellant herein has challenged the Environment Clearance dated 11.11.2022 issued by the answering Respondent No. 1 under EIA Notification, 2006 and ICRZ Notification,2019 and Stage I Clearance dated 27.10.2022 issued under Section 2 of the Forest (Conservation) Act, 1980 for the diversion of 130.75 sq. km of forest land in favour of Andaman & Nicobar Islands Integrated Development Corporation (ANIIDCO)for establishment of:

   a. International Container Transshipment Terminal (ICTT)-14.2 Million TEU

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b. Greenfield International Airport (4000 Peak Hour Passengers-PHP)

c. Township & Area development

d. 450 MVA Gas and Solar based power plant over an extent of 16610 hectares (Ha) in the Great Nicobar Islands.

The Appellant has consequentially prayed for setting aside of the Environment Clearance (EC) dated 11.11.2022 issued to the 2nd Respondent (Andaman and Nicobar Islands Integrated Development Corporation Limited).

5. Since the issues involved in the above appeals are same, a single counter affidavit is being filed for the all appeal, for the sake of brevity and avoid repetition.

6. It is respectfully submitted that Government of India, considering the strategic importance of Great Nicobar Island situated in the southernmost point of the country, conceived the project for holistic development of Great Nicobar Island. The holistic development of Great Nicobar Island project is a project of national importance in view of its strategic, security and socio economic benefits. The project of holistic development of Great Nicobar Island will transform the Island into a hub of port led development. NITI Aayog has conceived a vision for holistic development of identified Islands. A&N Administration vide order dated 28.07.2020 appointed Andaman Nicobar Island Integrated Development Corporation Ltd. (ANIIDCO) as Project Proponent for development of various projects in Great Nicobar Island. On 18.12.2020 NITI Aayog appointed a qualified Technical Consultant for preparation of Master Plan for Holistic Development of Great Nicobar Island. True copy of letter dated 18.12.2020 of NITI Aayog and Administration order dated 28.07.2020

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are annexed hereto and marked as annexure **R-1** and **R-2** respectively.

7. It is humbly submitted that considering the objective of holistic and sustainable development, the technical consultant appointed for preparation of Master Plan for Great Nicobar Island carried out land suitability assessment, eco sensitivity analysis, carrying capacity assessment, etc. to delineate all environmentally sensitive areas and to provide a development suitability map of the Island. Accordingly, an EIA study has been undertaken to identify and analyse impact of the project on the environment and suggest various mitigation measures to ensure that the development takes place with minimal environmental and social impact. Further, in compliance of the Terms of Reference (ToR) issued by MoEF&CC vide letter dated 25.05.2021, assistance of technical organizations/institutions with expertise in ecological and biodiversity studies such as ZSI, WII, SACON etc. was taken for ecological assessment and their studies/ reports are part of the EIA report. As per the terms & conditions of grant of EC & CRZ Clearance vide letter dated 11.11.2022, wildlife conservation plans have been prepared for leatherback sea turtle, nicobar megapode, salt water crocodile, inter tidal flora & fauna, mangroves, nicobar macaque, robber crab, other endemic bird species and corals in consultation with Wildlife Institute of India (WII), Zoological Survey of India (ZSI), Salim Ali Centre for Ornithology and Natural History (SACON), Botanical Survey of India (BSI) and Institute of Forest Management (IIFM). Fund for the wildlife conservation plans shall be released to the institutes by the Respondent No. 2. Further, as per the terms & conditions of grant of EC & CRZ Clearance, three independent committees have been set

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upto oversee pollution related matters, biodiversity and welfare &issues related to Shopmen and Nicobarese tribes.

8. In recent years, the Government of India (GOI) has adopted a proactive policy aimed at transforming the Andaman and Nicobar Islands (A&N Islands), as an economic hub. Strategically located, the A&N Islands, larger than several island countries in themselves, are an asset in India's cultural, economic and strategic calculus.

9. The project will strengthen India's presence in the Andaman Sea and in Southeast Asia; and will create an economic hub with a major cargo transshipment terminal and a global tourism destination. The location of the project, besides being of strategic importance, presents immense opportunities to further strengthen India's trading position in the world by developing an International Transshipment terminal. A new transshipment port at GNI can be competitive because of the cost savings that shippers can realize using feeder ships to service ports around the rim of the Bay of Bengal. A new port at GNI highlights its locational advantages over competing ports in the region for accessing ports in Bay of Bengal region.

10. The importance of the said project would further be evident from the following facts:

a) The Andaman and Nicobar Islands constitute just 0.2 per cent of India's landmass but account for 30 per cent of the country's 200-nautical-mile Exclusive Economic Zone (EEZ).

b) Great Nicobar Island is the largest of the Nicobar group of Islands which represents a huge, strategically located land mass in the

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Bay of Bengal, whose economic potential and strategic importance is enormous.

11. It is humbly submitted that the principle of sustainable development is the benchmark through which development projects are judged. The principle espouses that both development and environment must go hand in hand. The principle of sustainable development is deep-rooted in the jurisprudence of Indian environmental law. It has emerged as a multi-faceted principle, which does not prohibit development, but structures it around what is sustainable. Sustainable development incorporates two related ideas - development which not only ensures equity between the present and the future generations but also development which ensures equity between different sections of society at present. In this connection, reliance is placed on the dicta of the Hon'ble Supreme Court in the recent decision in *Citizens For Green Doon and Others Versus Union of India and Others* (2021 SCC OnLine SC 1243) pertaining to the Char Dham project.

12. It is submitted that only 166.1 sq. km of area is proposed for development which is approximately 2% of the total area of A & N Islands. Further, 130.75 sq. km of forest area is proposed to be diverted for the project which is only approximately 1.82% of the total forest area of A & N Islands.

13. It is humbly submitted that the answering Respondent No. 2 on 08.09.2020 submitted an application to Respondent No. 3 and Respondent No. 3 on 07.10.2020 submitted the application to Respondent No. 1. It is submitted that the A&N Administration has been allowed to accept and process the Forest Clearance applications

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through offline mode as per Ministry's letter dated 12.06.2015. It is further submitted that the answering Respondent No. 2 on 03.03.2021 filed online Terms of Reference (ToR) application to MoEF&CC which was considered by the meeting of the Expert Appraisal Committee (EAC) and ToR was issued on 25.05.2021. The draft Environmental Impact Assessment (EIA) report was uploaded on the MoEF&CC portal on 24.12.2021. The public hearing on the draft EIA report was held on 27.01.2022 and the final EIA report after incorporating the written suggestions/ objections and public hearing was uploaded on the MoEF&CC portal on 07.03.2022. The EAC in its meeting held on 24.03.2022, considered the proposal and MoEF&CC on 11.11.2022 granted EC& CRZ clearance.

14. A comprehensive EIA study was undertaken by QCI-NABET accredited consultants to evaluate environmental impact and identifying mitigation measures for the project. The following studies were undertaken as part of the EIA study by various technical organizations:

- Marine Ecological Conservation of Island Fauna Diversity and Marine Ecological Studies.
- An assessment of the Environmental sensitiveness of sea turtle nesting beaches of the Great Nicobar Island.
- Environmental Baseline Data Monitoring, Socio-Economic Survey, Environmental Impact Assessment Study.
- Topographic survey through helicopter mounted LIDAR and OLS Survey.
- Mathematical Modelling Study.
- Oceanographic Study, Hydrographic Survey and Bathymetric & Geophysical Survey.
- Soil Investigation Study.
- Traffic & Market Analysis for Port.

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As part of the EIA study, alternate site analysis for Port, Airport and Power Plant were undertaken, requirement for power, water and solid waste management were worked out. Thereafter, baseline environmental studies for air, water, noise & ecological attributes were undertaken. Mathematical modelling was undertaken for the Port project for shoreline changes, transportation study was undertaken for working out details of road network, impact assessment &mitigation measures for land environment, reclamation, change in coastline/shoreline, air emissions, noise pollution, waste water, solid waste, social ecology, coral reef, etc. were worked out; risk assessment study was undertaken for Port, Airport, Power Plant considering earthquake, tsunami, cyclone for preparation of management plan. Information and data obtained during the course of these studies were part of the comprehensive EIA report submitted to MoEF&CC.

As per the directions of EAC in its meeting held on 24 – 25.05.2022 following conservation plans were prepared and submitted to MoEF&CC which was considered by EAC in the meeting held on 22 – 23.08.2022:

a. Conservation and management plan for corals by Zoological Survey of India (ZSI) including translocation/restoration sites of Great Nicobar Island.

b. Conservation and long-term monitoring of sea turtles of Nicobar Islands with special focus on the leatherback sea turtle by Wildlife Institute of India (WII).

c. Comprehensive conservation plan – long term monitoring and conservation of the endemic Nicobar Megapode by Wildlife Institute of India and Salim Ali Centre for Ornithology & Natural History (SACON).

d. Mangrove conservation and management plan by Forest Department of A&N Administration.

e. Crocodile conservation plan by Wildlife Institute of India.

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Further Respondent No. 2 will be implementing following Wildlife conservation and Tribal welfare plans for a period of 30 years and 50 years respectively as per the terms and conditions of grant of EC and CRZ clearance vide letter dated 11.11.2022:

a. Leatherback Sea Turtles by WII.
b. Nicobar Megapode by Wildlife Institute of India and SACON.
c. Saltwater Crocodile by WII.
d. Impact of invasive species on native FLORA by Botanical Survey of India (BSI).
e. Impact on inter-tidal flora and fauna by ZSI.
f. Nicobar Macaque, Robber Crab and other endemic bird species of Great Nicobar by SACON.
g. Mangrove Restoration by Forest Department of A&N Administration.
h. Coral translocation by ZSI.
i. Welfare of local tribal population of Shompen and Nicobaris by Tribal Welfare Department.

UT Administration has notified a Coral Sanctuary at Meroe Island, a Megapode Sanctuary at Menchal Island and a Leatherback Turtle Sanctuary at Little Nicobar Island under Section 26(A) of Wildlife (Protection) Act, 1972 after following the due process of Law for conservation of these species. True copy of the notification is annexed hereto and marked as annexure **R-3**.

Safe wildlife corridors along the eastern side of the island connecting forest and seashore through via-ducts (elevated crossings) on the north south arterial road have been proposed and incorporated in the master plan. In addition to wildlife corridors, number of culverts and canopy crossings will be provided at appropriate locations and the same will be incorporated in the detailed engineering design for movement of wildlife. The locations of the proposed wildlife corridors i.e. via ducts have been selected based on the ground situation and input provided by ANDAMAN & NICOBAR ISLANDS D. ILANGO Advocate Date: 14/2/2023 NOTARY

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input provided by ZSI and Department of Environment & Forest.

In view of the above, biodiversity conservation including species diversity and endemism in the island and the region have been given due consideration and all efforts will be made for its protection, conservation and management. True copy of the relevant extracts from the EIA report and submission made to EAC with reference to the meeting held on 24.05.2022 and 23.08.2022 are annexed hereto and marked as annexure **R-4**.

15. It is respectfully submitted that the Pollution Control Committee (PCC) uploaded the draft EIA report on the website of A&N Administration, and after due publicity in local and mainland newspapers, broadcasting the information regarding public hearing in All India Radio (AIR) and Doordarshan, conducted public hearing on the draft EIA report on 27.01.2022 at 11.00 am in the community hall, Gram Panchayat, Campbell Bay, Nicobar District under the chairmanship of Deputy Commissioner (Nicobar). 138 participants including tribals, settlers, representatives of Tribal Council and Andaman Adim Janjati Vikas Samiti attended the public hearing alongwith the officials of A & N Administration. Written comments were received from 12 organizations/persons and 14 persons gave their comments during public hearing. All the written comments and verbal comments received during the public hearing were responded and the reply is part of the EIA report. The final EIA report after incorporating the written suggestions/objections and public hearing was uploaded on the MoEF&CC portal on 07.03.2022. True copy of relevant extracts from the final EIA report are annexed hereto and marked as annexure **R-5**.

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16. It is respectfully submitted that detailed site alternative analysis has been undertaken as part of EIA to identify the best location for Port, Airport and Power Plant. Alternate site analysis has been carried out as part of EIA wherein multi criteria analysis of alternate site have been undertaken considering factors like land development, cost risk, dredging requirement, environmental issues, tribal, breakwater, etc. which is mentioned under Analysis of Alternatives under Chapter 5 of the EIA report. As per the alternate site analysis, Galathea Bay appears to be the most feasible in terms of technical, environmental and financial parameters, and was thus selected for further detailed evaluation. True copy of relevant extract from chapter 5 of the EIA Report is annexed hereto and marked as annexure **R-6**.

The proposed development is integrated in nature and includes, port, airport, power plant and all supporting infrastructure within the township. The township development provides all social and infrastructure amenities required to support the proposed development. The trunk infrastructure thus proposed spreads from North of Campbell Bay to Galathea Bay including seven revenue villages within project boundary. As the availability of non-forest land is very limited in Great Nicobar Island and to have the integrated and strategic development of the island, forest land is required for which the diversion of forest land was proposed. Residential township is required to cater to the requirement of personnel engaged in defence and Port development and therefore cannot be considered as stand-alone development. For the integrated development of GNI, only 130.75 sq. km of forest land is proposed for diversion which is around 1.82% of the existing forest area of A & N Islands.

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17. It is submitted that the Andaman & Nicobar Administration is committed to preserve and protect the Particularly Vulnerable Tribal Groups of the Islands and their interests. The Great Nicobar Island (GNI) has Tribal Reserve measuring 751.070 sq. km. Out of the total area proposed for development measuring 166.10 sq. km, 84.10 sq. km falls within Tribal Reserve. In order to compensate the reduction in Tribal Reserve and to protect the habitat of Shompen and Nicobari tribe Andaman & Nicobar Administration proposes to re-notify 76.96 sq.km of land in Campbell Bay National Park, Galathea National Park and land outside the National parks as Tribal Reserve. Therefore, effectively only 7.11 sq. km Tribal Reserve area will be required for de-notification for the project which is only 0.21% of the total tribal reserve area of A & N Islands and thus 743.96 sq. km of the Great Nicobar Island will remain protected as Tribal Reserve. Section 3 of A&N (Protection of Aboriginal Tribes) Regulation, 1956 empowers A&N Administration to declare reserve Tribal area specifying the limits of such area. Accordingly the Empowered Committee of UT Administration has recommended de-notification of Tribal Reserve and Ministry of Tribal Affairs vide letter dated 18.11.2020 has given no objection for the proposal for de-notification of tribal reserve area in Great Nicobar Island subject to compliance under Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. True copy of Section 3 of A&N (Protection of Aboriginal Tribes) Regulation, 1956 and letter dated 18.11.2020 issued by the Ministry of Tribal Affairs is annexed hereto and marked as annexure **R-7** and **R-8** respectively.

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The President of India has delegated the powers of the State Government to the Administrator/Hon'ble Lt. Governor, A&N Islands

under the Scheduled Tribes and Other Traditional Forests Dwellers (Recognition of Forests Rights) Act 2006 within the said Union Territory vide Notification dated 07.06.2022. Accordingly, the Hon'ble Lt. Governor, A&N Islands has constituted the Sub-Divisional Level Committee (SDLC), District level Committee (DLC) and State Level Monitoring Committee (SLMC) vide Order No. 148 dated 26.07.2022. Consequently, RoFR (Recognition of Forest Rights) certificate has been issued on 18.08.2022 by the District level Committee (DLC) as per the FRA, 2006. The Respondent No. 2 further respectfully submits that PAT Regulation 1956, Forest Rights Act, 2006 and Shompen Policy, 2015 and recommendation of Empowered Committee shall be complied. True copy of the Notification dated 07.06.2022, Order No. 148 dated 26.07.2022 and RoFR certificate dated 18.08.2022 is annexed hereto and marked as annexure **R-9**, **R-10** and **R-11** respectively.

18. As per the Hon'ble Supreme Court order dated 07.05.2002 in IA No. 502 of 1999 in W.P. No. 202 of 1995 (T.N. Godavarman Thirumalpad Vs UoI & Ors), necessary detailed Environment Impact Assessment (EIA) has been carried out for the project.

19. With regard to EC & CRZ clearance, it is submitted that during the Andaman & Nicobar Coastal Zone Management Authority (ANCZMA) meeting convened for recommending CRZ Clearance for various projects in A&N Islands held on 17.03.2022, the Principal Secretary (Environment & Forests) has attended the meeting and on 27.06.2022, the Commissioner-cum-Secretary (E&F) has attended the meeting as a member of the ANCZMA. Both the officers were not holding the charge of Managing Director of ANIIDCO

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(2nd Respondent). With regard to Forest Clearance, it is submitted that the A & N Administration had vide Order No. 639 dated 28.07.2020 designated the 2nd Respondent as the project proponent of various projects in GNI. As part of the recommendation of the State Govt. for diversion of forest land, the then Commissioner-cum-Secretary (E&F) had recommended the Holistic Development proposal of GNI on 07.10.2020. During that period the then Commissioner-cum-Secretary (E & F) was not holding any charge in the office of the 2nd Respondent. Thus, there is no conflict of interest contrary to what has been alleged by the applicant in the present appeals.

20. It is submitted that the project has been considered for EC and CRZ Clearance as per the provisions contained in ICRZ Notification 2019. The MoEF&CC vide letter No. F. No.12-3/2021-IA.III dated 01.06.2021 has conveyed its approval of the ICRZ Plans for the Great Nicobar Island as per ICRZ 2019. The para 5 (III)(A) of the ICRZ 2019, mandated that the draft ICRZ plans shall be prepared in 1:25000 scale and accordingly NCSCM has prepared the draft ICRZ maps in 1:25000 scale. After receipt of ICRZ map, the same was published in print and electronic media for wide publicity and for obtaining claims/suggestion/views from general public and other stakeholders. Public hearing on the draft Island Coastal Regulation Zone (ICRZ) Plan was also conducted. The ICRZ Plan of the Great Nicobar Island as per the ICRZ Notification 2019 was finalized after following the due process and after consulting the stakeholders in a fair and transparent manner.

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21. It is submitted that as per the guidelines of Forest (Conservation) Act, 1980 formulated by the MoEF&CC dated 22.05.2019, the states/UTs having forest land of more than 75% of their respective total

geographical area, shall not be insisted upon for providing non-forest land for raising compensatory afforestation and the same may be taken up in any other state/UT having deficient forest land/cover and having land bank for CA. Since, the UT of Andaman & Nicobar Islands is having recorded forest cover of more than 75% of the geographical area, the compensatory afforestation is proposed to be raised in other States in conformity with the aforesaid guideline formulated by the MoEF&CC and in view of the fact that sufficient non-forest land for the purpose is not available in this UT. True copy of guidelines dated 22.05.2019 is annexed hereto and marked as annexure **R-12**.

22. It is submitted that the project area does not fall within the boundary of any National Park or Wildlife Sanctuary or their Eco-Sensitive Zones. Therefore, the project is not proposed to be established in any Eco Sensitive Zone of any Protected Area contrary to what has been claimed in the present appeals.

23. It is submitted that Hydrological and terrain analysis have been conducted and accordingly, the existing water bodies and higher order water streams are preserved. No existing rivers or water bodies will be damaged/impacted by the project development.

24. Therefore, the answering Respondent pray that this Hon'ble Tribunal may be graciously pleased to consider the above submissions and dismiss the present appeals being devoid of any merit and may pass any other appropriate orders as deemed fit by the Hon'ble Tribunal in the interest of justice.

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25. The answering Respondent further crave for the liberty to file further affidavit and/or additional documents/information as may be directed or deemed fit by this Hon'ble Tribunal.

DEPONENT

महाप्रबंधक
General Manager
अनिइको लिमिटेड
ANIIDCO LTD, PORT BLAIR

VERIFICATION

Verified at Port Blair by the Deponent above named on this the 14th day of February, 2023 and I do hereby verify that all the facts as mentioned in the affidavit are true to my knowledge and no part thereof is false and nothing material has been concealed therefrom.

(Mohammed Pervaiz)
General Manager (Projects)
ANIIDCO
Deponent

Date: 14.02.2023
Place: Port Blair

Affirmed before me after the contents are read over & explained in simple Hindi / English ~~Bengali~~.

14/2/23

D. ILANGO
Advocate
NOTARY PUBLIC
Port Blair, A & N Islands

NOTARIAL D.ILANGO Advocate Date: 14/2/2023 NOTARIAL
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Annexure R-1

NITI Aayog appointed Technical Consultant vide letter dated 18.12.2020

F.No. M-13040/32(2)/2020-IDA
Government of India
NITI Aayog
(NRE Vertical – Island Development)

NITI Bhawan, Sansad Marg,
New Delhi, Dated 18th December, 2020

To

Shri Vishal Kundra,
Technical Director,
M/s AECOM India Pvt Ltd.
9th floor, Infinity Tower – C
DLF Cyber City, DLF Phase II,
Gurugram, Haryana - 122002
Contact No. 0124 4830100, E-mail: vishal.kundra@aecom.com

Subject: Selection of Technical Consultant for 'Preparation of Master Plan for Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands' – Issuance of Letter of Award (LoA) – regarding.

Sir,

Please refer to your proposal dated 04.10.2020 regarding selection of Technical Consultant for Preparation of Master Plan for Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands.

1. In this regard, we wish to inform you that the Competent Authority has approved your proposal as **Technical Consultant for 'Preparation of Master Plan for Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands'** as per details laid down in the RfP dated 07.09.2020. Also, the Consultant shall carryout the Environment Impact Assessment studies of Great Nicobar Island in Andaman & Nicobar Islands including preparation of mitigation/management plan for turtle nesting and various other clearances. The project is being awarded to you at the quoted price of ₹ 22,40,53,103/- (Rs. Twenty Two Crore Forty lakh Fifty Three Thousand One Hundred and Three only) inclusive of service tax (GST 18%).
2. You are requested to submit a legal, valid and enforceable Performance Security in the form of an unconditional and irrevocable bank guarantee as security for the performance by the consultant of its obligations under this agreement as per Clause No. 7.1 (Schedule 3) of the Request For Proposal (RfP) document and in the form set out in Annex-7(Schedule 3) of the RfP document, for an amount equal to five percent of the awarded price of the contract as per Para-2 above.

3. The following documents shall be deemed to form and be read and constructed as part of this LoA:
   i. . NITI Aayog's Request for Proposal (RfP) No. M-13040/32(2)/2020-IDA dated 07.09.2020, e published on 07.09.2020 on Central Public Procurement Portal (CPPP) & NITI Aayog website.
   ii. Suppliers Technical bid dated 04.10.2020
   iii. Suppliers Financial bid dated 04.10.2020
   iv. Response to Queries in Pre-bid meeting issued by NITI Aayog on 22.09.2020
4. Also, you are required to procure the insurance policies as per Clause No. 3.5(Schedule 3) of the RfP document.
5. The above required documents must be submitted within 10 (Ten) days from the date of the issue of this LoA.
6. The payment schedule will be as per percentage payment schedule given in para 6.2 (Schedule 3) of ToR for Technical Consultant.
7. In case the aforesaid offer is acceptable, as per Clause No. 2.28 of the RfP document, you are requested to sign and return the duplicate copy of the Letter of Award (LoA) in acknowledgement thereof, within seven days of receipt of LoA.
8. You are also requested to enter into an agreement in terms of clause 2.13 of RfP within the stipulated period of 10 days of issue of this letter (Rs. 100/- non-judicial stamp paper).
9. All correspondence on the subject should be sent to the Sr. Research Officer, NRE Vertical, NITI Aayog, Sansad Marg, New Delhi, 110001, E-mail:gopinath.lagudu@nic.in with a copy to Adviser (NRE), NITI Aayog, Sansad Marg, New Delhi, 110001, E-mail: amishra-pc@nic.in.
10. Concurrence of SS&FA has been obtained vide Note #57 of the File No. M-13040/32(2)/2020-IDA dated 14.12.2020.

Kindly acknowledge the receipt of this letter.

Yours faithfully,

(L. Gopinath)
Sr. Research Officer
E-mail: gopinath.lagudu@nic.in

Annexure R-2

Appointment of ANIIDCO as Project Proponent vide letter dated 28.07.2020

PCCF (C2 & FC)
ACF (C2 & FC) 30/7
NC

(61)

अंडमान तथा निकोबार प्रशासन
ANDAMAN & NICOBAR ADMINISTRATION
उद्योग निदेशालय
DIRECTORATE OF INDUSTRIES

30.7.20 38/7

Port Blair Dated 28th July 2020

ORDER NO. 609

Hon'ble Lt. Governor, A & N Islands has been pleased to designate Andaman & Nicobar Islands Integrated Development Corporation Ltd. (ANIIDCO), Port Blair as the Project Proponent for Development of various projects in Great Nicobar Island.

By Order

Director of Industries
F.No. 2-942/PPGN/PL/IND/2020-21

OFFICE ORDER BOOK

1. PCCF (A & V/Territorial), Forest Department, Van Sadan, Haddo, Port Blair
2. PCCF (RZ & FC), Forest Department, Van Sadan, Haddo, Port Blair
3. OSD (Forest & Environment), A & N Administration, Secretariat, Port Blair
4. Managing Director, ANIIDCO, Vikas Bhawan, Port Blair
5. Secretary (Revenue), A & N Administration, Port Blair
6. Secretary (Tribal Welfare), A & N Administration, Port Blair
7. Secretary (Environment), A & N Administration, Port Blair
8. Deputy Commissioner (South Andaman District), Port Blair
9. Deputy Commissioner (Nicobar District), Carnicobar
10. Assistant Commissioner, Campellbay

Copy forwarded for information to

1. Sr. PS to Chief Secretary, A & N Administration for kind information of Chief Secretary.
2. PS to Commissioner-cum-Secretary (Ind), A & N Administration for kind information of Commissioner-cum-Secretary (Ind).
3. PS to Secretary to Hon'ble Lt. Governor, A & N Islands for kind information of Secretary to Hon'ble Lt. Governor.

Director of Industries

Annexure R-3

A&N Administrations Notification
dated 03.10.2022 – A Coral Sanctuary at Meroe Island, A Megapode Sanctuary at Menchal Island and A Leatherback Turtle Sanctuary at Little Nicobar Island.

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Andaman And Nicobar Gazette
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Published by Authority
सं.109 पोर्ट ब्लेयर, सोमवार, 03 अक्तूबर, 2022
No. 109, Port Blair, Monday, October 03, 2022

अण्डमान तथा निकोबार प्रशासन
ANDAMAN AND NICOBAR ADMINISTRATION
(पर्यावरण एवं वन विभाग)
(DEPARTMENT OF ENVIRONMENT & FORESTS)

NOTIFICATION

Port Blair, dated the 03rd October, 2022.

No.105/2022/F.No.CWLW/WL/243/974.— Whereas, the Andaman and Nicobar Administration by reason of its adequate ecological, faunal, floral, geomorphological, natural and zoological significance considers that the area specified in the Schedule to this Notification needs to be constituted as 'Leatherback Turtle Sanctuary' for the purpose of protecting, propagating and developing wildlife therein especially Leatherback Turtle, its habitat and environment.

AND, WHEREAS, in exercise of powers conferred upon him by Sub-section (1) of Section 18 read with Sub-section (29) of Section 2 of the Wildlife (Protection) Act, 1972 (Act 53 of 1972), the Lieutenant Governor, Andaman and Nicobar Islands declared his intention to constitute 'Leatherback Turtle Sanctuary' vide Notification No. CWLW/WL/243/217 dated 21.04.2022.

AND, WHEREAS, as provided under Section 19 to 26(A) of the Act, the Collector / Deputy Commissioner (Nicobar) has reported that no rights or claims of any person exist in and over the area proposed to be constituted as Wildlife Sanctuary.

NOW, THEREFORE, in exercise of the powers conferred by clause (a) of Sub-section (1) of Section 26-A of the Wildlife (Protection) Act, 1972 (Act 53 of 1972) read with Sub-section (29) of Section 2 thereof, the Lieutenant Governor (Administrator), Andaman and Nicobar Islands is pleased to declare that the aforesaid area, the situation and limits of which are specified in the Schedule given below as a Wildlife Sanctuary for the purpose as aforesaid, from the date of issue of this Notification in the Official Gazette:

SCHEDULE

Leatherback Turtle Sanctuary

Total Area: 13.75 Sq. Km. (Approximately) at Little Nicobar Island in the A & N Islands including 6.67 Sq. Km of water area within the baseline system.

Description of Boundary:

The boundary of the Leatherback Turtle Sanctuary will be as follows:

North: Starting from a point **'A'** at 7° 20' 15.05" N, 93° 37' 59.26" E, the boundary runs Eastwards along an imaginary line till it meets point **'B'** at 7° 20' 15.00" N, 93° 38' 37.57" E.

East: From the point **'B'** the boundary runs Southwards along an imaginary line passing through point **'C'** at 7° 19' 53.12" N, 93° 38' 37.54" E, point **'D'** at 7° 18' 52.98" N, 93° 38' 22.81" E, point **'E'** at 7° 15' 52.74" N, 93° 38' 22.56" E, and meets point **'F'** at 7° 14' 53.22" N, 93° 38' 46.74" E.

South: From the point **'F'**, the boundary moves Southwest along an imaginary line till it touches the low tide line at point **'G'** at 7° 14' 48.53" N, 93° 38' 38.60" E.

West: From the point **'G'** the boundary runs Northwest along an imaginary line in the Bay of Bengal till it touches the coastline at point **'H'** at 7° 15' 49.61" N, 93° 37' 47.17" E, thence further the boundary runs along the coastline till it meets point **'I'** at 7° 16' 1.41" N, 93° 37' 44.46" E. From the point **'I'** the boundary moves Northwards along an imaginary line and touches a low tide line at point **'J'** at 7° 18' 31.9" N, 93° 37' 20.70" E, then the boundary follows the low tide line and touches point **'K'** at 7° 18' 34.63" N, 93° 37' 20.89" E. From point **'K'** the boundary further moves Northeast and culminates at point **'A'**.

Admiral D.K. Joshi, PVSM, AVSM, YSM, NM, VSM (Retd.)
Lieutenant Governor,
Andaman & Nicobar Islands.

By order and in the name of the Lieutenant Governor,

Sd./-
(Pankaj Kumar, IAS)
Secretary (Environment & Forests)

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Published by Authority
सं.111 पोर्ट ब्लेयर, सोमवार, 03 अक्तूबर, 2022
No. 111, Port Blair, Monday, October 03, 2022

अण्डमान तथा निकोबार प्रशासन
ANDAMAN AND NICOBAR ADMINISTRATION
(पर्यावरण एवं वन विभाग)
(DEPARTMENT OF ENVIRONMENT & FORESTS)

NOTIFICATION

Port Blair, dated the 03rd October, 2022.

No.107/2022/F.No.CWLW/WL/243/974.—Whereas, the Andaman and Nicobar Administration by reason of its adequate ecological, faunal, floral, geomorphological, natural and zoological significance considers that the area specified in the Schedule to this Notification needs to be constituted as 'Coral Sanctuary' for the purpose of protecting, propagating and developing wildlife (terrestrial and marine) therein especially the Corals, its habitat and environment.

AND, WHEREAS, in exercise of powers conferred upon him by Sub-section (1) of Section 18 read with Sub-section (29) of Section 2 of the Wildlife (Protection) Act, 1972 (Act 53 of 1972), the Lieutenant Governor, Andaman and Nicobar Islands declared his intention to constitute 'Coral Sanctuary' vide Notification No. CWLW/WL/243/219 dated 21.04.2022.

AND, WHEREAS, as provided under Section 19 to 26(A) of the Act, the Collector / Deputy Commissioner (Nicobar) has reported that no rights or claims of any person exist in and over the area proposed to be constituted as Wildlife Sanctuary.

NOW, THEREFORE, in exercise of the powers conferred by clause (a) of Sub-section (1) of Section 26-A of the Wildlife (Protection) Act, 1972 (Act 53 of 1972) read with Sub-section (29) of Section 2 thereof, the Lieutenant Governor (Administrator), Andaman and Nicobar Islands is pleased to declare that the aforesaid area, the situation and limits of which are specified in the Schedule given below as a Wildlife Sanctuary for the purpose as aforesaid, from the date of issue of this Notification in the Official Gazette:

560.

558.

SCHEDULE

Coral Sanctuary:

The entire Island of Meroe Island (0.51 Sq.Km.) including the surrounding marine area (2.22 Sq.Km.) covering an extent of 2.73 Sq.Km. situated in between latitudes 7°30'32.20" N to 7° 31' 36.0" N and Longitudes 93° 32' 18.50" E and 93° 33' 4.00" E.

Admiral D.K. Joshi, PVSM, AVSM, YSM, NM, VSM (Retd.)
Lieutenant Governor,
Andaman & Nicobar Islands.

By order and in the name of the Lieutenant Governor,

Sd./-
(Pankaj Kumar, IAS)
Secretary (Environment & Forests)

MGPPB—111/Gazette/2022—115 Copies. (DTP-2)

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Published by Authority
सं.110 पोर्ट ब्लेयर, सोमवार, 03 अक्तूबर, 2022
No. 110, Port Blair, Monday, October 03, 2022

अण्डमान तथा निकोबार प्रशासन
ANDAMAN AND NICOBAR ADMINISTRATION
(पर्यावरण एवं वन विभाग)
(DEPARTMENT OF ENVIRONMENT & FORESTS)

NOTIFICATION

Port Blair, dated the 03rd October, 2022.

No.106/2022/F.No.CWLW/WL/243/974.—Whereas, the Andaman and Nicobar Administration by reason of its adequate ecological, faunal, floral, geomorphological, natural and zoological significance considers that the area specified in the Schedule to this Notification needs to be constituted as 'Megapode Sanctuary' for the purpose of protecting, propagating and developing wildlife therein especially Megapode, its habitat and environment.

AND, WHEREAS, in exercise of powers conferred upon him by Sub-section (1) of Section 18 read with Sub-section (29) of Section 2 of the Wildlife (Protection) Act, 1972 (Act 53 of 1972), the Lieutenant Governor, Andaman and Nicobar Islands declared his intention to constitute 'Megapode Sanctuary' vide Notification No. CWLW/WL/243/218 dated 21.04.2022.

AND, WHEREAS, as provided under Section 19 to 26(A) of the Act, the Collector / Deputy Commissioner (Nicobar) has reported that no rights or claims of any person exist in and over the area proposed to be constituted as Wildlife Sanctuary.

NOW, THEREFORE, in exercise of the powers conferred by clause (a) of Sub-section (1) of Section 26-A of the Wildlife (Protection) Act, 1972 (Act 53 of 1972) read with Sub-section (29) of Section 2 thereof, the Lieutenant Governor (Administrator), Andaman and Nicobar Islands is pleased to declare that the aforesaid area, the situation and limits of which are specified in the Schedule given below as a Wildlife Sanctuary for the purpose as aforesaid, from the date of issue of this Notification in the Official Gazette:

SCHEDULE

Megapode Sanctuary :

The entire Island of Menchal Island covering an area of 1.29 Sq.Km. situated in between 93°45'44.5" and 93°46'19" East Longitude and 7°24'11" N and 7°23'38" North Latitude in the Bay of Bengal.

Admiral D.K. Joshi, PVSM, AVSM, YSM, NM, VSM (Retd.)
Lieutenant Governor,
Andaman & Nicobar Islands.

By order and in the name of the Lieutenant Governor,

Sd./-
(Pankaj Kumar, IAS)
Secretary (Environment & Forests)

MGPPB—110/Gazette/2022—115 Copies. (DTP-2)

Annexure R-4

Extract of Chapter 4(A), 4(B), 4(C) and 4(D) of final EIA report.

CHAPTER 4A

4.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 General

The earlier chapters provided project description (Chapter 2) and baseline environment descriptions (Chapter 3) and this chapter describes potential impacts and mitigation measures for the ICTT project. The entire concept from public point of view is simplified and provided as follows:

(A) The project	(B) Baseline Environment	(C) when (A) the project is constructed and operated at (B) ICTT region, the impact on environment
Proposed project as provided in Chapter 2 project Description	Baseline environment as provided in Chapter 3 that includes physical, biological and the socio-economic Environment.	There will be both positive and negative impacts. Potential negative impacts and the possible avoidance of those impacts or to mitigate or minimise or compensate for such impacts are the subject matter of this Chapter 4

All mitigation and avoidance measures are designed or formulated to negate the predicted possible and probable negative impacts and enhance the positive impacts described for all relevant environmental parameters including ecological and physical environmental and social components. During the whole process the nature, type of the predicted potential impacts likely on the physical, biological and social environmental components are assessed to the extent possible. For the assessment of impacts, (primary surveys, secondary surveys, field visits and stakeholder consultations) relating to various environmental components have been utilised.

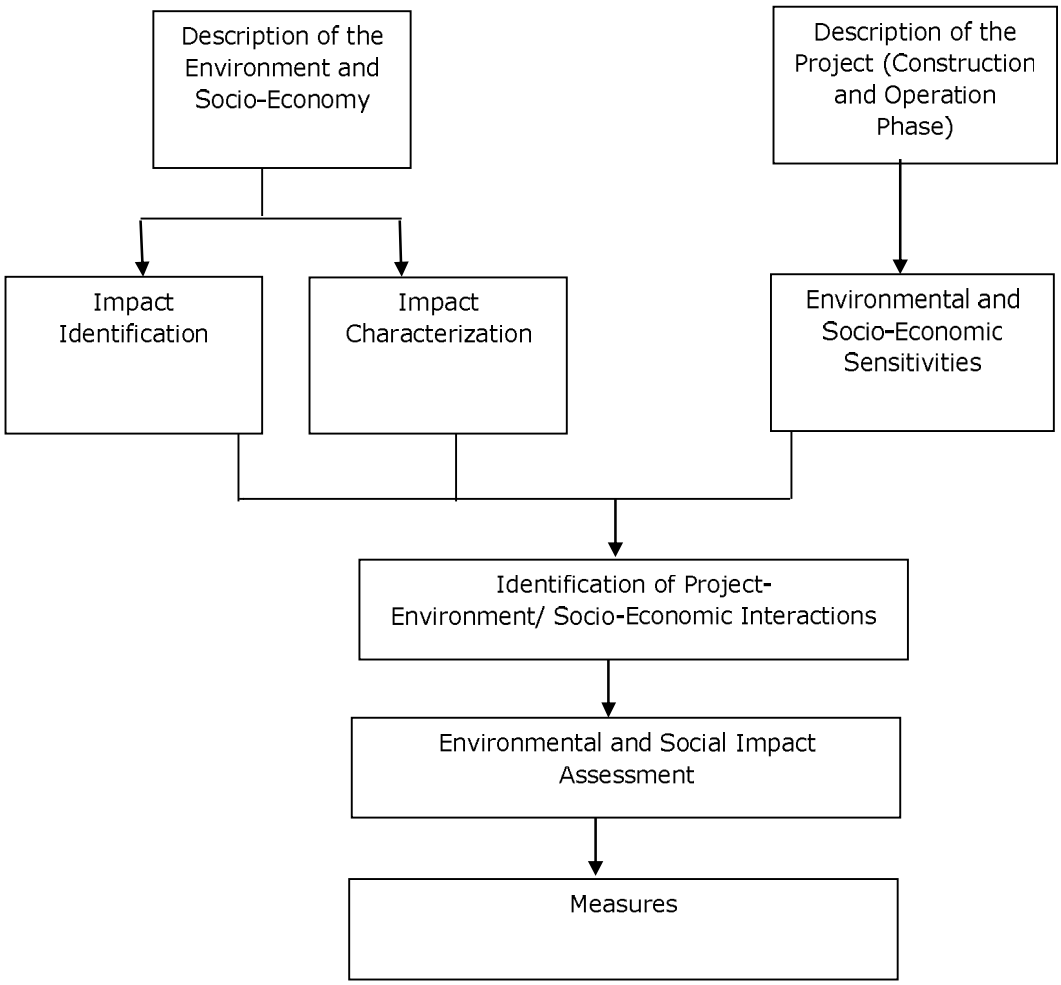
Baseline environment for which impacts have been determined include "avoidance" as the best mitigation measure to avoid all major impacts. All such events have been completely addressed at the design stage itself. Further, in addition to the regulatory mitigation measures, all possible environmental enhancement measures which normally could improve the public perception about the project has also been adopted and provided in the following sections. The methodology adopted for the impact assessment is shown in the **Figure 4.1.** The Environmental Impact Assessment (EIA) was focussed on :

Port construction phase activities including	• Construction of breakwaters and berths • Dredging and reclamation • Dredging (capital) • Reclamation • Disposal of (unusable) dredged material into marine disposal area • Quarrying including transportation of quarry materials • Road connectivity • Port infrastructure • Ancillary facilities (Backup areas/warehouse/PAF) • zone • Labour Camp and labour population influx • Batching Plant • Construction material storage
Port operation and maintenance phase	• Container Terminal • Movement of ships, tugs and port crafts • Road cconnectivity

Project impacts assessed are for:

- Land Environment
- Water Environment
- Marine Environment (Coastal Hydrology/Bottom sediment, Sea/Harbour water quality)
- Air Environment
- Noise pollution
- Biological Environment (Coastal and marine ecology)
- Waste Management
- Socio-economic Environment.

Figure 4.1: Methodology for Environmental Impact Assessment



An Environmental Management Plan (EMP) for anticipated environmental impacts is a key to ensure a sustainable environment during the Project construction, operation phases. The EMP envisages the plans for the proper implementation of mitigation measures to reduce the potential adverse impacts arising out of the project activities. This proposed mitigation framework has been prepared for addressing issues like:

- Pollution control/mitigation measures for abatement for the undesirable impacts caused during the Project construction and operation stages.
- For each of the identified impacts specific mitigation measures have been defined. The general rule in designing such measures is:
- **Avoidance of major impacts:** major impacts are generally considered unacceptable, certainly ones that would endure into the long-term or extend over a large area
- Minimization of impacts and reduction of major and moderate risks to "**As Low as Reasonably Practicable" (ALARP)** by planning, designing and controlling mitigation measures. This implies that technically feasible and cost effective mitigation measures will be applied. The appropriate technologies and measures are established by good international industry practices.
- Where minimization is not possible to compensate or offset residual impacts Implementation of good Contractor practices will be ensured so that such impacts are not neglected, but managed adequately.

Generally, mitigation measures need to be considered in the design of the project through a hierarchy as described in **Table 4.1**. Similar considerations, in the context of ALARP, will apply to the on-going development of mitigation measures during the development of the port and the detailed design.

Table 4.1: Various Impacts Mitigation Strategies applied in this Project

Strategy	Approach and Methodology
Avoid or Reduce at Source	Avoiding or reducing at source is essentially "designing" the project so that a feature causing an impact is designed out (e.g. road re-route) or altered (e.g. reduced working width), often called minimisation. Or Avoid project or a small part of the project or activities
Abate on Site	This involves adding something to the basic design to abate the impact - pollution controls fall within this category, often called „end-of-pipe.
Abate at Receptor	If an impact cannot be abated on-site then measures can be implemented off-site - an

Strategy	Approach and Methodology
	example of this would be to install double-glazed windows to minimize noise impact at a nearby residence.
Prevention	Preventing negative environmental impacts
Preservation	Achieved by extending legal protection from any future actions
Minimisation	Limiting reducing the degree, extent, magnitude or duration of adverse impacts
Rehabilitation	Repairing or enhancing affected resources such as natural habitats, water resources or human habitats
Restoration	Restoring the affected resources to an earlier State, typically back ground or pristine condition
Compensation	Creation, enhancement or protection of the same type of resource at another location to compensate for resources lost to development. Where other mitigation approaches are not possible or fully effective, then compensation, in some measure, for loss, damage and general intrusion might be appropriate. This could be in kind, such as planting new woodland elsewhere to replace what has been lost
Enhancement	Enhancement of Environmental resources as a value addition to the project with minimum cost and better appreciation

Measures have been defined separately for the various project components and for each project phase (construction, operation and maintenance). Mitigation measures for the decommissioning are comparable with those for the construction phase. As the lifetime of the port is in average 75 years, a proper Decommissioning Plan should be drafted according to appropriate principles applicable at that time. This will be the responsibility of Environmental Cell of SPV. The proposed mitigation measures are based on the design (Master Planning, AECOM, April 2021) and will have to be adapted by the design team.

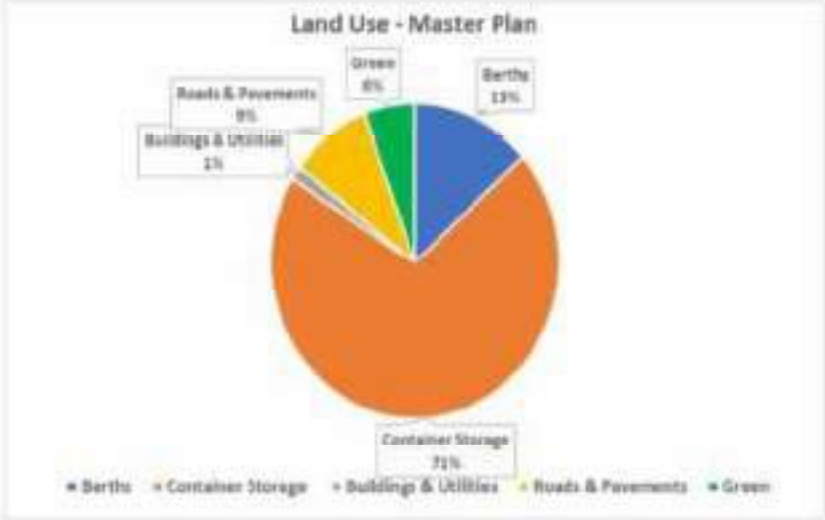
4.2 Land Environment Impact

Impact to Land resources is one of the most potential impacts due to the construction and operation of the port project, development of ancillary sites and the road component.

4.2.1 Potential Impact due to Port Location

4.2.1.1 Impacts due to Land Acquisition

The total project area for port is 966 ha (out of which 739 ha is on land and 227 ha shall be created through reclamation). Out of the total land 228.4ha is Protected forest and 48.5ha is deemed forest land. 1.58 ha land is under revenue (0.54 ha is owned by government and 1.04ha is private land). Only one private plot exists in the proposed location. The total reclaimed land (227 ha) has been redistributed between berths (13%), container storage (71%), building & utilities (1%), road & pavements (9%) & Green areas (6%).



4.2.1.2 Impacts due to Changes in Land Use Pattern

The proposed project facilities berth and harbour area with breakwater will be developed within the offshore. Other infrastructure facilities like Container Storage, Internal Roads, Port & Utility Buildings, parking etc will be developed on the landside adjacent to the reclaimed land of the port. Overall, for the all phases put together, 3.27 km seawater area will be used as port area within the breakwater that will be used for vessels. Most of the land cover of the landside area of the port is covered with *Cyathea Albosetacea* and Orchid's tress which will be retained wherever possible. Nevertheless, few buildings for port operator will be required. The existing land use and the proposed land use are discussed in the **Chapter 3** and **Chapter 2** respectively.

4.2.1.3 Mitigation Measures- Land Use

The land use of the backup areas may not be changed and the facilities and other building will be constructed as per the existing landscape without any major

cutting and filling and hence will not be impacted. The planning will be in accordance with landscape planning concepts to minimise major landscape changes. Land reclamation and change in land use pattern will be limited to the proposed port limits and will be carried out in such a way that to ensure the proper drainage by providing surface drainage systems including storm water network, etc. Based on the peak hour traffic requirements of the ICTT, the road network providing the connection to the airport should have the capacity to cater to the traffic needs and provide accessibility at an uncongested Level of Service (LoS). Thus, keeping that in mind a Right of Way of 45m with a six-lane divided carriageway configuration is the minimum requirement to cater for the traffic requirement. Provision for walk ways is on either side of the carriageway with a footpath width of 3m. A median of 3m is provided which shall also suffice the future land requirements of an elevated Mass transit system if proposed in the center to cater the travel demand of the ICTT.

4.2.1.4 Impacts due to Changes in Coastline/Shoreline

Based on the bathometry, wave current, tide etc, the shoreline change modal has been constructed to understand the change in the shoreline pattern due to the projects and its appurtenances.

The Shoreline changes over the past several years were studies and no changes were observed.

Figure-4.2: Map for Shoreline change Over 35 years

Shoreline changes after the construction of the port were observed in Mathematical model and the following was concluded:

- It is observed that there is no presence of littoral drift system in this morphology.

- The Coastline does not experience erosion due to construction of Port.
- There are negligible changes to the shoreline post construction of Port
- The Shoreline remains stable.

4.2.1.5 Land Reclamation – Impacts

The Backup area will have to be developed by reclamation which will extend up to the intertidal zone. The total reclaimed land (227 Hac) has been redistributed between berths (13%), container storage (71%), building & utilities (1%), road & pavements (9%) & Green areas (6%) .No cutting of hills is required. Minimum Dredging is envisaged. falls partly under ICRZ Zone 1A. Turtle nesting sites are observed at the mouth of Galathea river. Presence of Megapode nesting sites are under investigation. No crocodile nests in the port location. No development will be planned at the location of Turtle and Megapode nesting sites. There will not be any disturbance to Shompen Tribes as the Shompens stay upstream of the Galathea river.

Capital dredging of approximately 17.7 million cum in Final phase & 6.4 million cum in initial Phase will be required. It is estimated that only part of the dredged material will be suitable for reclamation (only 50 %). Land reclamation with capital dredged material is likely to impact the reclamation area/site with the turbid water. Predominantly the port land proposed to be reclaimed is an intertidal zone and seaward which is saline in nature and also low lying area having slope towards sea. In phase I, the dredged material will be used for port reclamation and unusable material, if any, will be disposed off in the designated marine disposal location.

To check the suitability of dredge material for reclamation, detailed study on characteristics of dredge material was studied by a marine borehole study. Analysis was carried out to study the quality of dredge material in terms of toxic metals and in accordance with schedule II of the hazardous waste management rules 2016 as amended.

The side scan record of the survey area, the entire area is indicative of loose to dense sediments and as Silty CLAY/Silty SAND with traces of fine SAND and shell fragments. The high reflectivity area observed is of rugged in nature and may be due to compactness of sediments.

Shallow Geology of the survey area shows three units as follows:

Unit A: Silty CLAY/Silty SAND with traces of fine SAND and shell fragments. The thickness of the layer varies between 1.3m to 6.7m with an average thickness of approximately 5.3m

Unit B: Fine Sandy Clayey SILT/ Silty SAND which is dense to well compacted in nature with intermittent layers of gravels. The thickness of the layer varies between 0.5m to 21.5m with an average thickness of approximately 9.5m.

Unit C: Silty SAND/Clayey SAND with intermittent clay which appears to be consolidated in nature and extends up to depth of penetration (35m to 40m).
Hence based on above analysis, there will not be any impacts due to the dredged material that can be suitably used for reclamation and any excess/unusable material can be safely disposed in appropriately selected offshore location.

4.2.1.6 Land Reclamation - Mitigation Measures

Judicial planning of port facility will be carried out. Reclamation bunds and setting ponds shall be constructed, the dredged material will be pumped into the reclamation area enclosed by reclamation bunds wherein the solids will be allowed to settle and the return water will be directed into sea through appropriate return channel/pipelines after passing through the settling ponds of designed size. The dredge fill will be covered by gravel before hard standing. After completion of the reclamation and hard standing, necessary development shall be carried out. In order to prevent the seepage of return sea water into the groundwater, suitable impervious liners such as LDPE will be provided all along the return water channel if required. Also required retention time of return water in the reclamation area as well as in the return channel will be ensured. The impact due to reclamation activity will not be significant due to location specific (Sea ward side new area) controlled nature of methodology that the Contractor has to follow. In order to study variations in groundwater quality of nearby villages due to reclamation, regular water quality monitoring will be carried out.

4.2.2 Impact During Construction

During construction phase changes in Land use/land cover may arise, Topography changed. Due to construction activity and Soil compaction, consolidation may cause in loss of vegetation and tree cover, soil pollution and even flooding also. These details are discussed in sections below:

4.2.2.1 Impact on Local Infrastructure

During construction phase, significant amount of construction material will be required, particularly quarry stone for the construction of breakwater, bunds, buildings, etc. GNI is a small island with little possibility of development of quarry sites to access the construction material, moreover, provision of setting up quarry within GNI to be avoided. Majority of the construction material like gravels, stones, clay etc will be transported form Indian mainland or from other nearby countries like Indonesia, Malaysia etc depending on availability and market viability. If the quarry sites are in India, it is imperative that these sites be treated/closed/isolated, once the excavation of construction material is completed. The ideal measure for treatment is the refilling of these sites to its original level and their re-vegetation.. For sites of other countries, the quarry rehabilitation practices of those countries will be followed.

The viable option for rock quarrying and transportation which is socially acceptable, environmentally sound and technically feasible is transportation of

rocks to the site through barges. The final selection of quarry will depend on the EPC contractor.

If the material is quarried from India, the norms of the GOI will be followed. The following measures will be implemented to minimize adverse impacts on environment during quarrying:

- Quarrying will be done from approved/legitimate quarries to minimise impacts
- Quarry operations will be restricted to daytime to reduce the impacts from increased noise and will be minimized to reach the threshold levels stipulated by CPCB at the nearest habitations.
- It will be ensured that quarry sites and borrow pits be of a regular shape and if possible, of equal size.
- If possible, their location would be at least 1.6 km away from the nearest habitation
- Runoff water collected in the lowest pits will be drained in to the nearest water body by a drainage system
- Only rocky outcrops will be quarried and quarrying below the general ground level, surrounding the rock will be avoided
- Some localized road improvement measures will need to be undertaken near the quarries and near the project site to enable moving of the large quantity of stones by road using trucks
- Contractors Quarry management plan will be prepared and approved with the help of super vision consultants in place before excavation started

Borrow Areas - impacts & mitigation measures: SPV and EPC Contractor has to ensure that the sourcing of borrow material shall not lead to any potential impact to the local communities and suitable contract clauses should be included in the EPC contract

- Borrow pits would be located along the natural drainage course and not across the natural drainage.

- Borrow pits will be in a series, so that they can be inter-connected leading the collected water to the lowest level of the pit, which will be of sufficient size to hold the discharge from the upstream pits. The bottom of each pit will be gently sloped towards the next pit below in the series and the inter-connections will be done by pipes or open drains filled with broken stone, to prevent scouring of drains.

- Top fertile soil shall not be used for construction material.

Transportation of Construction Material - impacts & mitigation measures: Being an Island, all the construction material will be transported by sea and is unlikely to load the public infrastructure like roads, drainage, water and power supply. Since the roads will not be loaded significantly, any traffic congestion is not envisaged.

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,

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.

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.
- Total number of construction labours are given

Estimated labour requirement		
Phase I	**Phase II**	**Phase III**
2000	1400	1600
Estimated labour + Family + Support requirement		
2800	1960	2240
Water requirement and source (lpcd)		
420000	294000	336000
Quantity of waste generated and fractionation (organic, hazardous, recyclable and biomedical) (Kg/day)		
1000	700	800
Fuel requirement (kg/day)		
675	470	535

- **Water treatment system for the labour colonies: -**In the initial stages of construction, the treated water will be provided through tankers till the proposed trunk infrastructure is laid down in GNI. Compact waste water treatment plant / Septic tank shall be installed within the labour colonies during the initial phase of construction. However, one the infrastructure is ready, the waster will be supplied through the central waste treatment plant.
- All the waste water generated in the labour colonies will be treated before discharge. In the initial stages the wastes from the toilets will be treated through septic tanks. However, once the central treatment plant is ready, all the waste water will be directed to the treatment plant and will recycled. No water is expected to be discharges. However, some makeup might be required for operation of the plant and the quantity will be used for gardening purposes.

- **Municipal waste management system that is Collection, transportation treatment and disposal system for the labour colonies. (Details of MSW system is given in chapter 2C (2.7.4), Township)**

✓ Separate bins will be installed within the labour colonies for dry and wet waste.

✓ It will be contractor's responsibility to collect and transfer the waste to nearest solid waste transfer site
✓ After collection and transfer, solid waste management shall be integrated with overall SWM system of GNI

- ✓ At least 2 Organic Waste Composters of 1-2 T capacity each will be installed in the labour colonies.

Medical facilities for the labours number of dispensaries, hospital and emergency medical centres in case of accidents).

- ✓ Considering the phase wise total labour requirement, local health centre / dispensaries will be planned within the labour colonies. For any treatment required facility above the local health centre; the GNI local facilities shall be utilized.

- ✓ Ambulance facility shall be provided by the contractor all the time at site as well as at labour colonies

- **Medical check and vaccination programmes for prevention of contagious and vector borne diseases.**

- ✓ It will be contractor's responsibility to follow the centre / UT guidelines related to health, disease preventive measures, and vaccination programme. This shall be part of the contract agreement.

- **Mosquito control programmes**

- ✓ It will be contractor's responsibility to have time to time cleaning, fogging, and medication camping.

- **Emergency evacuation plan in case of natural disasters like floods, cyclones and tsunamis and earthquakes and epidemics.**

- ✓ It will be contractor's responsibility to prepare a disaster management plan including evacuation plan for site as well as labour colonies.

With regards to the impacts due to construction worker camps, to ensure there is no strain on the existing infrastructure, the worker camps will be self-sufficient and would not rely on any local resource. This would also ensure that there is no conflict with the local population. To mitigate impacts from health hazards, sanitation self-sufficient infrastructure facilities will be provided. Further, the worker camps will be located away from the coast and habitations.

It is presumed that community kitchen will be formed by the labor contractor where all the labor and their families can take meals. However, some of the labor may like to use separate kitchen for their families. No firewood will be allowed for the purpose of cooking. Gas cylinders will be supplied to the community kitchen and to those who prefer to cook separately. Strict vigilance will be maintained to ensure that no wood is used for cooking.

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

No discharge of wastewater/waste from the ships calling at ICTT port will be permitted into the port area. Facilities for discharge of waste oil will be provided at the port. The ships will have their own sewage reception/treatment facilities on board and hence no discharge of sewage will be done at the port. In addition, the ships are expected to discharge sewage in deep seas as per defined procedures for International ship movements (Ref: MARPOL Convention). This will ensure the ships have their own storage capacities in their on board sewage receptions to handle wastes generated during the period/days the ship is at the port. Ships shall conduct ballast water exchange at least 200 nautical miles from nearest land and in water at least 200 m in depth prior to calling at a port. Where ballast water exchange at 200 nautical miles to nearest land is not possible, exchange should take place at least 50 nautical miles from nearest land and in water at least 200 m in depth. Each ship shall have on board a ballast water record book which may be an electronic recording system. Port officers may inspect the ballast water record book.

4.2.3.2 Impacts due to Changes in Coastline/Shoreline

Coastal structure similar to a groin or a breakwater when introduced into the sea interrupts wave-induced littoral sediment transport in the direction of flow. The obstruction of sediment transport leads to sediment built-up up-drift and erosion down-drift due to deficit in sediment supply due to the obstruction. These aspects are studied individually in the context of proposed developmental activities which is detailed in the following section. The present study aims at the assessment of shoreline evolution during the different phases of port development.

As per the hydrodynamic study, no impact on the shoreline is envisaged till 2052.

4.2.3.3 Shoreline - Mitigation Measures

- Continuous monitoring of shoreline with the help of high resolution satellite imageries during construction and operation phase.
- Strengthening the erosion prone shoreline (if any) just prior to construction phase by latest satellite imagery and then ground truthing on a regular basis with close monitoring and ground markings.

4.3 Water Environment

4.3.1 Potential Impact Due to Port Location

4.3.1.1 Impact on Existing Water Resources

A water demand of 0.4 MLD & 1.7 MLD is estimated in initial phase and final phase respectively. The same will be sourced from the surface water through integrated water supply network proposed for GNI development.

4.3.2 Potential Impact Due to Construction Phase

4.3.2.1 Port development- Impacts on Surface water

A preliminary assessment indicates that daily demand for potable water will be around 0.1 MLD in the construction phase. The surface water and sea water will be the source of water for construction phase.

Few of the main sources of water pollution during construction is associated with litter and construction waste carried by wind, dewatering runoff or periodic rainfall, effluent and fuel through accidental spills, inadequate storage and management, vehicle wash down and overuse of water for site road wetting.

There are a number of activities associated with construction of the proposed project, which could have impacts on surface water:

- Poor control of run-off from site activities leading to siltation and eventual blocking of drains caused by excessive sand and silt in the storm water run-off
- Pollution of surface water caused by improper handling and disposal of other types of construction site wastewater
- Contamination of surface water sources if wastes and wastewater from labour camp not managed properly
- Blockage of outlets (small natural streams) by the reclamation or otherwise by solid structures may lead to ponding in the area behind the actual port. The design should therefore cater for a free flow of the discharge water, even in the wet season
- Water pollution may result from wastewater produced by the quarry activities and by the accidental spillage of fuel, lubricants and other chemicals used in the quarry process.

4.3.2.2 Mitigation Measures

- Project Water Management Plan should be developed in order to secure the project sustainable water balance and in the project region in the construction phase and other artificial water sources in use as of today.
- A surface water monitoring program shall be implemented during the construction phase.
- Effective water conservation measure should be followed.
- Implementation of rain water harvesting/ storm water management in the projection region.
- Providing water & wastewater treatment facilities at construction camp.
- Regular monitoring of surface water for quality and quantity water needs should be limited through recirculation and reuse, implementing closed-circuit systems from sedimentation ponds to the quarrying process.
- Storm water should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge.

4.3.2.3 Port Development- Impacts on Groundwater

The port is located on the edge of the shore and therefore the ground water resources is scanty and may have no relevance. Moreover, in near shore environment the ground water is generally saline due to sea water intrusions and therefore have little relevance to it utility. However, all attempts should be made to conserve the ground water resources without altering the environmental conditions. There are a number of activities associated with construction of the proposed project, which could have an impact on groundwater:

- Spillage or infiltration of oils, fuels and hydraulic fluids from plant maintenance and re-fuelling areas into the soil.
- Blockage of natural drains in the port area will lead to higher groundwater tables and a permanently changed drainage pattern.

4.3.2.4 Mitigation Measures

- Baseline review of the existing groundwater resources and current consumption in the project region.
- A groundwater monitoring program should be implemented during the construction phase.
- In addition, a water quality monitoring programme should be developed.
- There can be rainwater harvesting for meeting/boosting water requirements

4.3.2.5 Port development- Impact on Marine water quality

Port Development - Impact due to Stagnation of Wastewater in Harbour

The construction of marine structures such as breakwaters will change the current patterns and results in tranquil conditions suitable for the operation of the port. The natural flushing of the water due to high and low tides will be affected due to the construction of berths and the breakwater. In case, the untreated wastewater from the domestic/industrial activities in the vicinity of the port flows into the harbour, it can result in stagnation of water. This condition may deteriorate Harbour water quality significantly through increase of phytoplankton and a decrease of dissolved oxygen, caused by effluents containing nutrient salts (chemical compounds including N and P). Anaerobic water leads to the generation of hydrogen sulphide (H2S).

Mitigation Measures

- The wastewater and sewage generated during construction at site and at labour camp will be disposed of into septic tank, in the initial stage of construction, However, when the central treatment plant is ready, all the sewage should be connected to the treatment plant though pipes

- Surface run-off from the construction site should be discharged via sand/silt removal facilities such as sand or silt traps and sediment basins. Channels, earth bunds, or sandbag barriers should be provided on site to direct storm water to such silt removal facilities.

- Special provision will be made to select Contractor with proven track record in implementation of EMP. Provision for a contractor's waste water management plan will be incorporated in the contractors EMP.

4.3.2.6 Port Development - Impact due to Land Reclamation/Wastewater Generation

Generally, reclamation of low lying areas with capital dredged material is likely to affect groundwater quality due to intrusion of sea water. The proposed port is predominantly to be developed on reclaimed land and land side land and is separated from any crop land. The slope of port site is towards the sea and chances of intruding sea water into groundwater are envisaged to be negligible. Hence, no significant impacts are anticipated due to land reclamation on groundwater.

Construction phase Mitigation Measures

- Return seawater quality from the reclaimed area shall be monitored during reclamation phase.
- An adequate drainage system will be provided at the site with separate collection streams to segregate the storm run-off from roads, open areas, material storage areas, vehicle wash water and other wastewater streams.
- No construction during rainy days or extreme climatic conditions. Suitable measures will also be taken to prevent the washing away of construction materials into the drainage system.
- Contaminated storm water will be collected and conveyed to sedimentation tank for removing grit.

4.3.3 Potential Impact During Operation Phase

4.3.3.1 Impact on Water Quality Marine Side due to Cargo Operations

Since the proposed port is International Container Transhipment Terminal (ICTT) , there will be no dusty cargo, dry bulk cargo such as coal, iron ore or hazardous cargo, etc. will be handled at port. Hence, direct impact on water with cargo handling will be insignificant. Marine water may get polluted as a result of releases of contaminants, if any into the marine system including.The leakage/ spill of oil in port and its surrounded area will impact water quality.

Water Quality - Mitigation Measures

This section deals with water quality impacts

- Streams in port area which are connecting sea will be treated in upstream side of the stream. Treated water will be discharged into sea water after meeting marine discharge standards prescribed by regulatory agencies.
- Port operators should prepare a Spill prevention, control, and counter measure plan consistent with the IMO Manual on Oil Pollution Section II – Contingency Planning.
- All ship related waste with a potential to cause pollution to the marine environment should be disposed of according to the guidelines stipulated by the MARPOL Convention.
- Port authorities will apply appropriate procedures, in agreement with National and international regulations, for the handling and storage of hazardous cargoes and waste generated by handling and storage of this type of cargoes.
- Ships used for the project should be registered with Lloyds or a similar shipping register and comply with all international maritime conventions such as MARPOL.
- Good operational practices such as good positioning and protection of (fuel) stores, use of drip trays, proper maintenance of plant and equipment.
- Careful storage and usage of fuels, oils (and chemicals if any).
- Consider whether fuel storage is needed on-site, how much is to be stored and how.
- Check whether sub-contractors have adequate fuel storage facilities.
- Fuel and oil stores must be located away from the site drainage system and the shoreline. If this is not possible, ensure adequate measures are identified to prevent or contain any spillage (e.g., blocking drainage points).
- Oil and chemical-handling facilities will be located with consideration of natural drainage systems and environmentally-sensitive areas
- Hazardous materials storage and handling facilities will be constructed away from active traffic and protect storage areas from vehicle accidents
- Fuel dispensing equipment will be equipped with breakaway
- Hose connections that provide emergency shutdown of flow should the fuelling connection be broken by movement.
- All ancillary equipment (e.g., valves, hoses) should be contained securely within the bund when not in use
- Ensure that tanks are correctly marked/labelled as to their contents and capacities
- Keep a store of spill response equipment at the fuel facility and bowsers
- Standard operating procedures that reduce or eliminate the chance of a spill, even in the case of equipment failure.
- Routine maintenance and testing schedules should be determined for all aspects of port operation particular attention paid to product storage and handling, and fuel transfer systems.
- General awareness of all workers should be increased through training and safety meetings with focus of Environmental Management systems and practices with **"Zero Waste Tolerance"** planned with an objective to achieve as much as we can.
- Port operator should be required to develop system for holding and collecting storm water runoff and surface runoff produced by site activities and its treatment before discharge.

- Waste water should be treated up to the standards for discharge (Prevention and Control of Pollution) Act 1974).

4.4 Marine Environment -Sediment Transport

4.4.1 Potential Impact Due to Port Location

4.4.1.1 Sediment Transport

Sediment transport is the movement of solid particles (sediment), typically due to a combination of the force of gravity acting on the sediment, and the movement of the fluid in which the sediment is entrained. In marine environment, it is a complex coastal process that results from the combination of interaction within the waves, current and wind. The sediment particles are transported by currents (tide driven, wave driven or wind driven), wave motions and combinations of the two. Waves, due to their orbital velocity, keep the coastal sediment in suspension, which are then transported by tidal flow or coastal currents. This results in erosion or accretion of sediments and subsequent modification of the morphology till equilibrium is reached between various acting forces. Any modification to this equilibrium in the form of new developments in the coastal zone could lead to changes to the seabed and coastal morphology. In order to investigate the fate of suspended sediment in coastal and estuarine waters, sediment dynamics need to be studied thoroughly. It is a widely accepted practice to use numerical modelling tools to predict the sediment transport patterns and to assess its impacts like the amount of annual maintenance dredging or the behaviour of shoreline, etc.

The aim of this study is to assess the effect on sediment transport due to the proposed port. The sediment transport in the vicinity of the project site is expected to be influenced by tide driven, wind driven and wave driven currents. A thorough assessment of hydrodynamics has been done to evaluate the effect of the port development on the prevailing currents. The result of the hydrodynamic model is used for the assessment of the variation in the sediment transport due to the development of various stages of port.

Sediment Transport Model Setup

From the analysis of deep-water waves, 13 wave events were identified. The sediment transport simulations were done for these events separately. The results were then combined to obtain the annual sedimentation in the region by accounting the probability of occurrence of each wave event.

The domain and bathymetry for the sediment transport model is taken same as that of hydrodynamic model. The formulation of Souls by and Van Rijn for bed load and suspended sediment transport was used to calculate the sediment transport rates. The parameters like relative density of sediment, critical Shields parameter, sediment grain size and grading were specified in the input file. Simulations are done for the existing condition and with layouts of various phases of proposed port to estimate the variation in sedimentation pattern and

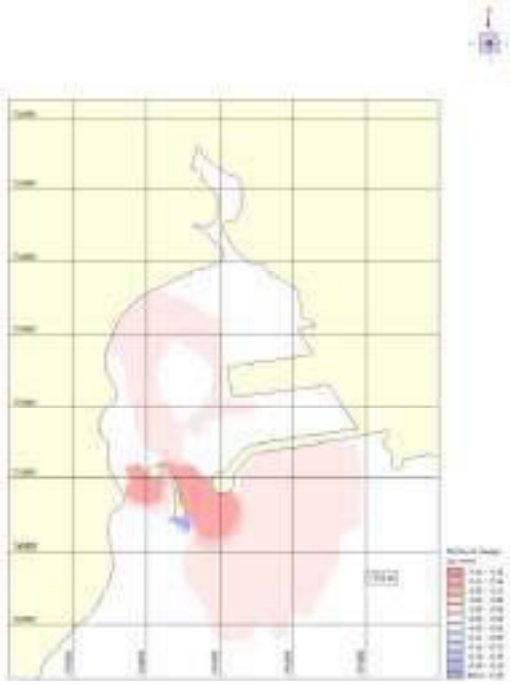
maintenance dredge quantity in the fishing harbour and proposed port due to the construction of the breakwater of proposed port. The results obtained from these simulations were analysed and are discussed in the following sections.

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



4.4.2 Marine Side Potential Impact Due to Construction

Developmental activities such as capital dredging, dredged material disposal and construction of approach channel and cargo berths will result in disturbance to marine environment. During these activities, particularly dredging, localised and short term impacts on marine water quality are likely to occur due to increased turbidity from suspended sediment. Further, marine sediment quality indicates that it is free from any significant pollution.

As per the preliminary dredging and reclamation quantity estimates for phase-I development, it is expected to have a dredging-reclamation sand balance (i.e. sand required for reclamation purpose to be procured from dredging activity itself). In case of disposal of unusable dredge material, a dredge disposal site would be needed to dump the excess/unusable dredged material with least impact on the environment. So, the dredged material disposal site study has been performed by (Indomer Coastal Hydraulics (P) Ltd) and its results are given in Mathematical Model Study Report, July 2021. Particle Analysis (PA) module of MIKE was used to assess the fate of dredged material after disposal.

4.4.2.1 Impact due to Capital Dredging and Disposal of Dredged Material

The estimates of the various dredging and reclamation areas for the proposed port are based on the navigational requirements. **Table 4.2** provides the various dredge depths and the calculated dredging volumes.

Table 4.2: Dredge Areas for the ICTT

Sr. No.	Dredge Area		Dredge Depth in meters with respect to CD	Dredge Volume (m3)
1	Approach Channel	Outer channel	-19.8 m CD	-
		Inner channel	-	-
2	Turning Circle		-19.0 m CD	2.03
3	Berths Pockets		-18.2 m CD	1.79
4	Maneuvering area		-19.0 m CD	13.87

4.4.2.2 Dredged Levels

The structural design of the berths shall be carried out for the design dredged level in the ultimate stage based on the design vessel sizes to be handled at these berths:

Table 4.3: Design Ships and Dredged Levels at Berths

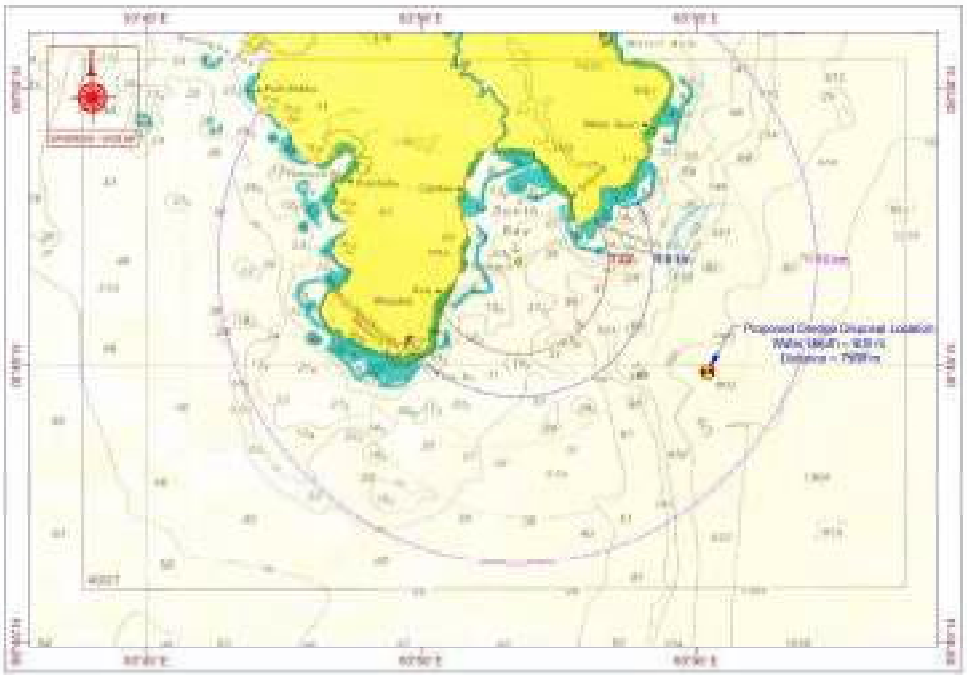
Sr. No.	Vessel Type	Design Vessel Size	Design Vessel Dimensions (m)			Minimum Designed Dredged Level at Berth
			LOA	Beam	Loaded Draft	m with respect to CD
1	Container Vessel	19,650 TEU	398	61.5	16.6	-19.0

4.4.2.3 Criteria for Selection of Dredge Disposal Location

As per the recommendations of ZSI, the dredged material will have to be disposed at the depth of 200m. In GNI area, the continental shelf in the area is very short and gives way to continental slope within a short distance. The purpose of recommendation of ZSI to dispose the dredged material at 200m depth is due to the fact that coral and benthic life is low in such depth as there is limited penetration of sunlight.

As per the plan, the dredged material will be disposed in the SE area of the GNI peninsula at a depth of about 600m. The model result shows that the sediment plum will disperse within a short distance and therefore not going to have any significant impact in an area where the sunlight penetration is practically nil and the marine life is rare. Very few marine flora and fauna is reported at a depth of 600m at a distance of 7500m from the nearest shoreline. Refer figure below:

Figure-4.4: Proposed disposal location



4.4.3 Potential Impact on Existing Fishing

The Galathea area has an estuarine environment due to the discharge of fresh water from the Galathea river. However, no fishing goes on in the estuary as there are no fishermen nearby and there are no consumers. The Shompens do undertake near shore fishing but their fishing activity is restricted near the Casuarina Bay area which is near to their habitation. No fishing activity will therefore be affected due to the location of the port at Galathea Bay area.

4.4.3.1 Dredging Impact on Marine Ecology

Capital dredging and construction of approach channel, breakwaters and cargo berths will result in disturbance to marine ecology.

Turbulence – Changes in Dissolved Oxygen (DO) Levels: During dredging, oxygen-demanding compounds, nutrients and sediments from the sea bed enter into water column. Since concentrations of oxygen-demanding compounds are normally much higher in pore water than in water column it will cause a drop (depletion) in oxygen concentration. Nutrients may stimulate primary production when light and temperatures are sufficient and may cause eutrophication problems when released in favourable conditions. DO levels in bottom sediments, which are usually low, would increase during dredging period. Changes in DO levels and noise are likely to result in localised and short-term impacts on marine ecology.

Removal of Benthic Communities associated with Bottom Sediments: Dredging would result in removal of benthic communities associated with bottom sediments. During dredging, sessile forms are removed along with sediments and mobile species tend to move away and are likely to increase species diversity in areas adjoining dredging site. Further, it is observed that due to movement of mobile species and transfer of nutrients during dredging, there will be an increase in species diversity and density in areas adjoining dredging site.

Mitigation Measures: To mitigate impacts on marine ecology, measures such as selection of equipment and dredgers, environmental monitoring and regulating activities based on monitoring results will be adopted.

Smothering Effect Due to Settling of Sediment: Settlement of the suspended sediments can result in the smothering or blanketing of sub-tidal communities and / or adjacent inter-tidal communities. Presently, the marine biota in Indian Coast is already subjected to considerable changes in turbidity due to large-scale littoral movement, which is a recurring regular natural phenomenon. Therefore, it would be able to withstand localised turbidity induced during the dredging.

4.4.3.2 Changes in Seabed Profile

Generally construction of marine structures may alter the seabed profile. In the proposed development, marine structures include cargo berths, breakwaters etc. which in turn involve lowering of piles into the seabed. The changes in the seabed could be in terms of disturbance to the strata and localised sediment dispersion. The dispersed sediment tends to increase the turbidity of the seawater resulting in an impact on the food chain of the marine biota. The details of littoral drift and sediment transport which leads to changes in seabed profile are discussed.

4.4.3.3 Mitigation Measures

No discharge from the dredgers or work boats shall be allowed into marine waters. The dredging activity will be confined within the project site and the impact due to dredging will cease upon completion. The impact due to dredging can be minimised with the implementation of a dredge management programme. Prior to commencement of dredging with the help of supervision of Consultants, a Contractors Dredge Management Plan will be prepared and implemented, which will include the following details.

- A schedule for dredging shall be prepared and list of DO(s) and DO NOT(s) shall be circulated among the people involved in construction activities
- It is proposed to check turbidity levels with baseline turbidity levels as a reference during dredging
- Less intrusive dredging techniques shall be adopted to minimise turbidity
- It will be ensured that suitable dredging equipment is deployed to minimise the suspension of fine sediments at the dredge site
- Dredging activity will be regulated during rough sea conditions

- It will be ensured that barges/workboats have slop tanks for collection of liquid/solid waste generated on board. Discharge of wastes into sea will be prohibited.
- Spill control measures will be adopted while fuelling dredgers, barges, workboats, etc.
- Post dredging monitoring program will be carried out to assess effect of dredging and disposal on marine ecology
- Environmental Monitoring Programme comprising of monitoring of marine water quality, marine sediment quality and marine ecology will be initiated one week prior to commencement of dredging and will be carried out throughout dredging period
- Dredging and dredged material disposal will be monitored for compliance with proposed mitigation measures
- Galathea River mouth needs to be periodically dredged to keep the riven mouth open all the time to maintain the estuarine characteristics of the Galathea bay.
- The grain size of the sediments should be monitored on half yearly basis

4.4.4 Potential Impact During Operation

4.4.4.1 Impact on Marine Water Quality and Ecology in Basin

Due to Aqueous Discharges: During the operation phase there will be continuous movement of cargo vessels and port crafts round the clock. There is a possibility of aqueous discharges from the cargo vessels such as dumping of ship wastes (sullage)/sewage, bilge water, solid wastes, etc. if not regulated.

Ships/vessels calling at ICTT port will not be permitted to dump the wastes /bilge water during the berthing period. However, during emergency, sufficient reception facilities will be provided to receive the residues and oily mixtures generated from ship operations according to provisions of the International Convention for the Prevention of Pollution from Ships, 1973/78 (MARPOL). In addition, reception facilities for garbage, waste oil and bilge water from the ships shall also be provided. The bilge water will be collected by authorised waste recyclers and taken for further treatment.

In addition, land-based sources of pollution such as runoff from the cargo berths, waste water, sewage and effluents from the port operations would also affect the marine water and sediment qualities in the harbour basin, if disposed without proper treatment. To avoid impacts on the marine water quality it is proposed to prevent discharges from certain areas and regulate the discharges from other areas. Accordingly, storm water runoff will be directed into open concrete lined channels. The runoff from uncontaminated areas will be discharged directly into the sea. The runoff from berths and cargo storage areas will be intercepted and directed to collection ponds where the water quality will be tested and then discharged in to the sea if the water quality meets the marine water discharge standards. Only increase in oil and grease content may be expected in the water from this area. Hence, the oil and grease content exceeds marine discharge

standards (10 mg/l), it will be routed through Oil- Water Separator to bring down the Oil and Grease content.

Due to Cargo Spills during Handling: Spills are not anticipated to occur during normal operations, as the cargo will be handled by specialised ship-loaders/un loaders. In the event of accidental spills of cargo during transfer from / to the ships, the marine water quality, sediment quality and ecology in the harbour basin will be impacted.

Due to Oil Spills during Fuelling: Oil spills are not anticipated to occur during normal operations. In the event of accidental oil spills during fuelling of port crafts and accidental spillage of oil from ships visiting the port, the marine water quality in the harbour basin will be impacted. To minimise the impacts on marine water quality, the spills will be recovered.

4.4.4.2 Mitigation Measures

- Ships visiting the port will comply with MARPOL convention and avoid discharges into the harbour basin.
- To provide waste reception facilities at port in emergency, standard format of the advance notification form for waste delivery to port reception facilities and standard format for the waste delivery receipt following a ship's use of port reception facilities as recommended by Marine Environment Protection Committee, IMO will be maintained.
- Collection ponds will be provided for containment/treatment of runoff from cargo storage areas and other areas liable for oil & grease pollution. When the oil and grease content exceeds marine discharge standards (10mg/l), it will be routed through Oil- Water Separator to bring down the Oil and Grease content.
- It will be ensured that the dumping of the maintenance dredge spoil would be uniform.
- Along with the operational phase environmental monitoring, an additional Environmental Monitoring Programme comprising of monitoring of marine water quality, marine sediment quality and marine ecology will be initiated one week prior to commencement of maintenance dredging and will be carried out during the dredging period.
- In case of any cargo spillage during transfer from/to ships, it will be attempted to recover the spill
- Oil spill4.4 control equipment such as booms / barriers will be provided for containment and skimmers will be provided for recovery.
- As the accidental spills will be in harboured waters, it would not spread spatially and the response time for shutting down the fuelling, containment and recovery will be quicker.

4.5 Ecological Environment (Terrestrial and Marine Ecology)

4.5.1 Potential Impact Due to Port Location

4.5.1.1 Impact on Mangroves and other sensitive Ecosystems

The total project area for port is 966 ha (out of which 739 ha is on land and 227 ha shall be created through reclamation). Out of the total land 228.4ha is Protected forest and 48.5ha is deemed forest land. 1.58ha land is under revenue (0.54ha is owned by government and 1.04ha is private land). A part of the coast does have mangroves and its associated species. Therefor the mangroves on the eastern flank of the Galthea Bay will be affected due to the construction of the berths. However, on the western flanks since no activities has been envisaged, the mangroves will not be affected.

The International transhipment route is 40 km away. ZSI data suggest that the Galathea Bay is devoid of any coral reefs. However, there are reefs away from the bay area. Forest department has also planted casuarina trees on both the eastern and western flank of the Galathea bay. There are no national parks/sanctuaries/biosphere reserves in the proposed site.

4.5.2 Potential Impact Due to Construction

4.5.2.1 Impact due to Capital Dredging and Disposal

Capital dredging is required to create inner navigation channel, outer navigation channel, turning circle and berthing areas which may cause temporary disturbance to biological environment. Dredging removes bottom biota and dumping of dredged material covers bottom habitat. Piles, rubble mounds and concrete surfaces will form new habitat. During the construction phase there will be impact on fishing activity/ fisheries in the project region.

Marine water quality will be impacted due to dredging and disposal and also during construction of breakwaters and cargo berths during construction phase. Direct impact of these activities on marine water quality would be an increased turbidity due to suspended sediment and will be predominant during dredging.

Turbidity due to dredging operation varies with depth and lateral distance from the dredger location. During dredging, transport of sediment depends on velocity and fine material concentration. Very fine cohesive material will remain in suspension for a long time and is independent of hydrodynamic conditions. Due to above factors, there will be an increase in turbidity due to suspended sediment in water column. Thus, it can be inferred that dredging can cause a short-term and localised impact on marine water quality.

Apart from turbidity, the marine water quality could be affected due to aqueous discharge (oily wastes, sanitary wastes, etc.) from the dredgers, barges and workboats involved in the activities.

4.5.2.2 Mitigation Measures

- Appropriate selection of equipment for pile driving and dredging
- Providing silt screen to avoid movement suspended solid for a longer distance
- Uniform disposal of dredged material at identified disposal location
- A well planned implementation programme based on contractors dredge management plan

4.5.2.3 Impact on Ecology due to Reclamation

The total project area for port is 966 ha (out of which 739 ha is on land and 227 ha shall be created through reclamation). Out of the total land 228.4ha is Protected forest and 48.5ha is deemed forest land. 1.58ha land is under revenue (0.54 is owned by government and 1.04ha is private land). For this reclamation area, about 9 MCM dredge material will be used out of total dredging of 17.69 Mcum. Total quantity of Reclamation 33 Mcum.

Currently the bay mouth is about 3.8 km north from the proposed construction area. Due to the construction of the Berths which will be on the reclaimed land, the bay mouth will reduce substantially. This might hinder the entry of the turtles in the area for breeding. The turtles will have a smaller approach path to the western flank of the beach. The experience of ZSI in Dharma and Paradeep port suggests that port activities often do not affect the nesting of turtles. However, as per ZSI recommendation off shore construction activity may be halted to possible extent between November to February, which is the breeding season for the turtles. Off shore Construction during the night time also may be restricted.

4.5.2.4 Mitigation Measures during Reclamation

While reclaiming the area, bunds will be provided with a suitable overflow facilities so that only clear water will be returned to the sea. Ecology in the vicinity of the port is not anticipated to be disturbed during reclamation. The Chapter 10 EMP provides the detailed methodology of actual implementation of dredging and reclamation (Dredge & reclamation Management Plan) without impacting the nearby waters.

As per ZSI, artificial illumination on the beach can affect the sea turtle nesting and hatchlings. Using a smaller number or lower intensity 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 ordinary lights. Wherever possible, use sodium vapour lamps or other light sources with lower intensity. There are sea turtle friendly lights developed and available which can be installed on the beaches during construction.

4.5.3 Potential Impact Due to Port Operation

4.5.3.1 Impact due to Aqueous Discharges and Mitigation Measures

During the operation phase there will be movement of cargo vessels and port crafts round the clock. There is a possibility of aqueous discharges from the cargo vessels such as dumping of ship wastes (sullage)/sewage, bilge water, solid wastes, etc. if not regulated. It will affect on marine life & production due to mixing of oil & grease, heavy metal, Pesticide, nutrients in sea.

4.5.3.2 Mitigation Measures

Sewage/ effluent coming out from port premises and surrounding areas and joining the should be treated through integrated waste water management system proposed for GNI development.

4.5.3.3 Potential Impact due to Cargo Operations

Due to Cargo Spills during Handling: Spills are not envisaged to occur during normal operations, as the cargo will be handled by specialised loaders/unloaders, mutli-purpose cranes, etc. In the event of accidental spills of cargo during transfer from/to the ships, the marine water quality, sediment quality and ecology in the harbour basin can be impacted.

Lighting during the operation needs to follow the ZSI recommendations. 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 ordinary lights. Where possible, use sodium vapor lamps or other light sources.

4.5.3.4 Potential beneficial Impact during port operation

The break water structure could provide a good anchor for the benthic habitat. It has been experienced in many ports in India and elsewhere that the breakwater structure develops its own ecology especially on the calmer side. Due to less effect of current and tides and calmer environment, large amount of benthic flora and fauna grows along the slope of the break water structure. However, such development is site specific and further monitoring will have to be undertaken throughout the project cycle to document the beneficial impact.

4.5.3.5 Mitigation Measures

Spill contingency plan as a part of Disaster Management Plan will be prepared in accordance to the cargo to be handled Spill recovery/immediate response measures will be displayed at cargo handling areas, Material Safety Data Sheet (MSDS) of cargo (if applicable) being handled will be displayed. Mock drills will be conducted at periodic intervals.

4.6 AIR ENVIRONMENT

4.6.1 Potential Impact During Construction

4.6.1.1 Impact due to Transportation of Construction and Cargo Material

Some of the project activities (site clearance, dredging and reclamation, construction of breakwaters, construction of port infrastructure, traffic during construction and use of heavy machinery construction of road) will generate air pollutants like NO_2, SO_2, HC, CO, PM, VOCs, etc. This has the potential to cause temporary impacts on the air quality.

The baseline concentrations of Particulate Matter (PM_{10} and $PM_{2.5}$), SO_2, NO_2 and CO are within the limits of NAAQS stipulated by MoEF/CPCB. With the present background concentrations of air quality parameters, it is expected that there will only be a mild build-up of air pollutants. Further, because of the prevailing strong winds along the coastal region and the resulting dispersion the impact on air quality from pollutants would be reduced. Towards land ward side all is green with complete coverage of trees (green barrier) will also nullify any air pollution impacts. In addition, adoption of suitable mitigation measures will ensure that these impacts are rendered insignificant.

Mitigation Measures during construction

The following measures could mitigate the anticipated negative impacts on the ambient air quality

- To reduce the impact on air quality, quarry material is planned to transport from respective quarries from nearby harbours to ICTT port. This material transportation through sea will reduce dust as well gaseous emissions drastically.

- Transportation vehicles to be properly and timely maintained and serviced regularly to control the emission of air pollutants in order to maintain the emissions of NO_X and SO_X within the limits established by international regulations;

- All static and mobile diesel generator sets should be used only during power cuts;
- Use of good quality fuel and lubricants will be promoted. Moreover, low sulphur content diesel shall be used as fuel for generator sets to control emission of SO2;

- Generators, machineries and vehicles are to be serviced and maintained regularly to avoid generation of dust and other air pollutants;

- Regular verification of PUC certificates of all the vehicles entering into the port area;

- Vehicles older than 15 years will not allowed to operate during construction phase
- Storage facilities shall be equipped with leak detection systems.
- Include vegetation screens alongside the port access roads and apply of speed restrictions in order to the dispersion of pollutants from roads
- Minimize idling time for vehicles
- Water sprinkling will be carried out to suppress fugitive dust during earthworks and along unpaved sections of access roads.
- Environmental awareness program/training will be organised to the personnel involved in developmental works
- Adequately sized construction yard will be provided at the site for storage of construction materials, equipment tools, earthmoving equipment, etc. In addition, temporary field offices and worker amenities will be provided at site. Appropriate spill control measures and labelling / handling procedures will be maintained.

4.6.1.2 Impact due to Quarrying

4.6.2 Potential Impact Due to Operation

Operation of the port (container terminal) does not include bulk or uncovered materials exported from or imported to the terminal or stored on site. The sources of air pollutants from port operations include combustion emissions from ships" propulsion and auxiliary engines and boilers, mainly consisting of sulphur dioxide (SO_2), nitrogen oxides (NO_X), greenhouse gases (e.g. carbon dioxide [CO_2] and carbon monoxide [CO]), fine particulate matter [PM], and volatile organic compounds [VOC]), followed by combustion source emissions from vehicles, port equipment and land-based engines and boilers contributing similar pollutants. Volatile organic compounds (VOC) may also be emitted fuel storage and transfer.

However increased traffic on the access road has the potential to cause an impact on the air quality experienced by the residents along the access road; specifically an increase in pollutants such as oxides of nitrogen and particulates. Concentrations of primary pollutants generated by road traffic decrease exponentially with increasing distance from the road. This means that 50 m from the road centre the concentrations of carbon monoxide, oxides of nitrogen, particulates and non-methane hydrocarbons (benzene and related compounds) are considerably less than half the levels at the central median.

Currently there are practically no traffic accidents in GNI. Due to increase in road traffic, the number of accident case might increase unless adequate road safety measures are adopted.

During the operation phase, there could be unauthorised cluster settlements around the port. These settlements generally do not have adequate infrastructure facilities and therefore unhealthy such settlements have grown around many of the ports in the mainland.

4.6.2.1 Mitigation Measures

Operation of the port (container terminal) itself is not anticipated to result in any significant air quality impacts.

The following measures could mitigate the anticipated negative impacts on the ambient air quality during O&M phase.

- Project will implement "Cold ironing" to reduce pollution and also to reduce the diesel generated power consumption from the ship. Cold Ironing is basically using electrical supply from the port main to the ship for all purposes for the entire period of stay in the ICTT port. Transportation vehicles to be properly and timely maintained and serviced regularly to control the emission of air pollutants in order to maintain the emissions of PM, CO, NOx and SOx within the limits established by international regulations.
- All static and mobile diesel generator sets to be used only during power cut;
- Use of good quality fuel and lubricants to be promoted. Moreover, low sulphur content diesel to be used as fuel for generator sets to control emission of SO2.
- Generators, machineries and vehicles are to be serviced and maintained regularly to avoid generation of dust and other air pollutants.
- Regular verification of PUC certificates of all the vehicles entering into the port area.
- Developing air quality management procedures for ship operators, such as navigation of port access areas at partial power, achieving full power only after leaving the port area, limiting the practice of blowing soot from tubes or flues on steam boilers.
- Include vegetation screens alongside the port access roads and apply of speed restrictions in order to the dispersion of pollutants from roads.
- No unauthorised habitation clusters should be allowed to develop. Proper masterplan has to be developed during the post operation stage with emphasis on encroachment management system.
- If the annual nitrogen dioxide concentrations (expected outcome of the air quality modelling) exceed internationally accepted standards for protection of human health port operator have to consider resettlement of the residents living adjacent to the port access road.
- Although entire land area of port side is a green belt wherever possible thick greenbelt in port and its associated facilities will be provided.
- Proper road safety measures need to be notified and implemented.

4.6.2.2 Impact due to Ship Emissions

During the operational phase, there will be an increase in the movement of traffic and hence, emissions from the moving vehicles will also increase. The exhaust from the DG set at the port, the tugs, launches, diesel operated small boats, dredgers etc will enhance a pollution load during operational phase. With the increase in the number of ships and boats, their operation and movement of cargo to and fro will also increase. These activities will increase the pollution load in the atmosphere. The Annex VI of MARPOL Convention deals with the "Regulations for the Prevention of Air Pollution from Ships". It sets limits on NO_x and SO_x emissions from ship exhausts, and prohibits deliberate emissions of ozone depleting substances. It also prohibits the incineration on board ships of certain products, such as contaminated packaging materials and polychlorinated biphenyls (PCBs). The vessels are required to comply with the regulations and should have the "International Air Pollution Prevention Certificate". ICTT port will take all appropriate measures to comply exhaust emission from vessels in accordance with MARPOL regulations and Euro Emission standard norms so as to reduce pollution load in the air environment.

Mitigation Measures

- Ambient air quality monitoring will be carried out regularly at selected locations in the predicted maximum impact zone in order to check and compare the predicted concentrations with the measured concentrations.
- Although Natural green belt exist, the Greenbelt of adequate width will be developed in all possible areas including Cargo storage areas and long the boundary of project area to minimise the likely impacts due to air pollution.

Air Pollution Modeling

As the proposed project site is located in coastal environment, air dispersion modeling studies were conducted using CALPUFF model. CALPUFF is an advanced, integrated multi-layer, multi-species non-steady-state puff dispersion model that simulates the effects of time and space varying meteorological conditions on pollution transport, transformation and removal. CALPUFF can be applied on scales of tens to hundreds of kilometers. This model has been adopted by the United States Environmental Protection Agency (EPA) in its Guideline on Air Quality Models as a preferred model for assessing long range transport of pollutants.

➢ **Model Set-up and Scenarios**

In Calpuff, the modeling domain has set-up by 25 X 25 km horizontal grid with each grid cell spacing of 4 X 4 km to provide adequate resolution of terrain features. Calpuff has run with 10 different layer options with default cell face heights.

- ***Dispersion Model Input Data***

The specific types of emission sources considered during the operational phase of the port are given in **Mitigation Measures**

- Ambient air quality monitoring will be carried out regularly at selected locations in the predicted maximum impact zone in order to check and compare the predicted concentrations with the measured concentrations.
- Although Natural green belt exist, the Greenbelt of adequate width will be developed in all possible areas including Cargo storage areas and long the boundary of project area to minimise the likely impacts due to air pollution.

Air emissions are generated from the operation of proposed DG sets used as the standby electricity source in the case of power supply failure. The total power required for the entire port will be 2x1000 KVA. Though the backup DG sets operate only in case of power interruptions, continuous run of all DG sets for peak hour has been assumed to obtain maximum GLCs for the study period to estimate a worst-case scenario. The emission characteristics of proposed DG sets are given in **Table-4.5.**

Table-4.4: Details of Stack Emissions

Sr. No.	Parameters	DG Sets
1	No. of DG Sets	2
2	Stack Height (m)	45 m each
3	Stack Diameter (m)	0.5 each
4	Exit velocity (m/s)	8.0 – 13.5
5	Exit temperature (°C)	250°C - 275°C
6	Flow rate (Nm^3/s)	800 Nm^3/hr – 900 Nm^3/hr
7	Fuel used	Ultra-Pure Low Sulfur Content Diesel
8	Particulate Matter (PM_{10})	35 - 37.5 mg/Nm^3
		0.0077 - 0.0094 g/s
9	Sulphur dioxide (SO_2)	45 – 50 mg/Nm^3
		0.01 - 0.012 g/s
10	Nitrogen oxides (NO_x)	15 – 20 mg/Nm^3
		0.0033 - 0.005 g/s

Source: Stack Monitoring Reports of Similar DG Sets

Table-4.5 : Incremental GLC's (DG Sets) - Worst Case scenario

Sr. No	Parameter	GLC ($\mu g/m^3$)	Distance (Km)	Direction
1	NOx	8.02	3.4	WSW
2	CO	3.41	3.4	WSW
3	SO_2	0.25	3.4	WSW
4	PM_{10}	0.43	3.4	WSW
5	$PM_{2.5}$	0.22	3.4	WSW

Table-4.6 : Resultant Concentrations Due To Incremental GLC's (DG Sets) - Worst Case scenario

Pollutant	Maximum AAQ Concentrations Recorded During the Study Period (µg/m³)	Predicted Incremental Concentrations (µg/m³)	Resultant Concentration (µg/m³)	NAAQ Standards (µg/m³)
SO_2	8.3	0.25	8.55	80
NO_2	10.1	8.02	18.12	80
CO	245	3.41	248.41	2000
PM_{10}	22.6	0.43	23.03	100

The modelling tool has been executed to assess the predicted incremental concentrations due to the operation of 2 DG sets for continuous 8 hours per day. The resultant concentrations as per the above prediction are found to be well within the permissible limits. The Isopleths for Incremental concentration for Scenario are given in **Figure-4.5 to Figure-4.9.**

Figure –4.5: Predicted Glcs – So2

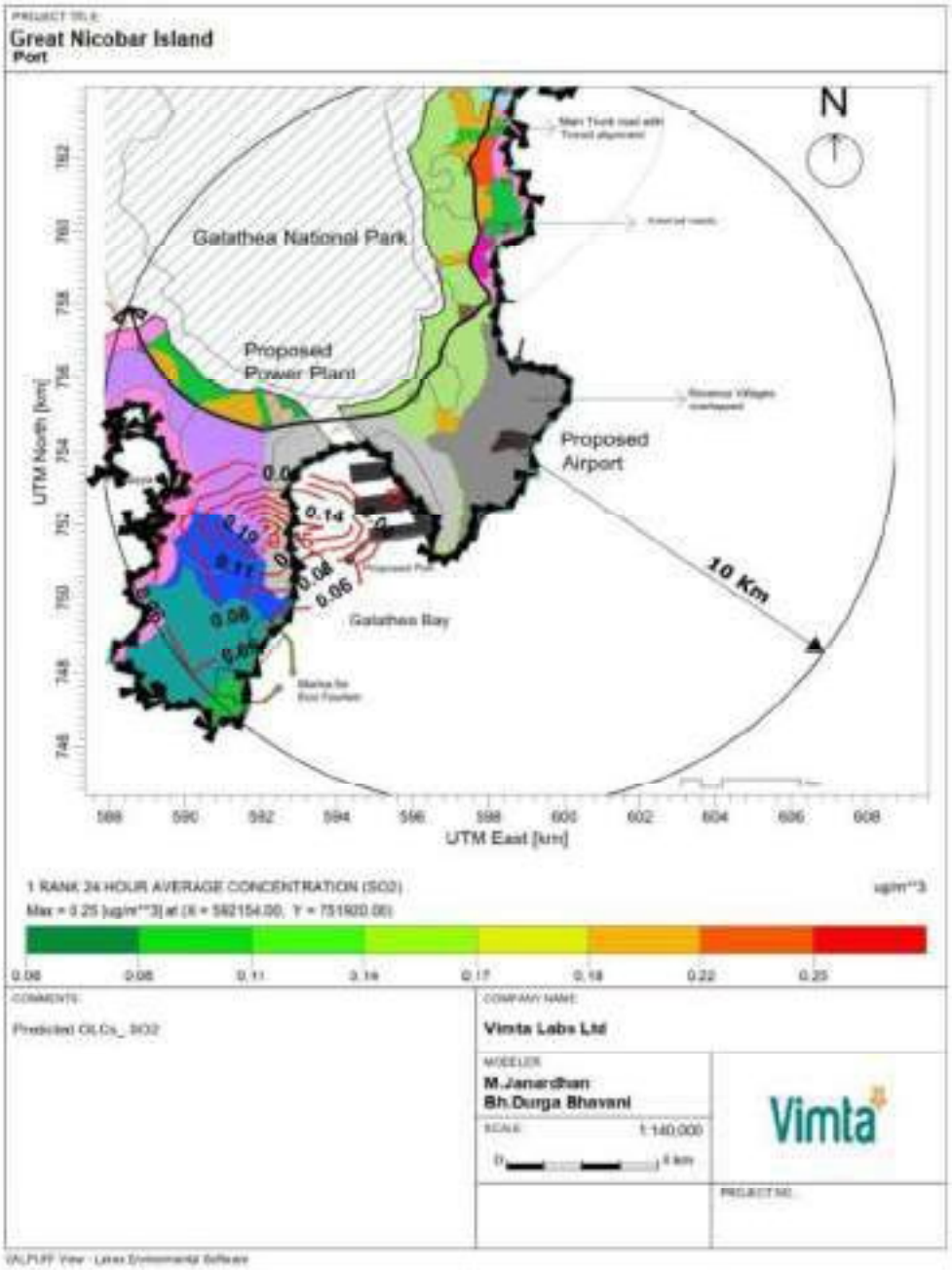


Figure –4.6: Predicted GLCs – NOx

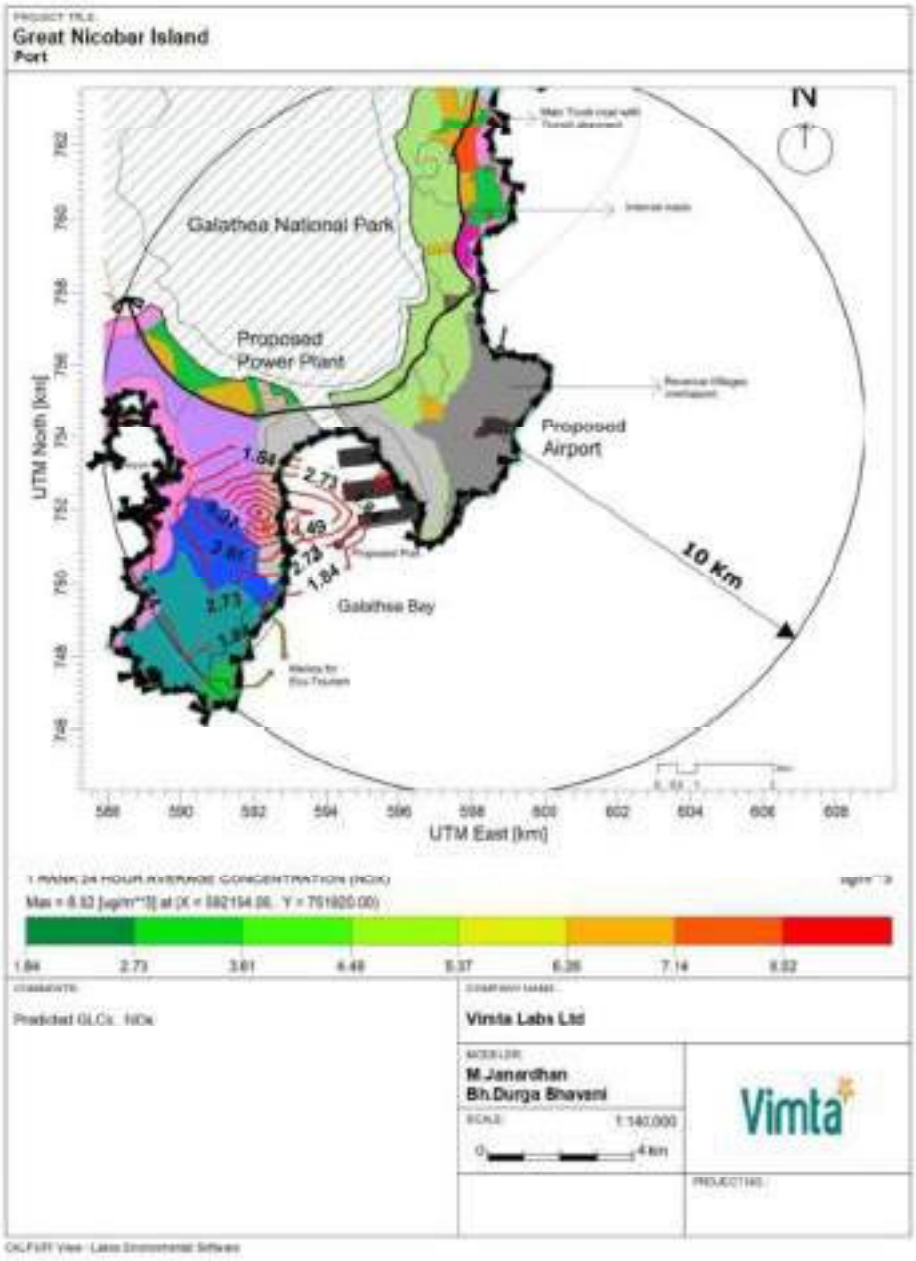
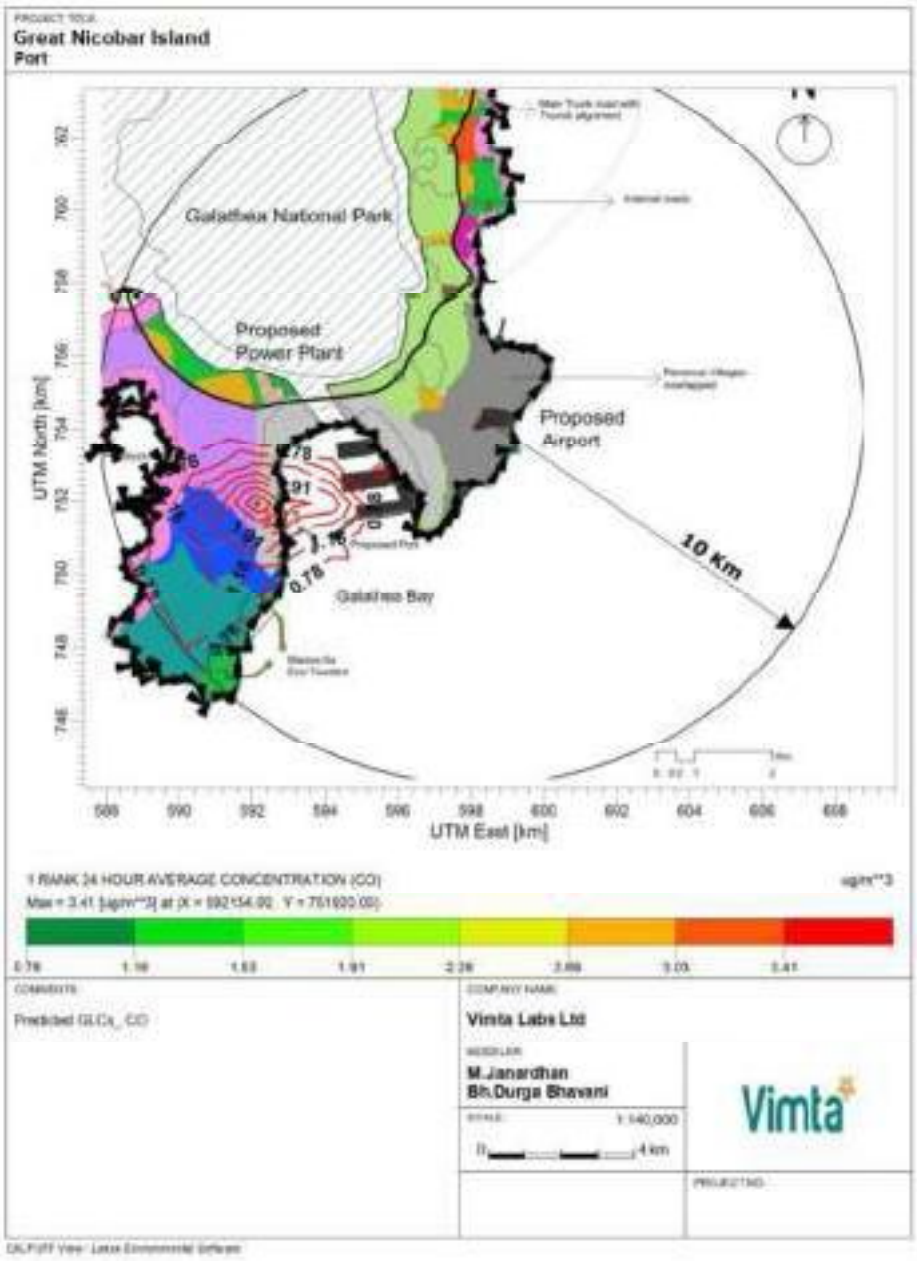
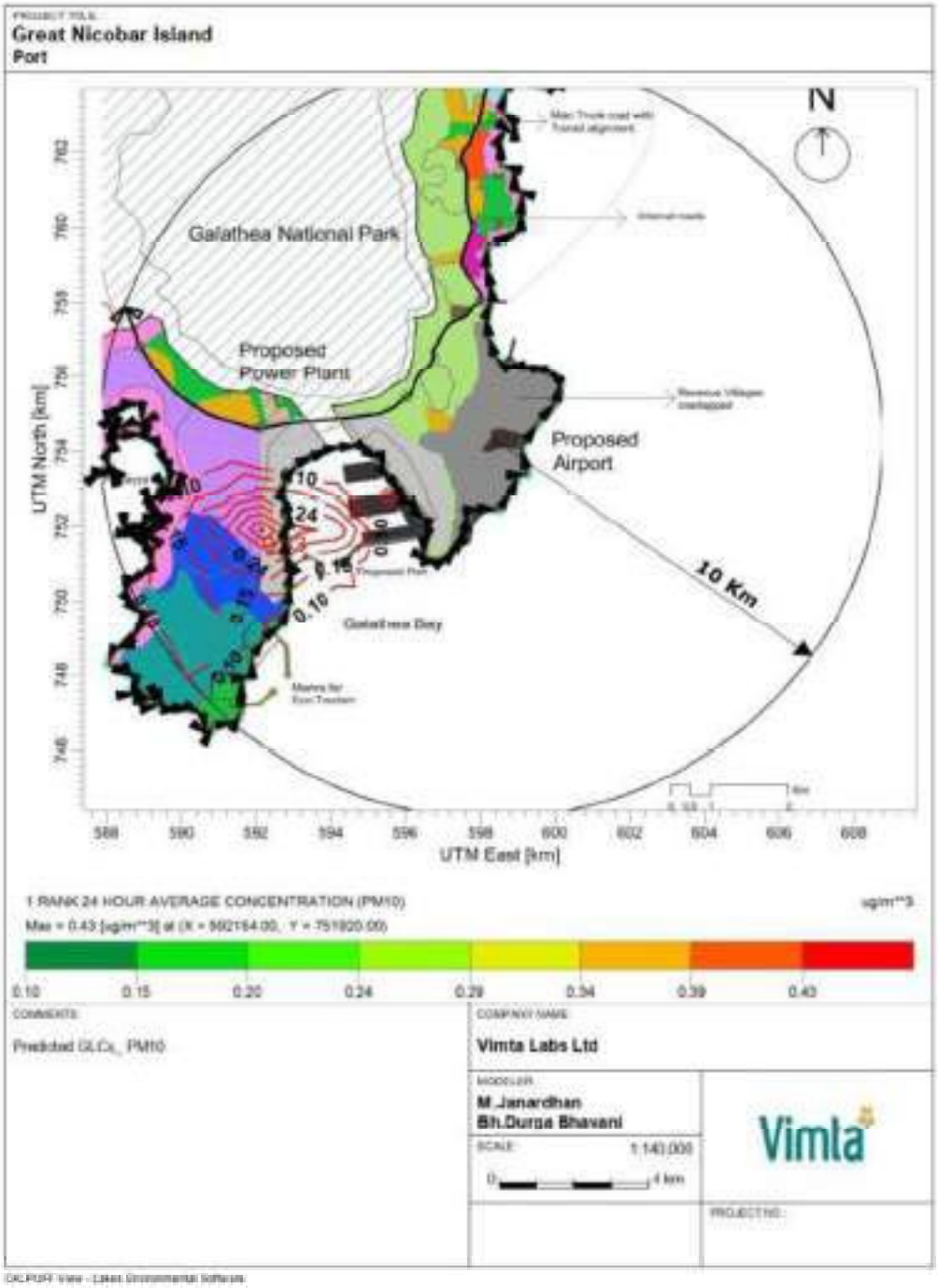


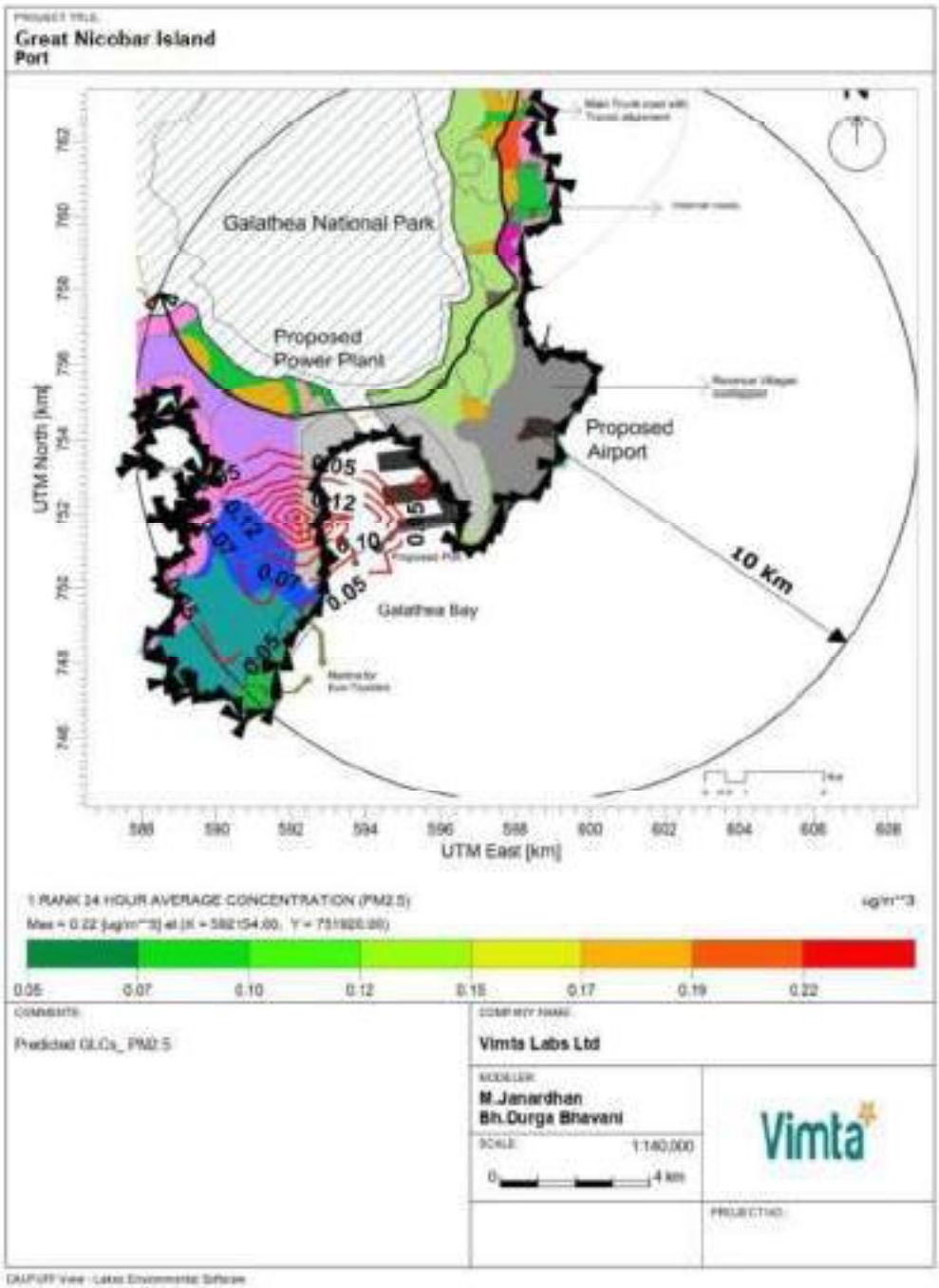
Figure –4.7: Predicted GLCs – CO



Figure–4.8: Predicted GLCs – PM10



Figure–4.9: Predicted GLCs – PM2.5



4.6.2.3 Impact due to Cargo Handling and Storage

Since it's a container terminal, and no dust cargo will be handled at port, no significant direct impact on air quality is anticipated while handling and storage. On-shore operation activities and vehicle traffic on unpaved roads, may also contribute to particulate matter emissions.

Mitigation Measures

- All static and mobile diesel generator sets to be used only during power cut;
- Regular verification of PUC certificates of all the vehicles entering into the port area
- Project will implement "Cold ironing" to reduce pollution and also to reduce power consumption
- Similarly most of the Cranes in the port will also use electric power.
- Prohibition of use of more than 15 Year old vehicles for construction and operational phase
- Use of electric cars inside the port area for all transport requirements.

4.7 Noise Pollution

4.7.1 Potential Impact Due to Port Construction

4.7.1.1 impact due to port construction activities

Construction noise will result from operation of equipment including the dredger and associated tugs, piling equipment, tracked excavators, Lorries, dump trucks, and other earth-moving equipment, cranes, and generators / lighting equipment. The exact construction methods and plant utilised will depend on the EPC contractor. Noise nuisance during construction depends on the exact place of the receptor and of the source and the duration of the activity.

The noise and vibration generated by piling in water if not controlled and monitored properly, can be transmitted considerable distances through the water and therefore have the potential to impact on marine mammals.

Such noise pollution may cause nuisances to the population. Atmospheric conditions that may affect noise levels include humidity, wind direction, and wind speed.

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.

Mitigation Measures

The following measures could mitigate the negative impacts caused by noise emissions:

- Noise mitigation measures shall be in place prior to the commencement of any construction work.
- Under water noise generation should be restricted with modified equipment.
- All contractors and subcontractors involved in the port construction phase should comply with the relevant international noise standards;
- Activities that take place near residential or sensitive receptors to be careful planned (restricted to daytime, taking into account weather conditions, etc.);
- Residents in the vicinity to be notified about construction schedules and activities;
- All plant and equipment to be fitted with silencers, mufflers, acoustic linings, or shields, as necessary.
- If necessary, measures to be taken to reduce noise emissions from the site shall include provision of screens or bunds to absorb noise and deflect it away from receptors;
- Before commencing any piling operations, the contractors shall be required to submit calculations to demonstrate that the appropriate standards will not be exceeded
- Timing and programming outside sensitive seasons (e.g. avoiding the migration seasons of marine mammals, etc.), especially concerning underwater noise;
- Apply a change management process to modify operations, if necessary to address noise issues;
- Vehicles and generator sets to be serviced regularly and maintained properly to avoid any unwanted generation of noise or vibration from them;
- Employees working in noisy environment should be made to wear ear muffs/ear plugs to avoid any adverse impact of noise on them;
- Employees exposed to hand vibration while handling/operating of heavy machineries should compulsorily wear anti vibration gloves made up of visco elastic material;
- Shock absorbing techniques should be used to minimise the impact of vibration from heavy machineries;
- Heavy machineries and generators to be operated during day time only.
- A noise monitoring programme during construction should be implemented Vehicles older than 15 years will not be allowed to operate during construction and operational phase.
- Preferably battery operated very low noise generating vehicles will be used in the port premises during operational stage

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

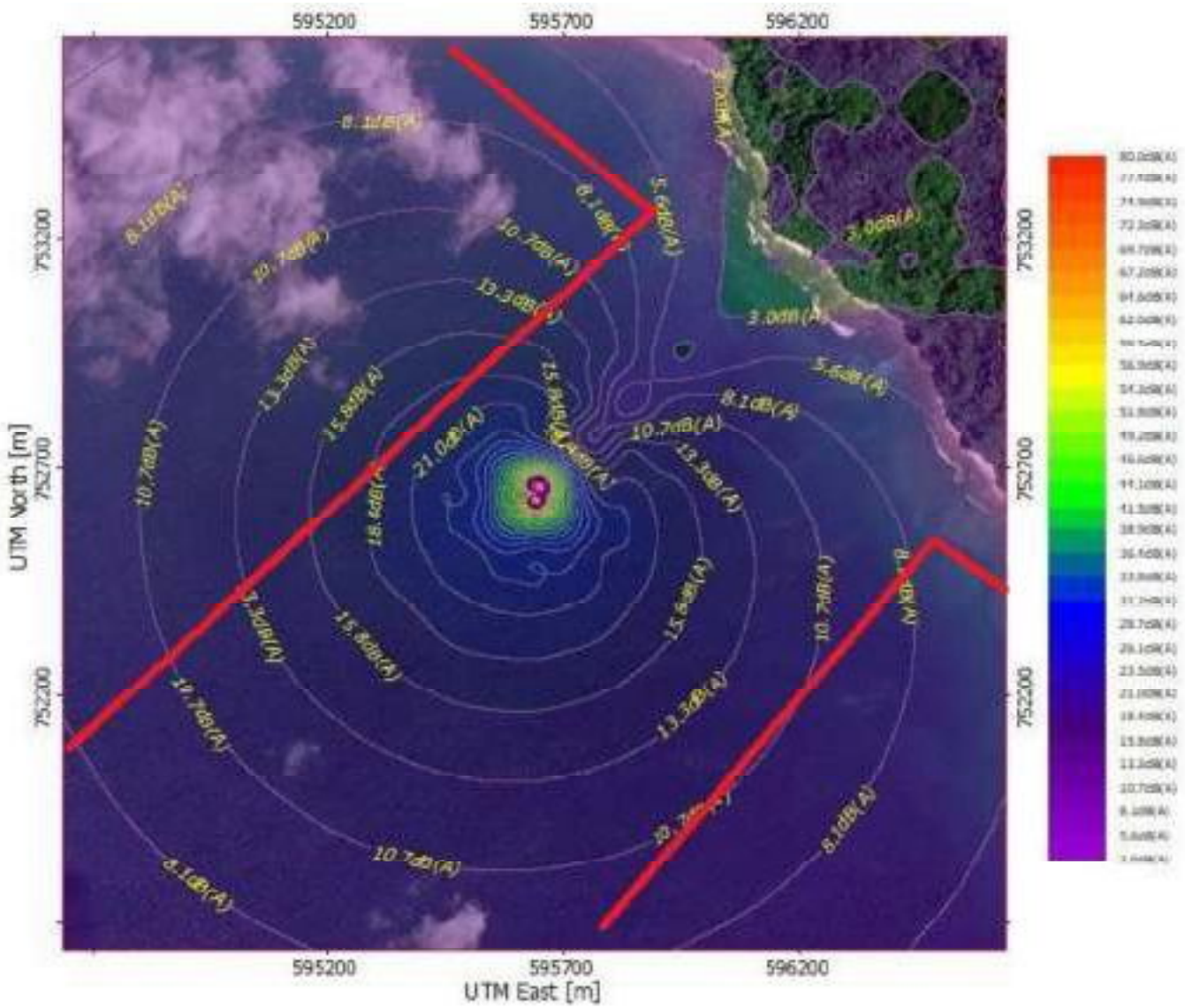
- Where necessary, noise emissions should be minimised and controlled through the application of techniques which may include installation of sound barriers
- Optimising dredging activity and duration
- As per ZSI, the main sources of underwater noise pollution are shipping, dredging, and seismic surveying. 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

traffic that will result from container traffic arriving and departing through the port business day. Seawater is an efficient medium for sound propagation, particularly low frequency sound and therefore marine life over a wide area could be potentially affected. 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.

Figure-4.10: Noise Contours – ICTT



4.7.2.1 Noise Mitigation Measures

- Acoustic fencing might be installed along the edge of the access road should the traffic-generated noise levels be significant to warrant mitigation measures
- Apply a change management process to modify operations, if necessary to address noise issues when they occur.
- Vehicles and generator sets to be serviced regularly and maintained properly to avoid any unwanted generation of noise or vibration from them.
- Employees working in noisy environment should be made to wear ear muffs/ear plugs to avoid any adverse impact of noise on them;
- A regular noise monitoring programme should be defined and implemented for the port O&M phase.
- Underwater noise has to be controlled during the operation phase. The measures 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.

4.8 Solid Waste Management

4.8.1 Potential Impact Due to Port Construction

Solid wastes cause significant degradation of environment creating unhealthy conditions causing various diseases and other civic problems. During the construction stage, there will be a sudden labour influx in the area and unless adequately managed will cause unhealthy environment within and outside the port boundaries. Every human activity generates municipal wastes. The wastes from the labour colonies include human wastes, wastes from kitchens and other wastes like food packets, drinking water bottles, boxed from consumables etc. Unless there is a proper waste collection, transportation, treatment and disposal system, the whole area will be visually obnoxious, and will create unhealthy environment, more so, especially during the rains. Uncollected green wastes generally decay within 24 hours in hot and humid climate creating a fertile ground for vectors.

4.8.1.1 Construction and Other Wastes

Construction will potentially generate the following wastes: green wastes from vegetation clearance, excess construction materials, including offcuts and packaging; hazardous wastes; oils, fuels and other chemicals generated by onsite maintenance and repair of construction equipment and machinery; Excavation materials; food wastes from construction personnel; site office wastes; and human waste; poor construction procedures that generate excessive wastes increase construction costs and results in disposal of otherwise valuable resources. In the study area no sanitary landfill is foreseen. Therefore, there is a moderate risk to the soil quality, surface and groundwater and marine environment.

4.8.1.2 Hazardous Materials Management

Hazardous wastes (oil, chemicals, lubricants, paints, compressed gases, and varnishes, etc.) generated during the construction phase should be dealt with separately from non-hazardous waste.

4.8.1.3 Mitigation Measures/Solid Waste Management

The port **Waste Management Plan for construction and operation phase** should be developed defining adequate measures for SW collection, segregation, reuse and disposal.

The sewage/solid waste/hazardous wastes to be treated and disposed or sold to authorised recyclers as per the MoEF guidelines.

- The integrated waste management facility designed for the GNI development should be established at an early date so that onsite disposal can be avoided.
- Port operator should prepare a Waste Management Plan defining adequate measures for SW collection, segregation, reuse and disposal during construction.
- Proper sanitation bins to be installed in the port area for collection of sewage/solid waste/construction wastes on site.
- Solid waste generated during the construction process to be separated and recycled where possible / appropriate.
- Burning of waste on site should not be permitted. All waste, which cannot be recycled on site, should be collected and taken off site for recycling/reuse or disposal to an integrated waste management facility for GNI development.
- A scavenging boat should be available at all times for collection of windblown rubbish within the harbour basin itself.
- All rubbish, waste materials and debris shall be systematically cleared from working areas as they accumulate; all such materials should be cleared at the end of each working day.
- If removal of waste materials at the end of the working day is not possible, the materials should be covered with tarpaulin or similar.
- Waste materials not removed directly from the site shall be temporarily stored at designated points and covered, pending removal from the site.
- All working areas and site roads to be kept clear of mud, water, silt and other materials at all times. If earth, mud, or other debris is deposited on roads, it shall be immediately removed.
- Hazardous waste should only be handled by authorised agency and following good international practices and applicable local and international regulations (Basel and Rotterdam Convention)
- For the purpose of a highly efficient EMP implementation particularly solid waste management the entire port and associated infra facilities have been divided in to 10 units (refer Chapter 10). The ultimate objective of the EMP is to create an awareness of **"Zero Tolerance"**

4.8.2 Solid Waste - Potential Impact During Port Operation

The amount of solid waste produced by the operational activities in the proposed port may be quite substantial. Wastes originating at the port may include inert solid waste from cargo packaging and from administrative offices, as well as hazardous or potentially hazardous waste associated with vehicle and equipment maintenance operations (e.g. used lubricating oils and engine degreasing solvents). Wastes originating from ships may include oily sludge, inert materials such as food packaging, and food waste. Among others, substantial amounts of solid waste will result from the terminals" daily and periodic activities, including the cleaning of storage tanks. The quantity of municipal solid waste generated from canteen and administrative areas is estimated at about 1000 Kg/Day, of which 60% will be bio-degradable and 40% non-biodegradable. These wastes will generate odour and health impacts and ground and surface water contamination, if not managed properly. Details for the integrated solid waste management system has been provided in Chapter 2C (2.7.4) of Township.

4.8.2.1 Solid Waste - Mitigation Measures

The port Waste Management Plan should be developed defining adequate measures for SW collection, segregation, reuse and disposal.

- Port operation activities solid waste shall be adequately collected and managed by Contractor (as one option) in accordance with the relevant Indian laws, IFC PSs and IFC EHS guidelines for Waste Management Facilities.
- In accordance with the requirements of MARPOL 73 /78 and its annexes IV and V, appropriate facilities shall be provided for the reception of all wastes arising from ships. These should include facilities for the following basic categories of ship-generated wastes:

✓ Oily waste (usually oil mixed with larger quantities of seawater, also fuel residues and sludge).
✓ Garbage (originating from crew and passengers, maintenance of the ship, cargo and fishing activities).

4.9 Socio-Economic Impact

Positive Impacts:

a. The road network will be increasing therefore the accessibility will increase.

The goal of the project for Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands' is to development of a new 'greenfield city' with a diverse and robust economy based on maritime services and tourism, amongst other drivers. Great Nicobar Island to attract international and national visitors to experience the outstanding natural environment and participate in

sustainable tourism activity. As per the future requirement the road network will be increase therefore the accessibility will increase.

b. Educational facilities

Considering that Great Nicobar Island is not well developed and is mostly rural in nature, there is a complete lack of educational facilities. For the future communities to come and settle in the GNI planning area it is paramount that certain educational facilities to be provided based on the need based social and physical infrastructure development assessment. 77 Primary schools, 19 secondary schools, total of 8 integrated schools, 4 colleges, 3 scientific research centers, 2 ITIs, 1 adult education center, 2 technical education centers will be provided. These facilities will be located at appropriate catchment locations for easy access.

c. Medical facilities

Considering that Great Nicobar Island is not well developed and is mostly rural in nature, there is a complete lack of healthcare facilities. For the future communities to come and settle in the GNI planning area it is paramount that certain healthcare facilities to be provided based on the need based social and physical infrastructure development assessment. 38 dispensaries/poly clinics, 08 Nursing home& maternity homes, 04 hospitals 100 beds to 200, 04 hospitals 20 beds to 80 beds, 04 multispecialty hospitals 100 beds to 200 beds, 04 specialty hospitals 100 beds to 200 beds, 02 general hospitals 300 beds to 500 beds, 04 family welfare centers along with pediatric centers, gastric centers with diagnostic facility are required. The medical facilities will be increased as per the requirement.

d. Availability of water and power

Two raw water reservoirs will be built to supply drinking water to the planning area including all seven villages. Availability of drinking water will be increase. 450 MVA Gas and Solar based power plant will be constructed in 39 ha. The availability of power will be increase.

e. More industries will open thereby increasing the job opportunities etc.

The International Container Transshipment Terminal (ICTT) project shall bring major investments to the region covering a wide range of sectors connectivity and Cargo industry. It will help in setting up ancillary facilities which will provide the spin of benefits to the economy and will help livelihood around the people. More industries will open thereby increasing the job opportunities etc. The project once fully operational shall bring total employment potential of 1,250 and 4,200 persons and an investment of INR 18,308 Crores and INR 35,959 Crores during initial Phase and Final phase respectively, thereby opening up employment opportunities for the youth in the region.

Construction Phase

The proposed project of ICTT, apart from generating employment opportunities within the project would pave way to increase in number of auxiliary business opportunities for local population and also to outsiders.

It is expected that the locally available labour will be engaged during construction.

Operation Phase

The proposed project provided employment to persons of different skills and trades. The local population is the largest beneficiary among these employees. The employment potential ameliorates economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service-oriented activities. This in turn will improve the socio-economic conditions of the region.

The project is expected to create positive impact on the occupation structure of the study area and marginal workers would get full employment with skill up gradation and change in occupation, thus improving their income level and economic status.

f. The revenue for the GNI will increase which can be used for infrastructural development.

Subsequently large number of people workers, skilled persons, tourists with different background and financial status will come to the area, the new shops will develop, and the consumerism will increase creating more shops and consequent economic development will be initiated. The revenue for the GNI will increase which can be used for infrastructural development.

g. Impact on Education Sector

Schools, colleges and ITI will come to the area thereby upgrading the skills of the local population. The residents do not of have to go to Port Blair or to mainland for higher education and skill development institutions.

The negative aspect of the development will be:

a. The natural resource will deplete to some extent and forest will be diverted for non-forest purposes.

b. The pollution will increase.

For construction of ICTT project reclamation of Land to develop Onshore Storage facilities. Minimal hill cutting is required, and minimal dredging is

required site levelling, clearance of trees, shrubs and bushes are envisaged. In addition to above, some hills need to be cut. Pollution will increase however; it will not exceed the ambient AQ standards.

c. Water may get contaminated doe to construction activity.

   227 ha of land reclamation is required for ICTT. Large displacement of the marine sediments and the development of mud-waves beneath the reclamation fill". This would disrupt the ocean's ecosystem, lead to soil liquefaction and pollute the water.

d. Noise levels will increase

   For ICTT project 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 & support infrastructure will be developed. Noise levels will increase however it will not exceed the ambient AQ standards.

e. The attitude of people will change. Now they are simple folks with low levels of consumption.

f. Law and order situation and traffic accident cases may increase.

CHAPTER 4B

4.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 Introduction

This chapter presents identification and appraisal of various impacts from the proposed airport project on surroundings environment. The mitigation measures including Environment Management Plan (EMP) during construction and operational phases of the proposed project are also described in the chapter.

Various environmental parameters are studied during construction and operational phase of airport project for assessment of their impact on the surrounding environment. The prediction process involves resources, receptors and pathways linking them. Their nature, magnitude, extent of coverage and probability of occurrence, determine their relevance and significance. The pathway, sources, resources, receptors and the cause-and-effect relationship in the prediction of impact process of airport development project in operation. During the identification and prediction of the impacts in the construction and operational phases of the airport project, the baseline conditions are either assumed to remain unchanged or revised as per trend analysis from known data collected till reference date of construction or operation of project.

4.2 Prediction of Impact during Construction Phase

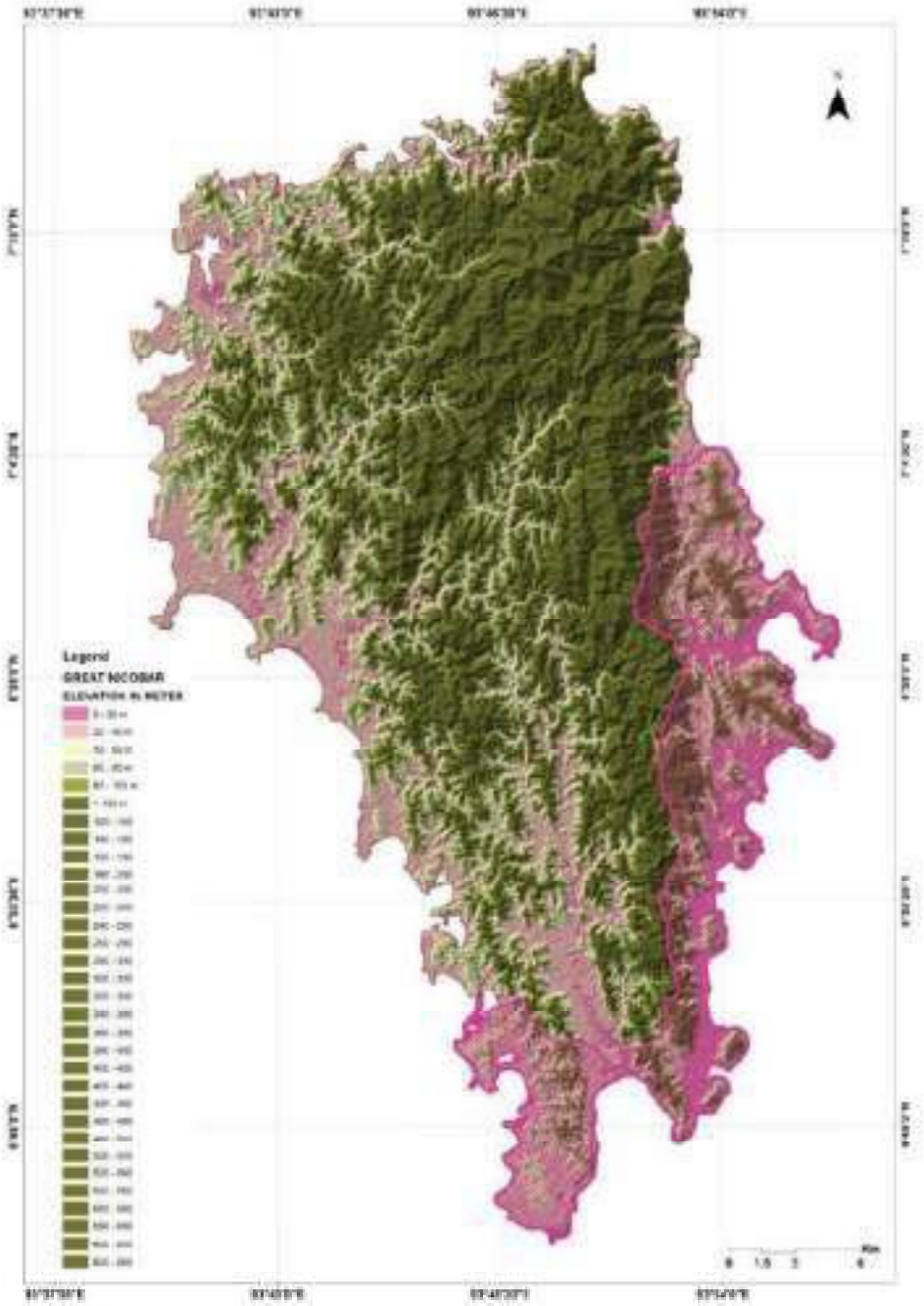
The activities that take place during construction phases of airport project are levelling of site, construction and erection of main airport structures like terminal building, aprons, runway, construction of blast pads at extreme of runway, provision of runway shoulders, etc for aerodrome reference code. The impacts are on land use, soil, air quality, ecology, demography and socio-economics, access roads and public expectation. The potential primary and secondary impacts on the environment, their prediction, significance and mitigation are discussed in subsequent section.

4.2.1 Impact on Land Use and Topography

Topography

The project area includes flat land sloping towards the coast on the east and south of the island. Here there is habitation and plantations of coconut, spice, vegetables, etc. The western edge of the project area is a hilly terrain of undulating landform covered with dense forest. The site is approx. 4000 m long, running along a flat open patch ay an average elevation of 3 to 20 m above MSL. The site is dominated by a 100 m high ridge line on the West and has two isolated knolls on the East. A few of spurs jets out from either direction which can be levelled in the event of selecting this site. The site has tidal area jetting inside which would need to be filled and levelled. A part of the tidal area could be developed into a Sea Jetty for High-speed boats connecting the Airport with the Port and Campbell Bay. Establishing of approach lights, ILS etc for the first runway and providing full length second runway (if required in future) will require some reclamation of land on North and South.

Figure-4.1: Project Area Overlaid on Topographic Map



1. Wind Direction: The site is oriented in North South direction approximately and hence suitable for preferred Runway orientation.

2. Obstruction to Air Navigation: There exists a dominating ridge line on West of the site running North- South with some heights over 100 m thus penetrating the obstacle limiting surface of Inner Horizontal Surface and Conical Surface. However, this ridge line also separates the Airport and the proposed port site and provides a buffer zone between the two. Suitable and appropriate ATM procedures need to be established by AAI for safe navigation once the operations are about to commence.

Land Use

916 Ha of area has been identified for development of International Airport which includes 845 ha of land and 71 ha of reclaimed area. The proposed area is sparsely populated and there are only two villages in the area of proposed airport. Most of the area is revenue land except for approximately 141 ha, which is under forest land and deemed forest land. The revenue villages lying in the area of proposed airport are Gandhi Nagar and Shastri Nagar, part of which will need to be displaced. The land to be utilized for the proposed airport is presently part vacant, tsunami submerged land, part is owned by villager's part owned by the Government. In view of this, a limited rehabilitation and resettlement plan for human habitat is required or is foreseen.

The Gandhi Nagar site (South Site) includes a large area of revenue land, and minimal forest land will be affected. In order to achieve the required length of the runway, reclamation of the sea-coast in North and South will be required.

Inundation:

The area is shielded from sea with two high grounds of approx. 70 to 100 m elevation above MSL for almost 70 % of length of airport. The site passes through an inundated patch of approximately 0.73 Sq km in the centre of Site. This patch was earlier agricultural land but got inundated during the 2004 tsunami and remained inundated till date. Rest of the area is relatively at higher ground with average elevation of 3 to 20 m. The inundated land will be landfilled and compacted on which the runway will pass. All care has been taken to avoid the acquisition of habitats due to the airport construction.

Reclamation area for runway extending into sea. The options for selecting of a site for an airport are very limited on this island; the strategic requirement of constructing an airport entails to make do with whatever is available with constraints. Hence, the present site needs to reclaim land approximately 194 Ha of land in order to establish an operational airport. This area extends 55 % in the South and about 45 % in the North in the Sea.

4.2.2 Impact on Soil

This excess volume of topsoil after utilizing for greenery development will be treated as a contingency to cover any additional losses that may occur during construction such as losses during clearing & grubbing, settlement and consolidation of native soils underlying proposed embankment areas and for any removal & disposal of unsuitable or unstable materials encountered (wet areas, organics, buried debris, etc.).

Accidental spillage of oil from construction vehicles might cause soil contamination. In order to prevent soil contamination of oils drip pans will be placed at the parking places of vehicles and the dripped oil will be collected and subsequently sent to the authorized recycling agencies.

During construction phase there will be import of material from outside specially the construction material like bricks, cement, murrum, lining material, insulation bricks, HDPE pipes, backfill material, sand, clay, etc, these materials will be stored at the site which is likely to change the characteristic of the soil in the construction area. In addition to that, municipal wastes due to construction workers, domestic sewage & sullage from construction labour canteen and office at project site etc., will contribute to changing the soil characteristics.

The hazardous materials used during the construction may include petrol, diesel, welding gas and paints. These materials will be stored and handled according to the guidelines specified under Manufacture, Storage and Import of Hazardous Chemical Rules (MSHIC) and Hazardous Wastes Storage, Handling and Transportation Rules of MoEF&CC. Some of the precautions of storage and handling of hazardous materials and waste includes the following:

- Dyked enclosures will be provided which can contain complete contents of the largest tank;
- The underground diesel tanks (if any) will be tested for leak every year as long the underground tanks are under operation.
- The Fuel Farm, Diesel and other fuels will be stored in separate dyke enclosures; away from the main work area and habitation.
- Wherever possible, hazardous raw materials to be substituted by non-hazardous materials, e.g. cleaning solvents can be replaced with bio-degradable cleaners, usage of non-chlorinated strippers instead of strippers containing methylene chloride and substitution of water-based paints for oil-based ones;
- Separate storage of waste paints and thinners, contaminated rags and brushes to facilitate recycling and reuse. Rags could be laundered for reuse;
- Installation of on-site recycling equipment to be considered by large
- Vehicle maintenance area to be designed to prevent contamination of ground water by accidental spillage of oil; and
- Maintaining appropriate inventory control.

Apart from localized construction impacts within airport site, no adverse impact on the soil in the surrounding area is anticipated.

4.2.3 Impact on Air Quality

Impacts of construction activity on ambient air quality are cause for concern mainly in the dry months due to settling of dust particles. The concern is magnified mainly because the construction site is adjacent to human habitation of Gandhi Nagar. The habitation is in the down wind direction. Most of the houses of Gandhinagar will be acquired, however only few houses will be left which area adjacent to the Airport boundary. The main sources of emission during the construction period are the movement of equipment at site and dust emitted during the leveling, grading, earthworks, foundation works, and other construction related activities. Construction material storage also contributes to the degradation of the air quality especially during the high wind conditions.

The impact is likely to be felt during construction period and would be generally confined locally to the construction site itself. However, when the construction activity is near to the habitation, it might be cause of concern. All care must be taken to ensure that dust generated during construction is suppressed with water sprays. The composition of dust in this kind of operation is however mostly coarse particles, inorganic and non-toxic in nature. These are not expected to travel long distance before settling, which also can be arrested with proper management plan.

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 hydrocarbons. The impact will however, be reversible, marginal, and temporary in nature.

4.2.4 Impact on Water Resources and Quality

During the construction phase, water required for construction purposes will be from the water supply from the catchment storages dams that will be constructed in the development area. It is also proposed to adopt the techniques and equipment, which will further help in reduction of water demand during construction. The water used for the construction will be as per the designed capacity of the storage structures where from the water will be supplied. Therefore, the impact on the water resources during the construction phase would be minimal in nature.

Impact on water quality during construction phase is possible due to sewage generated from the construction workforce stationed at the site especially during the initial stages of construction when the trunk infrastructure may not be fully operational. Initially the toilet water may be treated through septic tanks however, as the infrastructure development progresses the construction site sanitation facilities will be linked to the sewerage pipes and sent to integrated STP proposed for GNI development for treatment and proper recycling and disposal.

However, during construction activity in rainy season, the water quality is likely to be affected due to the construction work and loosening of topsoil. This is likely to increase the suspended solids in the run-off during heavy precipitation. In order to reduce the impact on water quality, temporary sedimentation pond will be

constructed for the settlement of the suspended matter. These ponds and oil water separators will be suitably located near rain water harvesting ponds.

Additionally, following measures will be taken to avoid the surface water pollution:

- Appropriate slope stabilization measures will be provided; and
- Appropriate sanitation facilities to be provided for the construction workers to reduce impact on surface water quality.

The construction wastes, as far as possible, will be recycled, reused or recovered. No wastewater will be discharged outside the project site premises.

The following measures will be taken to minimize the water usage in the operational phase:

- Use of low flow fixtures and appliances for reduced water consumption such as low flush water closets and cisterns;
- Water saving shower head flow controls, spray taps and faucet aerators and photo-sensitive taps;
- The storm water from the area will also be routed to the rainwater harvesting structures after running through due settling ponds;
- The storm water treatment facility will be located at an appropriate site keeping in view the slope contours and collection point at the most convenient point;
- The storm water in rainy season will be harvested to maximum extent possible;
- Dry cleaning process in workshop and maintenance area to clean the oil spillages;
- Drip and sprinkler irrigation system to maintain green areas to minimize the water requirement.;
- Smart irrigation system that uses daily, weather data, slope, soil types, planting coefficients, and precipitation and infiltration rates to calculate actual water requirements daily;
- Water will be supplied through closed conduits only; and
- Creating awareness among the employees on water conservation.

4.2.5 Sewerage System

The airport will be connected to the integrated sewage treatment plant located within the GNI development. Treated wastewater from sewage treatment plant will be recycled and used for gardening and non-potable purposes. The water treatment technology details along with characteristics given in Chapter-2C-Township and area development project.

4.2.6 Impact of construction on Noise

At the peak of the construction, marginal increase in noise levels is expected to occur locally at the construction site. The activities, which produce periodic noise, are as follows:

- Foundation construction including pile driving; and
- Infrastructure construction.

The typical noise levels of some construction equipment are given in **Table- 4.1.**

Table-4.1: Typical Noise Levels at the source Of Construction Equipment

Particulars	Noise Levels dB(A)
Earth Movers	
Front End Loaders	72-84
Backhoes	72-93
Tractors	76-96
Scrapers, Graders	80-93
Pavers	86-88
Trucks	82-94
Material Handlers	
Concrete mixers	75-88
Concrete pumps	81-88
Cranes (movable)	75-86
Cranes (derrick)	86-88
Stationary Equipment	
Pumps	69-71
Generators	71-82
Compressors	74-86

The peak noise levels from continuous construction activity may be about 86-96 dB (A). this noise will be generated due to the operation of the equipment and will be within a meter. However, silencers, mufflers will have to be used to ensure that the sound level does not exceed 75dB at all the time at the boundary of construction sites. The nearest habitation areas are located well beyond 1 km from the major construction sites, however few homesteads are located within proximity of 600m from the runway construction areas. If during monitoring it is found that the noise level at the homestead sites exceeds the permissible limit, well designed noise barriers will have to be erected. The noise levels are considered to have no significant impact on community. However, the potential noise impact on the workers at Airport needs to be mitigated by providing earplugs

Overall, the impact of noise generated on the environment is likely to be insignificant, reversible and localized in nature. Community noise levels are not likely to be affected because of the vegetation and likely attenuation due to the physical barriers. The following recommendations will be implemented:

- Provision of silencers and mufflers at the exit of noise source on the machineries like generators, pumps. vehicles etc.;
- Construction equipment with minimum noise will be chosen;

- Vehicles and construction equipment with internal combustion engines without proper silencer will not be allowed to operate at the construction site;
- Regular maintenance of construction equipment;
- The use of damping materials such as thin rubber/lead sheet for wrapping the work places like compressors, generator sheets;
- Shock absorbing techniques will be adopted to reduce impact;
- Inlet and outlet mufflers will be provided which are easy to design; and
- Ear plugs will be provided to the workers working in high noise level areas.

4.2.7 Impact of construction due to Solid Waste Generation

About 2% of construction materials generally end up as construction waste. During construction phase, solid waste will be refilled for levelling etc. During construction phase, solid wastes in terms of canteen wastes, food packet wrappers, paper, plastic drums, paints, oil containers etc will be generated. This may cause for environmental degradation at the project site as well as its immediate surroundings, if adequate measures are not taken.

Mitigation measures

In order to avoid any solid waste disposal problems, an effective solid waste management system by means of collection of wastes in different types of dust bins and transporting the same to the central waste treatment facility. Though the whole development project will have an integrated waste storage, treatment and disposal facility (Refer Chapter 2 of Township for details), the airport operators should also develop a waste management plan in tune with the overall waste management system for the whole project. Strict adherence to the established solid waste collection and disposal system will ensure clean environment during construction period.

4.2.8 Impact of construction on Ecology

The noise levels outside the construction boundary at any point of time will be restricted to <55dB. Proper maintenance of the equipment will help in reducing these noise levels, and therefore the impacts on ecology will be insignificant.

The initial construction works at the project site involves land clearance, cutting, filling and leveling. The basic significant impact of construction on ecology will be due to the loss of vegetation. The airport will need 55.46 ha of forest land. This area is generally densely vegetated. The removal of vegetation will impact the birds and other fauna which depends on the flora. However as per ZSI, the impact will be limited as most of the faunal species will be able to relocate to other areas where the vegetation is significant. The herbaceous vegetation generally causes loosening of topsoil. However, such impacts would be primarily confined to the project site during initial periods of the construction phase and would be minimized through adoption of mitigative measures like paving and surface treatment, water sprinkling and appropriate plantation programme.

One more ecological impact that is envisaged during construction related to lighting in the construction area. Light generally affects birds and especially the nocturnal ones. All care should be taken to ensure that excessive lighting does not happen in the area. Using a smaller number or lower intensity lights; repositioning, shielding, redirecting, lowering, or recessing fixtures are some of the available options for reducing illumination in the construction site.

For the airport, a creek which was formed due to tsunami will be reclaimed. The creek was agricultural land and was used for cultivation before tsunami. Tilting of the SW part of the GNI caused ingression of the sea into the land and small mouth opened which caused flooding of these agricultural land. Initially, immediately after the tsunami, there was a total loss of the then existing ecology as trees were uprooted. However, Over the years, the submerged area developed its own ecology and now few saltwater crocodiles have been reported. There have been incidents of crocodile attack on humans and the villagers wanted the removal or culling of the crocodiles. While reclaiming the creek area, the crocodiles will have to be relocated to suitable habitat. Since many crocodile habitats exist in the Island, there should not be problems in relocating the crocodiles. Further, any shifting of crocodiles must be done only with the prior written approval of Chief Wildlife Warden under Section- 11 of Wildlife (Protection) Act, 1972.

The airport will also need to reclaim small part on both ends of the runway. The total reclaimed land will be 194 ha. To ensure that the ecology of the area is only affected to minimum extent, the runway length has been reduced from 4000 m to 3120 m. Now the area which is being designated as reclaimed area will be piled for lighting the runway. This will have only marginal impact on the ecology of the area as there will be practically no change in the tide or current pattern. ZSI, however, have reported few coral patches on the southern end of the runway lighting piles. The coral reefs are further south of the piled area and not in the area where piling is to be undertake, However, during the construction some small patches of coral reefs may get affected. The precise amount of loss will have to be determined just before the construction as the growth and bleaching of corals are common in the Island. However, even if there is any loss of corals during construction, it would not exceed 1-2 ha at the maximum. Even if there is no loss, the project can take some proactive actions and restore some area with coral replantation.

The construction activities lead to inward migration of a huge labour force in the area and thus there would be pressure on trees in the area due to increase in fuel demand. Care will be taken that the labours do not cut small trees or branches as fuel wood, for their requirement in cooking and other purposes. The area being an aviation zone, impact on terrestrial fauna will be negligible.

Mitigation measures for ecology restoration during construction

Various mitigation measures to reduce the ecological impacts will include:

- Reduction of noise levels with proper maintenance of the construction equipment and vehicles.

- Innovative lighting in the construction face. Using a smaller number or lower intensity lights; repositioning, shielding, redirecting, lowering, or recessing fixtures are the options available for light reduction.
- Careful relocation of few crocodiles that inhabit the creek area which will be reclaimed with due consultation from the forest department.
- Care to be taken while piling the runway extensions for airport lighting.
- Coral restoration and replantation measures.

4.2.9 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.

- Total number of construction labours are given

Estimated labour requirement	
Phase I	**Phase II**
1200	1470
Estimated labour + Family + Support requirement	
1680	2058
Water requirement and source (lpcd)	
252000	308700
Quantity of waste generated and fractionation (organic, hazardous, recyclable and biomedical) (Kg/day)	
600	735
Fuel requirement (kg/day)	
405	495

- **Water treatment system for the labour colonies: -**In the initial stages of construction, the treated water will be provided through tankers till the proposed trunk infrastructure is laid down in GNI. Compact waste water treatment plant / Septic tank shall be installed within the labour colonies during the initial phase of construction. However, one the infrastructure is ready, the waster will be supplied through the central waste treatment plant.
- All the waste water generated in the labour colonies will be treated before discharge. In the initial stages the wastes from the toilets will be treated through septic tanks. However, once the central treatment plant is ready, all the waste water will be directed to the treatment plant and will recycled. No water is expected to be discharges. However, some makeup might be required for operation of the plant and the quantity will be used for gardening purposes.

- **Municipal waste management system that is Collection, transportation treatment and disposal system for the labour colonies. (Details of MSW system is given in chapter 2C (2.7.4), Township)**

✓ Separate bins will be installed within the labour colonies for dry and wet waste.

- ✓ It will be contractor's responsibility to collect and transfer the waste to nearest solid waste transfer site
- ✓ After collection and transfer, solid waste management shall be integrated with overall SWM system of GNI

- ✓ At least 2 Organic Waste Composters of 1-2 T capacity each will be installed in the labour colonies.

Medical facilities for the labours number of dispensaries, hospital and emergency medical centres in case of accidents).

- ✓ Considering the phase wise total labour requirement, local health centre / dispensaries will be planned within the labour colonies. For any treatment required facility above the local health centre; the GNI local facilities shall be utilized.

- ✓ Ambulance facility shall be provided by the contractor all the time at site as well as at labour colonies

- **Medical check and vaccination programmes for prevention of contagious and vector borne diseases.**

- ✓ It will be contractor's responsibility to follow the centre / UT guidelines related to health, disease preventive measures, and vaccination programme. This shall be part of the contract agreement.

- **Mosquito control programmes**

- ✓ It will be contractor's responsibility to have time to time cleaning, fogging, and medication camping.

- **Emergency evacuation plan in case of natural disasters like floods, cyclones and tsunamis and earthquakes and epidemics.**

- ✓ It will be contractor's responsibility to prepare a disaster management plan including evacuation plan for site as well as labour colonies.

With regards to the impacts due to construction worker camps, to ensure there is no strain on the existing infrastructure, the worker camps will be self-sufficient and would not rely on any local resource. This would also ensure that there is no conflict with the local population. To mitigate impacts from health hazards, sanitation self-sufficient infrastructure facilities will be provided. Further, the worker camps will be located away from the coast and habitations.

It is presumed that community kitchen will be formed by the labor contractor where all the labor and their families can take meals. However, some of the labor may like to use separate kitchen for their families. No firewood will be allowed for the purpose of cooking. Gas cylinders will be supplied to the community kitchen

and to those who prefer to cook separately. Strict vigilance will be maintained to ensure that no wood is used for cooking.

4.2.10 Demography and Socio-Economics & Rehabilitation & Resettlement

916 Ha of area has been identified for development of International Airport which includes 845 ha of land and 71 ha of reclaimed area. The revenue villages lying in the area of proposed airport are Gandhi Nagar and Shastri Nagar, which will be affected need to be displaced. The land to be utilized for the proposed airport is presently owned by Government and private. However, part of the land is tsunami submerged land and under forest.

The impact of the proposed facility will begin with the starting up of the construction activities at the site. The proposed construction will provide employment to considerable number of skilled, semi-skilled and un-skilled construction laborer. In normal circumstances, the local people will be given preference for the unskilled activities, as there are many construction laborers in the vicinity of the project and are expected to be available with normal wages.

It is anticipated that to the extent possible the labour force will be sourced from the local area. Provision of wage employment to the local populace during construction period of the project will solve the un-employment problem in the local area to some extent. This will enhance the income levels of the construction laborer's and lead to their socio-economic well- being during the construction phase of the proposed facility, which will be a positive impact due to the project. The project will construct schools, colleges and ITI centers with an aim to train people and develop their skills. The training centers will start at the early stage of construction phase so that more skilled locals are eligible for the job in the project.

4.3 Impacts during Operational Phase

Environmental impacts associated with the operation of the project will be avoided/minimized by implementing the key design and planning strategies, the project will inevitably give rise to some impacts on the environment. Therefore, detailed assessment of the environmental impacts has been carried out and, where necessary, appropriate mitigation measures have been given to further alleviate the potential impacts. A summary of the major assessment findings is presented in the subsequent sections:

- Land use;
- Topography;
- Climate;
- Air quality;
- Water resources and quality;
- Soil quality;
- Noise levels;
- Terrestrial and aquatic ecology; and
- Demography and socio-economics.

4.3.1 Land Use

Land use/land cover will change as the proposed airport miscellaneous civil works etc. will be developed in this area. The existing vegetation and crops, trees will be cleared for the development of the airport and its allied facilities. The operation phase is generally a restoration phase where many of the negative impacts of construction will be mitigated. The area has high rainfall and the soil is generally fertile. Under these circumstances there will be a tendency for growth of luxurious vegetation. Trees, bushes etc attract birds which might compromise flight safety. However, care should be taken to periodically clear wild growth of vegetation. ZSI is also of the opinion that no fruiting trees, which attract birds, should be planted within 1 km from the airport boundary. During operation, it involves only movement of aircrafts. Some of the other allied activities may involve ground force and taxiway which will be operational only during LTO and within airside of the airport.

Mitigation Measures

- Transfer of fuels during refueling operations, leak detection containment of any surface spillage is to be monitored; and
- Aircraft maintenance, sensitivity of the location where activities are undertaken and control of runoff of potential contaminants, chemicals etc. to be properly implemented and reported.
- Removal of all fruiting trees within 1km of the boundary of the airport

4.3.2 Topography

The site is approx. 4000 m long, running along a flat open patch ay an average elevation of 3 to 20 m above MSL. The site is dominated by a 100 m high ridge line on the West and has two isolated high ground on the East. A few of spurs jets out from either direction which can be levelled in the event of selecting this site. The site has tidal area jutting inside which would need to be filled and levelled. The terrain around the proposed site is open, devoid of any high obstructions and safe for aircraft operations. The general topography can be overcome for operational uses with adequate site preparation.

Mitigation Measures

Proper drainage systems, emergency containment in the event of a major spill during monsoon season etc are to be provided.

4.3.3 Impact on Air Quality due to Airport Operations

- **Airside – Air Quality Modelling for ATM**

Impact on Air Quality

During the operational phase of the airport, the continuous air emissions are expected to be from aircraft engines during approach, landing, taxiing, take-off and initial climb or collectively called as reference **Landing and Take-off cycle**

(LTO cycle). The air pollutants of concern from the aircraft emissions will be unburnt hydrocarbons (HC), carbon monoxide (CO) and oxides of nitrogen (NO_X) as per ICAO guidelines. The impact on ambient air quality is assessed hereunder considering the following:

- The air quality impacts have been predicted for the proposed airport assuming that the pollution due to the existing activities (Pre-operational) has already been covered under baseline environmental monitoring; and
- MM5 data has been considered for site-specific meteorological parameters. Short-term 24-hourly incremental values (GLCs) were estimated using the site-specific meteorological data.

Air Pollution Modeling

As the proposed project site is in coastal environment, air dispersion modeling studies were conducted using CALPUFF model. CALPUFF is an advanced, integrated multi-layer, multi-species non-steady-state puff dispersion model that simulates the effects of time and space varying meteorological conditions on pollution transport, transformation and removal. CALPUFF can be applied on scales of tens to hundreds of kilometers. This model has been adopted by the United States Environmental Protection Agency (EPA) in its Guideline on Air Quality Models as a preferred model for assessing long range transport of pollutants.

➢ **Model Set-up and Scenarios**

In Calpuff, the modeling domain has set-up by 25 X 25 km horizontal grid with each grid cell spacing of 4 X 4 km to provide adequate resolution of terrain features. Calpuff has run with 10 different layer options with default cell face heights.

- ***Dispersion Model Input Data***

The specific types of emission sources considered during the operational phase of the airport are given in **Table-4.2.**

Table-4.2: LTO Emission Factors

Expressed in kg/LTO

Scenarios	Type of Aircraft	SO_2	NO_x	CO	HC	VOC	PM
Scenario-I	A319	0.37	25.86	14.80	1.25	0.005	0.14
	A321	0.48	16.72	7.55	1.42	0.013	0.030
	A320	0.36	9.01	6.19	0.57	0.005	0.07

Source: ICAO Air quality Manual

Presentation of Results

For the short-term simulations for volume and point emission sources, the concentrations were estimated around 1200 receptors to obtain an optimum description of variations in concentrations over the site in 10 km radius covering 16

directions. The incremental concentrations are estimated for the study period. The results are presented in **Table-4.3.**

Table-4.3 : Predicted 24-Hourly Short Term Incremental Concentrations

Expressed in µg/m³

Scenarios	SO_2	NO_x	CO	HC	VOC	PM
Scenario-I	0.57	14.30	9.81	0.91	0.008	0.11

- ***Resultant Concentrations after Implementation of the Project***

The maximum incremental GLCs due to the proposed airport for the above pollutants are superimposed on the maximum baseline concentrations of the respective pollutants recorded during the study period to arrive at the likely resultant concentrations after implementation of the proposed airport. The resultant concentrations (baseline + incremental) are tabulated in **Table-4.4** and the isopleths showing the incremental concentrations are shown in **Figure-4.2 to Figure-4.8.**

Table-4.4 : Resultant Concentrations Due To Incremental GLC's (Aircraft Operations) - Worst Case – Scenario-I

Pollutant	Maximum AAQ Concentrations Recorded During the Study Period (µg/m³)	Predicted Incremental Concentrations (µg/m³)	Resultant Concentration (µg/m³)	NAAQ Standards (µg/m³)
SO_2	8.3	0.57	8.87	80
NO_2	10.1	14.30	24.40	80
CO	245	9.81	254.81	2000
PM_{10}	22.6	0.11	22.71	100

The modelling tool has been executed to assess the predicted incremental concentrations of the air quality attributes considered 3 LTOs (for two scenarios – wide bodied aircrafts and narrow bodied). Also, it is assumed that the pollution due to the existing activities (Pre-project) already been covered under baseline environmental monitoring. The resultant concentrations as per the above prediction are found to be well within the permissible limits. The Isopleths for Incremental concentration for Scenario – 1 are given in **Figure–4.2 to Figure – 4.8**

Figure– 4.2: Predicted GLCS – Scenario – I: SO2

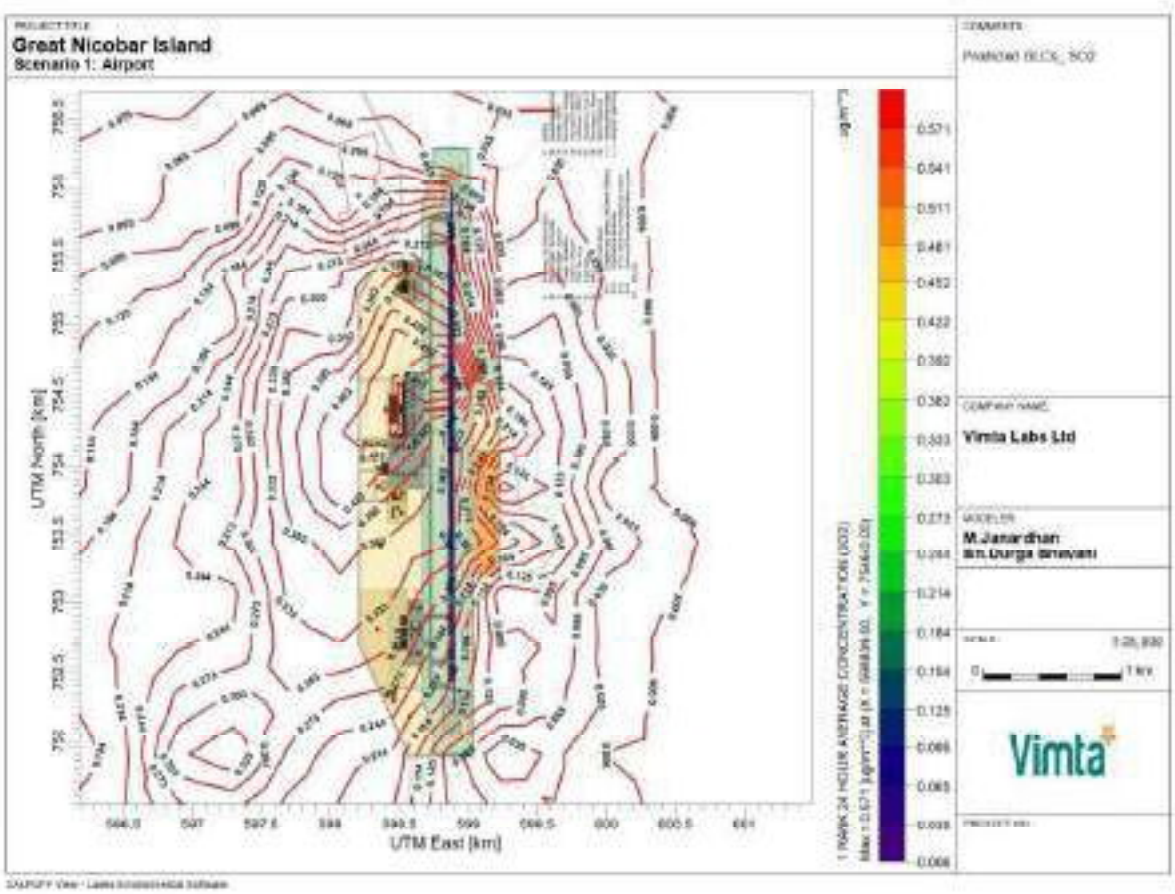


Figure – 4.3: Predicted GLCs – Scenario – I: NOx

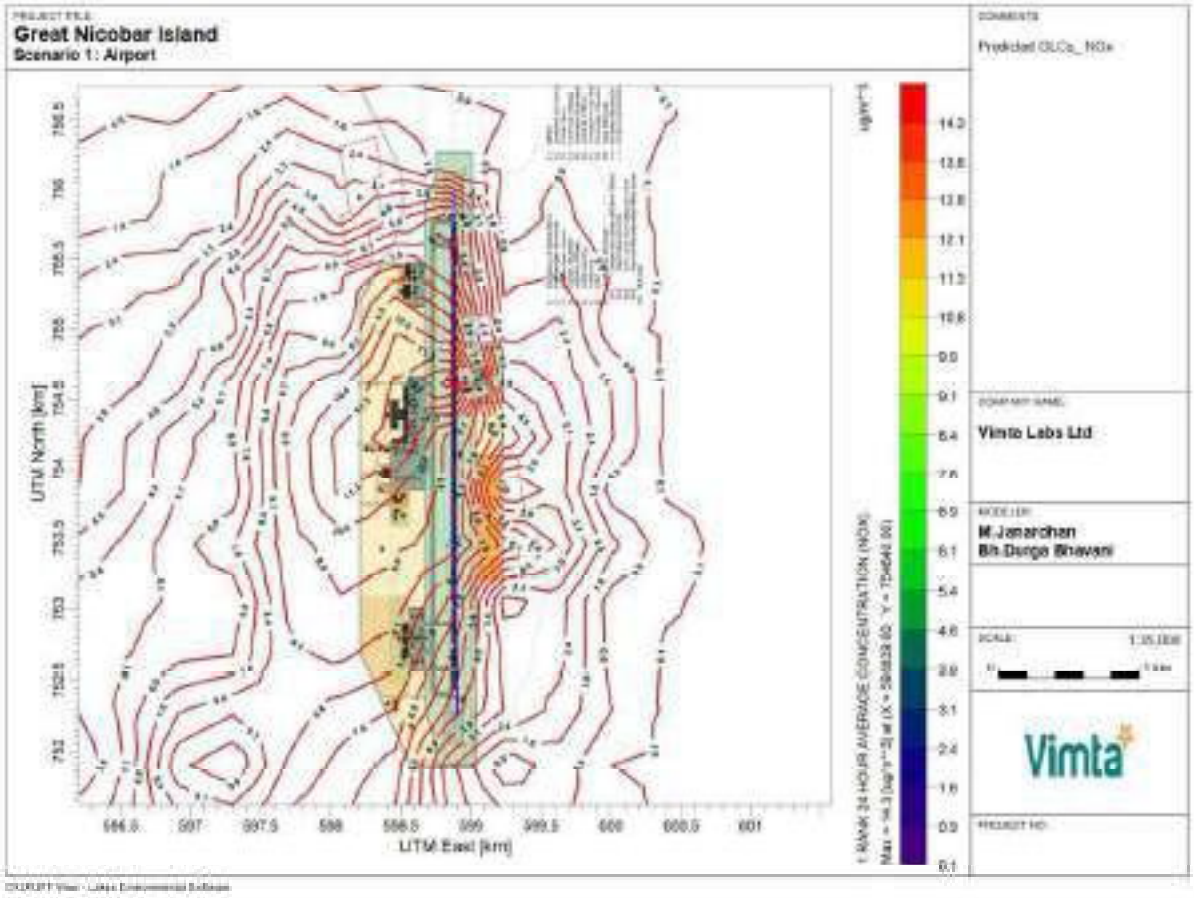


Figure – 4.4: Predicted Glcs – Scenario – I: CO

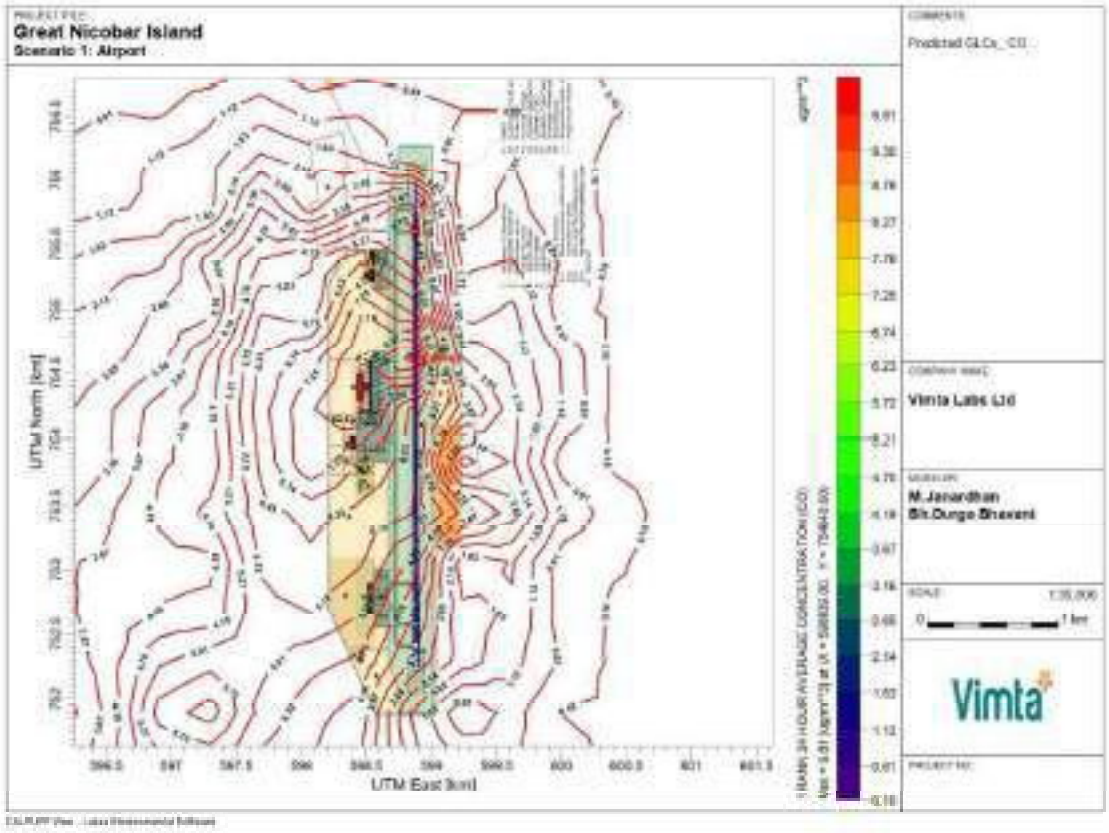
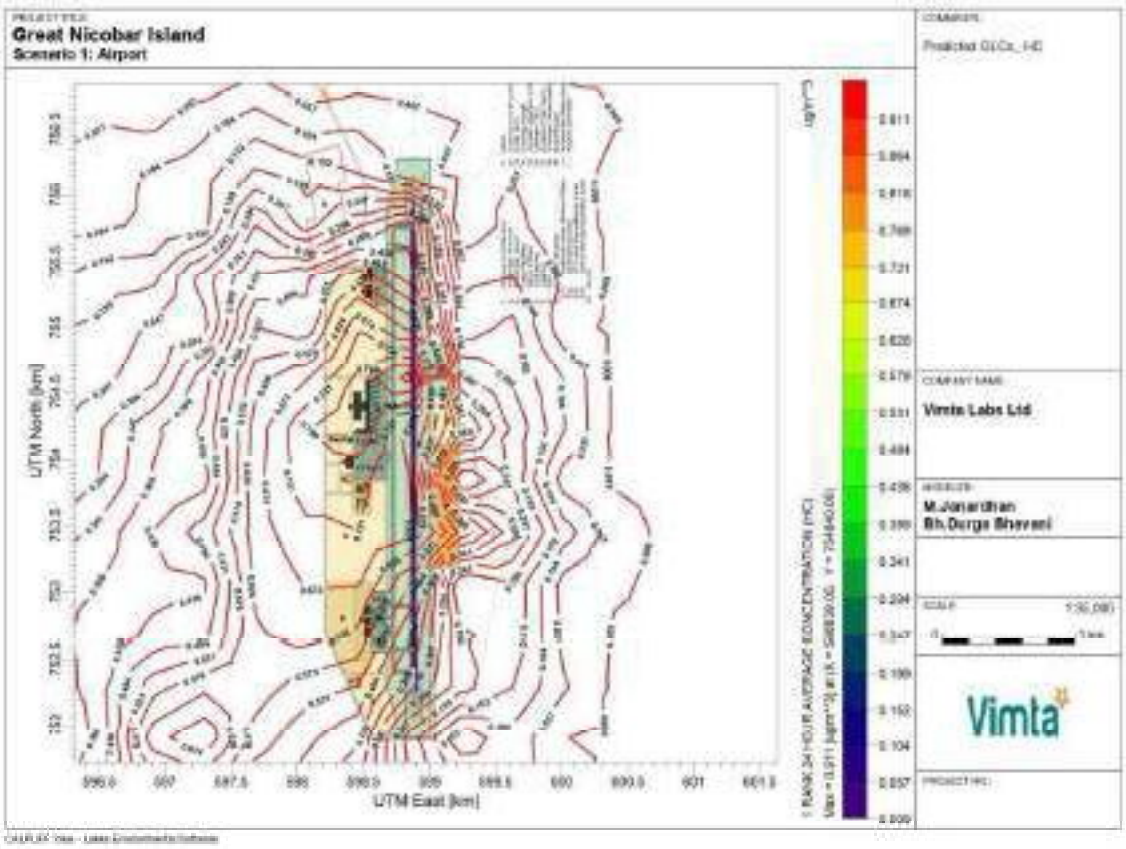
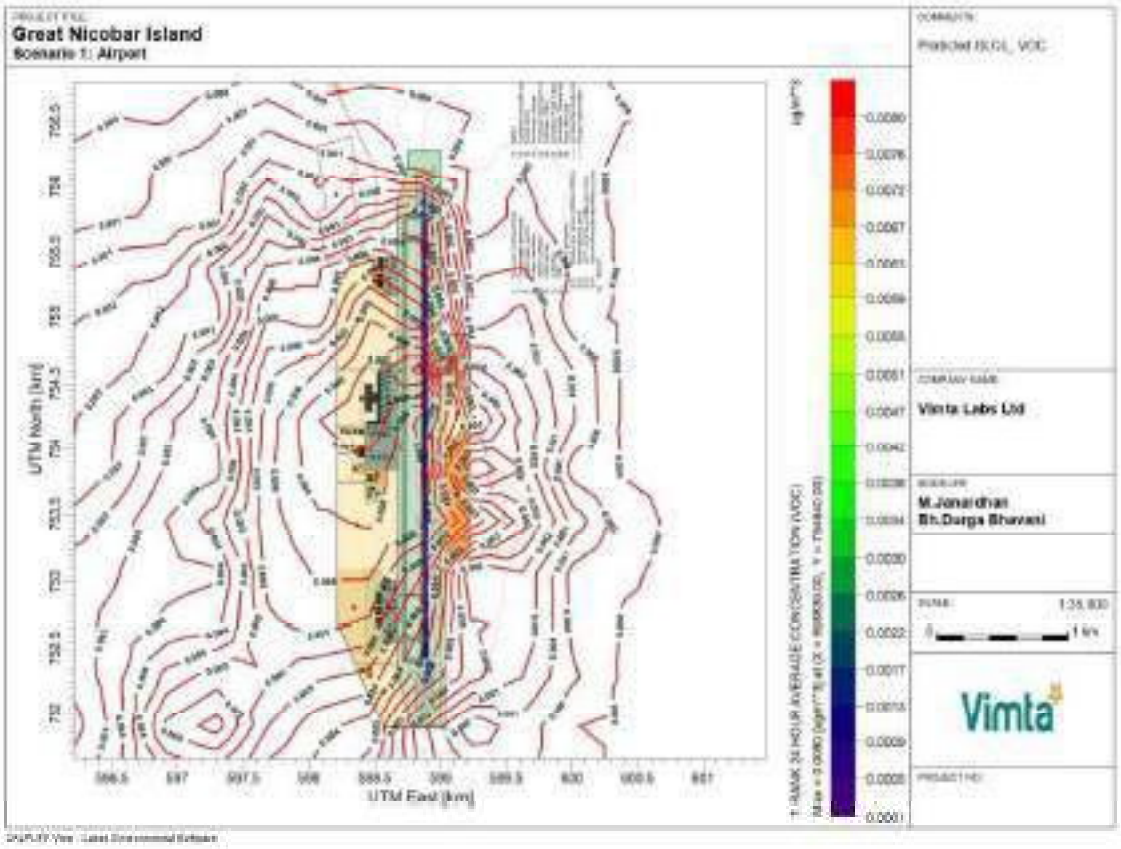


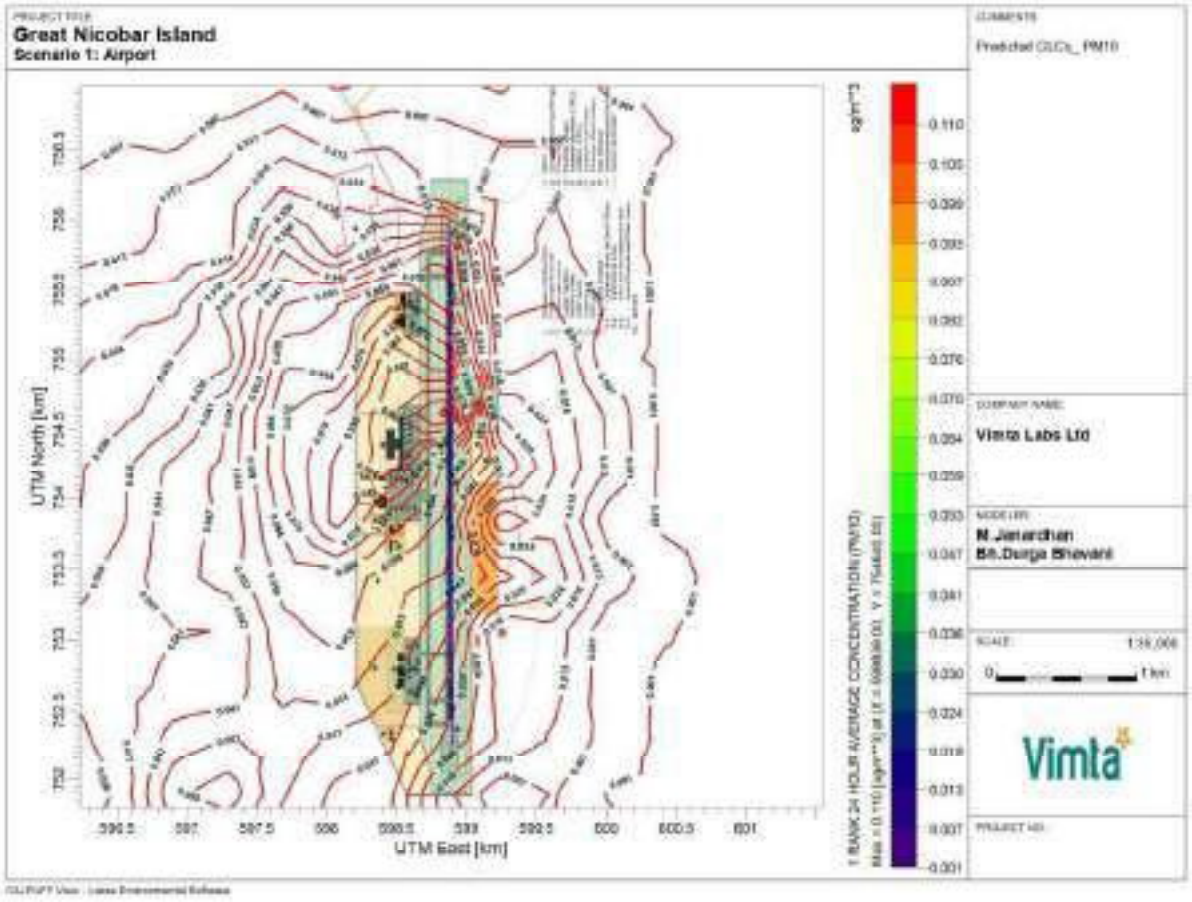
Figure – 4.5: Predicted GLCs – Scenario – I: HC



Figure–4.6: Predicted GLCs – Scenario – I: VOC



Figure–4.7: Predicted GLCs – Scenario – I: PM10



Figure–4.8: Predicted GLCs – Scenario – I: PM2.5

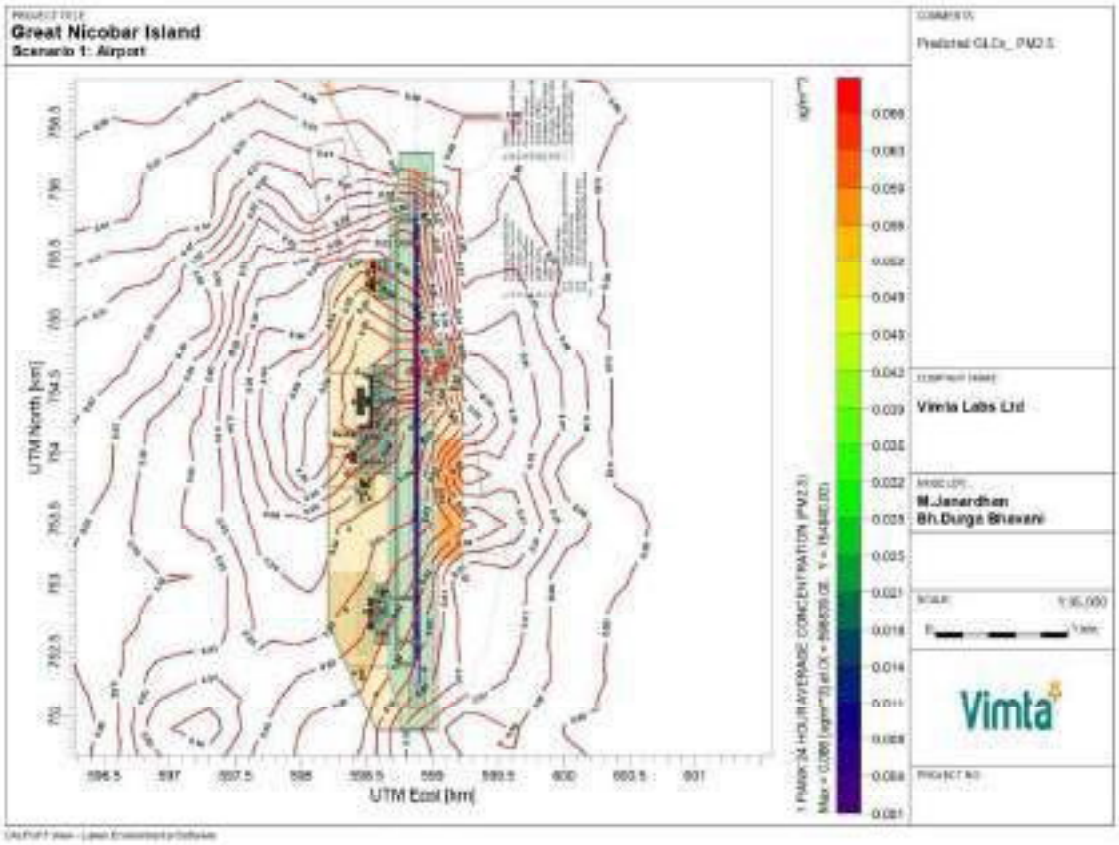


Table-4.5: Scenario 2- DG Set

Sr. No	Parameter	GLC (µg/m^3)	Distance (Km)	Direction
1	NOx	32.3	1.3	WSW
2	CO	13.7	1.3	WSW
3	SO_2	0.98	1.3	WSW
4	PM_{10}	1.74	1.3	WSW
5	$PM_{2.5}$	0.87	1.3	WSW

- *Emission Characteristics-Power Backup DG Sets*

Air emissions are generated from the operation of proposed DG sets used as the standby electricity source in the case of power supply failure. The total power required for the entire airport will be 3x750 KVA. Though the backup DG sets operate only in case of power interruptions, continuous run of all DG sets for peak hour has been assumed to obtain maximum GLCs for the study period to estimate a worst-case scenario. The emission characteristics of proposed DG sets are given in **Table-4.6.**

Table-4.6: Details of Stack Emissions

Sr. No.	Parameters	DG Sets
1	No. of DG Sets	7
2	Stack Height (m)	45 m each
3	Stack Diameter (m)	0.5 each
4	Exit velocity (m/s)	8.0 – 13.5
5	Exit temperature (°C)	250°C - 275°C
6	Flow rate (Nm^3/s)	800 Nm^3/hr – 900 Nm^3/hr
7	Fuel used	Ultra-Pure Low Sulfur Content Diesel
8	Particulate Matter (PM_{10})	35 - 37.5 mg/Nm^3
		0.0077 - 0.0094 g/s
9	Sulphur dioxide (SO_2)	45 – 50 mg/Nm^3
		0.01 - 0.012 g/s
10	Nitrogen oxides (NO_x)	15 – 20 mg/Nm^3
		0.0033 - 0.005 g/s

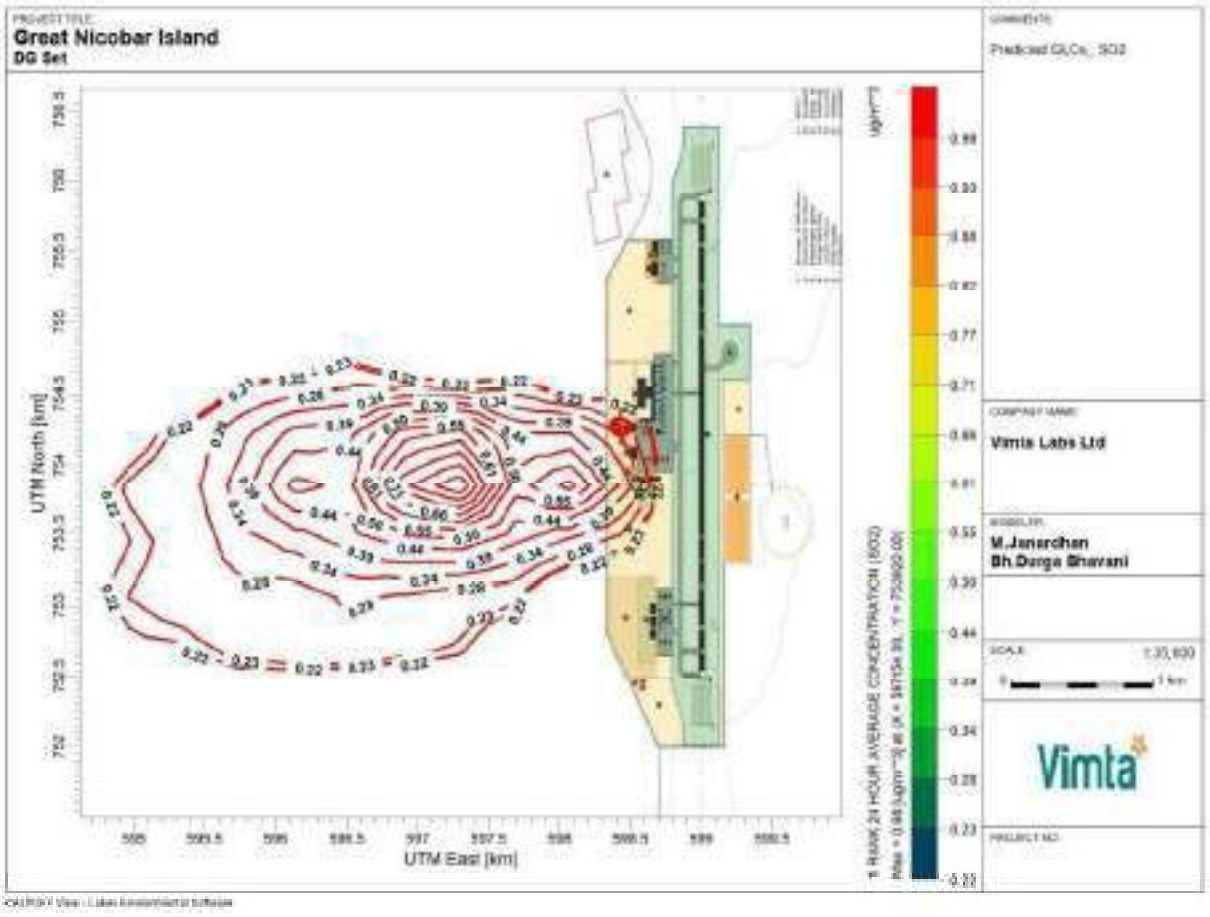
Source: Stack Monitoring Reports of Similar DG Sets

Table-4.7 : Resultant Concentrations Due To Incremental GLC's (DG Sets) - Worst Case – Scenario-II

Pollutant	Maximum AAQ Concentrations Recorded During the Study Period (µg/m^3)	Predicted Incremental Concentrations (µg/m^3)	Resultant Concentration (µg/m^3)	NAAQ Standards (µg/m^3)
SO_2	8.3	0.98	9.28	80
NO_2	10.1	32.3	42.4	80
CO	245	13.7	258.7	2000
PM_{10}	22.6	1.74	24.34	100

The modelling tool has been executed to assess the predicted incremental concentrations due to the operation of 7 DG sets for continuous 8 hours per day. The resultant concentrations as per the above prediction are found to be well within the permissible limits. The Isopleths for Incremental concentration for Scenario – 2 are given in **Figure–4.9 to Figure – 4.13**

Figure – 4.9: Predicted GLCs – Scenario – Ii: SO2



Figure–4.10: Predicted GLCs – Scenario – II: NOx

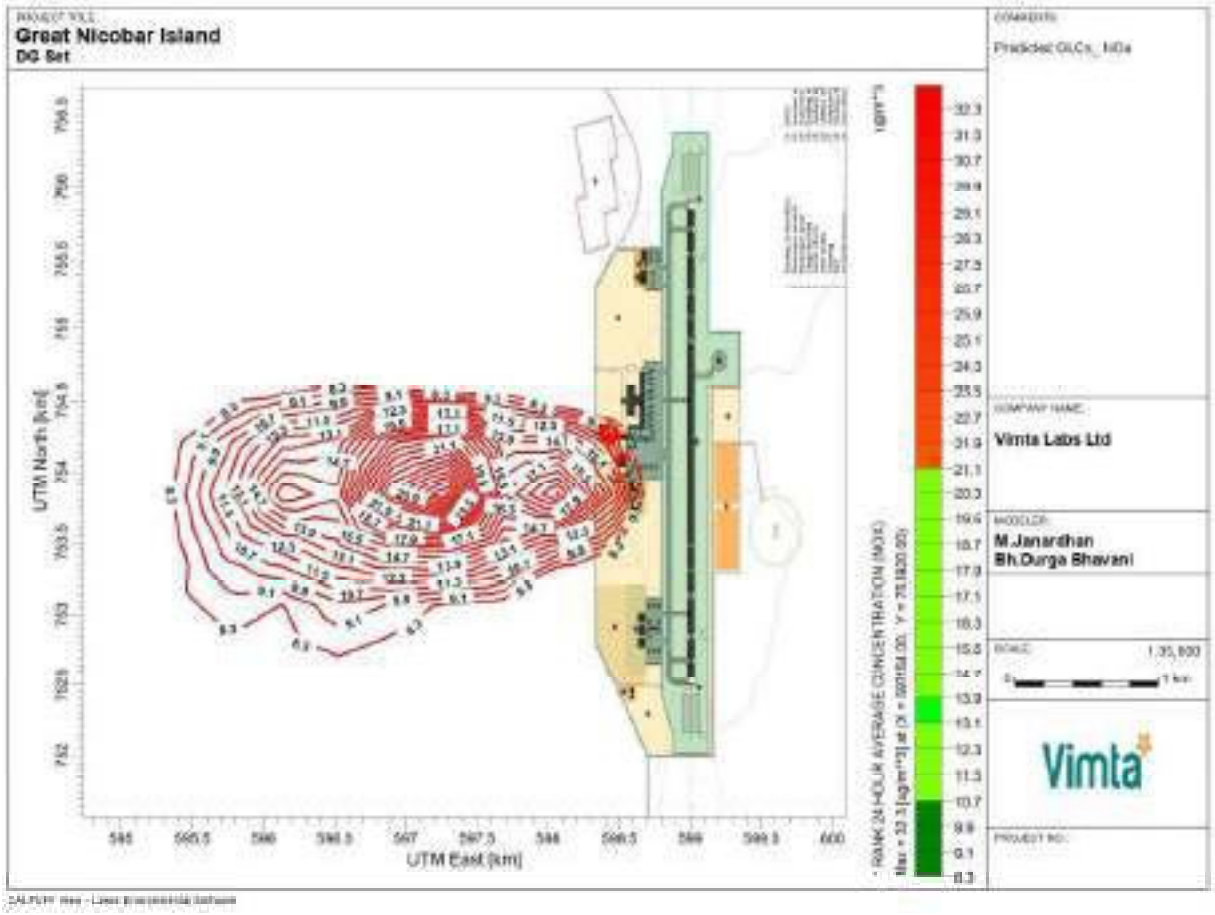


Figure – 4.11: Predicted GLCs – Scenario – II: CO

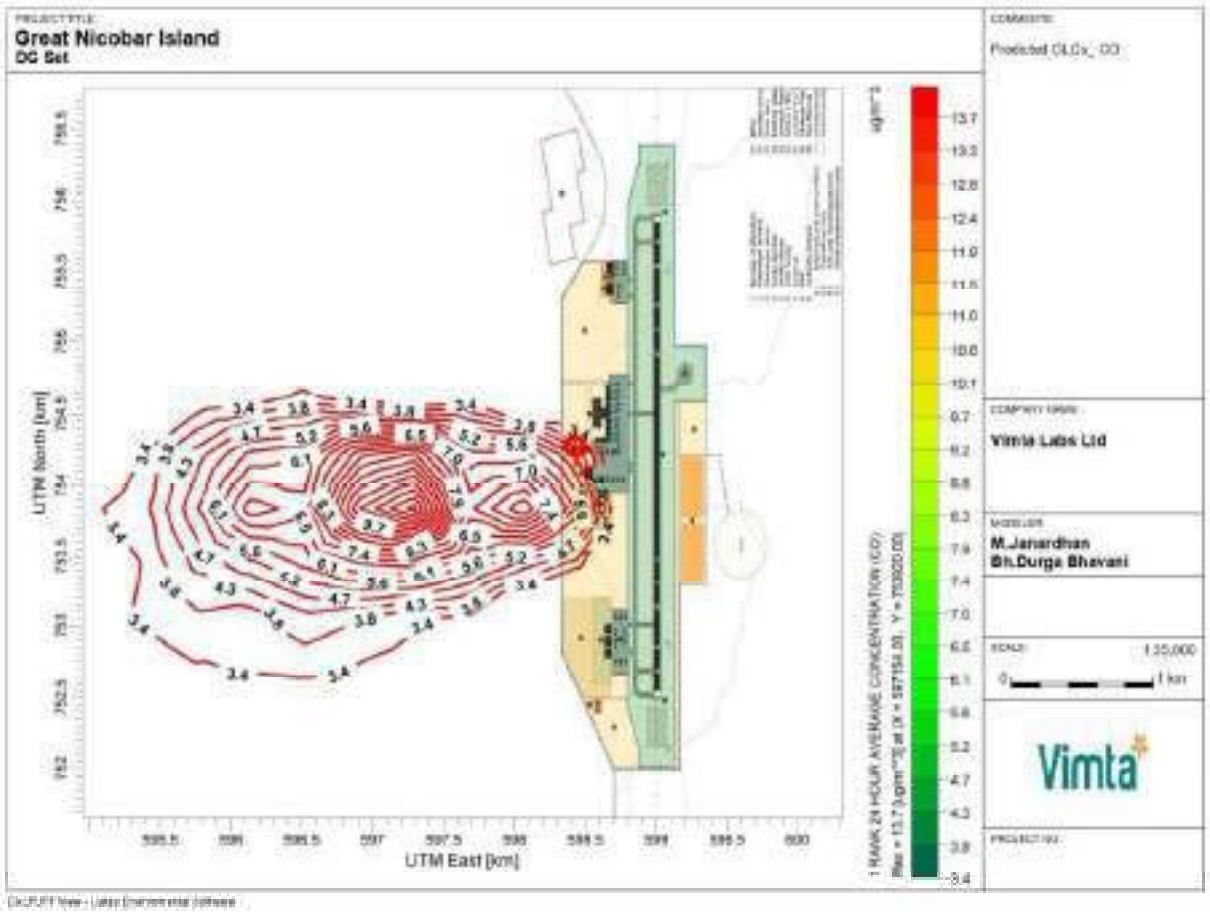


Figure – 4.12: Predicted GLCs – Scenario – II: PM10

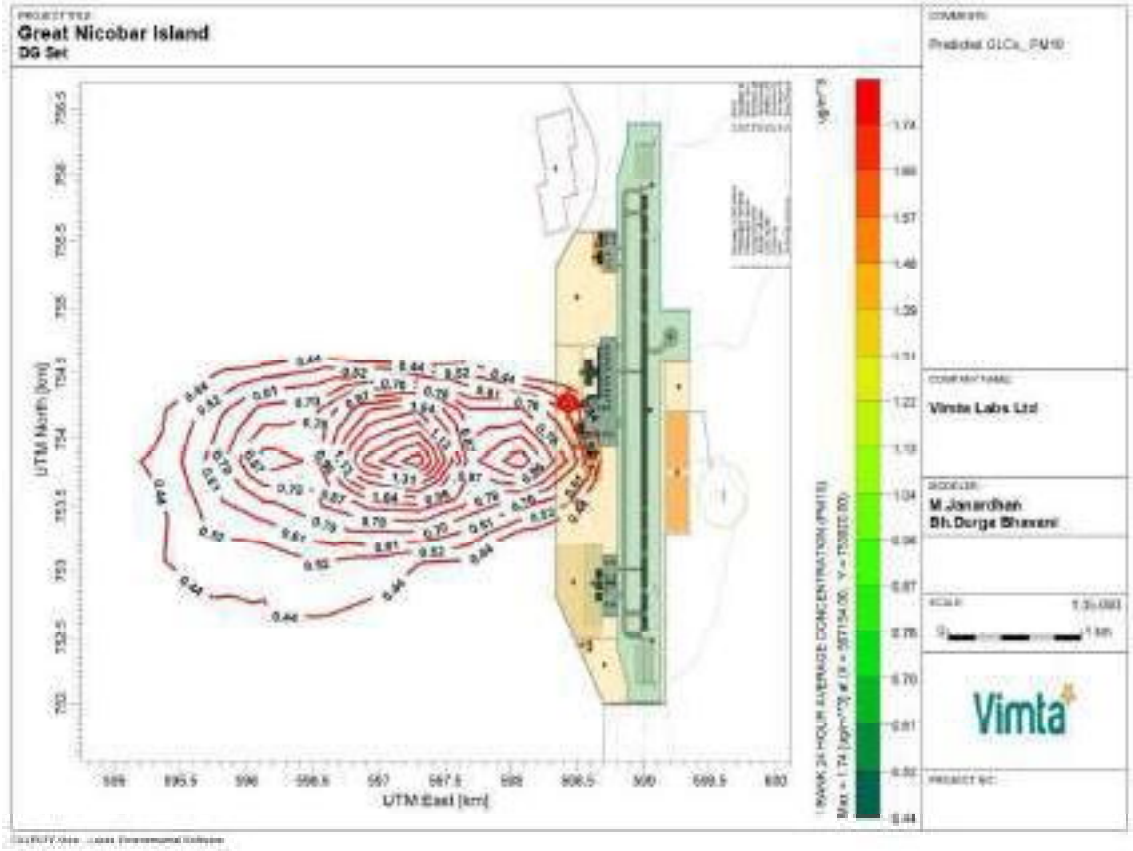
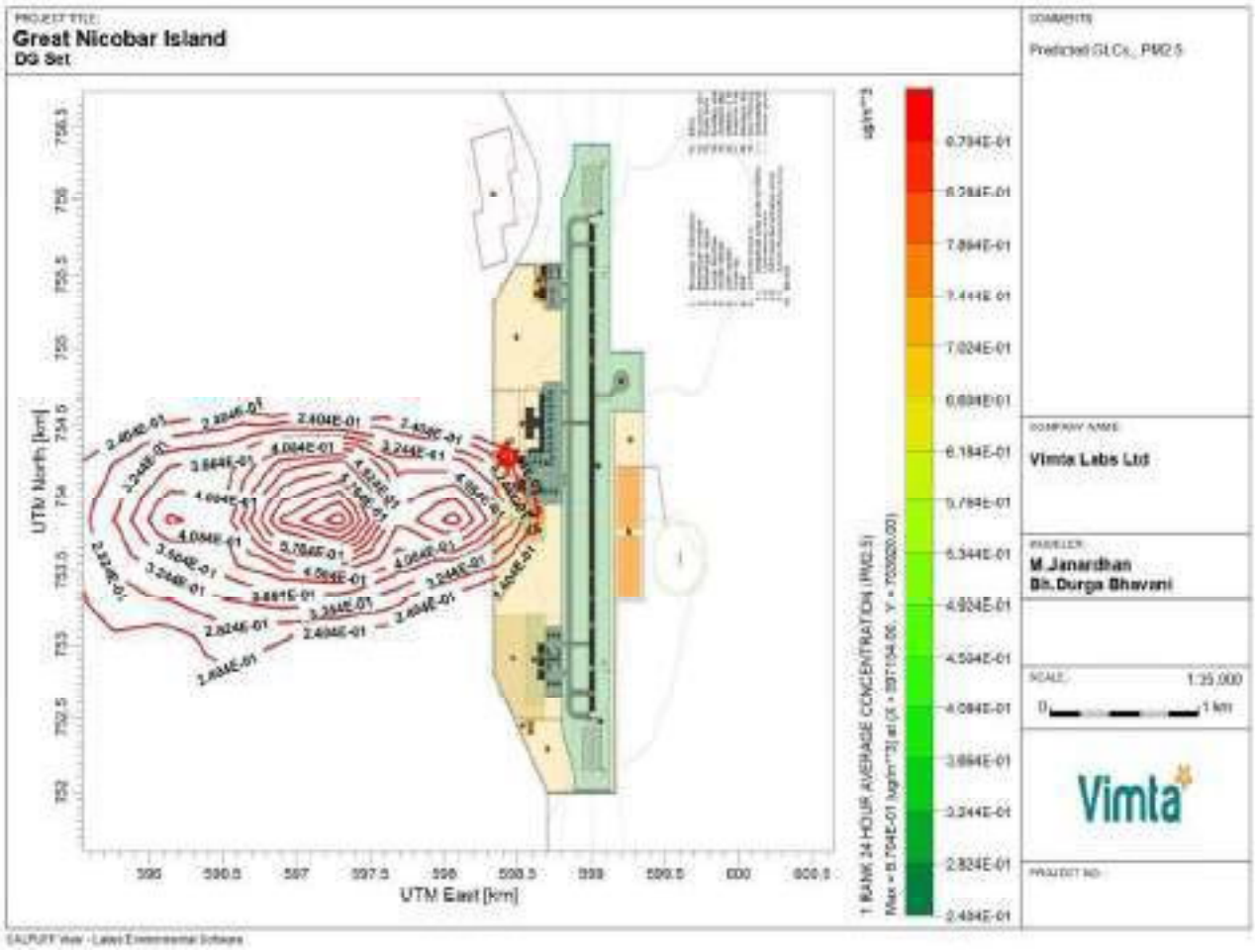


Figure – 4.13: Predicted GLCs – Scenario – II: PM2.5



4.3.4 Impact of Vehicular Traffic

- *Vehicular Movement in Parking Facilities*

A car park in-front of the terminal building has been developed at airport for the convenience of passengers and visitors to the airport. The vehicles at the parking lot include private cars, taxis and cabs. An entry and an exit of the parking facility with any idling and vehicle movement together, count as one operation. The input for average distance traveled in lot is an estimate for the average distance a vehicle travels between entry and exit.

Baseline study on traffic volume outside area and the observed speed has carried out during the study period. The anticipated additional traffic volume has been assessed assuming the movement of larger aircrafts like A-320.

With the implementation of the proposed project, the traffic is likely to increase on the existing road network near the airport and its surroundings. Hourly peak traffic of 4000 vehicles is considered for the dispersion study to evaluate the worst-case scenario. The impact of the traffic is assessed based on:

1. Incremental traffic due to the proposed project;
2. Impact on air quality;
3. Adequacy of the internal road network; and
4. Adequacy of parking facilities.

Table-4.8: Scenario 3- Car Parking Lot

Sr. No	Parameter	GLC (µg/m^3)	Distance from the centerline of the road (m)
1	NOx	9.42	20
2	CO	33.42	20
3	HC	2.66	20
4	PM_{10}	1.98	20
5	$PM_{2.5}$	1.48	20

- *Emission Factor*

For computing the emission rate, emission factors proposed by CPCB are considered

CO	NO_x	HC	PM
1	0.14	0.04	0.02

CPCB Guideline

Table-4.9: Resultant Concentrations Due to Incremental Glc's (Parking Lot) - Worst Case – Scenario-III

Pollutant	Maximum AAQ Concentrations Recorded During the Study Period (µg/m³)	Predicted Incremental Concentrations (µg/m³)	Resultant Concentration (µg/m³)	NAAQ Standards (µg/m³)
PM_{10}	22.6	1.98	24.58	80
NO_2	10.1	9.42	19.52	80
CO	245	33.42	278.42	2000

Predicted incremental concentrations due to the movement of traffic within the parking lot are computed using the dispersion modeling tool. The resultant concentrations as per the above prediction are found to be well within the permissible limits. The Isopleths for Incremental concentration for Scenario – 3 are given in **Figure – 4.14 to Figure – 4.18**

Figure– 4.14: Predicted GLCs – Scenario – III: NOx

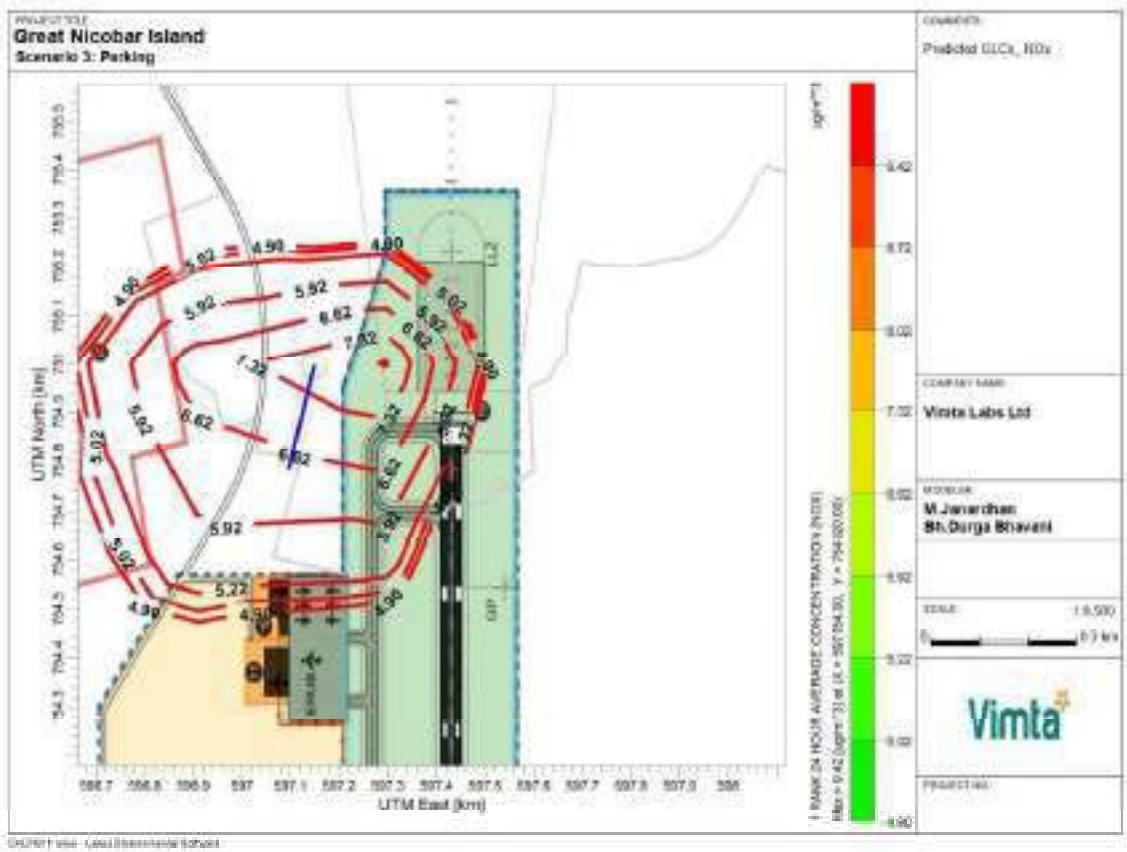


Figure – 4.15: Predicted GLCs – Scenario – III: CO

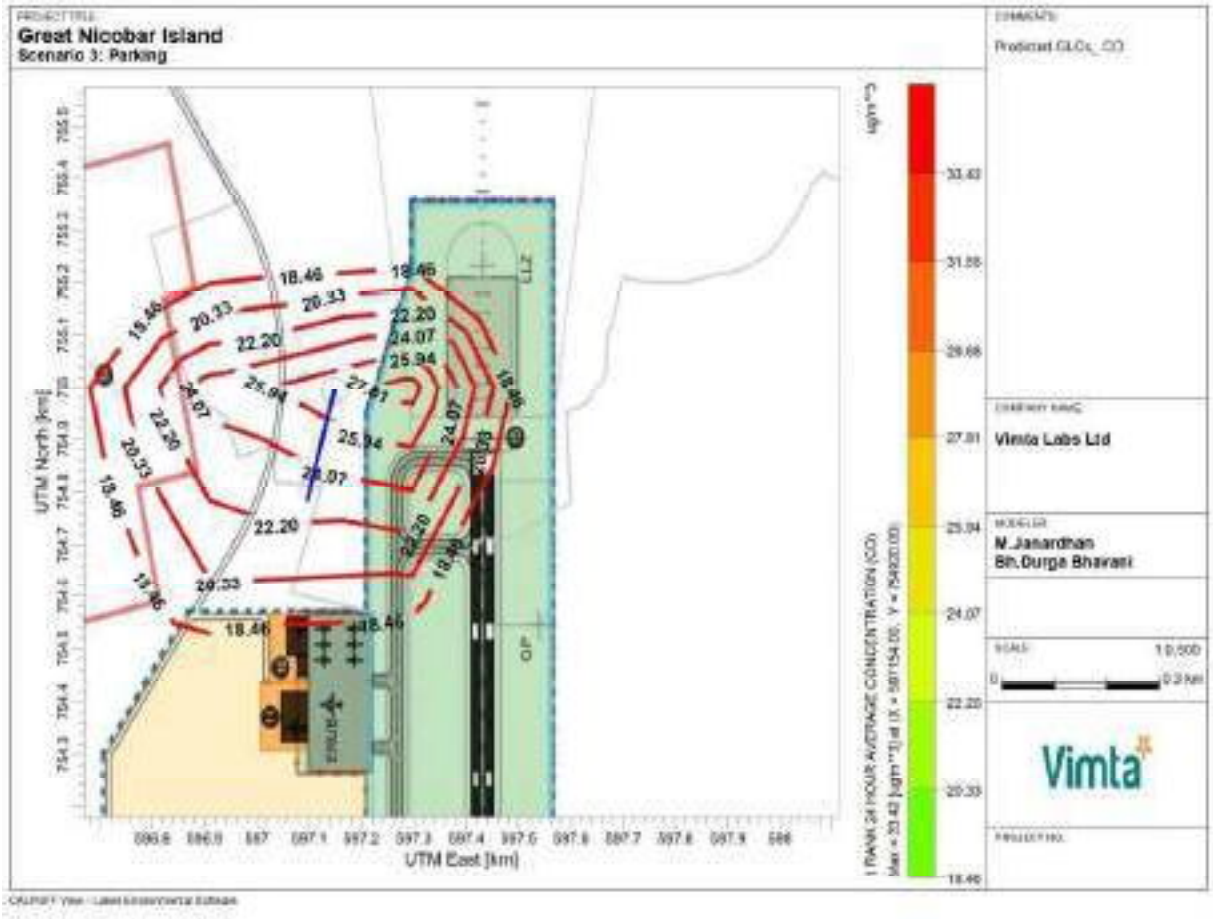


Figure – 4.16: Predicted GLCs – Scenario – III: HC

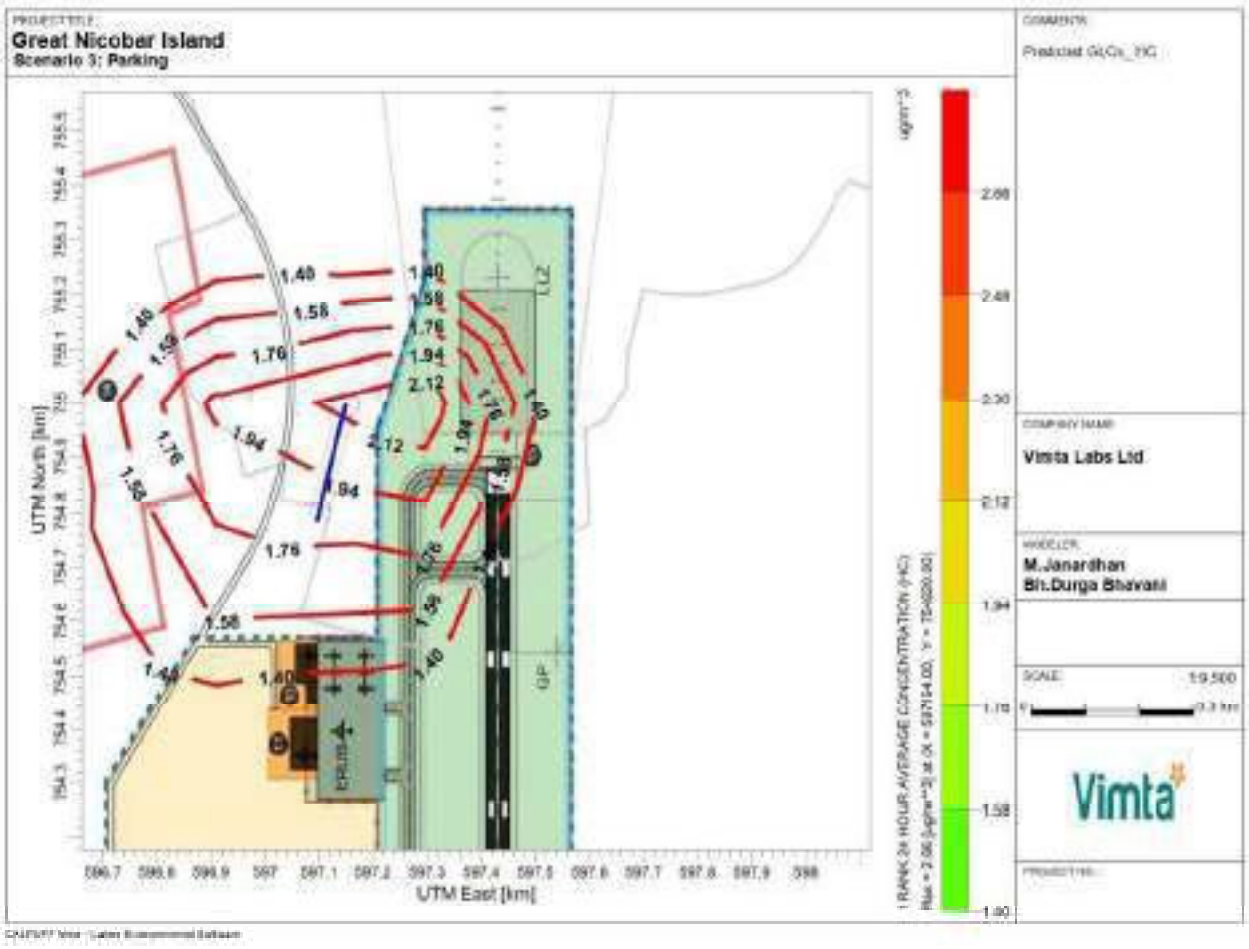


Figure – 4.17: Predicted GLCs – Scenario – III: PM10

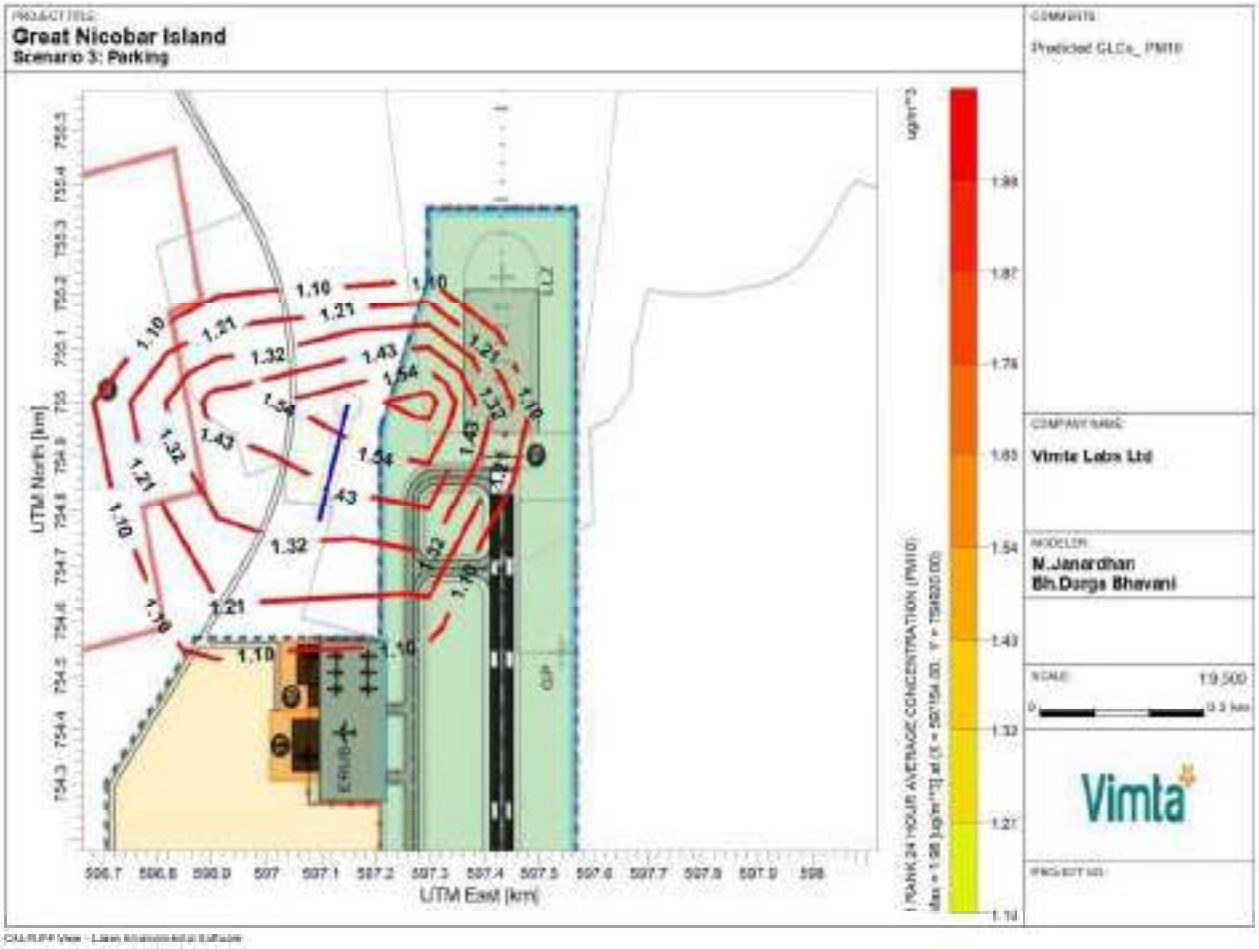


Figure – 4.18: Predicted GLCs – Scenario – III: PM2.5

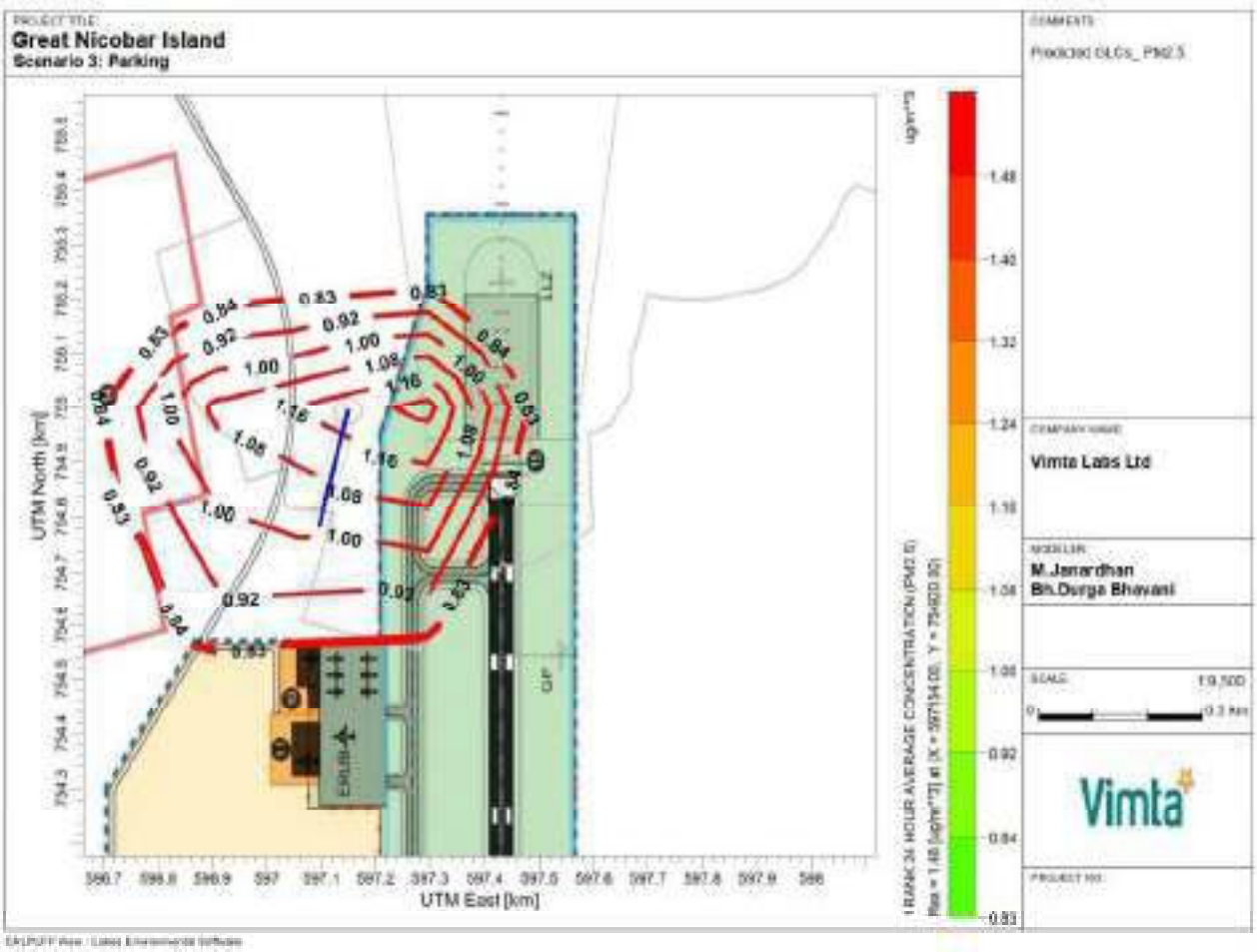


Table 4.10: Scenario 4- GSE Movement (Land side operation)

Sr. No	Parameter	GLC (µg/m^3)	Distance from the centerline of the road (m)
1	NOx	3.01	40
2	CO	1.42	40
4	PM_{10}	0.33	40
5	$PM_{2.5}$	0.21	40
7	HC	0.84	40

The predictions of traffic volume incremental concentrations of CO, NOx, HC, $PM_{2.5}$ and PM_{10} due to calculated traffic assumed due to the movement of GSE are estimated based on site specific meteorological conditions and line source emissions from vehicles estimated in air side. The model inputs considered for assessment of impact on air quality due to movement of vehicles.

- Based on traffic study total estimated peak GSE movement in airside is 480.
- The distance of traversal by GSEs in airside is about 3.5 km along a 7 m wide tarmac road.
- Emission factors for GSE has been considered from BS-IV standards recommended by CPCB.

The incremental concentrations due to the movement of GSE are given in Isopleths as shown in **Figure – 4.19 to Figure-4.23.**

Figure – 4.19: Predicted GLCs – Scenario – IV: NOx

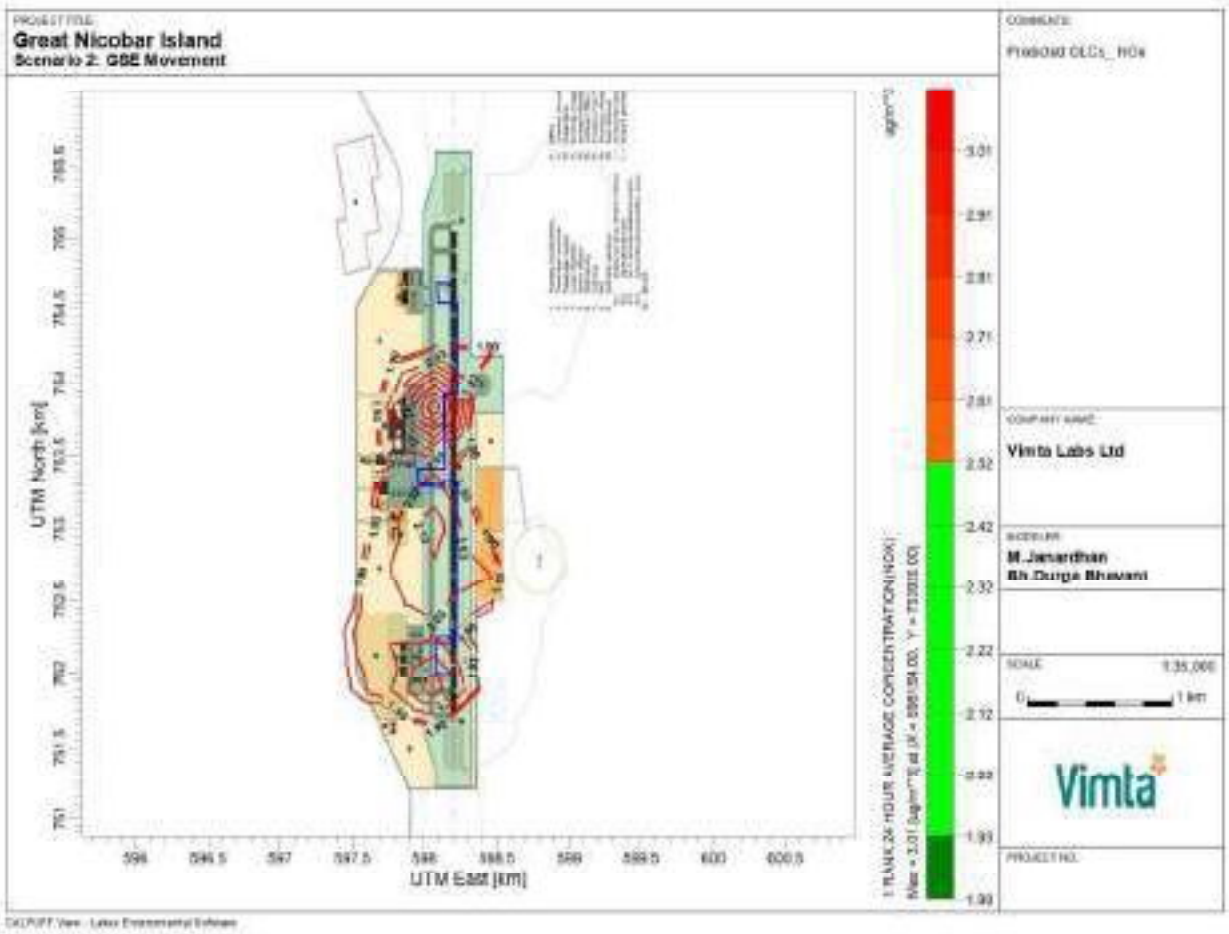


Figure – 4.20**:** Predicted GLCs – Scenario – IV: CO

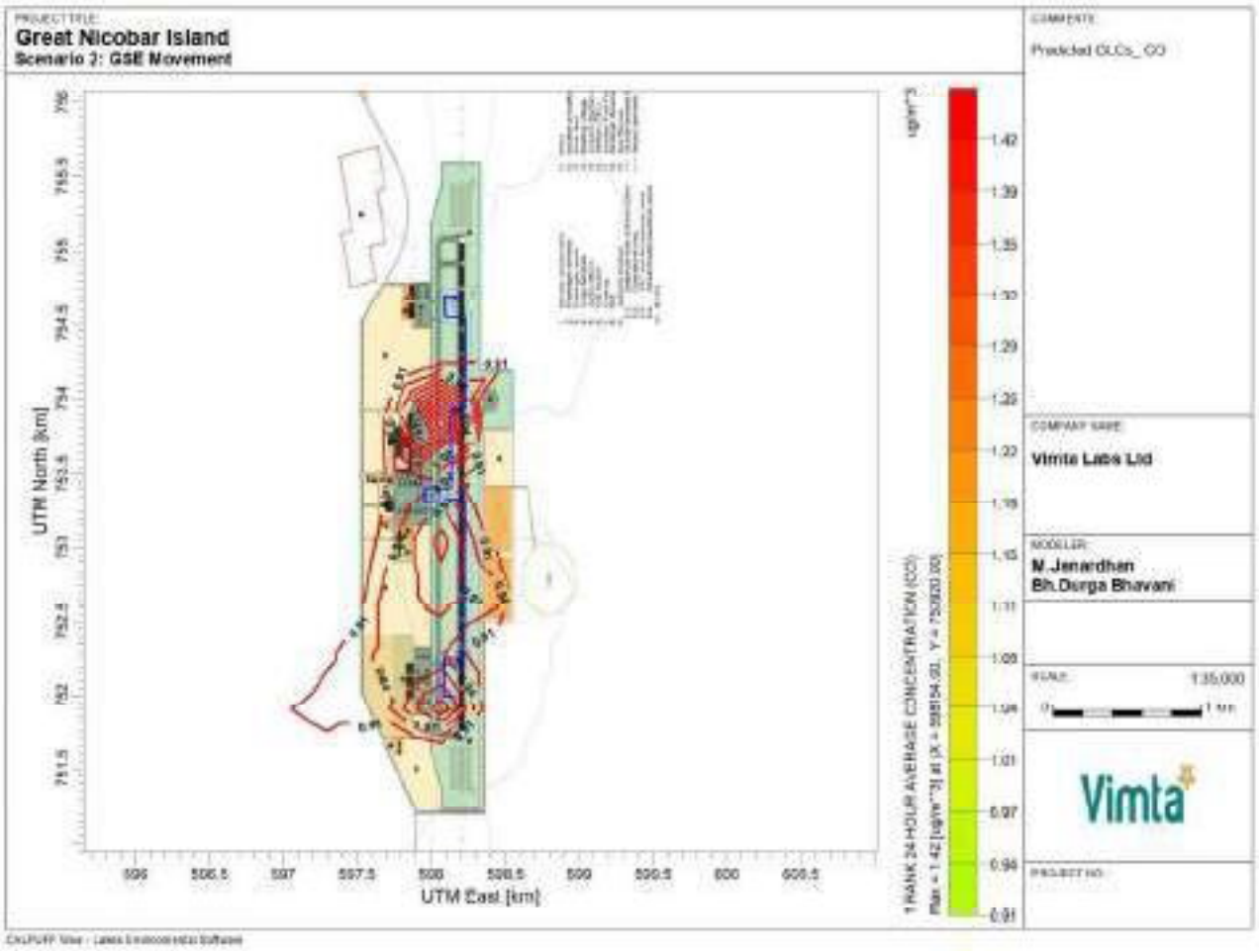


Figure – 4.21: Predicted GLCs – Scenario – IV: HC

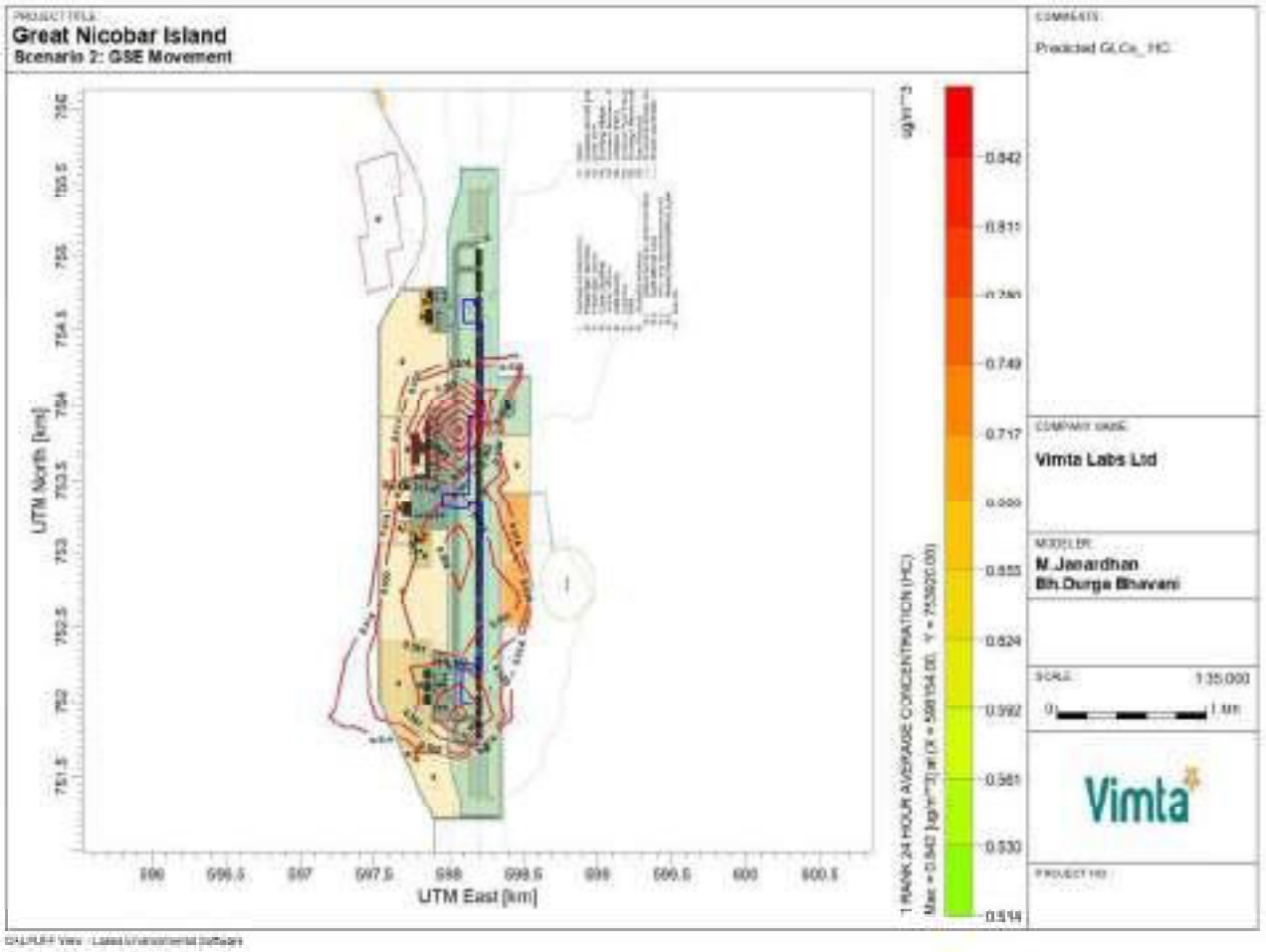


Figure – 4.22: Predicted GLCs – Scenario – IV: PM10

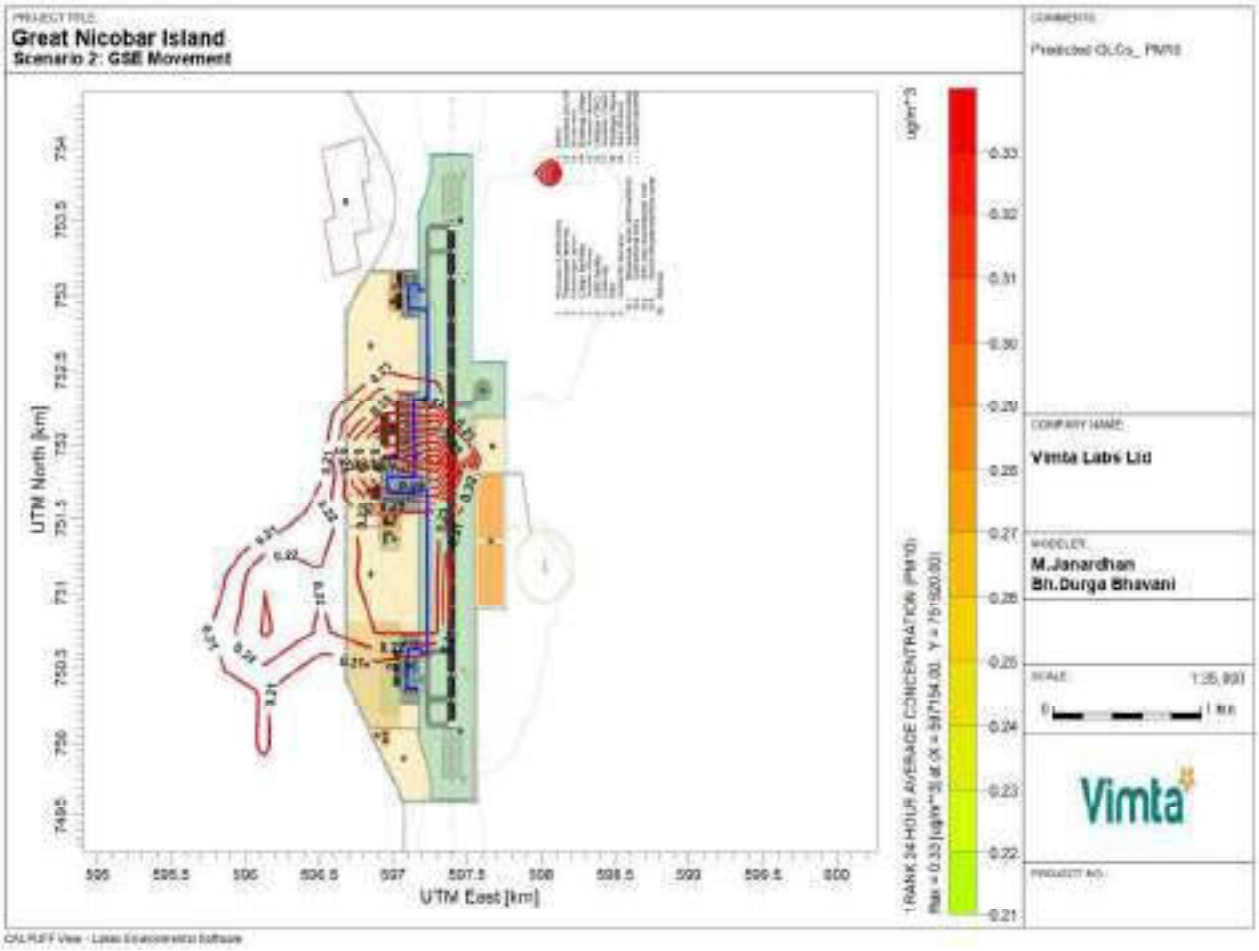
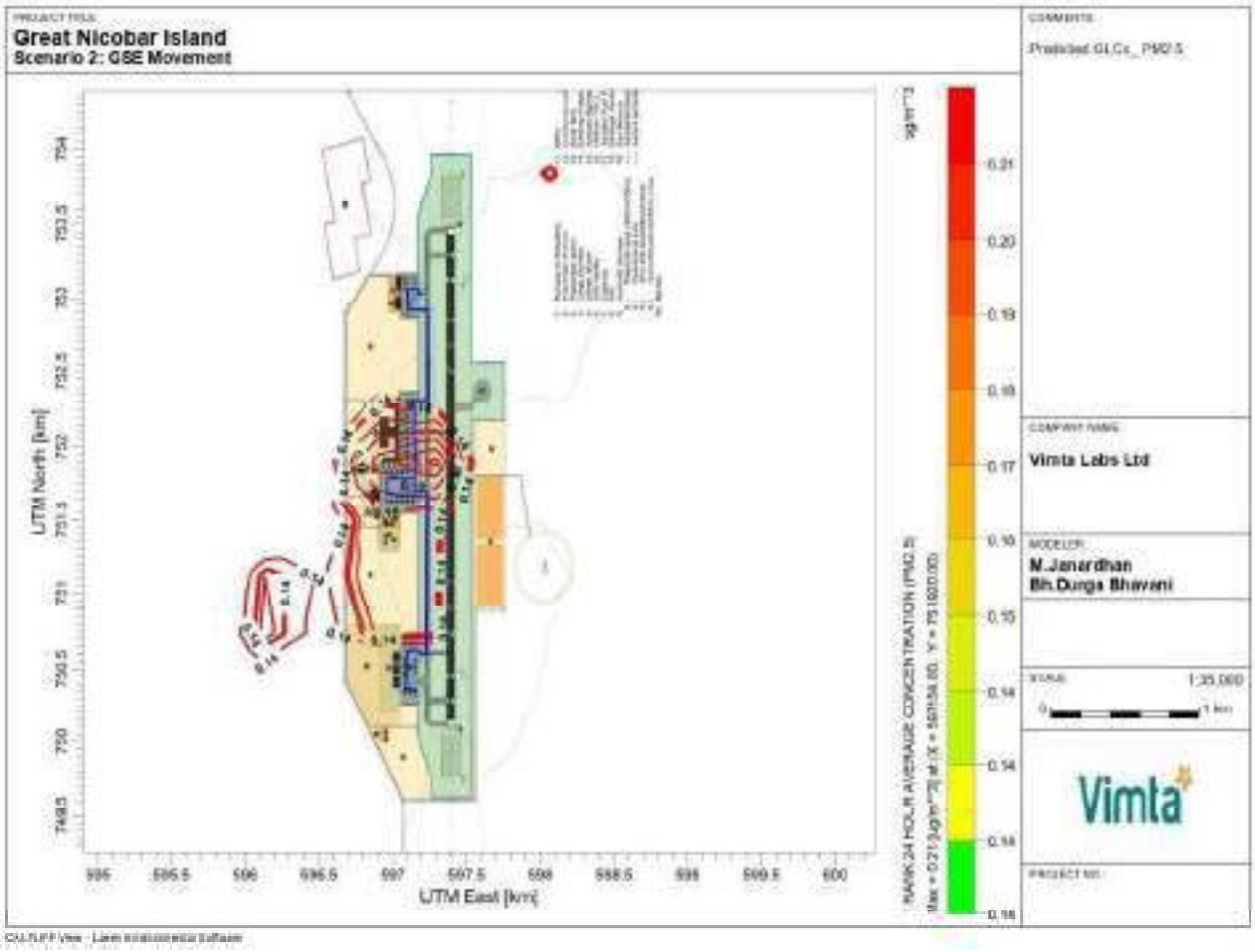


Figure – 4.23: Predicted GLCs – Scenario – IV: PM2.5



4.3.5 Air Quality Management

Major pollutants envisaged from the proposed project will be from aircraft exhaust, ground service equipment, vehicular traffic (airside and landside) and from DG sets. The following methods of abatement will be employed for the air pollution control at the source level.

- Aircrafts will be operated in accordance with ICAO/USEPA standards to ensure aircraft emissions are within specified standards;
- Allowing aircrafts with certified engines only to land and take-off, as far as possible;
- Shut down engines during idling and taxing;
- Toe the aircraft up to the runway to reduce ground emissions
- Single engine taxing and reduced taxing would be effective in reducing emissions of HC and CO from aircrafts;
- Converting ground service equipment to use alternative fuels;
- The Double Annular Combustor (DAC) burns the fuel at lower temperature in two stages to radically reduce NOx levels;
- Height of the stack for DG sets will be kept as per CPCB guidelines;
- Providing adequate buffer zones where pollution concentrations are highest to reduce the impact of emissions;
- Appropriate design of access roads to avoid traffic jams to reduce air pollution;
- Providing suitable green belt/green cover to reduce the impact of air pollution; and
- Vehicles moving within the airport will be maintained and emission checks will be carried out on regular interval.

In addition to the above, any additional control measures suggested by SPCB/CPCB/MoEF&CC will be implemented.

4.3.6 Impact on Water Resources and Water Quality

The wastewater generation mainly consists of sanitary waste, sewage from airport terminal, flight kitchen etc. The sewage and sanitary waste from the airport terminal, and other allied facilities is routed to 400 KLD Sewage Treatment Plant (STP) and is treated based on Moving Bed Biofilm Reactor (MBBR) technology. Sewage from the aircrafts is also being sent to the STP for treatment. The treated wastewater from the STP is used for flushing and green cover development. There is no discharge of any wastewater outside the airport premises.

- ***Wastewater Generation at Airport Terminal***

Water consumption may depend on types of passengers and Aeroplan maintenance services offered and include the operations of sanitary facilities for large number of transiting passenger and Aeroplan maintenance services or cleaning activities in general. Impacts on the public sewerage system, sewage treatment and disposal facilities associated with the project have been assessed based on the forecast of ATM, passengers at present and increase in ATM.

- ***Wastewater Generation due to Airport Operation***

The wastewater generated will be mainly consisting of sanitary waste, which will be treated in the integrated Sewage Treatment Plant (STP) proposed for GNI development.

4.3.7 Impact on Soil Quality

Solid waste generated from the proposed facilities would be basically the food waste and garbage from the terminal building, passenger transport center facilities. All the municipal wastes will be collected and transported to integrated Waste Management Facility for treatment and disposal.

Hence, the impact on soil due to solid waste and wastewater generation is not envisaged to be significant.

4.3.8 Impact on Noise Levels

During the operational phase, aircraft movements will be the major source of noise pollution from the proposed airport project. Noise will also be generated from the traffic and standby auxiliary power sources i.e., DG sets, but will be very less and localized in comparison to the noise from the aircraft, which can be felt at longer distance also. Hence, noise from the aircraft movement at the airport has been considered for the noise dispersion modeling.

The noise emanating from aircraft operations depends upon a number of factors including type of aircraft, overall number of daily takeoffs and landings, specific flight procedures, topography etc.

To predict the impact on the existing noise levels in the study area due to the proposed airport, the model **Integrated Noise Model (INM), Version 6.0** developed by **Federal Aviation Administration (FAA), Office of Environment and Energy, USA** is used. This model has inbuilt information on the various aircraft and has capability of assessing changes in noise impact resulting from runway configurations, traffic demand and fleet mix, routings and airspace structures, alternative flight profiles and modifications to other operational procedures like reverse thrust.

In the prediction of noise levels due to the proposed airport, operation of runway has been considered. Total LTO cycles of 3 have been considered in the prediction of noise levels. For the noise modeling exercise, it is assumed that the aircraft will follow standard procedures of flying for approaches and departures as defined in the model, INM 6.0. The following input is given to the model:

- Runway orientation;
- Aircraft fleet mix; and
- Terrain features.

4.3.9 Model Results

The model is run to estimate values of A-weighted exposure-based noise metrics viz., LAEQD (Audible Range Weighted Daytime Average), LAEQN (Audible Range Weighted Nigh Time Average) and LAEQ (Audible Range Weighted 24 hr Average). The outputs of the modeling exercise are presented in scaled contours in **Figure-4.24** to **Figure-4.26** and the area of influence of the predicted incremental noise levels are given in **Table-4.11**.

Table-4.11: Noise Levels and Area of Influence

Sr. No	Noise Levels in dB(A)	Area of Influence in km²		
		LEAQD (DAY TIME)	LEAQN (NIGHT TIME)	LEAQ (24 HOUR EQUIVALENT)
1	85	0.6	0.8	1.2
2	80	0.7	1.3	2.2
3	75	1.4	2.3	3.5
4	70	2.4	4.2	8.1
5	65	4.4	10.9	18.7
6	60	10.3	26.3	30.1
7	55	24.7	45.4	57.3

Source: Output data of INM Model

The areas which are likely to be impacted by the future air movements are the same. The areas are already affected by the flight movements and though the increase in frequency of the movement is likely to worsen the situation, as seen from the simulation, it can be practically inferred that the magnitude of change in noise impacts in terms of future flight frequency is unlikely to be of any significant consequence as the funnel zone end with sea. Hence, the impact in funnel area will be insignificant on habitation even in peak hours air traffic movements.

There will be a scope for some further modest improvement in takeoff/landing noise from future aircraft/engine designs which will further reduce the noise levels.

Noise Level Management

Some of the practices proposed for noise attenuation are as follows:

- Strict adherence to DGCA/ICAO prescribed environmental guidelines & circulars on airport operations;
- Continuous descent approach profiles for landing aircraft;
- Restricted usage of ground engine run-ups to reduce noise;
- Restricted use of thrust reversal while landing of aircraft to minimize noise in lateral direction;
- Aircrafts with certified engines only will be allowed to land and take-off to the extent possible to reduce the noise impacts on the surroundings;
- Dual nozzle in the aircraft will reduce the noise levels;
- Proper scheduling of the aircrafts to minimize the noise levels;
- Switching off as many engines as possible during idling and taxing;
- Proper maintenance of ground servicing equipments;

- Use of damping materials such as thin rubber/ lead sheet for wrapping the work places like compressor room, DG room etc;
- Maintenance of vehicles to reduce noise levels;
- Personnel working in noisy areas will be provided with ear plugs/mufflers to reduce the noise impacts;
- The DG set will be provided with acoustic enclosures and exhaust mufflers for effective noise reduction of 25 dB(A) each;
- Sources of intermittent noise generating equipment such as compressors will be provided with appropriate acoustic barriers so that the noise level within 100 m of these facilities when in operation will be less than 70 dB(A); and
- Noise attenuating green belt / green cover will be developed for effective reduction in noise wherever feasible.

Figure-4.24: Day Time Average Noise Level Contours-AIRSIDE

Figure-4.25: Night Time Average Noise Level Contours-AIRSIDE

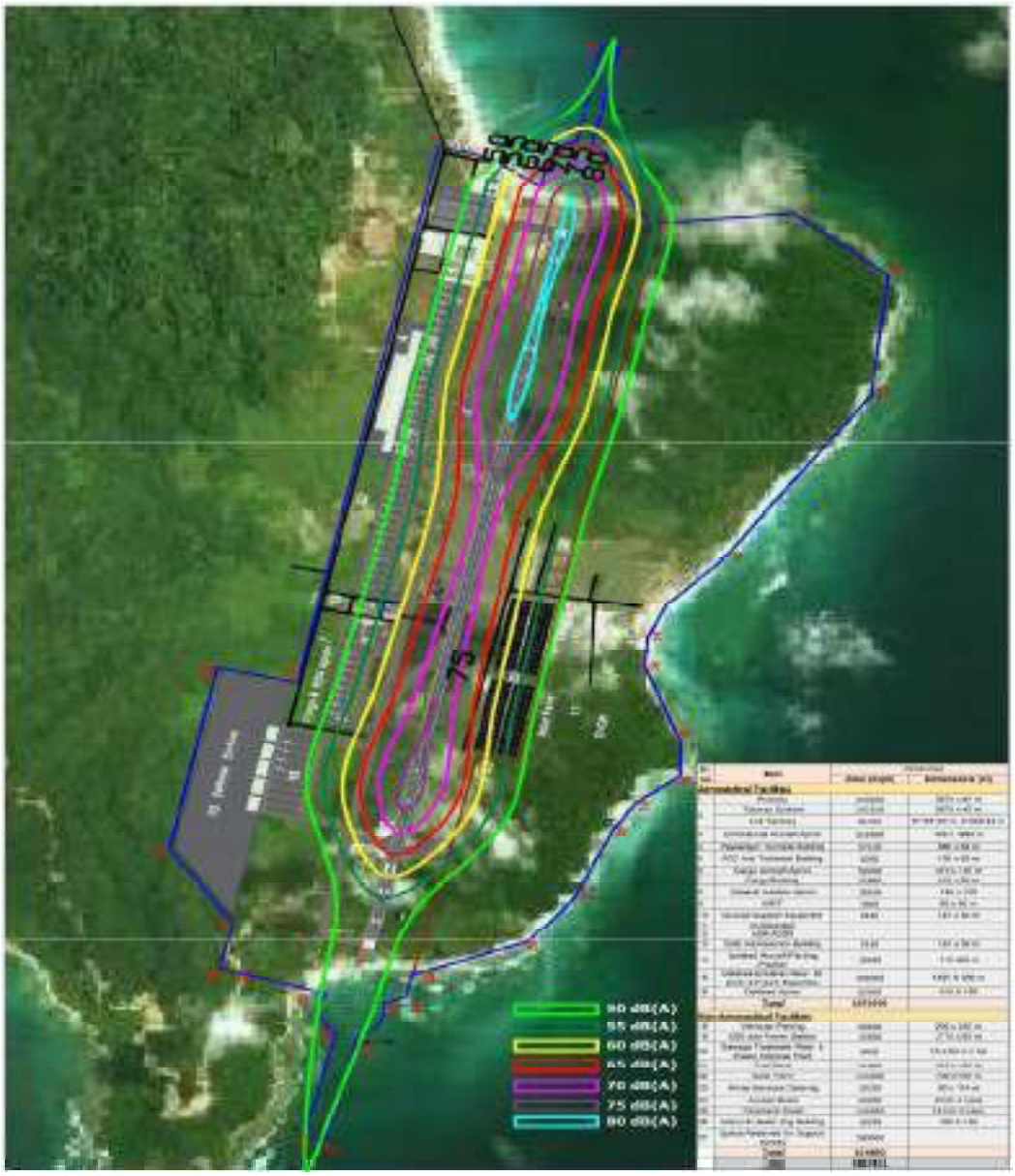
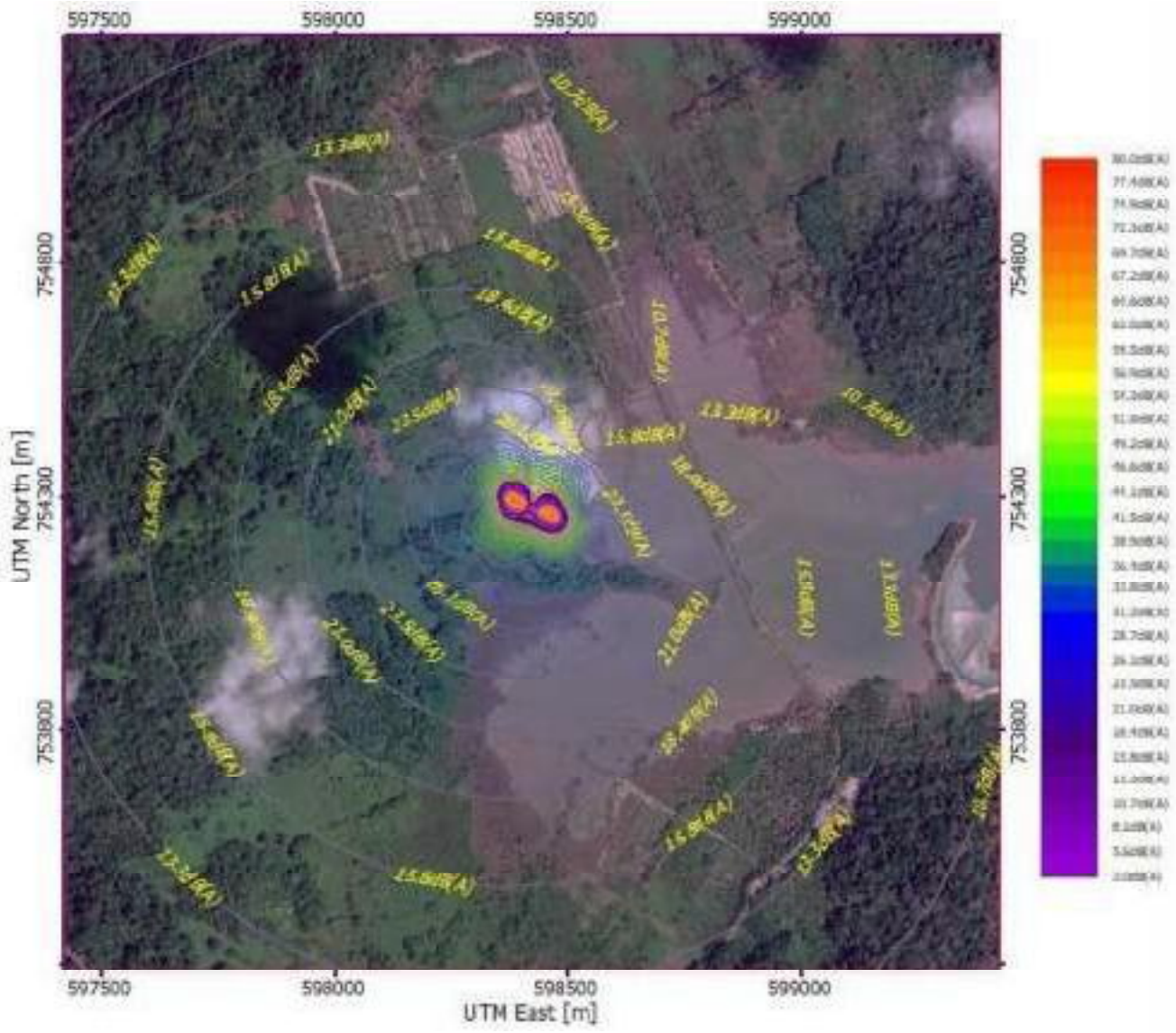


Figure-4.26: Hourly average noise level contours-airside

Figure-4.27: Noise generation diagram in the Airport complex due to proposed activities



The individual aircraft operators will provide necessary controlled equipment's like acoustic enclosures, mufflers and the proposed greenery development will also act as noise barrier.

According to the Occupational Safety and Health Administration (OSHA) Standards, the allowable noise level for the workers is 90 dB (A) for 8 hours exposure a day. Adequate protective measures in the form of ear muffler plugs to the workers working near the noise generating units will be provided by the occupiers.

Hence, the impact of noise on the surrounding environment is likely to be within the permissible limit with adequate control measures and judicious implementation of the environment.

4.3.10 Impact on Ecology

Effective utilization pollution reducing technologies, such as utilization of noise pollution reduction equipment during the operation phase will be of immense help and will aid in reducing the noise pollution during operation phase of the airport and appropriate plantation activity and using treated sewage water for the purpose of the green belt development and gardening activities which are earmarked in the area. The appropriate care should be taken so that no fruit bearing trees should be planted in the green belt/green cover area. The fruit bearing trees will attract birds which will be detrimental to aircraft safety.
The Aircraft landing and take-off generates significant noise and air blast. This may affect the nearby resident bird population. However, care will be taken to ensure that resident birds do not nest near the airport so that the flight safety is not compromised. As a remedial measure, it has been suggested that no fruiting tree which attract birds will be planted in the vicinity of the Airport site.

4.3.11 Impacts on Socio-Economics

a. The road network will be increasing therefore the accessibility will increase.

The goal of the project for Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands' is to development of a new 'greenfield city' with a diverse and robust economy based on maritime services and tourism, amongst other drivers. Great Nicobar Island to attract international and national visitors to experience the outstanding natural environment and participate in sustainable tourism activity. As per the future requirement the road network will be increase therefore the accessibility will increase.

b. Educational facilities

Considering that Great Nicobar Island is not well developed and is mostly rural in nature, there is a complete lack of educational facilities. For the future communities to come and settle in the GNI planning area it is paramount that certain educational facilities to be provided based on the need based social and physical infrastructure development assessment. 77 Primary schools, 19 secondary schools, total of 8 integrated schools, 4 colleges, 3 scientific research

centers, 2 ITIs, 1 adult education center, 2 technical education centers will be provided. These facilities will be located at appropriate catchment locations for easy access.

c. Medical facilities

Considering that Great Nicobar Island is not well developed and is mostly rural in nature, there is a complete lack of healthcare facilities. For the future communities to come and settle in the GNI planning area it is paramount that certain healthcare facilities to be provided based on the need based social and physical infrastructure development assessment. 38 dispensaries/poly clinics, 08 Nursing home& maternity homes, 04 hospitals 100 beds to 200, 04 hospitals 20 beds to 80 beds, 04 multispecialty hospitals 100 beds to 200 beds, 04 specialty hospitals 100 beds to 200 beds, 02 general hospitals 300 beds to 500 beds, 04 family welfare centers along with pediatric centers, gastric centers with diagnostic facility are required. The medical facilities will be increased as per the requirement.

d. Availability of water and power will increase

RO based desalination plant will be built for sea water. A reservoir will be built to supply drinking water to all villages. Availability of drinking water will be increase. 450 MVA Gas and Solar based power plant will be constructed in 39 ha. The availability of power will be increase.

e. Employment Generation

The requirement of unskilled manpower will be met from nearby villages during construction of the proposed facilities. Thus, the project will help in generation of the indirect employment.

The employment of people will be both on permanent as well as on contract basis. The employment will be categorized into different categories skilled laborers, semi-skilled and unskilled workers. Apart from the employment in the airport, there will be several secondary services that will developed around the Airport premises. Such occupations include running of restaurants, taxis, personal luggage handlers etc. This will be a positive socio-economic development for the region. There will be a general upliftment of standard of living in the region.

4.3.12 Bird Striking Reduction

As per ZSI, GNI do not fall under any migratory bird route. However, the resident bird population in GNI is significant and therefore there is always a possibility of bird hitting the aircraft. However, as per ZSI suggestions, the airport area will be devoid of fruiting trees which attracts birds. Moreover, bird's area also attracted by municipal garbage. The waste management system for GNI has been designed to ensure that no municipal waste will be litter in and around the airport site. The bird strike hazard on, or in the vicinity of, an aerodrome will be assessed through:

- The establishment of a national procedure for recording and reporting bird strikes to aircraft; and
- The collection of information from aircraft operators, airport personnel etc. on the presence of birds on or around the aerodrome.

When a bird strike hazard is identified at an aerodrome, the appropriate authority will act to decrease the number of birds constituting a potential hazard to airport operations by adopting measures like cracker blasting and generation of the ultrasonic waves to scare the birds.

4.4 Energy Conservation Measures

Airport consume significant levels of energy for space cooling and heating in terminals, external and internal lighting systems, and the operation of lug gate conveyance system. The airport complex has adopted the following energy conservation measures:

1 Provision of skylights for Passenger Terminal Building- utilizes sunlight throughout the day without use of artificial lighting;
2 Provision of glass (double seal) facade –allows natural light into the building and restricts heat entry;
3 Provision of Variable Frequency Drives (VFDs) to HVAC secondary pumps;
4 Provision of VFDs to STP air blowers;
5 Provision of dual lighting system for main access road;
6 Provision of metal halide bulbs instead of florescent lamps;
7 Provision of Waste Heat Recovery (WHR) system to chillers; and
8 Provision of energy efficient chilling system with non-CFC based refrigerants

The total requirement of power will be approx. 10MVA during Phase 1. The requirement will be met by the DG sets of 2 x 5 MVA each. Provision for harnessing solar energy of 1,33,200 Sq m has been made in the Airport design. However, since GNI has significant number of rainy days, the solar power will be used as and when available i.e. during the sunny days. When the solar power is available the generation from the integrated power plant will be reduced accordingly to maintain the grid stability.

CHAPTER 4C

4.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES OF TOWNSHIP

This chapter presents identification and appraisal of various impacts due to the proposed township during construction and operational phases. The environmental impacts are categorized as primary or secondary. Primary impacts are those, which are attributed directly to the project and secondary impacts are those, which are indirectly induced and typically include the associated investment and changed pattern of social and economic activities by the proposed action.

The mitigation measures proposed for minimizing the impacts have also been discussed in this chapter, Section-4.1 & 4.2. The impacts have been assessed for the project assuming that the pollution due to the existing activities has already been covered under baseline environmental monitoring and continue to remain same till the operation of the project.

The construction and operational phase of the proposed project comprises various activities each of which may have an impact on some or other environmental parameters. Various impacts during the construction and operation phase on the environment have been studied to estimate the impacts on the environmental attributes and are discussed in the subsequent sections.

4.1 Impact During Construction Phase – Land Environment

4.1.1 Impact on the Natural Drainage System and Soil Erosion

The implementation of the township has the potential to change the topography of the land which may also disrupt the natural drainage of the area. This is because the construction involves cut and fill earthworks. The cut and fill works will normally change the natural topography of the land which will result in a disruption of the natural drainage of the land and the surrounding vicinity.

Construction activities will have negative impacts on soil resources due to the removal of topsoil, which takes hundreds of years to form and other layers of the soil causing loss of vegetation cover and soil erosion.

The proposed township will be developed while undertaking minimum cutting for making terraces for construction of buildings while making minimum modifications in the terrain conditions and implementing appropriate environmental measures.

The flow of construction material, especially during the rainy season causes land degradation. Approximately about 2% of the construction material is generally wasted due to the construction process, transportation etc. These material gets deposited on the soils and makes the land infertile. They also clog the drainage pipes causing flooding.

landslides were noted at the construction sites of the new road connecting near Galethea bay. There were some landslides due to slipping of soil and fragmented rock overlaying the undegraded parent rock. This was observed where the hills were steep and trees on the slopes were tall and large. Hence, it was identified as a major problem and preventive measures should be made a part of development plan and to be included in the construction contract agreements. Slope stabilisation measures, needs to be undertaken wherever there is a possibility of landslides.

Land slide in Great Nicobar Location: Extension of Road up to Galathea Bay from the point where the old road ends. Hill cutting on the left. Landslide that may have occurred a couple of years back on the right

Loss of Productive Soil and Impact on Natural Drainage Pattern

Due to the proposed project, soil erosion will be accelerated because of removal of natural vegetation, compacting or disturbing the soil, changing natural drainage patterns and by covering the natural soil with impermeable concrete surfaces.

Additionally, sedimentation of the eroded soil can occur if the eroded soil is carried into nearby water bodies.

4.1.2 Mitigation Measures

- The top soil will be extracted, stored and shall be reused for greenbelt development and landscaping;
- Care will be taken to minimize the clearance of natural vegetation;
- Construction material will be stored in covered area to avoid flow of the material during rainy seasons.
- Regular cleaning of the drainage pipes, culverts etc during construction.
- Temporary seeding will be done during construction phase to avoid erosion; and
- Storm water management will be implemented so as to prevent flooding.

Apart from above, the guidelines laid by Indian Green Building Council (IGBC) shall be adhered to by the contractors on site.

4.2 Air Environment

4.2.1 Construction Phase

Particulate matter is the main pollutant during this phase, which will be generated during the site development activities such as leveling of land, cutting and filling activities, transportation of construction material to the project site from various sources, rock breaking, crushing etc. The particulate matters thus generated blows along the wind direction. Generally, these particles settle down within 100-200 m from the construction site. However, during strong wind conditions, they blow further. Here the wind direction is mostly from North-east. Since the island has very less inhabitants and there is not much of habitation along the wind direction, the impact of particulates on human health will be low. However, it will get deposited on the leafs of plants and trees causing lessening of photosynthetic activities leading to loss of pollination and even mortality.

The building material carrying vehicles as well as the construction machinery generate emissions and pollute the environment. Dusts include brick and silica dusts, wood dust from joinery and other wood working and from earth moving and other vehicle movements within the site.

Also, due to the increased vehicular movements, increase in NO_x and CO concentrations will be resulted at the project site. However, the increase in pollution levels in the ambient air, is temporary and will be negligible. As most of the construction equipment will be mobile, the emissions are likely to be fugitive and not concentrated at a single place or source. As the impacts will be localized in nature, the areas outside the proposed project boundary are not likely to face any significant adverse impact with respect to ambient air quality.

Mitigation Measures

- Sprinkling of water and fine spray from nozzles to suppress the dust;
- On road- Inspection should be done for black smoke generating machinery;
- Promotion of use of cleaner fuel should be done;

- Vehicles having Pollution Under Control (PUC) certificate may be allowed to ply; Every vehicle should be tested for pollution with a frequency of 3 months. Vehicles older than 15 years should not be engaged for construction work and related activities.
- Use of covering sheet to prevent dust dispersion at buildings and infrastructure sites, which are being constructed;
- Use of covering sheets should be done for trucks to prevent dust dispersion from the trucks;
- Reducing the speed of a vehicle to 20 kmph can reduce emissions by a large extent;
- All material storages shall be adequately covered so that they are not exposed to situations where winds on site could lead to dust / particulate emissions; and
- Fabrics and plastics for covering piles of soils and debris is an effective means to reduce fugitive dust.

4.3 Noise Environment

4.3.1 Construction Phase

Generation of noise during construction phase will be due to operation of heavy equipment such as rock drills, pneumatic tools, concrete mixers, cranes, generators, pumps, compressors, vibrators, etc and increased frequency of vehicular traffic in the area. However, these impacts will be short term and intermittent in nature. The heavy equipment to be used in the construction will be provided with acoustic enclosures/ treatments as per recommended noise limits. Due to moderate levels of construction activities, the anticipated noise generation during construction phase will be mostly confined to the facility itself and not anticipated to have significant adverse impacts on the surrounding ambient noise levels.

Mitigation Measures

In order to have less impact on noise levels in the area, the major works will be carried out during daytime as far as possible. Nevertheless, the following mitigation measures shall be adopted:

- Provision for insulating caps and aids at the exit of noise source on the machinery;
- The use of damping materials such as thin rubber/lead sheet for wrapping the work places like compressors, generator sheets;
- Shock absorbing techniques should be adopted to reduce impact;
- Inlet and outlet mufflers should be provided, which are easy to design;
- Earmuffs/earplugs should be provided to the workers and it should be enforced to be used by the workers;

- Noise prone activities shall be restricted to the extent possible during night time, particularly during the period between 10 pm to 6 am in order to have minimum environmental impact on the workers as well as on the neighborhood; and

- Effective barricading to requisite heights shall be provided to limit transmission of noise to adjacent areas and within permitted decibels.

4.4 Water Environment

Source of water for the proposed project is from surface water from two major water reservoir located towards the North-Eastern part of GNI through pipeline Raw water will be connected to WTP for treatment and further distribution network will provide the treated water to the township.

4.4.1 Construction Phase

During construction phase, water will be required for construction of structures, sprinkling on roads for dust suppression, domestic and non-domestic uses of the construction workers. One of the proposed waters reservoir will be constructed at the early stage of the development. However, till it gets constructed, as an interim measure, the water for construction will be supplied from the existing reservoirs through water tankers and shall be for limited duration.

Mitigation Measures

Impact on water quality during construction phase will be due to non-point discharges of sewage generated at the project site by the construction workforce. However, due to relatively smaller area that will be taken-up for construction the impact of water discharges at the site will be negligible. During the initial construction stages, the sewage from the labour colonies will be treated through septic tanks.

At the construction site, adequate number of toilets with hygienic environment will be provided.

No sewage will be discharged without treatment to any water body.
The construction runoff water will be passed thru settling ponds to remove the TSS to meet the necessary standards.

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.

- Total number of construction labours are given

Estimated labour requirement		
Phase I	**Phase II**	**Phase III**
4000	5500	4000
Estimated labour + Family + Support requirement		
5600	7700	5600
Water requirement and source (lpcd)		
840000	1155000	840000
Quantity of waste generated and fractionation (organic, hazardous, recyclable and biomedical) (Kg/day)		
2000	2750	2000
Fuel requirement (kg/day)		
1345	850	1345

- **Water treatment system for the labour colonies: -**In the initial stages of construction, the treated water will be provided through tankers till the proposed trunk infrastructure is laid down in GNI. Compact wastewater treatment plant / Septic tank shall be installed within the labour colonies during the initial phase of construction. However, one the infrastructure is ready, the waster will be supplied through the central waste treatment plant.
- All the wastewater generated in the labour colonies will be treated before discharge. In the initial stages the wastes from the toilets will be treated through septic tanks. However, once the central treatment plant is ready, all the wastewater will be directed to the treatment plant and will recycled. No water is expected to be discharges. However, some makeup might be required for operation of the plant and the quantity will be used for gardening purposes.

- **Municipal waste management system that is Collection, transportation treatment and disposal system for the labour colonies. (Details of MSW system is given in chapter 2C (2.7.4), Township)**

✓ Separate bins will be installed within the labour colonies for dry and wet waste.

✓ It will be contractor's responsibility to collect and transfer the waste to nearest solid waste transfer site

✓ After collection and transfer, solid waste management shall be integrated with overall SWM system of GNI
✓ At least 2 Organic Waste Composters of 1-2 T capacity each will be installed in the labour colonies.

Medical facilities for the labours number of dispensaries, hospital and emergency medical centres in case of accidents).

✓ Considering the phase wise total labour requirement, local health centre / dispensaries will be planned within the labour colonies. For any treatment required facility above the local health centre; the GNI local facilities shall be utilized.

- ✓ Ambulance facility shall be provided by the contractor all the time at site as well as at labour colonies
- **Medical check and vaccination programmes for prevention of contagious and vector borne diseases.**

- ✓ It will be contractor's responsibility to follow the centre / UT guidelines related to health, disease preventive measures, and vaccination programme. This shall be part of the contract agreement.

- **Mosquito control programmes**

- ✓ It will be contractor's responsibility to have time to time cleaning, fogging, and medication camping.

- **Emergency evacuation plan in case of natural disasters like floods, cyclones and tsunamis and earthquakes and epidemics.**

- ✓ It will be contractor's responsibility to prepare a disaster management plan including evacuation plan for site as well as labour colonies.

With regards to the impacts due to construction worker camps, to ensure there is no strain on the existing infrastructure, the worker camps will be self-sufficient and would not rely on any local resource. This would also ensure that there is no conflict with the local population. To mitigate impacts from health hazards, sanitation self-sufficient infrastructure facilities will be provided. Further, the worker camps will be located away from the coast and habitations.

It is presumed that community kitchen will be formed by the labor contractor where all the labor and their families can take meals. However, some of the labor may like to use separate kitchen for their families. No firewood will be allowed for the purpose of cooking. Gas cylinders will be supplied to the community kitchen and to those who prefer to cook separately. Strict vigilance will be maintained to ensure that no wood is used for cooking.

4.5 Solid Waste Generation – Construction Phase

During construction period, considerable quantities of earth and boulders will be excavated from the foundations of various proposed structures. The excavated earth and boulders will be used for leveling the low-lying terrain depending of the engineering properties. The topsoil excavated from the project site will be used for covering the area leveled with excavated material from foundation trenches, on which tree plantations and greenbelt development within the project premises will be undertaken.

The dripping of oil from construction vehicles might cause soil contamination. In order to prevent soil contamination likely to result from the oil spill and dripping from vehicles, drip pans will be placed at the parking places of vehicles and the

dripped oil will be collected. The collected dripped oil will be stored and subsequently sent to the authorized recycling agencies, recognized by SPCB.

One of the sources of pollution during construction phase is the wastes from the labour colony. Toilet waste, food waste and wastes from food packets, puddled of water etc creates unhealthy environment and the breeding grounds for vector diseases. Therefore, the wastes from the construction colonies will have to be properly managed.

Mitigation Measures

During the initial stages of construction phase, when the waste treatment infrastructure is not ready, the toilet wastes will be treated thru septic tanks. Once the centralized treatment plant is ready, all the sewage generated from the construction colony will be transported to the central STP for treatment. The kitchen wastes in the initial stages will be treated through onsite Organic Waste Converters (OWC). The mobile OWCs will be placed at an appropriate place and all the kitchen wastes will be collected and fed to the OWCs. The other wastes like food packets, plastic bottles, boxes will be collected and sold to some authorized venders. Once the Central SWM plant is ready, the all the wastes will be collected on site and transported to the plant for suitable treatment and disposal.

Socio-Economic Impact

The project and related developments like construction camps will be dependent on local resources (power, water), during both construction and operations, the only likely impact on infrastructure would be on the roads. Considering the high traffic during construction phase an effective traffic management scheme will be developed to avoid congestion on the nearby and local roads.

Mitigation Measures

Proper connectivity will be maintained by construction of truck road to avoid traffic congestion on roads.

4.5.1 Operational Phase

Impact on Air Quality

The impacts on air quality is assessed based on emissions from the proposed DG sets and incinerators in the proposed Township and Area Development Project. The emission levels have been considered as guaranteed emission levels for the engines for DG sets and hazardous solid waste for incinerators.

Prediction of impacts on air environment has been carried out employing mathematical model based on a non-steady state Gaussian plume dispersion model designed for multiple point sources for short term. In the present case, CALPUFF Version 8.6.1 dispersion model based on non-steady state Lagrangian-

Gaussian puff dispersion, designed for multiple point sources for short term and developed by United States Environmental Protection Agency [USEPA] has been used for simulations from point sources.

- ***Model Set-up***

The model set-up details are presented in **Table-4.1.**

Table-4.1: Model Set-Up

Sr. No.	Parameter	Details
1	Model Name	CALPUFF (Version 8.6.1)
2	Model Type	Non-Steady state Lagrangian-Gaussian puff dispersion model
3	Topography	Elevated
4	Averaging Time	24 hours
5	Source Type	Point source
6	Boundary Limits	10 km X 10 km
7	Co-ordinate System	Uniform Cartesian Grid
8	Receptor Height	Ground level
9	Anemometer	10 m
10	Surface meteorological data and Upper air Data	Prognostic Met data MM5

4.5.1.1 Model Input Data

The details of the emissions envisaged from the proposed township and area development project is presented in **Table-4.2.**

Table-4.2: Stack Emissions from Proposed Township and Area Development Project

Parameters	DG Stack- 1000 KVA	DG Stack- 500 KVA
Stack Height (m)	45	45
Stack Diameter at Top (m)	0.5	0.5
Flue Gas velocity (m/s)	40	40
Flue Gas temp. (°C)	200	200
NOx Emission Rate	1.75 g/s	0.87 g/s
SO_2 Emission Rate	0.05 g/s	0.03 g/s
CO Emission Rate	0.74 g/s	0.37 g/s
PM_{10} Emission Rate	0.09 g/s	0.05 g/s
$PM_{2.5}$ Emission Rate	0.04 g/s	0.02 g/s

Note: The emission parameters are based on Technical specification. However, the exact emission data shall be available after finalization of the vendor

Meteorological Data

The prognostic model CALMET ready MM5 data has been used in this model with 4 Km grid resolution. The modeling has been executed in one scenario which is presented below:

Scenario-I: Batching Plant

The DG sets have been considered in batching plant. The emission details are given below in **Table-4.3.**

Table-4.3: Batching Plant - Emission Details

Parameter	GLC (µg/m^3)	Distance (Km)	Direction
NOx	16.49	1.9	SW
CO	6.99	1.9	SW
SO_2	0.51	1.9	SW
PM_{10}	0.89	1.9	SW
$PM_{2.5}$	0.45	1.9	SW

Scenario-II: DG Sets

The DG sets have been considered in batching plant. The emission details are given below in **Table-4.4.**

Table-4.4: DG sets township & area development - emission details

Parameter	GLC (µg/m^3)	Distance (Km)	Direction
NOx	10.79	1.35	SW
CO	4.57	1.35	SW
SO_2	0.33	1.35	SW
PM_{10}	0.58	1.35	SW
$PM_{2.5}$	0.29	1.35	SW

Scenario-III: Incinerator

The DG sets have been considered in batching plant. The emission details are given below in **Table-4.5.**

Table-4.5: Incinerator- Emission Details

Parameter	GLC (µg/m^3)	Distance (Km)	Direction
NOx	1.76	2.3	WSW
PM	0.22	2.3	WSW
Hg	0.0002	2.3	WSW

Scenario-IV: Labour camp

The DG sets have been considered in batching plant. The emission details are given below in **Table-4.6.**

Table-4.6: Labour Camp- Emission Details

Parameter	GLC (µg/m^3)	Distance (Km)	Direction
NOx	3.7	1.24	SW
CO	1.57	1.24	SW
SO_2	0.11	1.24	SW
PM_{10}	0.2	1.24	SW
$PM_{2.5}$	0.1	1.24	SW

The model simulations were carried out for winter season. For the short-term simulations, the incremental concentrations were estimated to obtain an optimum description of variations in concentrations over the site in 10 km radius covering 16 directions.

The predicted cumulative ground level concentration isopleths NO_X during winter seasons (Study period) are given in **Figure-4.1.**

Figure-4.1: Scenario-I Predicted Incremental GLCs – NO_X

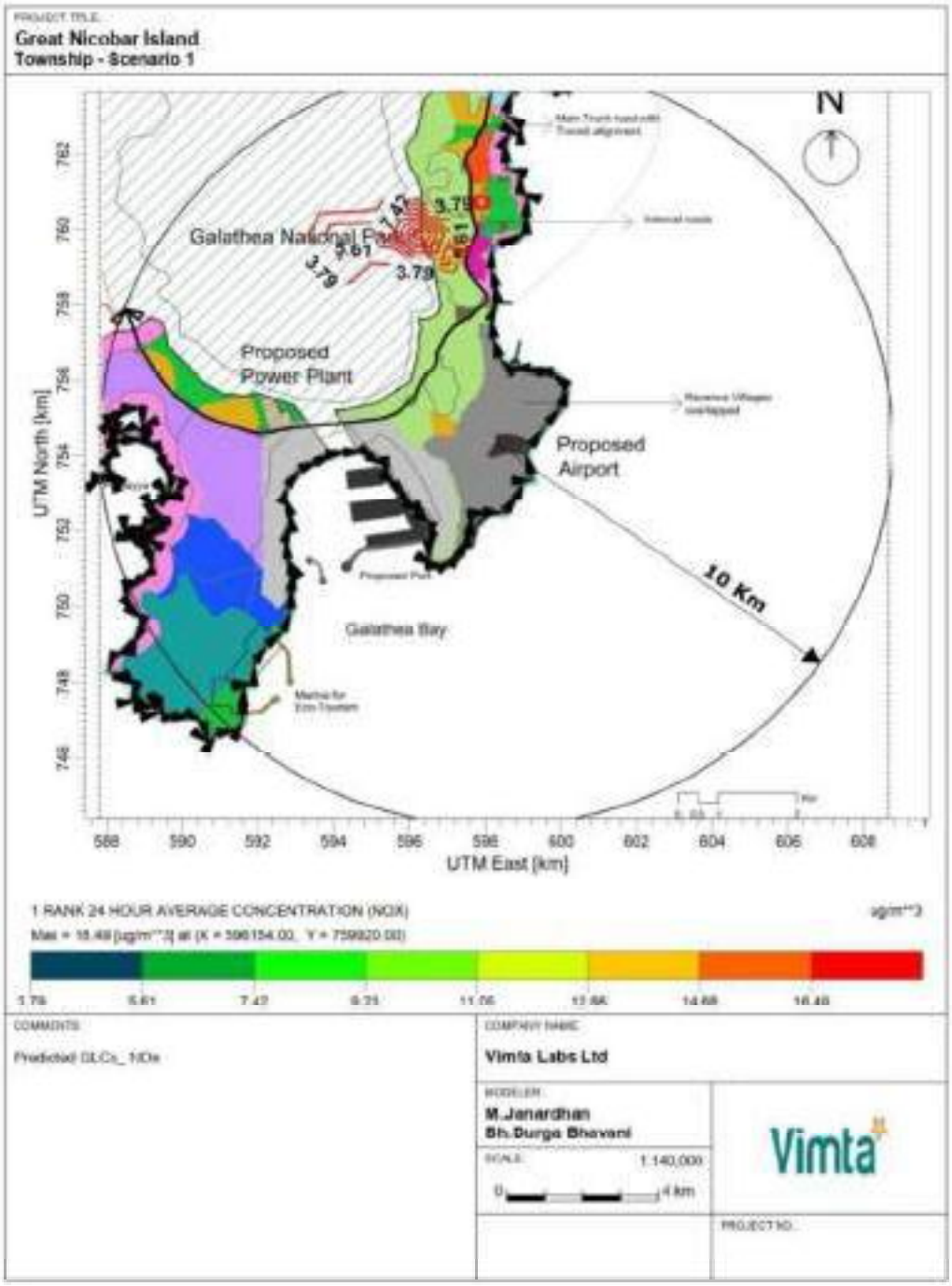


Figure-4.2: Scenario-I Predicted Incremental GLCs – CO

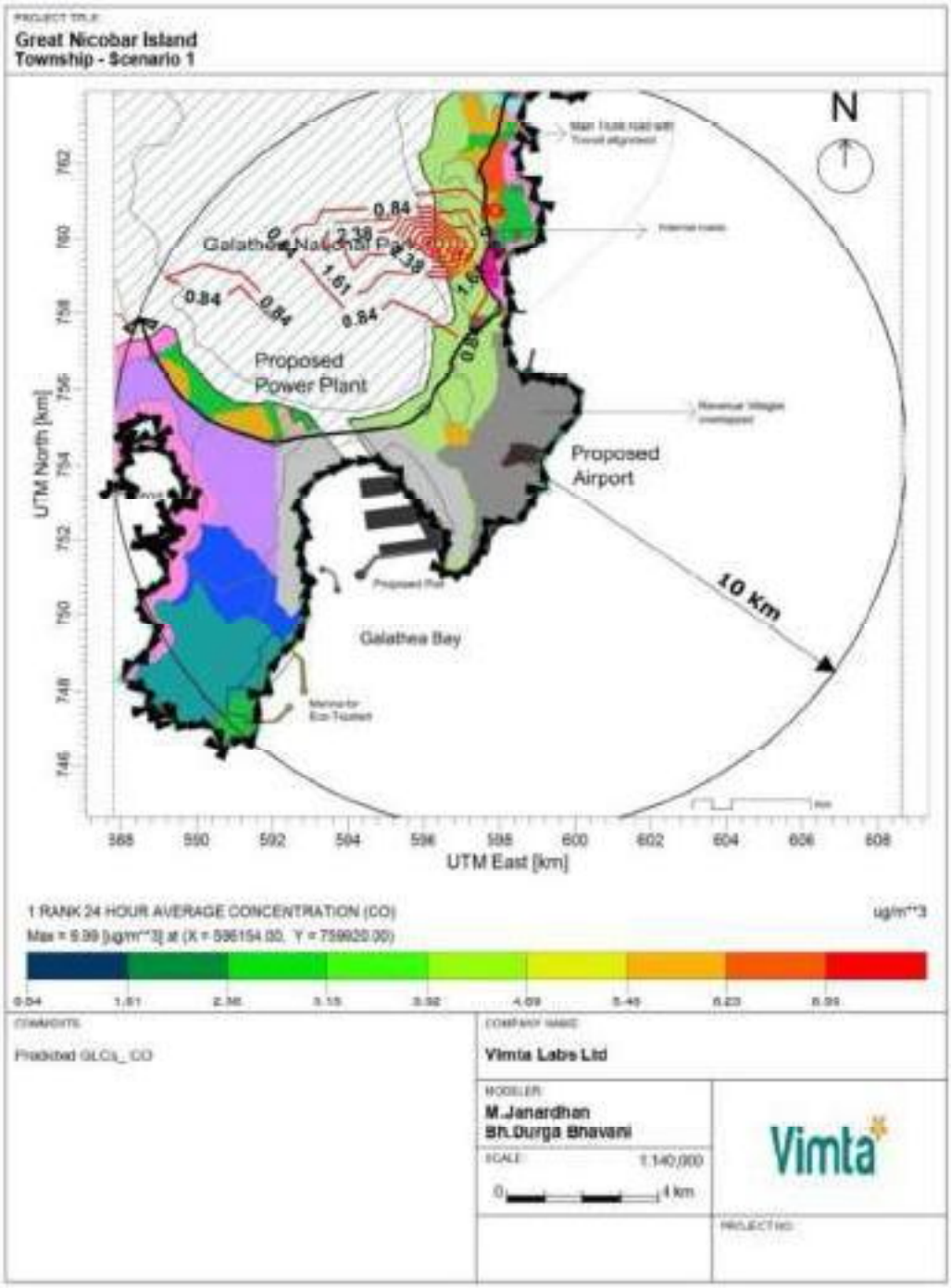


Figure-4.3: Scenario-I Predicted Incremental GLCs – SO_2

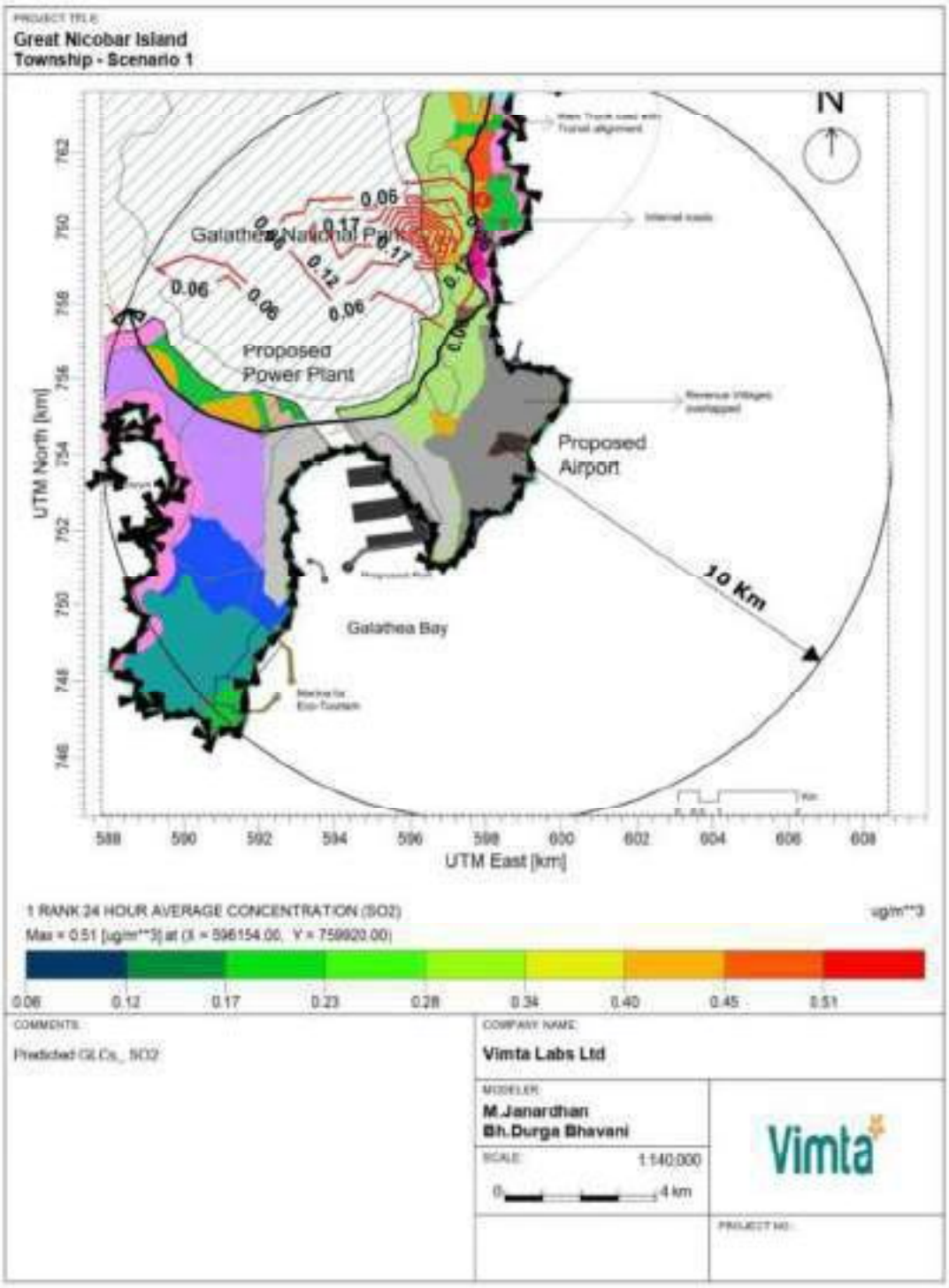


Figure- 4.4: Scenario-I Predicted Incremental GLCs – PM_{10}

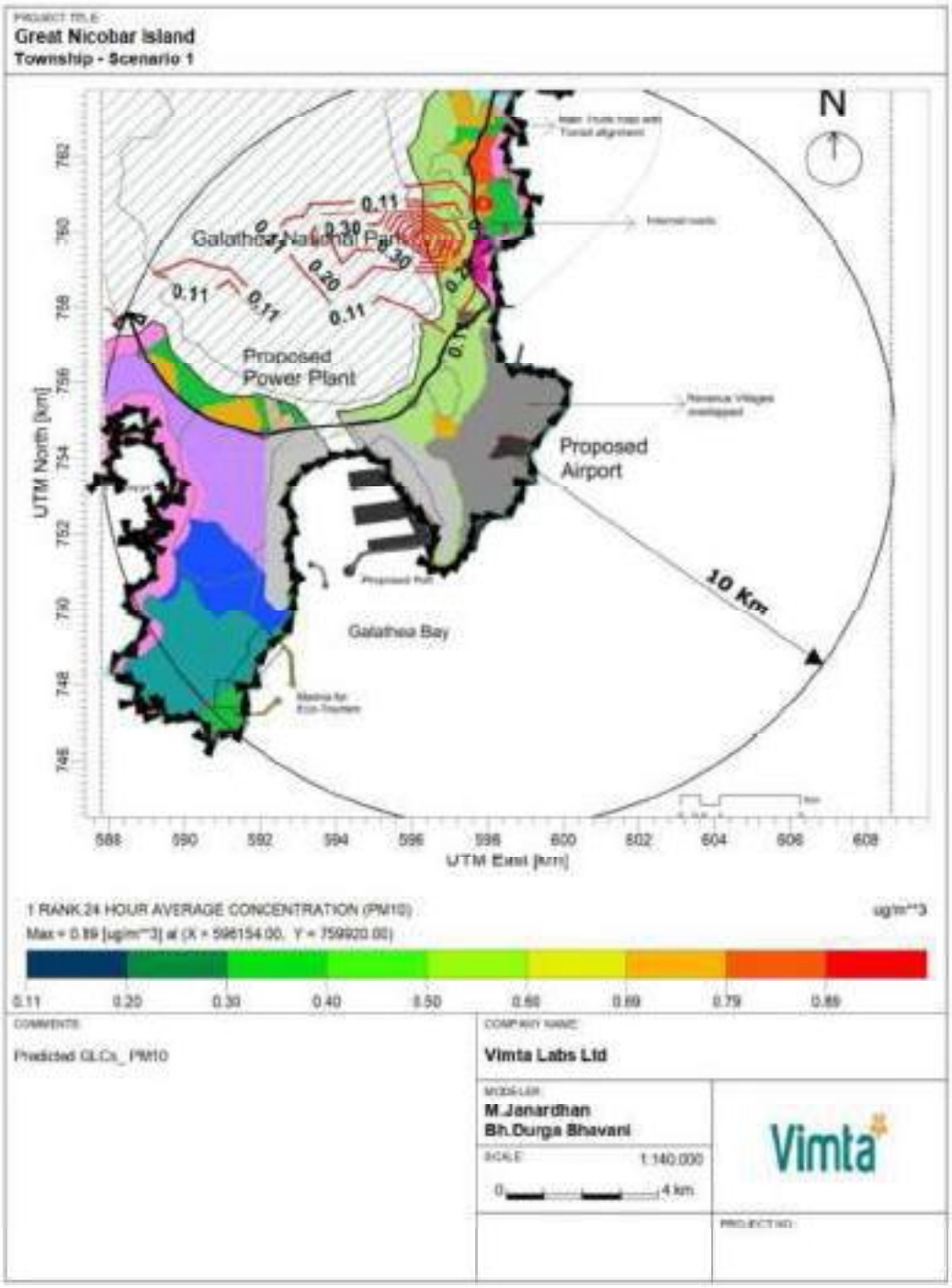


Figure-4.5: Scenario-I Predicted Incremental GLCs – $PM_{2.5}$

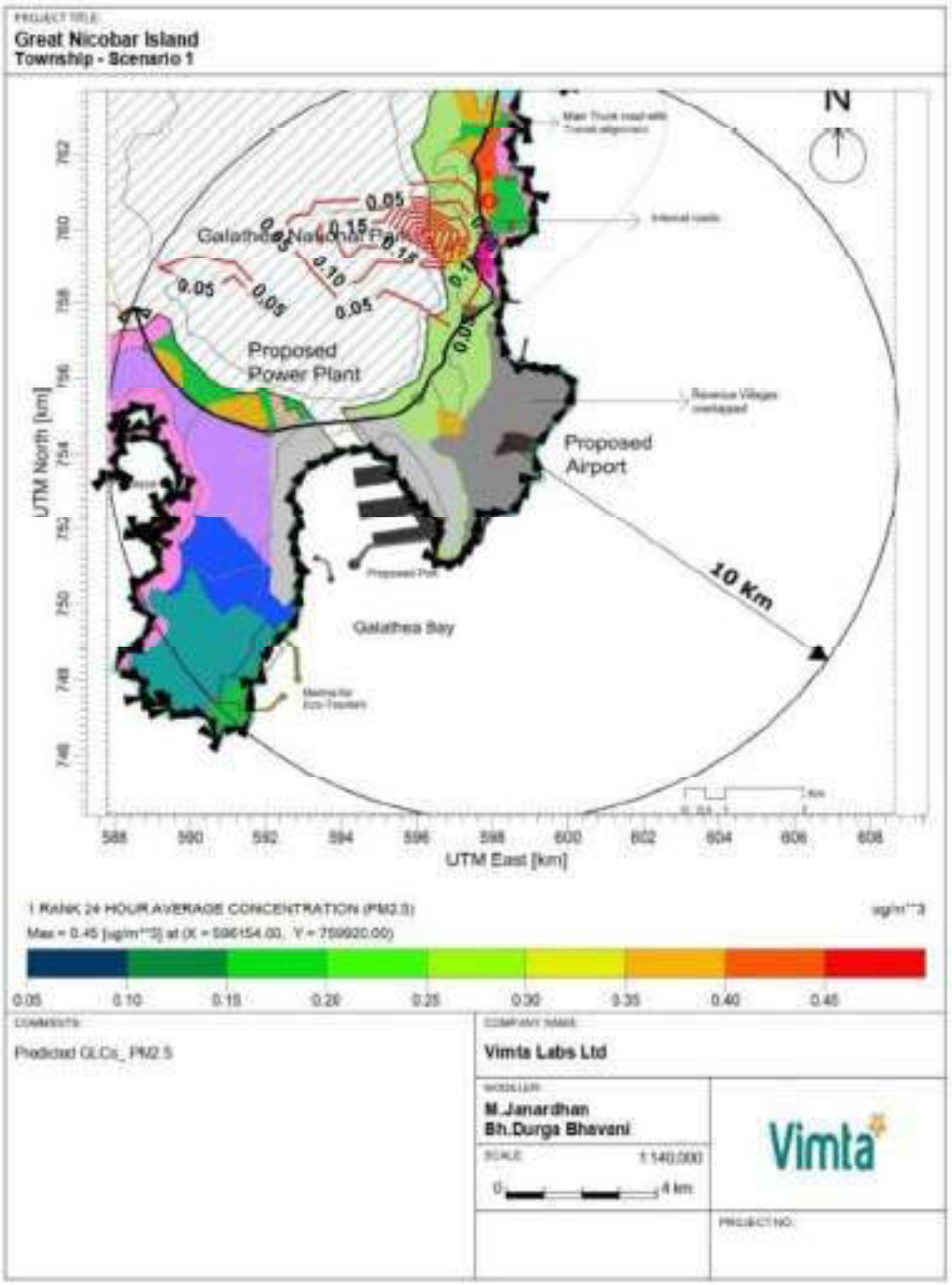


Figure-4.6: Scenario-II Predicted Incremental GLCs – NOx

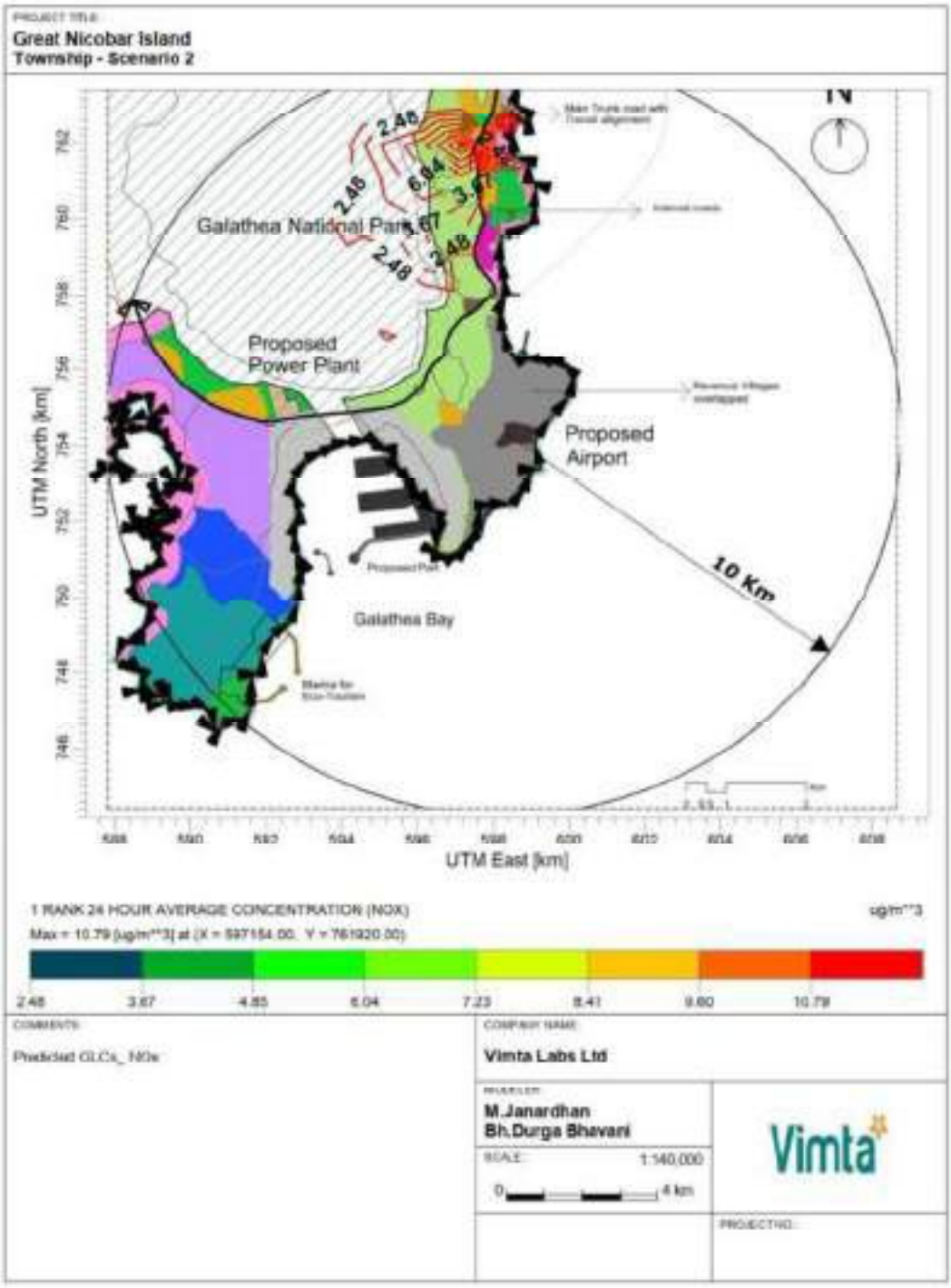


Figure-4.7: Scenario-II Predicted Incremental GLCs – CO

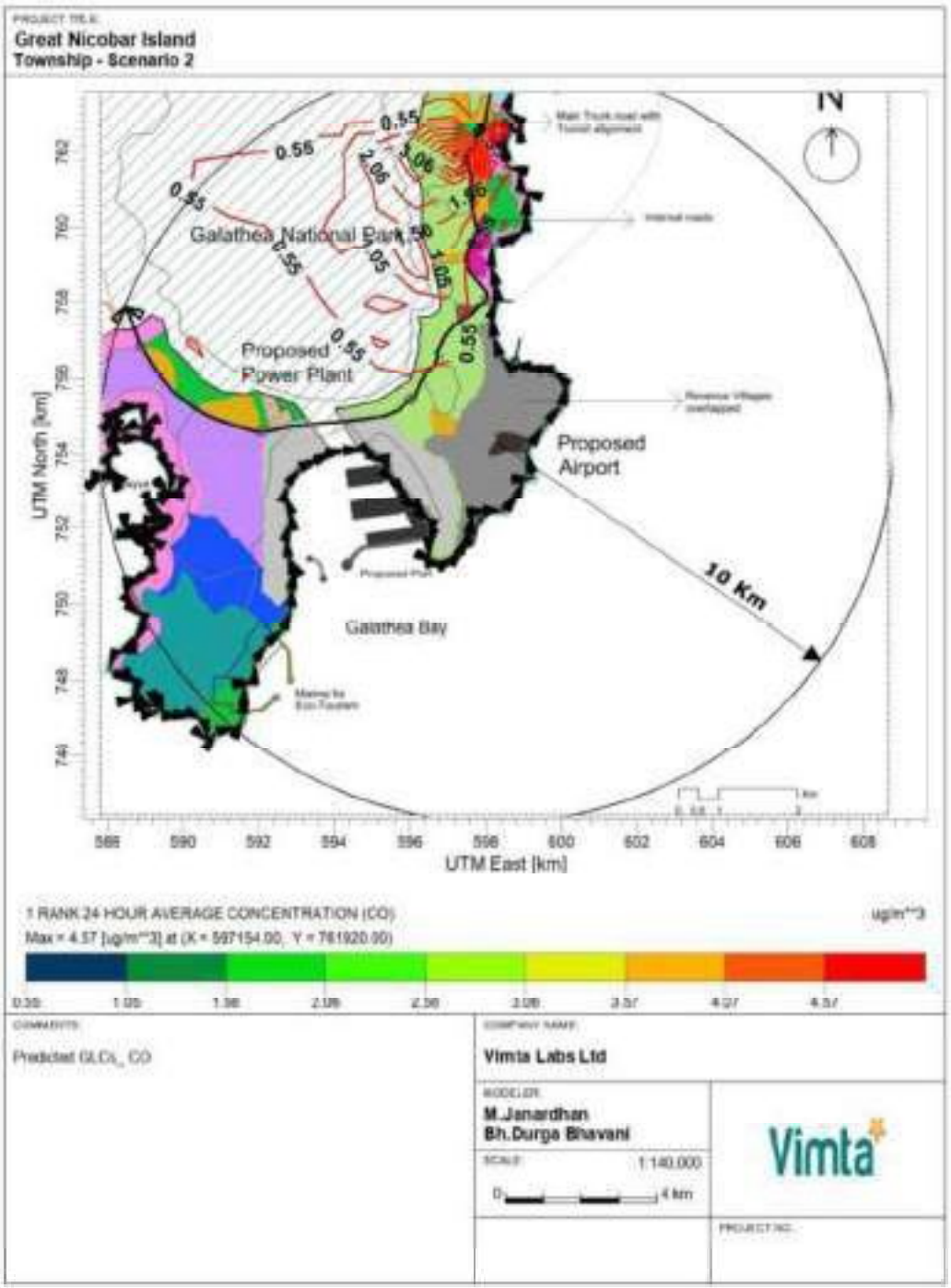


Figure-4.8: Scenario-II Predicted Incremental GLCs – SO_2

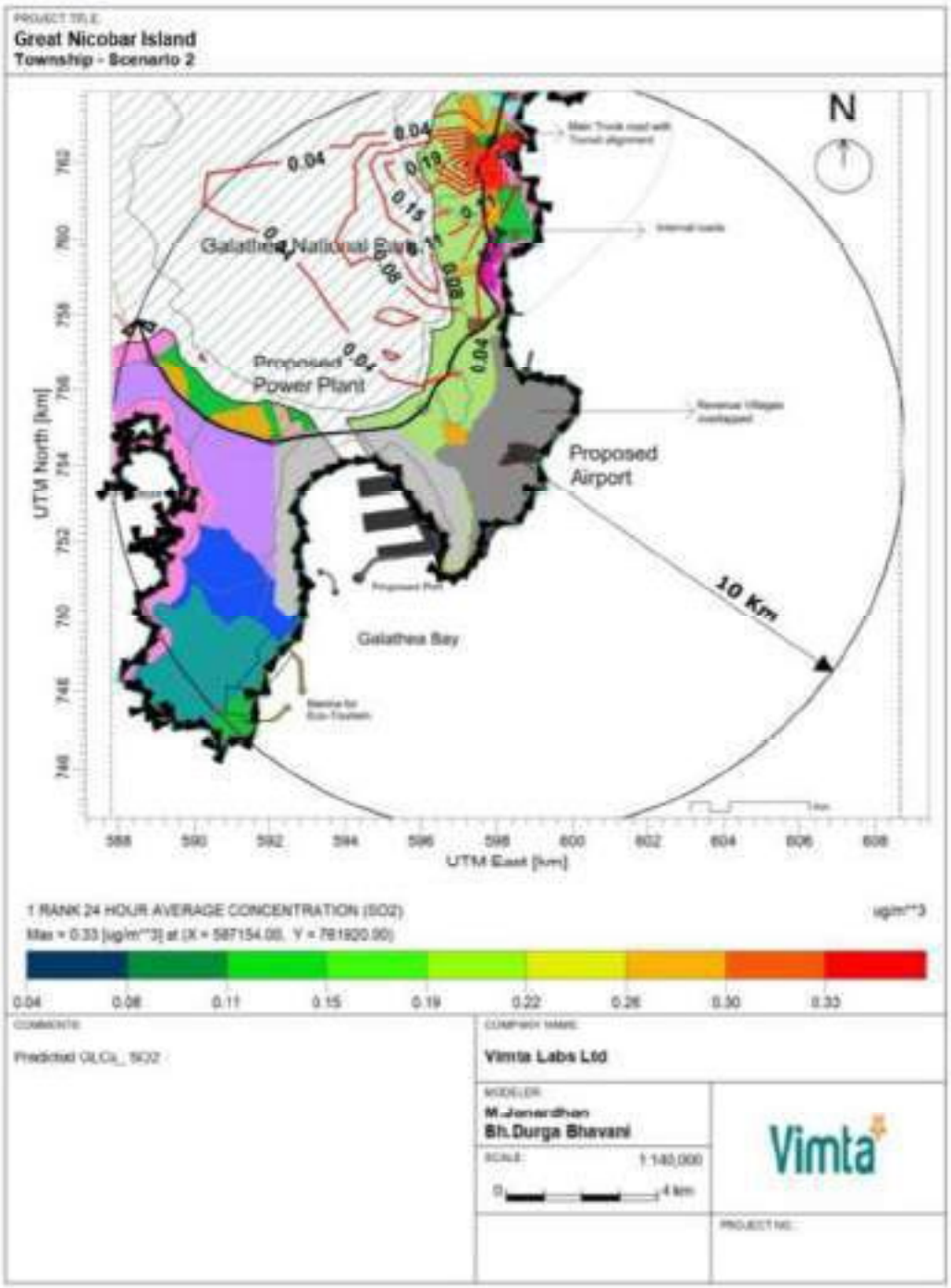


Figure-4.9: Scenario-II Predicted Incremental GLCs – PM_{10}

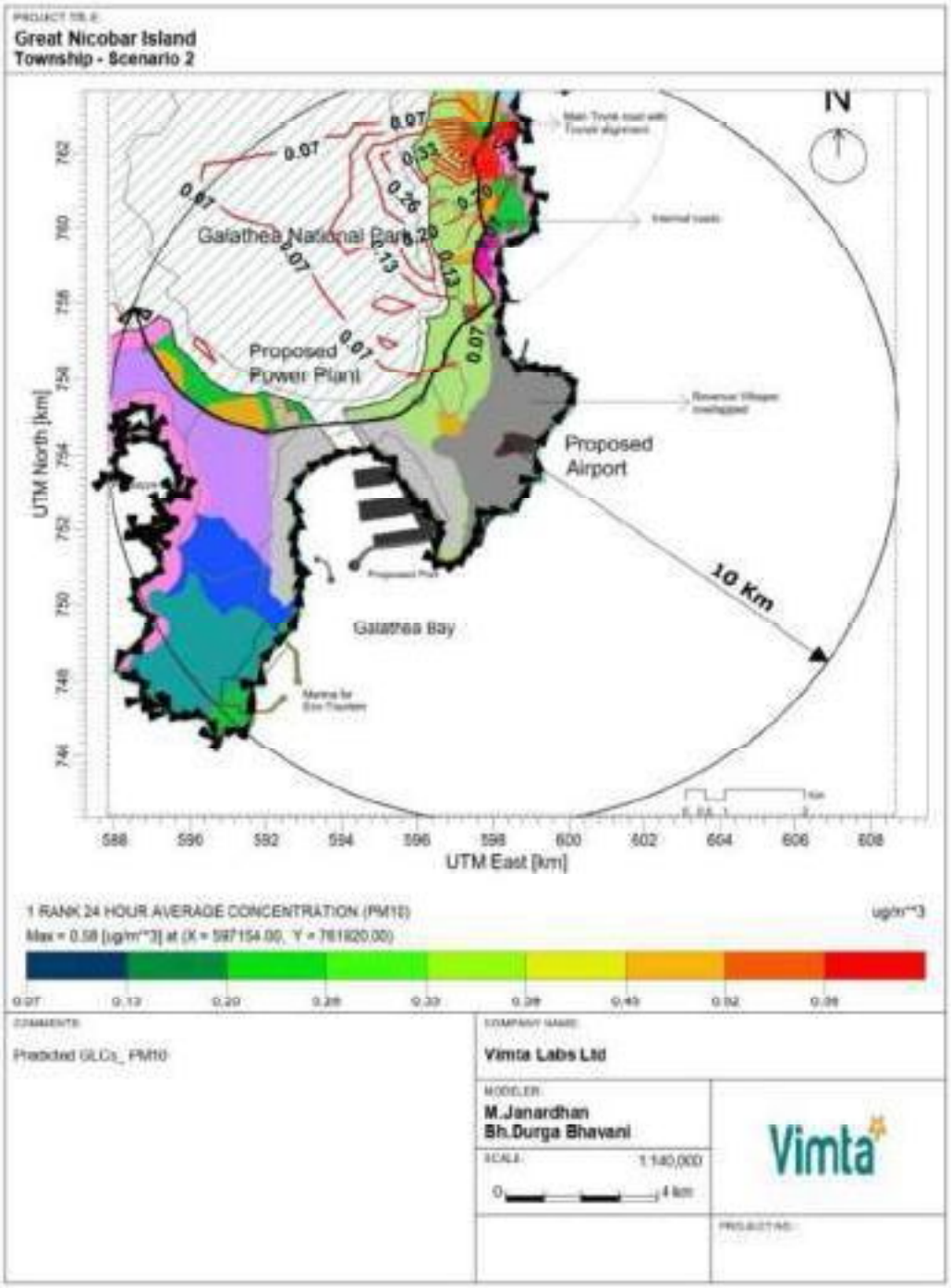


Figure- 4.10: Scenario-II Predicted Incremental GLCs – $PM_{2.5}$

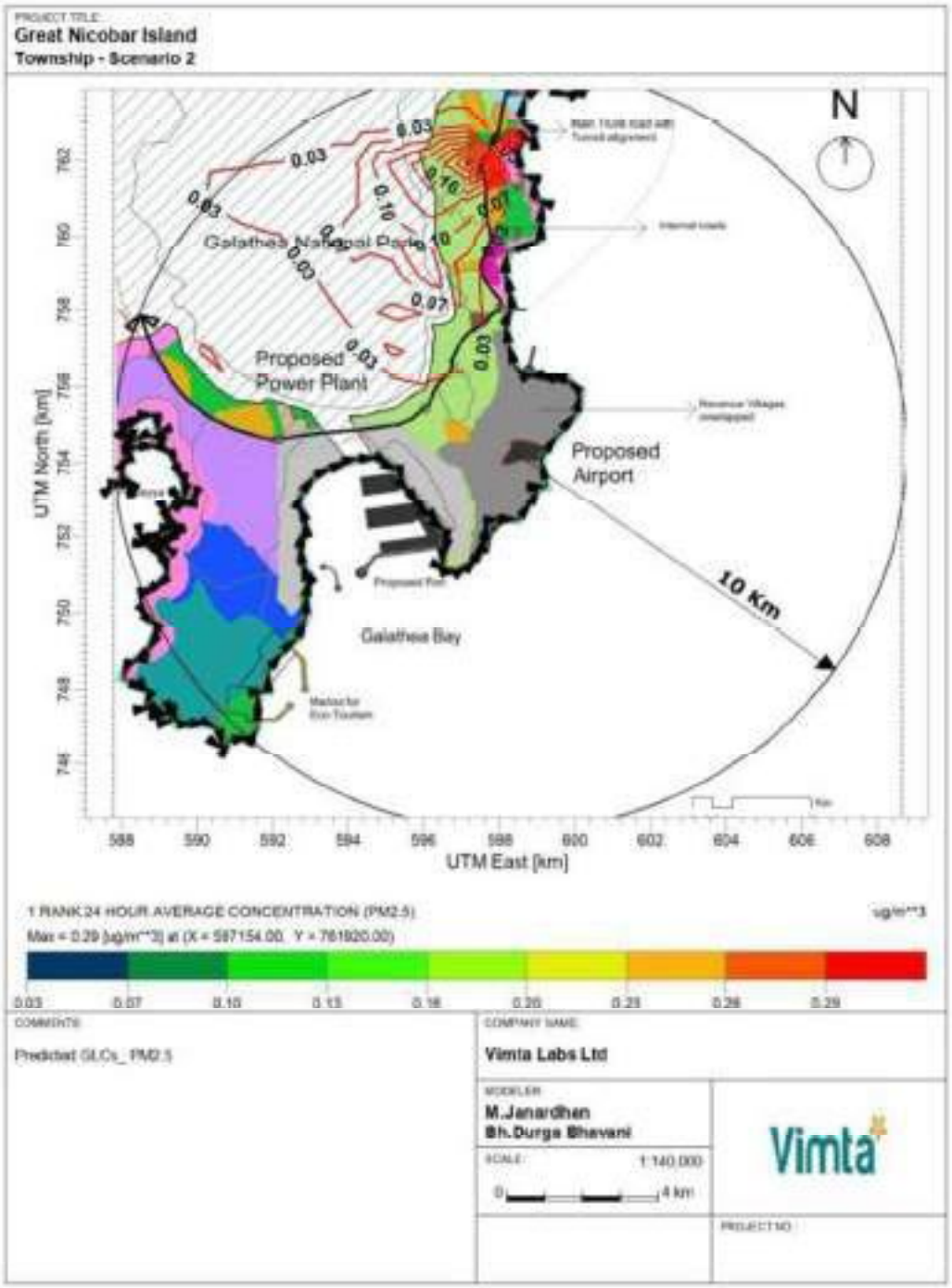


Figure-4.11: Scenario-III Predicted Incremental GLCs – NOx

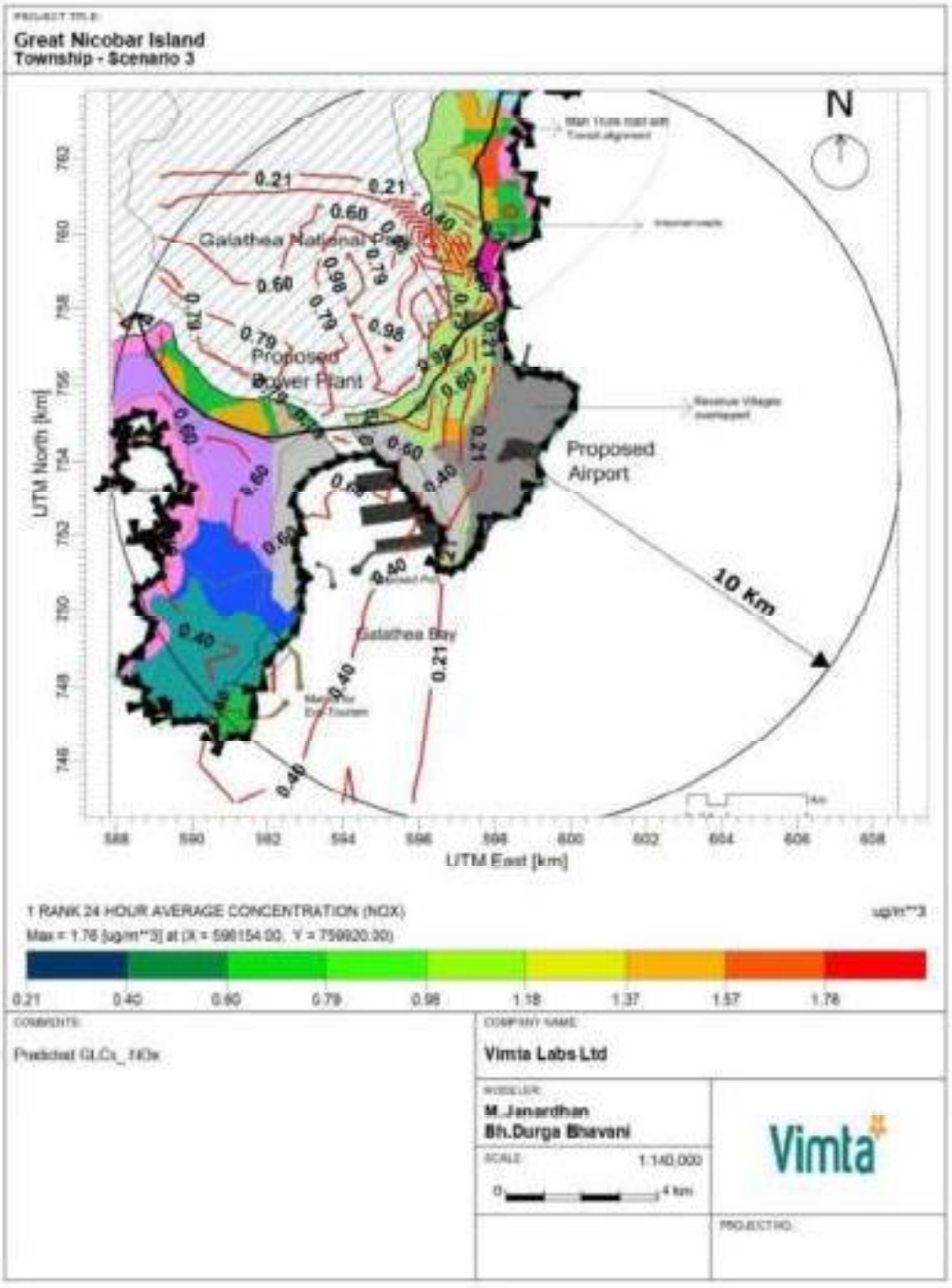


Figure- 4.12: Scenario-III Predicted Incremental GLCs – PM_{10}

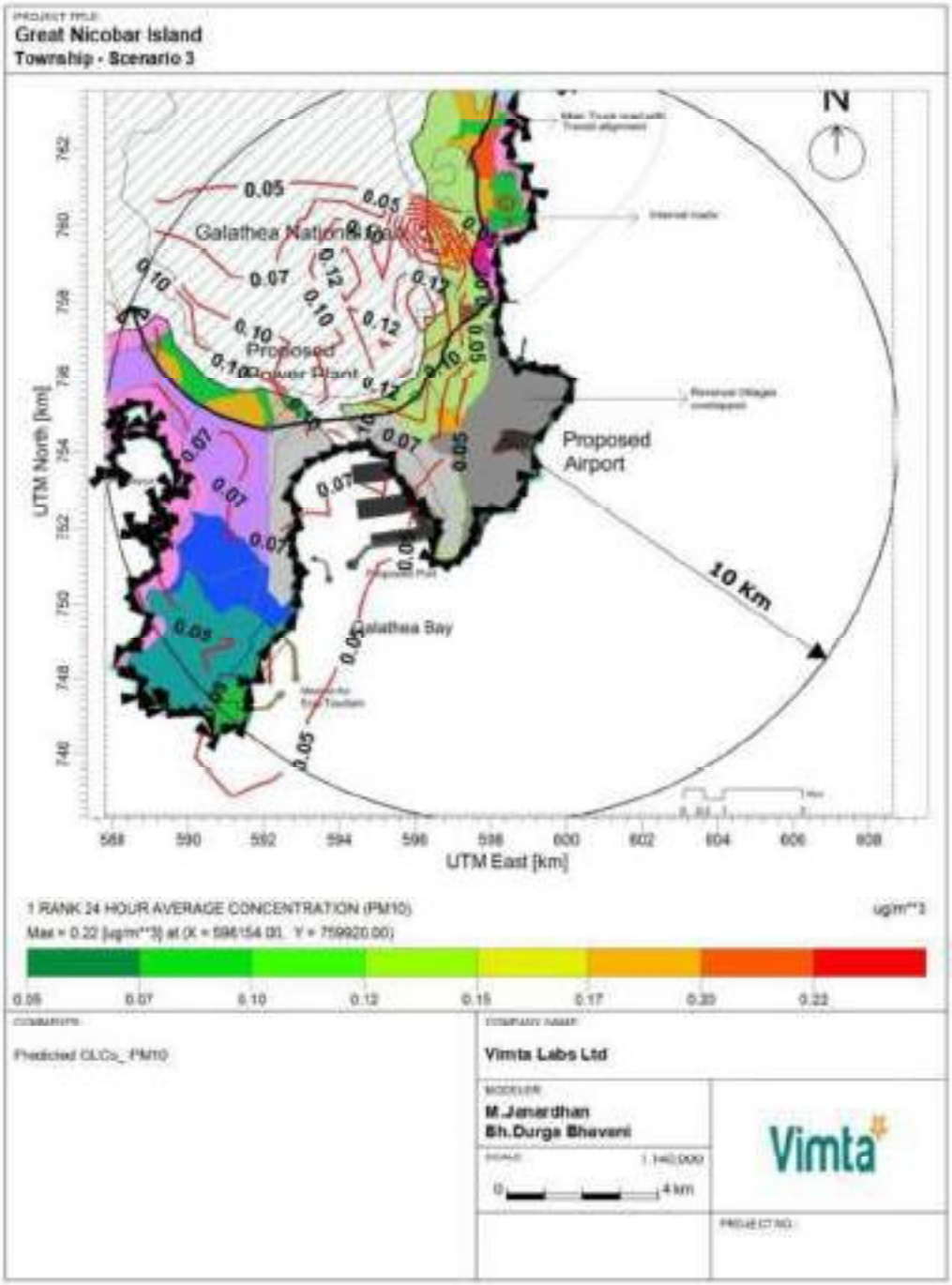


Figure-4.13: Scenario-III Predicted Incremental GLCs – Hg

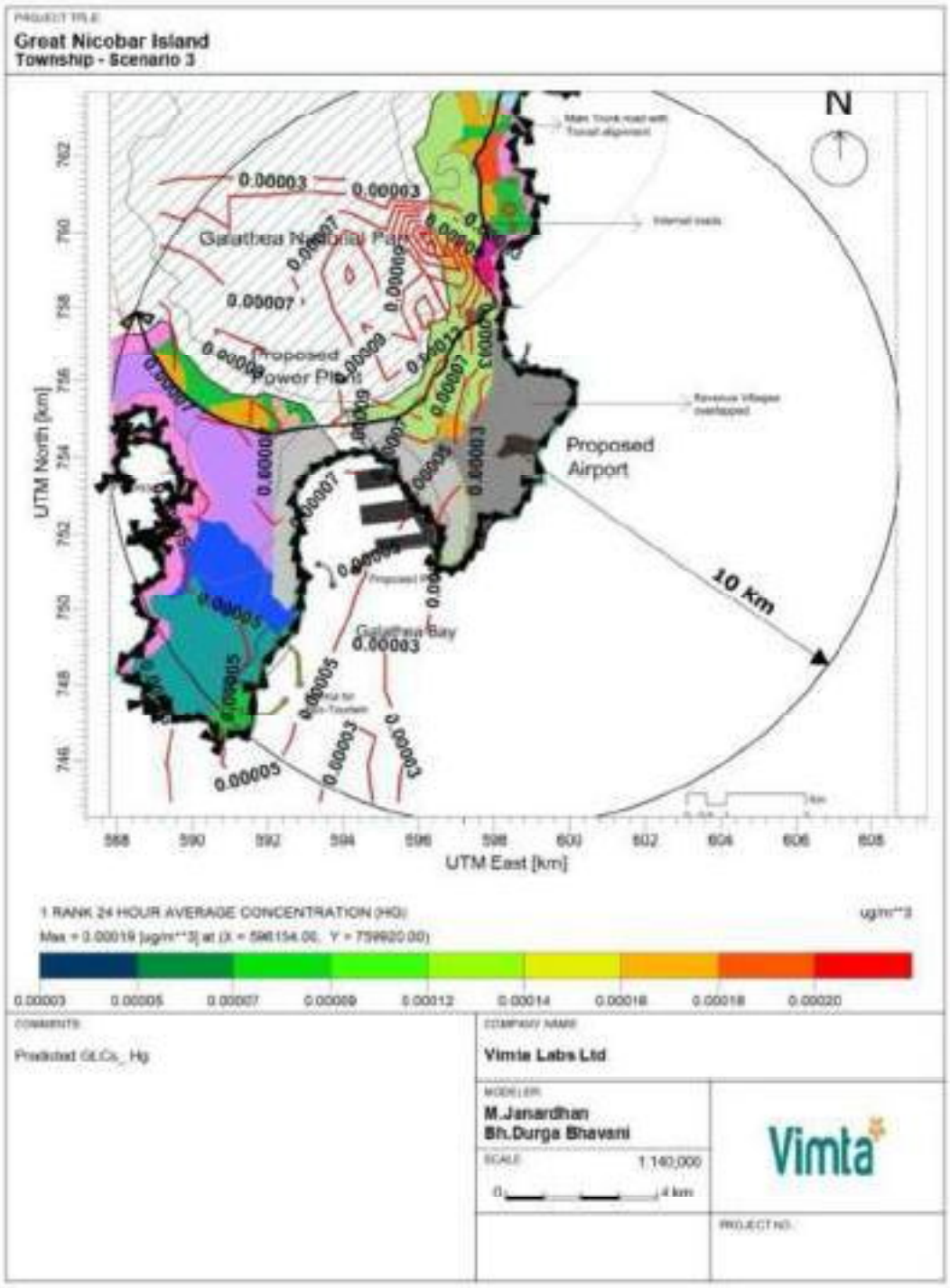


Figure-4.14: Scenario-IV Predicted Incremental GLCs – NOx

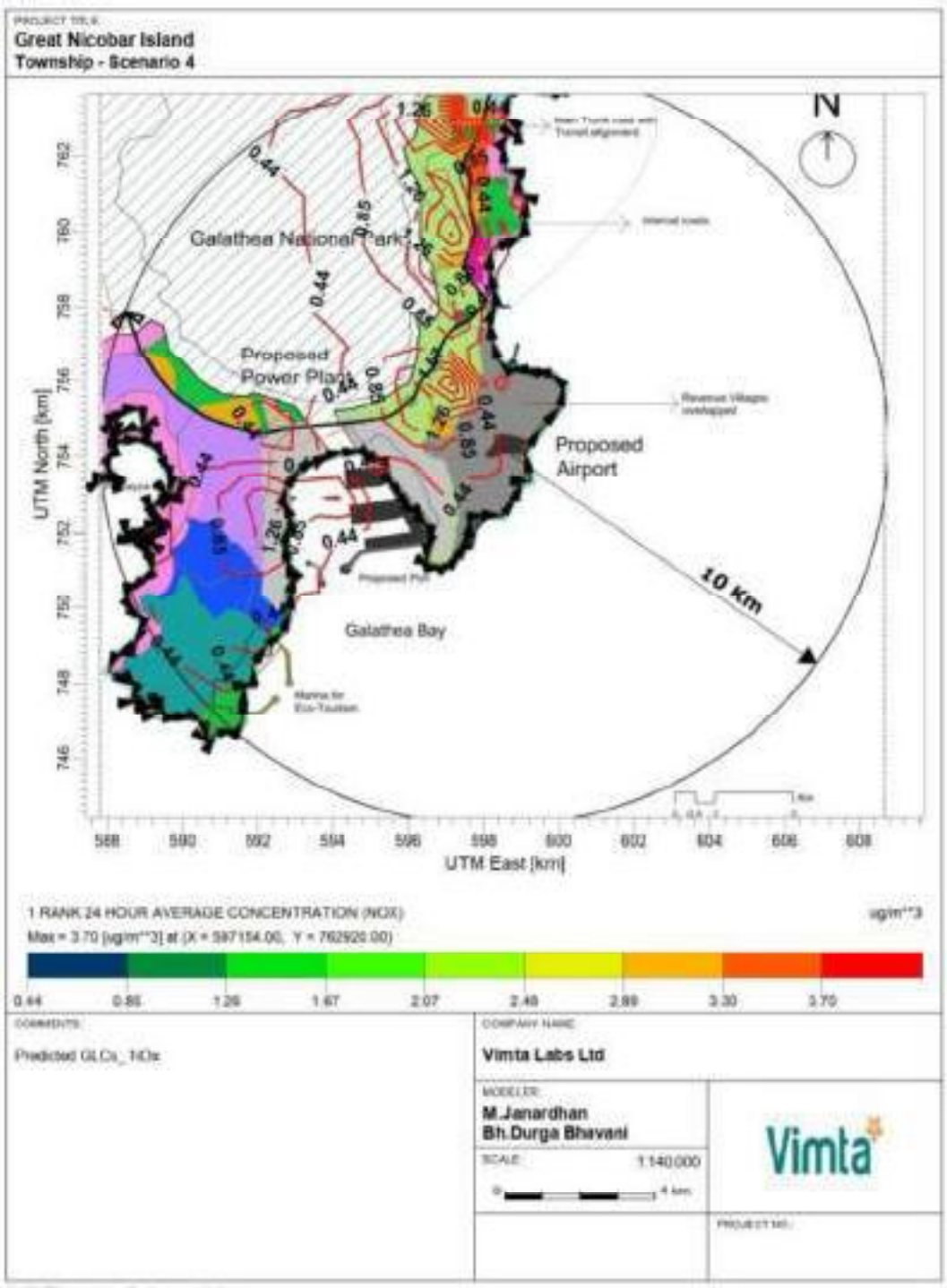


Figure- 4.15: Scenario-IV Predicted Incremental GLCs – CO

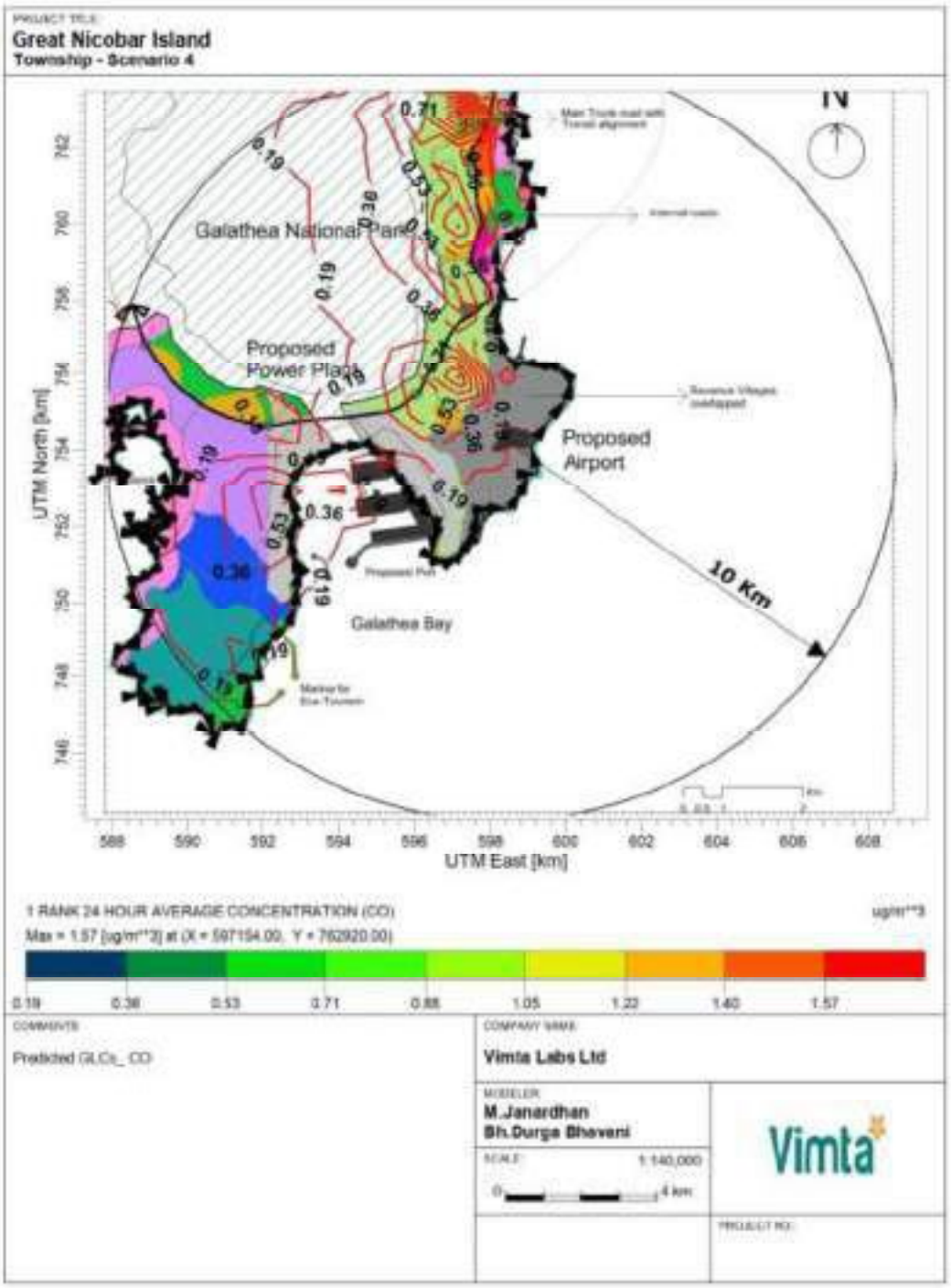


Figure- 4.16: Scenario-IV Predicted Incremental GLCs – SO_2

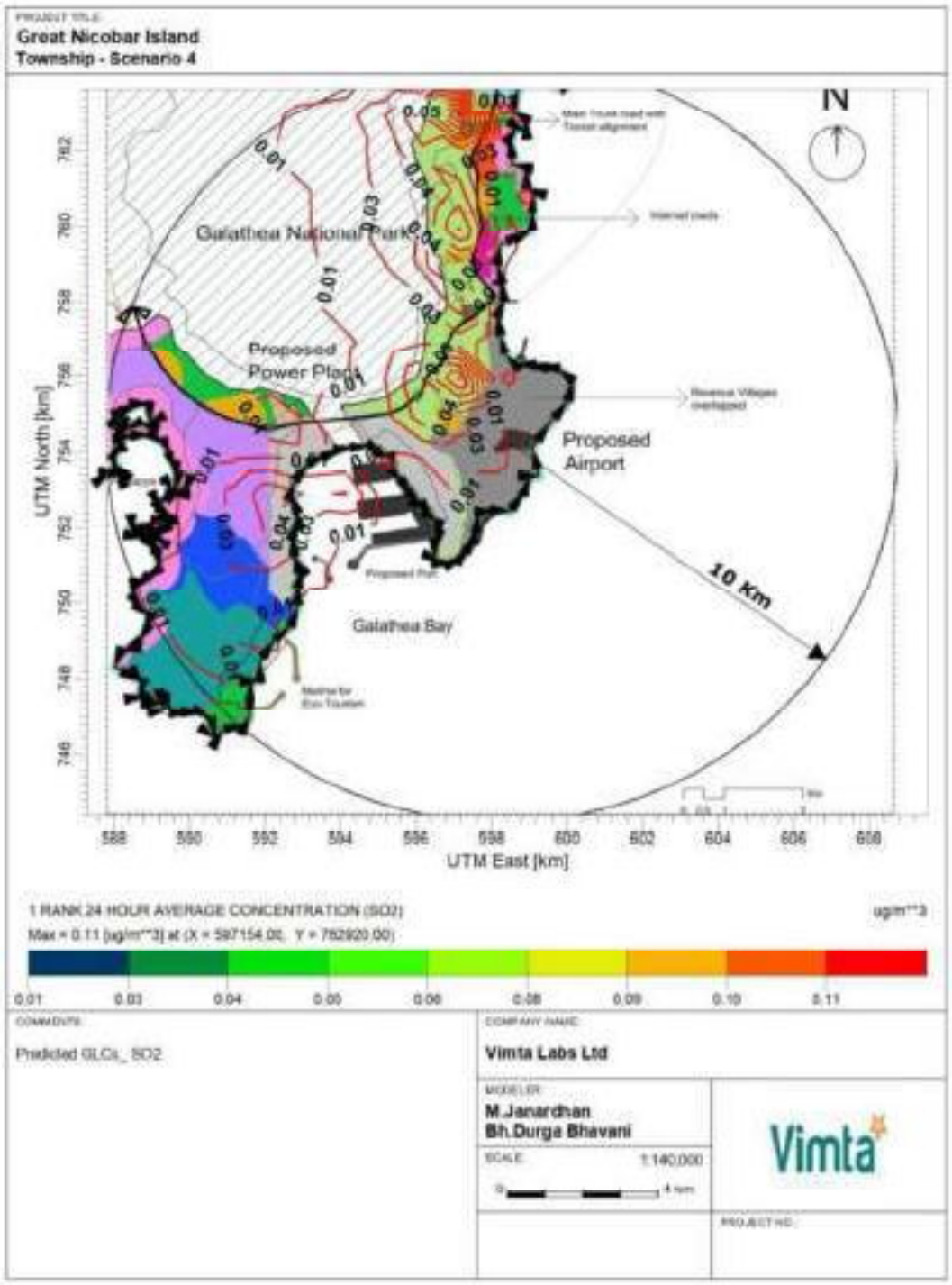


Figure-4.17: Scenario-IV Predicted Incremental GLCs – PM_{10}

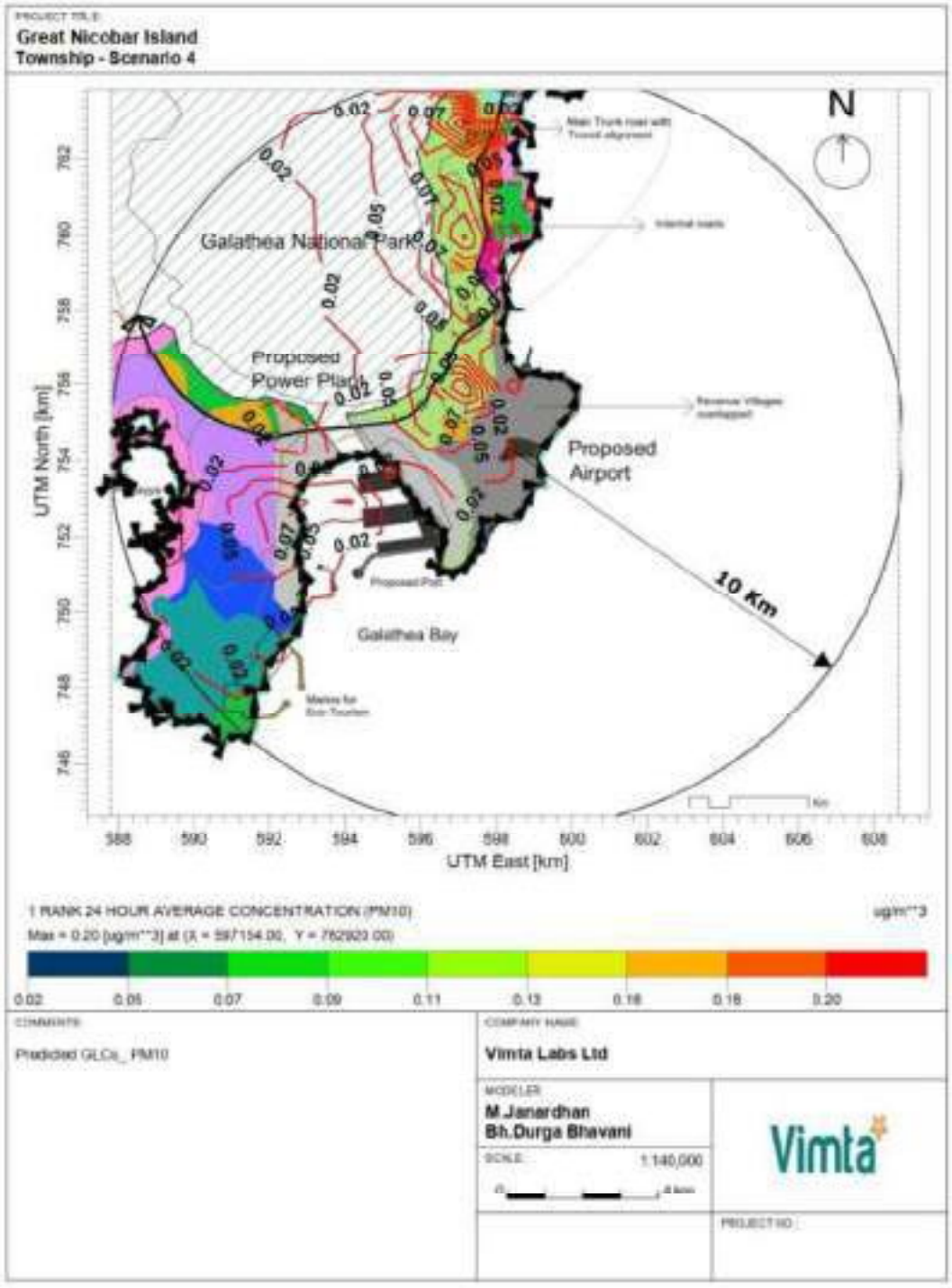
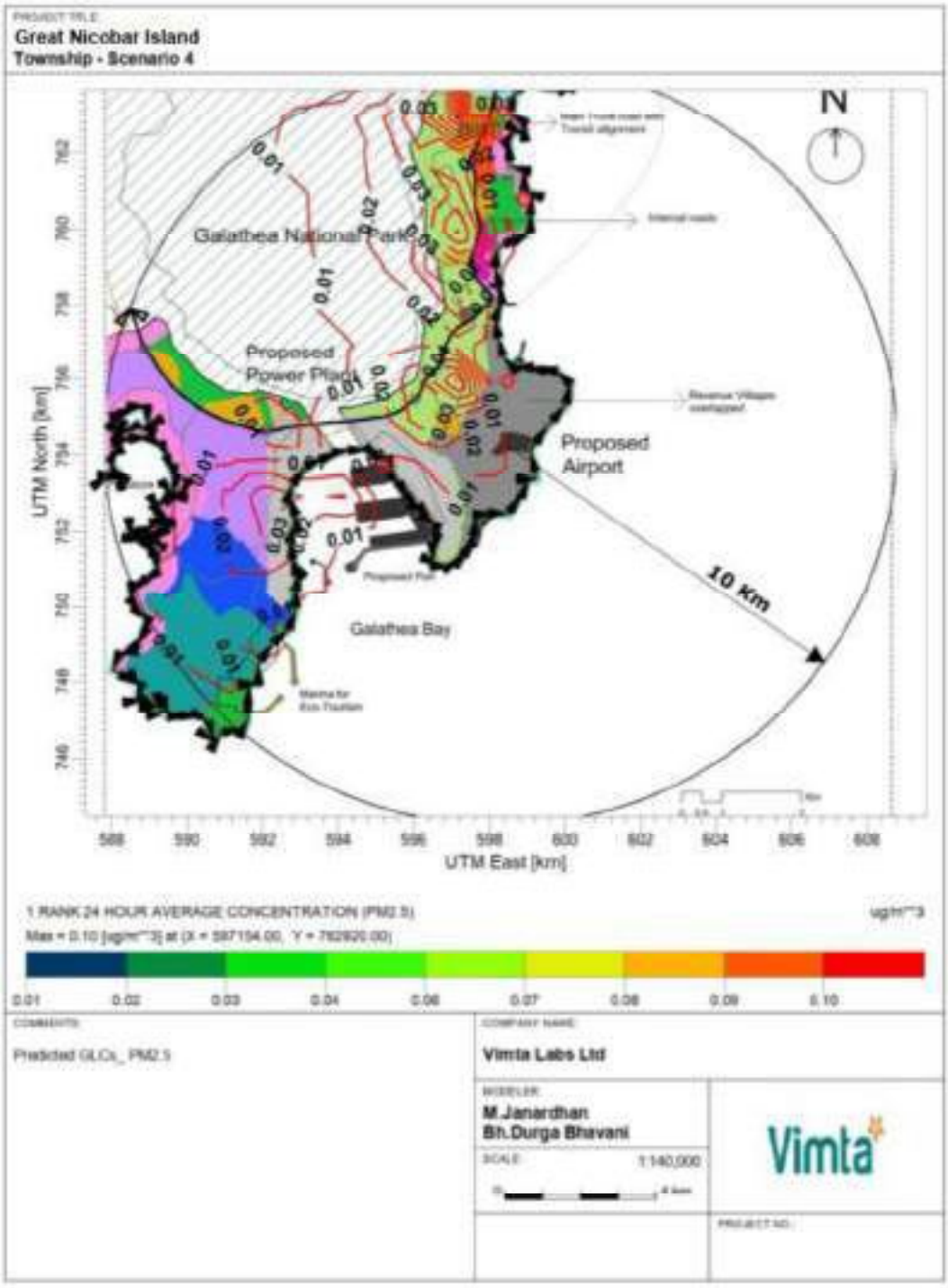


Figure-4.18: Scenario-IV Predicted Incremental GLCs – $PM_{2.5}$



Mitigation Measures - Air Impact

The proposed township will be excellently landscaped with proper terracing and benching and will be provided with pucca roads. As the entire project area will be covered with good landscaping and tree/grass cover, generation of fugitive dust within the premises is not anticipated. Even the dust, outside the project will be minimal due to the proposed compound walls, which will function as barriers and tree plantations along the boundary. Further, all fugitive emissions are likely to be controlled to a great extent, through proper maintenance of tree plantations and the greenbelt development undertaken within the project.

4.5.1.2 Noise Impact - Operation Phase

The noise generating sources from the proposed project is from motor vehicles and air conditioners only. There are no other major noise generating sources.

Mitigation Measures – Noise

- The entry/exit to the site will be with adequate curvature at corner so that vehicles coming out/ entering the building do not impinge on road traffic directly;
- Smooth flow of traffic will be ensured on the internal road to avoid idling of vehicles;
- Buffer in form of wall and tree plantation will be provide along the plot periphery to act as sound barrier especially in area with human habitation, schools, hospitals etc; If necessary, specially designed sound barriers will be erected where the noise levels exceed the permissible limits.
- Vehicular noise will be attenuated by proposed greenery; and
- In addition, honking will be prohibited inside the proposed township.

4.6 Water & Wastewater

Total wastewater generation from proposed township is 58 MLD. The domestic wastewater generated from township will be treated in sewage treatment plants at three proposed locations with a total capacity of 65MLD. The entire wastewater generated will be treated in the centralized sewage treatment plants and the treated water will be reused for flushing, watering and landscaping purposes in the township.

Mitigation Measures

- ***Wastewater Generation and Utilization of Treated Wastewater***

Treated wastewater from the STPs will be utilized within the project premises for non-potable purposes including greenbelt and horticulture. Zero discharge concept will be implemented in this project and no wastewater will be discharged outside the project boundary.

Rain Water Harvesting

In order to conserve water resources and rainwater in the proposed project, efforts will be made to utilize the rain water by constructing appropriate rainwater harvesting structures within each building premises which are having plot area equal or more than 500 sqm. The rainwater from the roofs shall be collected by the rainwater down take pipes and same will be connected to rainwater chambers at ground level. The landscape area and roads shall be sloped towards the storm water drains for appropriate draining.

4.7 Green area Development

Though, about 130 sq km of forestland will be diverted for non-forest purposes, not all the existing standing trees will be cut, only the area which will be accounted under net development will be considered. The approximate net development area is 78 sq km out of 130 sq km. Area reserve under Green and Eco-tourism are the areas where no tree cutting in envisaged. This area also will be conserved for bio diversity purposes. And if necessary, will be densified.

Further, adequate large chunk of land within township area is reserve under the green land use and in addition to this, 11% of public parks area also proposed in all the land uses.

The total green (Including Eco-tourisms and Green) area will be 73.78 sq km. That precisely means, about 44.4% of total project area (166.1sqkm) will be green. Suitable plant species of local varieties will be planted with adequate spacing and density for their fast growth and survival.

Recommended Open Green Spaces:

Based upon benchmarking and then applying the guiding principle, creating an open green space framework that is connected, within walking distance and accessible to all, the following Open Green Space Hierarchy is being recommended for the GNI planning area with Neighborhood Parks, Community Parks, Coastline Parks and Regional Parks.

Sr. No	Category	Approximate Numbers	Approximate Area in ha
1	Neighborhood Parks	77	115
2	Community Parks	19	67
3	Coastline Park	5	425
4	Regional Park	5	750

Neighborhood Parks

A total of 77 neighborhood parks are recommended within GNI planning area where area of each ranging from 1 to 1.5 Ha, serving a catchment area of 400m radius (5-minute walking radius). Exact location of each neighborhood park will

be considered and defined in the zonal plans during the detailed master planning stage.

Community Parks

The Community Park serves a broader purpose than Neighborhood Parks. These parks usually serve two or more residential clusters. Focus is on meeting community-wide recreation needs, as well as preserving unique landscapes and open spaces. These typically have parks, playgrounds, Community Club, Sports courts, multipurpose sports field (cricket, football etc.), Jogging track, shaded seating, open lawn/informal play space, etc. A total of 19 community parks are recommended within GNI project area where area of each ranges between 3 to 4 Ha serving a catchment area of 800m radius (10-minute walking radius).

All community parks shall be provided along the proposed roads to ensure connectivity. As explained, all open green spaces should have a function based upon its location. Keeping this principle in mind, some of the community parks will be identified with having a special function where public art and active uses such as a sports academy can be incorporated. It is recommended that community parks should incorporate public art features as a medium for social, environmental awareness and to enhance aesthetics value of surrounding developments. It is intended that local artists can be engaged to create public art features that can be incorporated in the community parks at strategic locations.

Coastline Parks

The Coastline Park serves a broader purpose than neighborhood and community parks. This will serve the entire GNI planning area at various locations along the coast and can capitalize by merging with the proposed coastal tourism. The coastline parks will connect the development within various land uses and urban zone. In order to have a functional coastline park, it is recommended to accommodate bike paths, nature trails or walking trails within it. Overlooks and trail nodes at regular intervals with signage, public art, street furniture will activate the area while providing resting space and space for social-environmental interactions. Along the coastline parks, it is also suggested to have neighborhood and community parks connected at regular intervals that function as an extension of the coastline park or it can function as a green corridor connecting major land uses. The coastline parks will run through the island edge for GNI planning area, it also provides an opportunity to locate some people-intensive uses and activities such as social & cultural spaces, banquet halls, religious facilities and convenience shopping, that can cater to the workers and visitors in the connected land uses. These approaches always break the monotonous environment of a dominant land use and at the same time activate the area with presence of people. Total of five (5) number of coastline park are proposed.

Regional Parks

The area towards the west in the project area is covered with forest and dense green pockets. Connected regional parks over and above the existing greens will give access to the habitants close to forest and serve broader purpose than neighborhood parks, community parks and will meet area-wide recreational requirement as well as preserving unique natural landscapes and open spaces. This area can have active to passive recreational spaces, center for ecological learning, eco-tourism or eco-resort, walking/ jogging tracks, sports facilities, cafes and other allowable uses. A regional level ecological park or nature preserve towards the western edge of GNI planning area is recommended for regional parks. Estimated number of regional parks would be 5 distributed within the delineated 166 sq.km of planning area. Each Park shall have distinguished program/ activities. These can be designed in a naturalistic manner to recreate the dense forest ecosystems.

4.8 Socio Economic Environment

For residential areas, the strategy includes clustering education, health, community amenities/facilities, neighborhood level commercial, EWS and other compatible amenities can be clustered together around or along an open green space. By doing so, the neighborhood centers would become nodes of social, cultural, economic activity at a neighborhood level that are walkable and centrally located with neighborhood clusters.

For commercial and institutional areas, the strategy includes clustering health, community amenities/facilities, neighborhood level commercial and other compatible amenities together around or along an open green space. The social infrastructure for the GNI planning area is divided into six broad categories, namely

- Education;
- Residential;
- Local Retail/Shopping;
- Community Facility (healthcare);
- Community Facility (cultural/entertainment); and
- Community Facility (others).

Each of the above types are elaborated in in Chapter-8

Impact on Social – Culture Impacts

Great Nicobar Island is inhabited by aboriginal mongoloid Shompen. The Shompens are hunter-gatherers and depend on the forest and marine resources for sustenance. They live where natural water source is available and use the surface water for drinking. Another Mongoloid Tribe, the Nicobarese, used to live in settlements along the west coast. After the tsunami in 2004, which devastated their settlement on the western coast, they were relocated to Afra Bay on the

north coast and to Campbell Bay. They survive on fish caught from the sea. There are about 237 Shompen and 1,094 Nicobarese individuals.
The areas where the tribal dwell have been declared as Tribal Reserve. The Shompens move between the Core and Buffer Zones, while the settlers and Nicobarese live in settlements spread along the coast in the Transition zone. The area of the tribal reserve is 751.070 sq.km. Of this 84.10 sq.km falling under tribal reserve, is proposed to be denotified. Andaman & Nicobar Administration proposes to renotify 45.23 sq.km of land in Campbell Bay and Galathea National Parks and 31.73 sq.km land outside the National parks. Therefore effectively 7.11 sq.km will be required for de-notification for the project. The aboriginal tribes will have to option to maintain their separate existence in their natural habitat, as is their current preference. Furthermore, tourism and development should not generate undue negative impacts on the existing tribes, nor should interaction initiated unilaterally by tourists or residents be permitted. The tribal reserves, including their core and buffer areas, will remain largely for the exclusive use of the native tribes.

As a Union Territory, Andaman & Nicobar Islands has created a legal framework to regulate urban development, coastal zone management, tourism and infrastructure. Native tribal laws and polices like the Shompen Policy (2015) and PAT Regulation 1956 seek to preserve and protect the lifestyle and cultural heritage of the tribals.

The A&N business community is willing and able to participate in development of the tourism and shipping sectors on the island. But given the scale of the projects, participation by large Indian and/or international players is also required. Breaking megaprojects into smaller chunks can help secure more local business participation. The business community is informed that the public sector mindset has changed, and that development on GNI can coexist with defence functions, in harmony with nature, aboriginals and the new city development.

Mitigation Measures

-To avoid degradation of the natural habitat in the Tribal Reserve Areas which may make harder from the aboriginal peoples to gather and hunt food the forest and the sea.

-To avoid intrusion of outsiders into Shompen and Nicobarese areas — such intrusions, which are known to be unwanted by the Shompen, could cause harm to the aboriginals and exacerbate their quality of life.

-Protect native tribes (Shompen and Nicobarese) from excessive exposure to mainlanders / tourists

Positive Impacts:

- The road network will be increasing therefore the accessibility will increase.

- The goal of the project for Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands' is to development of a new 'greenfield city' with a diverse and robust economy based on maritime services and tourism, amongst other drivers. Great Nicobar Island to attract international and national visitors to experience the outstanding natural environment and participate in sustainable tourism activity. As per the future requirement the road network will be increase therefore the accessibility will increase.

- Educational facilities

  Considering that Great Nicobar Island is not well developed and is mostly rural in nature, there is a complete lack of educational facilities. For the future communities to come and settle in the GNI planning area it is paramount that certain educational facilities to be provided based on the need based social and physical infrastructure development assessment. 77 Primary schools, 19 secondary schools, total of 8 integrated schools, 4 colleges, 3 scientific research centers, 2 ITIs, 1 adult education center, 2 technical education centers will be provided. These facilities will be located at appropriate catchment locations for easy access.

- Medical facilities

  Considering that Great Nicobar island is not well developed and is mostly rural in nature, there is a complete lack of healthcare facilities. For the future communities to come and settle in the GNI planning area it is paramount that certain healthcare facilities to be provided based on the need based social and physical infrastructure development assessment. 38 dispensaries/poly clinics, 08 Nursing home& maternity homes, 04 hospitals 100 beds to 200, 04 hospitals 20 beds to 80 beds, 04 multispecialty hospitals 100 beds to 200 beds, 04 specialty hospitals 100 beds to 200 beds, 02 general hospitals 300 beds to 500 beds, 04 family welfare centers along with pediatric centers, gastric centers with diagnostic facility are required. The medical facilities will be increased as per the requirement.

4.9 Ecology – Impact & mitigation for long tailed macaque

The project will divert 130.45 sq.km of forest land which is about 14.3% of the total Great Nicobar Island area. Out of the diverted forest land about 52 sq.km of the forest land will be left "as it is" and no construction is currently envisaged. It is therefore presumed that the habitat of the Nicobar long-tailed macaque will not be significantly affected. However, monkeys often reside near human habitat for easy food, and this often creates human animal conflict.

Coconut palms are most important commercial plants in the GNI. Consequently, their cultivation has become important for the future survival for the people in the region. It is quite possible that in absence of appropriate measures, the plantation of coconut and other fruit bearing trees may create human-monkey conflict (Shivakumar, 2010)

As per Indian ethics, monkeys are never killed. However, when band of monkeys reside near human habitat, they create problems for human residents. They destroy coconuts and fruits and often get into house and eat vegetables and fruits.

Despite its name, the crab-eating macaque typically does not consume crabs as its main food source; rather, it is an opportunistic omnivore, eating a variety of animals and plants. Although fruits and seeds make up 60% - 90% of its diet, it also eats leaves, flowers, roots, and bark. It sometimes preys on vertebrates including bird chicks, nesting female birds, lizards, frogs, and fish, invertebrates, and bird eggs.

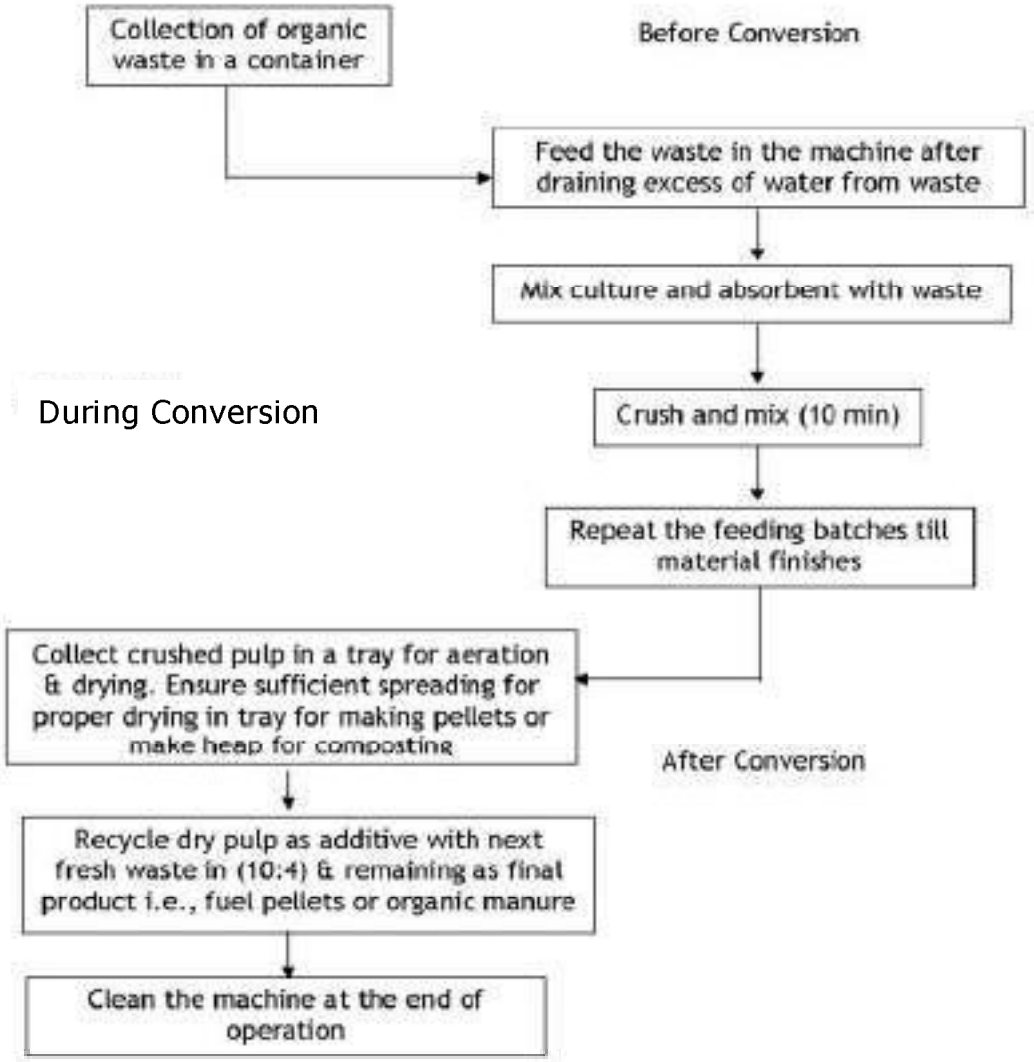
4.10 Solid Waste Management

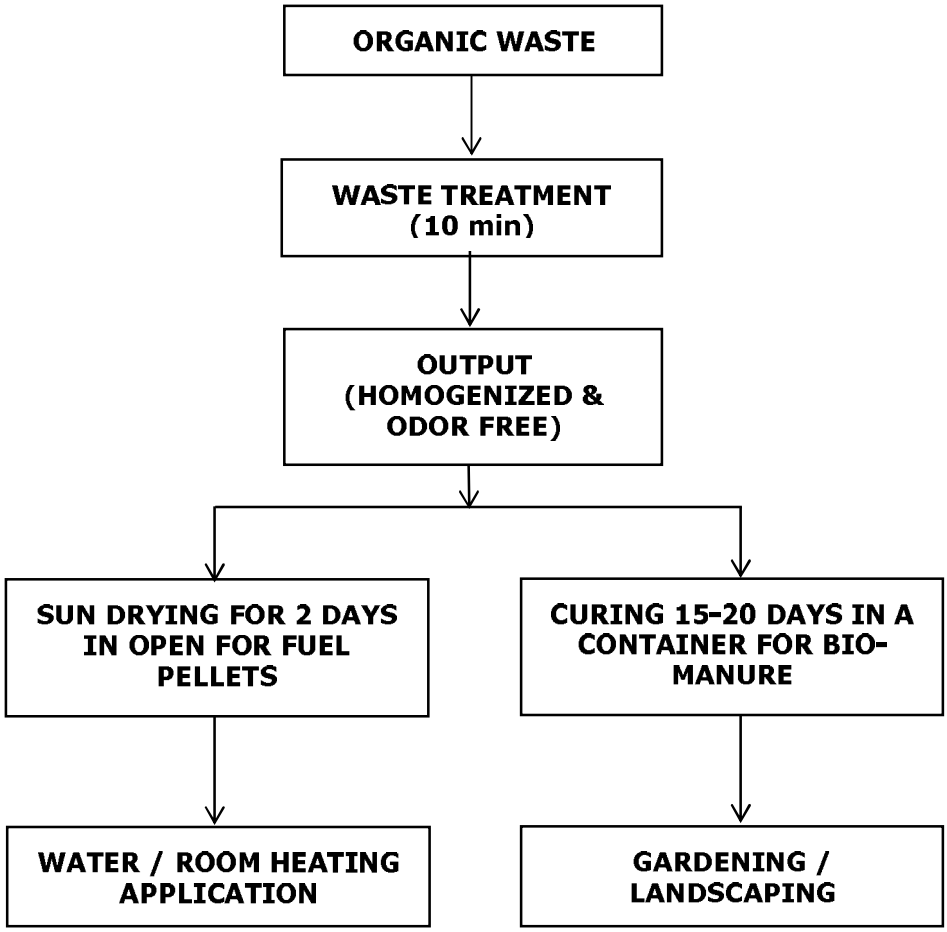
The solid waste management system during operation of the project will be through the centralized waste management facility and has been described in Chapter 2 (Township).

Mitigation Measures

Further, the proposed green cover, public parks and avenue plantation measures will enrich the soil binding characteristics and preserve topsoil from erosion. Approximately 44% of the total GNI development area will be under green cover.

Figure-4.19: Organic Waste Converter – Operational Procedure





4.11 Energy Conservation Measures

The buildings proposed within the township area will comply with standards included in NBC 2005 for lighting levels, comfort levels, natural ventilations and other system performance criteria. Other requirements of ECBC 2007 like building envelope, heating ventilation and air conditioning system, solar water heating system, lighting schedule will be considered during the operational phase of the project.

In addition, adequate monitoring of the power consumption is planned by use of smart metering system for different types of loads. The collected data can be used to optimize on the power requirements by varying operating schedules. Adequate awareness displays will also be highlighted in signage.

To minimize the use of energy and to conserve the energy some of the energy efficient technologies are to be followed.

The concept of passive solar design emphasizes architectural design approaches that minimize the energy consumption by integrating conventional energy efficient devices, such as mechanical and electrical pumps, fans lighting fixtures, and other equipment, with passive design elements, such as building sighting, an efficient envelope, appropriate amounts of fenestration, increased day lighting design, and thermal mass. The basic idea of passive solar design is to allow daylight, heat and airflow into a building only when beneficial. Some of the advanced solar passive techniques proposed are given below:

- Planning to bring maximum day light into a building and distributing it in a way that provides more desirable and better-quality illumination than artificial light sources. This reduces the need for electrical light sources, thus cutting down on electricity use and its associated costs and pollution;
- Energy efficient lighting devices are planned such as Light Emitting Diodes (LEDs), CFLs, tube lights in place of incandescent bulbs;
- Installation of smart metering at consumer end to check the power consumption & power loss;
- Suitable rating and size cables selection to limit the total power distribution losses;
- Solar water heated for pre-heating water required for bathing and cooking;
- Energy efficient construction materials to achieve the desired thermal comfort will be used to maximum extent;
- Split type air conditioners and CFC & HCFC free refrigerants i.e. R22 etc will be enforced through development control regulation as per ECBC norms.

4.12 Cost Provision for Environmental Measures

For environment protection and management and pollution control and treatment and monitoring systems, appropriate budgetary provision would be made and provision for recurring expenditure for environment management of the project would be made. The details of budget allocation during functional phase are given in **Table-4.7.**

Table-4.7: Budget Allocation for Environmental Protection

Sr. No	Environmental Aspects	Capital cost (Rs. in Crores)
1	STP, WTP, Water Network, Sewerage Network, Fire Networks, Recycle Network, Drainage/Storm Water system, Solid Waste, ICT etc)	9500 (part of construction cost)
3	Rain water harvesting	Cost will be borne by individual developers
4	Public Park development	1350
5	Eco-tourism & Green area development (street furniture and tree tagging, walking trails)	737
Total Cost		**11587**

4.13 Budget for Environment Monitoring Plan

The details of the construction and operation phases both for environmental monitoring plan with cost and parameters are given in **Table-4.8.**

Table-4.8: Budget Allocation for Environmental Monitoring Plan for township

Sr. No	Environmental Aspects	Frequency	Construction Phase (Rs in lakhs)	Operation Phase (Rs in Lakhs)
1	Ambient air quality	Once in three months @ 10 locations	6.0	6.0
2	STP inlet & Outlet	Daily	Will be included in STP operation cost	Will be included in STP operation cost
3	Noise Monitoring	Once at three months @ 30 locations	4.8	4.8
4	Potable water quality monitoring	Daily	Will be included in WTP operation cost	Will be included in WTP operation cost
5	Ecological monitoring	One in a year	100	100
Total Cost			**110.8**	**110.8**

CHAPTER 4D

4.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES-POWER PLANT

4.1 Identification of Impacts

Identification of impacts leads to quantification and evaluation of impacts and suggested mitigation measures. Although, in general, number of impacts have been identified while describing existing environmental status, it is necessary at this stage to identify the critical impacts that are likely to occur due to the proposed LNG based Power Plant for various components of the environment.

The environmental impacts are categorized as primary or secondary. Primary impacts are those, which are attributed directly to the project and secondary impacts are those, which are indirectly induced and typically include the associated investment and changed pattern of social and economic activities by the proposed action.

The construction and operational phase of the proposed LNG based power project comprise various activities each of which may have an impact on some or other environmental parameters. Various impacts during the construction and operation phase on the environment have been studied to estimate the impacts on the environmental attributes and are discussed in the subsequent sections.

The proposed Power Plant (450 MVA) of Gas engine-based power generation technology (LNG) at the mouth of the Galathea River in Great Nicobar Islands would create impact on the Environmental attributes in two distinct phases:

1) During construction phase – will be temporary or short term in nature
2) During operation phase – will be long term effect

However, various measures are proposed to be adopted to minimize the pollution from the project are discussed in subsequent sections.

4.2 Impacts during Construction Phase

The probable impacts during construction phase on various sectors of environment (such as air, water, soil, biotic, socio-economic environment etc. have been identified and listed in **Table-4.1**. The mitigation measures for significant impacts are also discussed in respective sections.

Table-4.1: Identification of construction activities and probable impacts

Construction Activities	Sector	Probable Impacts
A) Long Term Impacts		
Land acquisition	Land	• The entire land is forest which will be diverted for non-forest purpose. • No private or revenue land acquisition is involved.
	Socio-economics	• No displacements and loss of livelihood • The power plant is near to the

Construction Activities	Sector	Probable Impacts
		Shompen habitat.
B) Short Term Impacts		
Site clearing and levelling (cutting, stripping, blasting, excavation, earth movement, compaction)	Air	• Fugitive dust emissions • Noise/ air emissions from construction equipment & machinery
	Water	• Run-off from construction area • Run-off from vegetation stripped area
	Land	• Loss of fertile top soil • Change in drainage pattern
	Ecology	• Loss of vegetation • Topographic transformations
Transportation and storage of construction material/ Equipment	Air	• Noise and air emissions from vehicles • Fugitive dust emissions due to traffic movement • Spillage and fugitive emissions of construction materials
	Water	• Spillage of construction material and flow into streams • Run-off from storage areas of construction material
	Soil	• Deposition of spilled construction material on soil
Civil construction activities	Air	• Noise and air emissions from construction machinery and Generators • Fugitive dust emissions due to movement of traffic
	Water	• Run-off from construction areas containing construction material
Mech. & Elec. erection activities	Air	• Noise &air emissions from machines/ activities
	Water	• Run-off from erection areas containing oils, paints
Influx of labour& Construction of temporary houses	Socio-economics	• Stress on infrastructure • Stress on social relations
	Water	• Sanitary effluents from labour colonies
Transportation and disposal of construction debris	Air	• Noise and air emissions from transport vehicles • Fugitive dust emissions due to movement of traffic • Spillage and fugitive emissions of debris materials
	Water	• Spillage/ spread of debris material and flow into nearby sea • Run-off from disposal areas
	Soil	• Spillage/ spread/ deposition of debris • Conversion of land into waste land

4.2.1 Impact on Topography & Land use

The proposed project site is located at the mouth of the Galathea River, which is about 39 acres of forest land which will be diverted for non-forest purposes. The site is having irregular topography with elevation of 23 m to 35 m above MSL exists along the Galathea River. Leveling will be done by cutting and filling the natural ground levels.

The major change in the topographical feature of area would be erection of power plant structures. There will be a permanent change. This includes the activities related to leveling of site, construction of main plant and other related structures, erection of gas engines, desalination plant and other related equipment.

A labour colony for approximate 100 labours are proposed to be constructed on the western side of the plant boundary. This labour colony is proposed on forest land which will be diverted for the purpose of the non-forest development.

The present land-use of the project site falls under forest category. There will be change in land use after installation of the proposed power project from forest to industrial category. Also, the proposed project is not likely to have any adverse impact on the surrounding land use during the construction period.

It is presumed that community kitchen will be formed by the labor contractor where all the labor and their families can take meals. However, some of the labor may like to use separate kitchen for their families. No firewood will be allowed for the purpose of cooking. Gas cylinders will be supplied to the community kitchen and to those who prefer to cook separately. Strict vigilance will be maintained to ensure that no wood is used for cooking.

4.2.2 Impact on Soil

Construction activities involving leveling, excavation and removal of existing vegetation would invariably disturb the soil of the area. The impacts on soil during construction phase shall be mainly due to loss of top soil in the construction areas and contamination of the soils of surrounding area due to construction materials such as cement, sand etc. The disturbances would be more pronounced during the summer and monsoon seasons with strong rains as the project site is located near to the sea. However, it will be temporary and confined to the areas of construction by using proper storm water runoff system during construction phase also. Generally, such disturbances are confined to the area of activity i.e. the main plant.

Mitigation Measures:

Appropriate soil conservation measures associated with improved construction techniques would minimize such impacts. Timely afforestation activities would also contribute positively towards soil conservation. The hazardous waste from the construction site will be collected in the designated area and will not be allowed to contact with the soil.

Apart from localized construction impacts at the plant site, no adverse impacts on soil in the surrounding area are anticipated.

4.2.3 Impact on Air Quality

The dust will be the main pollutant affecting the ambient air quality of the area during the construction phase. The main sources of emission during the construction period are the movement of equipment at site and dust emission during the excavation, leveling, grading, earthwork and foundation works. The dust emitted during the above-mentioned activities depend upon the type of soil being excavated and the ambient humidity levels. Dust will be generated during excavation and handling of earth and movement of vehicles and other equipment. The dust generated during the construction activities will settle quickly. Therefore, the impact will be for short duration and confined locally to the construction site.

The impact will be confined within the project boundary and is expected to be negligible outside the plant boundaries. Exhaust emissions from vehicles and equipment deployed during the construction phase is also likely to result in marginal increase in the levels of NO_X, PM and CO. The impact will be for short duration and confined within the project boundary and is expected to be negligible outside the plant boundaries. The impact will, however, be reversible, marginal and temporary in nature.

Mitigation Measures

Proper maintenance of vehicles and construction equipment will help in controlling the gaseous emissions. Water sprinkling on roads and construction site will prevent fugitive dust.

4.2.4 Impact on Water Quality

All the water required during construction phase will be arranged from the private tankers and no groundwater is proposed to be utilized for the project during construction and operations. Hence, no quantitative impact is envisaged on the ground water resources.

The present river water may be impacted due to non-point discharges of solids from soil loss and sewage generated from the construction work force stationed at the site. However, the construction will be more related to mechanical fabrication, assembly and erection; hence the water requirement would be meagre.

Mitigation measures:

The overall impact on water environment during construction will be insignificant. Temporary sanitation facilities (septic tanks) will be set-up for disposal of sewage generated by the work force.

4.2.5 Impact on Hydrology

Construction water shall be supplied from existing source of raw water through tankers. Hence it will not have impact on the Hydrology of the region.

Mitigation measures:

The effluent from the construction area will pass through a sedimentation tank to arrest sediments and treated water will be reused in water sprinkling. As the construction activities will be confined to the existing project site only, no significant impact on the hydrogeology as part of the study area envisaged.

4.2.6 Impact on Noise Levels

The major sources of noise during the construction phase are vehicular traffic, blasting, construction equipment like dozers, scrapers, concrete mixers, cranes, generators, pumps, compressors, rock drills, pneumatic tools, saws, vibrators etc. The operation of these equipment will generate noise ranging between 70-85 dB(A). The noise produced during the construction will have significant impact on the existing ambient noise levels. The construction equipment may have high noise levels, which can affect the personnel, operating the machines.

Mitigation measures:

Use of proper personal protective equipment will mitigate any significant impact of the noise generated by such equipment on the labours working during construction. Similarly, as the major work will be carried out during the day time, and all care will be taken that the noise levels are withing the CPCB norms outside the plant boundary and therefore the impact on the surrounding area due to the activity will be negligible.

4.2.7 Impact on Terrestrial Ecology

The power plant is located in remote corner, near the mouth of Galathea River. The initial construction works at the project site involves land clearance. The plant is located in dense to riverine grass land area. During construction activities vegetation may be disturbed which can be consideredsignificant, as the proposed project site is irregular topography with riverine shrubs and bushes with sporadic dense vegetation.GNI generally devoid of vertebrate fauna. Apart from wild pigs, monkeys and snakes no other vertebrates is available in this area. Therefore, the impact on the vertebrate fauna will be marginal. However, the area is rich in avifauna. As per ZSI study, it is apparent that when the area will be cleared of forest, the birds have a tendency to migrate to a more suitable habitat for relocation.

There will be significant loss of species diversity due to the clearing of the site.

Mitigation measures:

Plantation will be developed in all available spaces after construction phase to improve the aesthetic value in the area. The removal of vegetation from the soil and

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.

- Total number of construction labours are given

Estimated labour requirement
Phase I
150
Estimated labour + Family + Support requirement
210
Water requirement and source (lpcd)
47775
Quantity of waste generated and fractionation (organic, hazardous, recyclable and biomedical) (Kg/day)
75
Fuel requirement (kg/day)
50

- **Water treatment system for the labour colonies: -**In the initial stages of construction, the treated water will be provided through tankers till the proposed trunk infrastructure is laid down in GNI. Compact waste water treatment plant / Septic tank shall be installed within the labour colonies during the initial phase of construction. However, one the infrastructure is ready, the waster will be supplied through the central waste treatment plant.
- All the waste water generated in the labour colonies will be treated before discharge. In the initial stages the wastes from the toilets will be treated through septic tanks. However, once the central treatment plant is ready, all the waste water will be directed to the treatment plant and will recycled. No water is expected to be discharges. However, some makeup might be required for operation of the plant and the quantity will be used for gardening purposes.

- **Municipal waste management system that is Collection, transportation treatment and disposal system for the labour colonies. (Details of MSW system is given in chapter 2C (2.7.4), Township)**

✓ Separate bins will be installed within the labour colonies for dry and wet waste.

✓ It will be contractor's responsibility to collect and transfer the waste to nearest solid waste transfer site

✓ After collection and transfer, solid waste management shall be integrated with overall SWM system of GNI
✓ At least 2 Organic Waste Composters of 1-2 T capacity each will be installed in the labour colonies.

Medical facilities for the labours number of dispensaries, hospital and emergency medical centres in case of accidents).

✓ Considering the phase wise total labour requirement, local health centre / dispensaries will be planned within the labour colonies. For any treatment

required facility above the local health centre; the GNI local facilities shall be utilized.

✓ Ambulance facility shall be provided by the contractor all the time at site as well as at labour colonies

- **Medical check and vaccination programmes for prevention of contagious and vector borne diseases.**

✓ It will be contractor's responsibility to follow the centre / UT guidelines related to health, disease preventive measures, and vaccination programme. This shall be part of the contract agreement.

- **Mosquito control programmes**

✓ It will be contractor's responsibility to have time to time cleaning, fogging, and medication camping.

- **Emergency evacuation plan in case of natural disasters like floods, cyclones and tsunamis and earthquakes and epidemics.**

✓ It will be contractor's responsibility to prepare a disaster management plan including evacuation plan for site as well as labour colonies.

With regards to the impacts due to construction worker camps, to ensure there is no strain on the existing infrastructure, the worker camps will be self-sufficient and would not rely on any local resource. This would also ensure that there is no conflict with the local population. To mitigate impacts from health hazards, sanitation self-sufficient infrastructure facilities will be provided. Further, the worker camps will be located away from the coast and habitations.

4.2.9 Impact on Demography and Socio-Economics

The power project site is the nearest site to the Shompen habitat compared to any other project appurtenant. The Shompen often visits the near to the site on the Galathea river for drinking water and even fishing.

The construction phase with large number of labours working on the site is often chaotic. The labours are under the contractors and often the project management have limited administrative jurisdiction.

With large labour force working in the area, there is always a chance of interaction with the Shompen. Such interactions if it ever happens, is totally undesirable. The labours in the area will come from the mainland and from nearby islands, with different cultural backgrounds and habits. Many may come from areas where vector diseases are common. Interactions with tribal may spread such diseases amongst the tribal. It has been experienced in past that many isolated communities do not have immunity to many common diseases like flu, influenza, diarrhea etc. Once these infections spread amongst the tribal, the whole community may face

extinction. Any interaction with the tribal is a serious issue and needs to be addressed suitably.

One of the basic problems that causes interaction with tribal during construction relates to the behavior of the labours. The labours are supposed to be restricted only to construction area and the labour colonies. All the facilities like food, kitchen, toilets, fuel, drinking water etc. are provided to the labours and they need not venture into the restricted areas like forest and tribal reserves. But in reality, it has been noticed in various projects that the labours often break the rules and get into the forest areas including the tribal reserves.

The Shompen are isolated tribes with practically no interaction with the mainstream population. They have survived for thousands of years with nature and have their own cultural and social identity. They live a life of hunter gatherers, drink natural surface water of the rivers and have survived. Over ages Any disturbance or alteration in the natural environmental setup where they live, may cause serious threat to their existence.

The project area and the labour colonies have been carefully chosen away from the Shompen dwelling areas. The other tribe which inhabits the GNI are the Nicobarese which have assimilated themselves with mainstream population to a large extent. They participate in various cultural activities, goes to school, engaged in business activities and few even works in government offices. However, there are few communities within the Nicobarese tribe who choose to be isolated and dwells in the forest. Government provides facilities to Shompen and Nicobarese to the extent they desire.

A significant number of workers, comprising of skilled, semi-skilled and unskilled laborer's, shall be employed by various contractors at site during the peak period of construction phase. Significant number of semiskilled and unskilled laborers would be recruited from the nearby areas. This would create temporary employment opportunities in the area.

Since most of sizeable labor force will be drawn from main land and change in demographic profile is anticipated. Most of the construction work is labour intensive. As most of the jobs will be done by contractors, it will be ensured that the contractor's workers are provided with proper facilities including sanitation and drinking water supply.

The social impact during the construction stage will be generally beneficial so far as employment opportunities are concerned. During construction of the project, people from main land will be engaged by contractors. Local people would be preferred for secondary employment with contracting agencies, depending upon their skill and experience. During construction, due to influx of labour, economic activities in surrounding areas will be increased.

The construction material like stone chips, sand and other construction materials may be procured locally. Thus, there is possibility of generation of local trading opportunities for limited period of time.

Mitigation Measures:

Strict restrictions need to be imposed to ensure that no labour or any other unauthorized persons trespasses forest area and have any chance to meet any tribal population. The forest and tribal area should be guarded and even barricaded with barbwires if necessary, to ensure that there is no interaction with the tribal during the construction and operation of the project.

During the construction phase, the drinking water and sanitation facilities shall be provided for the work force. Temporary toilets as per PHED norms will be constructed for the work force during construction period. Suitable septic tanks and soak pits of appropriate capacities will be constructed for treatment of sewage before disposal.

4.3 Impacts during Operation Phase

The proposed LNG based power plant during its operation phase involves generation of 450 MVA power through LNG fuel technology. The following activities related to the operational phase will have varying impacts on the environment and are considered for impact assessment:

- Land use;
- Soil quality;
- Topography and climate;
- Air quality;
- Water resources and quality;
- Solid waste;
- Noise levels;
- Terrestrial and aquatic ecology;
- Demography and socio-economics; and
- Infrastructural facilities.

Probable impacts on various sectors of environment during operation phase are given in **Table-4.2.** Further, the significance of these impacts is discussed in the subsequent sections.

Table-4.2: Identification of Operation and Maintenance Activities and Probable Impacts

Operation and Maintenance Activities	Sector	Probable Impacts
Transportation of fuel (LNG)	Air	• Noise and air emissions from vehicles/vessels • Fugitive dust emissions due to traffic movement • Fugitive emissions of LNG
	Water	• Spillage of oil and flow into nearby creek, marine or streams
	Public utilities	• Increased flow of traffic • Congestion on roads
Burning of fuel (LNG)	Air	• Stack emissions NO_x from LNG
Withdrawal of water	Ecology	• Entrapment/ Impingement of organisms

Operation and Maintenance Activities	Sector	Probable Impacts
Water treatment for various uses	Water	• Generation of effluents and sludge from treatment plant • Clarifier sludge • Filter backwash • DM plant regeneration waste • Tube settler sludge
Equipment cooling	Water/ Ecology	• Discharge of cooling water & brine
Transportation, storage & use of chemicals/ Cl_2O	Air/ Water	• Risks of Accidental spillage/ waste of chemicals
Operation of transformers and switchyard	Water	• Generation of effluents containing oil
Maintenance (cleaning, over-haul, oil change, lubrication etc.)	Water	• Generation of effluents containing oil/ chemicals
Domestic use of water in plant	Water	• Generation of sanitary effluents

4.3.1 Impact on Topography and Land Use

The major change in the topographical feature of area would be erection of power plant structures. There will be a permanent change.

The present land-use of the project site falls under forest category. There will be change in land use after installation of the proposed power project from forest to industrial category. Also, the proposed project is not likely to have any further adverse impact on the surrounding land use during the operation period.

4.3.2 Impact on Soil

The impact of a power plant operated on natural gas as fuel on soil characteristics is insignificant as compared to the impact of coal-based projects.

The soil conditions of the project site would be allowed to be stabilized during the period after the impacts of the construction phase. The topsoil in non-built up areas would be restored and such portions of the site would be subjected to plantations, which would help in bonding of the soil, thus increasing its strength.

The impact on soil during operation of the project could result due to gaseous emissions. The soil within the deposition zone of pollutants may undergo minimal physio-chemical changes due to deposition of washout of gases (NO_2) during the rains. The impacts on soil due to operation of the power plant and gaseous emission are likely to be negligible as the power plants using R-LNG is much more environmentally cleaner as compared to coal-based power plants of similar capacity. As they produce lesser fugitive/dust emissions, greenhouse emissions and release of effluents is significantly lower.

The impact on the topsoil will be confined to the proposed main plant area.The emissions of particles will be very minimal when compared to coal-based power plant, but this little quantity of particulate emission willbe dispersed through 30 m height chimney over wide area, causing minimal impact on soil. The air borne fugitive dust from the plant is likely to be deposited on the topsoil in the immediate

vicinity of the plant boundary. However, the fugitive emissions from the plant activity are likely to be controlled to a great extent through proposed control measures.

However, periodic monitoring of soils will be undertaken as wherever required within study area.

4.3.3 Impact on Air Quality

The impacts on air quality is assessed based on emissions from the proposed Gas based power project. As RLNG is free from sulphur, for the modelling purpose, only NOx is considered as pollutant. The emission levels of NOx while firing on LNG has been considered as guaranteed emission levels for the engines, which are less than the prevailing emission norms.

Prediction of impacts on air environment has been carried out employing mathematical model based on a non-steady state Gaussian plume dispersion model designed for multiple point sources for short term. In the present case, CALPUFF Version 8.6.1 dispersion model based on non-steady state Lagrangian-Gaussian puff dispersion, designed for multiple point sources for short term and developed by United States Environmental Protection Agency [USEPA] has been used for simulations from point sources.

- ***Model Set-up***

The model set-up details are presented in **Table-4.3.**

Table-4.3: Model Set-Up

Sr. No.	Parameter	Details
1	Model Name	CALPUFF (Version 8.6.1)
2	Model Type	Non-Steady state Lagrangian-Gaussian puff dispersion model
3	Topography	Elevated
4	Averaging Time	24 hours
5	Source Type	Point source
6	Boundary Limits	10 km X 10 km
7	Co-ordinate System	Uniform Cartesian Grid
8	Receptor Height	Ground level
9	Anemometer	10 m
10	Surface meteorological data and Upper air Data	Prognostic Met data MM5

4.3.3.1 Model Input Data

For the modeling purpose, as RLNG is free from sulphur, for the modelling purpose, only NOx is considered as pollutant. The proposed power plant is located in complex terrain. The details of the emissions envisaged from the proposed power project is presented in **Table-4.4.**

Table-4.4: Stack Emissions from Proposed Gas Based Power Plant

Parameters	Description (LNG Stack)	Description (DG Stack) 1000 KVA	Description (DG Stack) 500 KVA
Stack Height (m)	30	45	45
Stack Diameter at Top (m)	3.9	0.5	0.5
Flue Gas velocity (m/s)	25	40	40
Flue Gas temp. (°C)	400	200	200
Flue gas flow rate (kg/s)	15	-	-
Flue gas flow rate (Nm^3/s)	74	-	-
NOx Emission Rate	100 ppm 188.16 mg/Nm^3 (13.95 g/sec)	1.75 g/s	0.87 g/s
SO_2Emission Rate	NIL	0.05 g/s	0.03 g/s
COE mission Rate	NIL	0.74 g/s	0.37 g/s
PM_{10}Emission Rate	NIL	0.09 g/s	0.05 g/s
$PM_{2.5}$Emission Rate	NIL	0.04 g/s	0.02 g/s

Note: The emission parameters are based on Technical specification. However, the exact emission data shall be available after finalization of the vendor

Meteorological Data

The prognostic model CALMET ready MM5 data has been used in this model with 4 Km grid resolution.The modeling has been executed in one scenario which is presented below:

Scenario-I: Proposed Power Plant (450 MVA) + DG sets-20 no's (1000 KVA-2, 500 KVA-18)

The details of modeling along with predicted ground level concentrations are given in below section.

Scenario-I: Proposed Power Plant (450 MVA) + DG sets-20 no's (1000 KVA-2, 500 KVA-18)

The model simulations were carried out for winter season. For the short-term simulations, the incremental concentrations were estimated to obtain an optimum description of variations in concentrations over the site in 10 km radius covering 16 directions. The predicted cumulative ground level concentration isopleths NO_X during winter seasons (Study period) are given in **Figure-4.1**.

4.3.3.2 Presentation of Results

Comments on Predicted Concentrations

- ***Resultant Concentrations***

The incremental concentrations of the proposed project are super-imposed on the maximum baseline data to arrive at resultant concentrations during operational phase of the proposed project. The resultant concentration is given in **Table-4.5.**

Table-4.5: Resultant Concentration

Sr. No	Parameter	GLC ($\mu g/m^3$)	Distance (Km)	Direction
1	NOx	47.9	1.25	SW

2	CO	20.3	1.25	SW
3	SO_2	1.47	1.25	SW
4	PM_{10}	2.58	1.25	SW
5	$PM_{2.5}$	1.29	1.25	SW

4.3.3.3 Conclusions

Maximum short term 24 hourly incremental GLCs are described in **Table-4.5** and as shown in **Figure-4.1**to **Figure-4.5.** From the resultant values and from the isopleth figure, it is evident that the incremental concentration of NO_x is observed to be about 47.9 µg/m^3, Similarly SO_2 was observed to be 1.47 µg/m^3.CO was observed to be in the range of 20.3 µg/m^3. PM10 and PM2.5 was observed to be about 2.58 µg/m^3 and 1.29 µg/m^3 respectively during winter season (study period) which is well within the NAAQs prescribed limits. Hence, it can be concluded that the resultant GLC's will be within the prescribed limits during the operation of the proposed gas power plant at Galathea Bay, GreatNicobar Islands.

Figure-4.1: Short Term 24 Hourly Incremental GLCs Of NOxwith 100% LNG

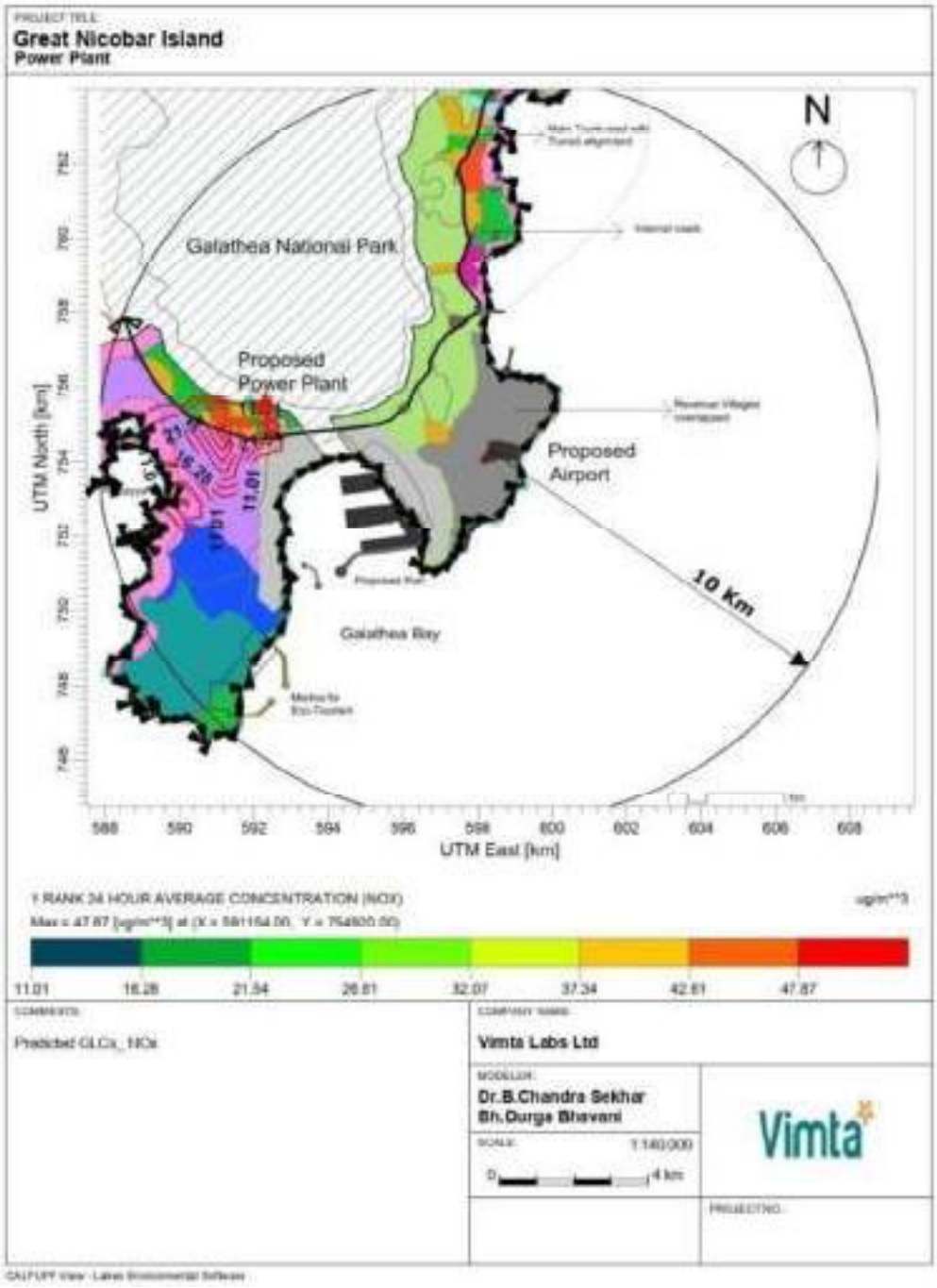


Figure-4.2: Short Term 24 Hourly Incremental GLCs Of Co with 100% LNG

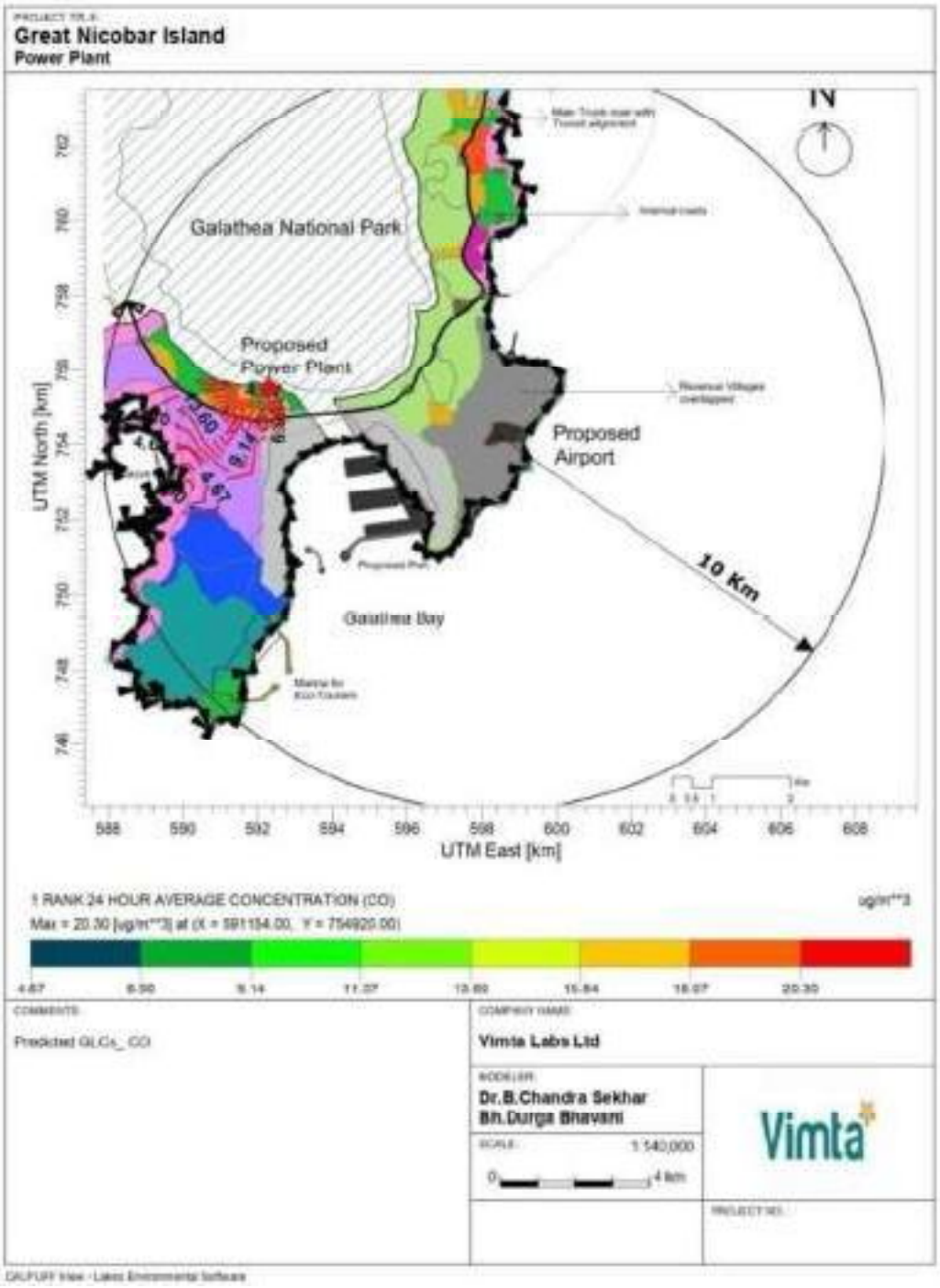


Figure-4.3: Short Term 24 Hourly Incremental GLCs Of $So_2$with 100% LNG

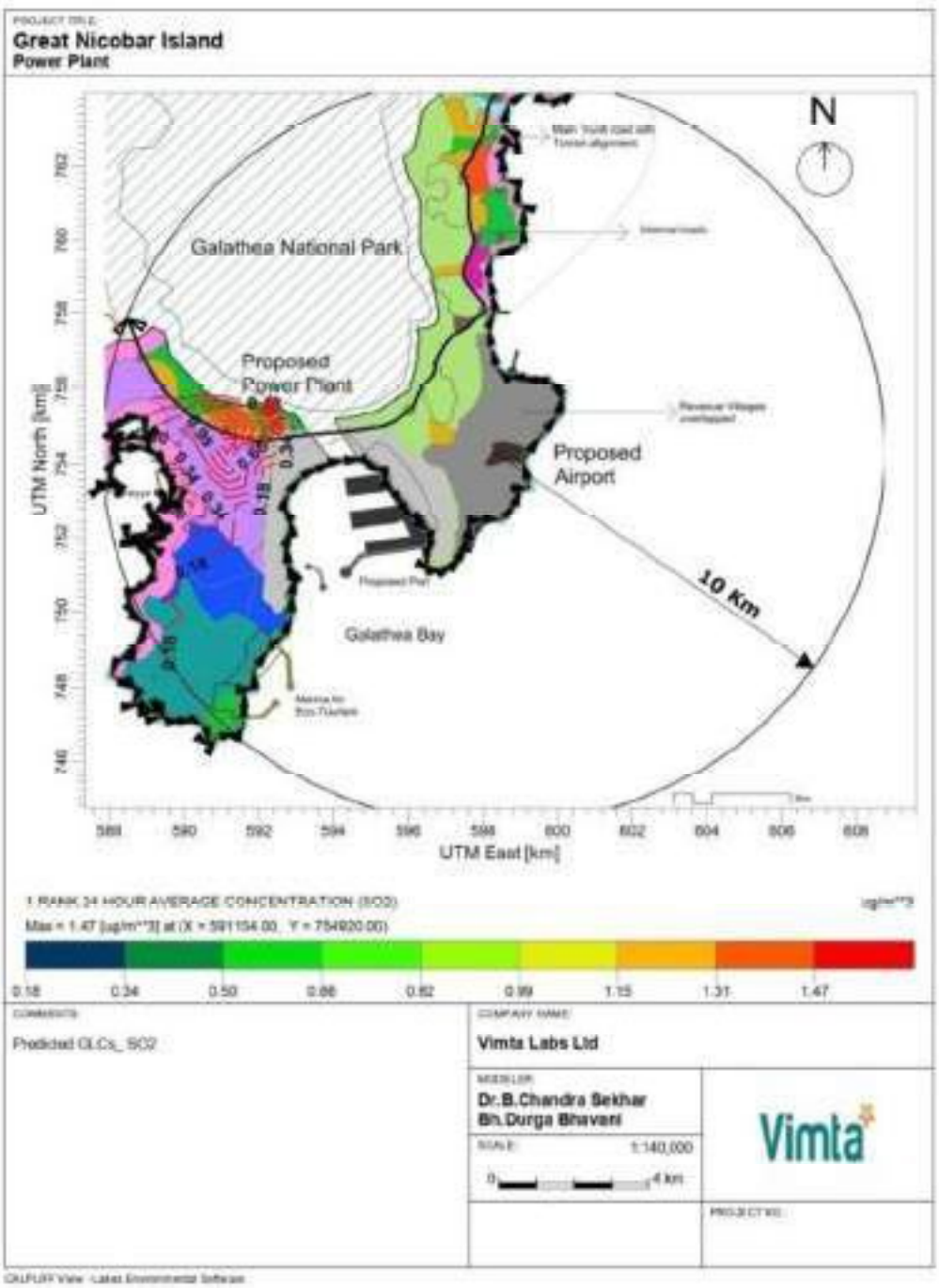


Figure-4.4: Short Term 24 Hourly Incremental GLCs of $Pm_{10}$with 100% LNG

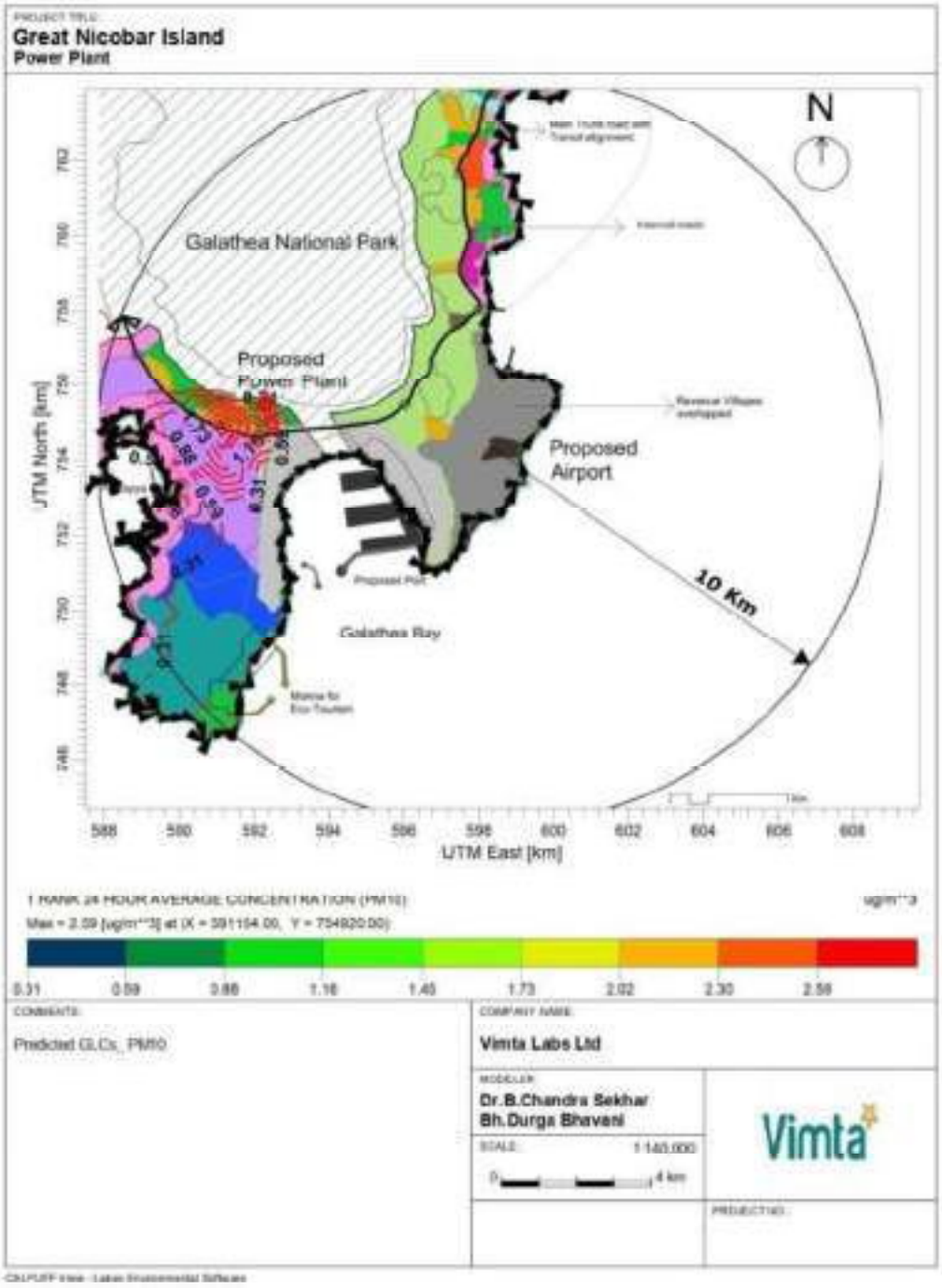
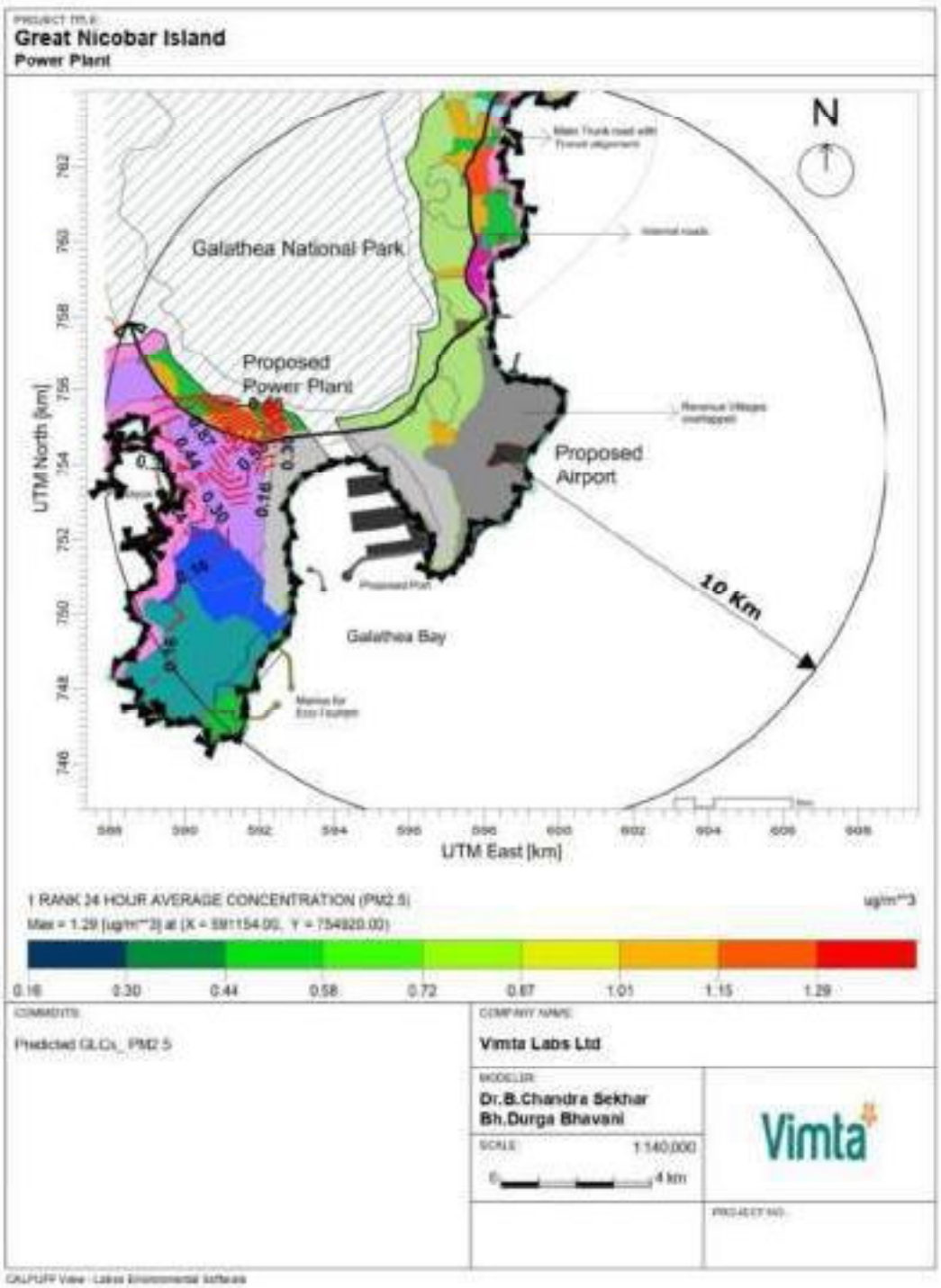


Figure-4.5: Short Term 24 Hourly Incremental GLCs Of $PM_{2.5}$ With 100% LNG



4.3.3.4 Impact on Air Quality – Fugitive Emissions

Generally, a thermal power project besides the main units like boilers, turbines also has several onsite and offsite facilities, viz. coal yard, conveyor system, coal crusher/pulverizes, coal handling (loading/unloading) etc. which also contribute to air pollution in the form of fugitive emissions. Whereas in the proposed gas-based power project there are no such onsite and offsite facilities required that generates fugitive dust emissions and hence there will be very less contribution of air pollution from the proposed gas-based power plant. The fugitive emission is envisaged only from the vehicle movement within the project site.

From the model, it is apparent that the incremental concentration of NOx, SO2, CO, PM10 and PM2.5 is low. In this area, the existing air quality is good (Refer chapter 3) and therefore even after the setting up the power plant, the emission from LNG chimney and DG sets will not exceed the prescribed ambient air quality.

4.3.4 Impacts of the proposed project on the Ecology and Biodiversity of the project site and its buffer zone

Prediction of impacts is based both on the direct and indirect; short-term as well as long-term; reversible and irreversible impacts that are most likely to occur owing to the proposed activity during establishment and operation.

As stated in the project proposal, it is a gas-based power plant involving 39 Ha of forest land. The project is around 2 km away from the Galathea national park. On account of a permanent change from an age-old tropical rain forest to the power plant, the project is going to cause damage to dense forests in 39 Ha. It is unlikely to have adverse impacts on the endemic fauna of the project site.

Major negative impacts of the project on terrestrial Ecology and Biodiversity is the loss of a small patch of thick forest. This could lead to severe erosion and invasion of weeds and exotic species which are already there in the revenue areas.

- The proposed activity will not lead to any fragmentation of wildlife habitats. There shall be no disruption in food chains. Predator-prey relationships are not going to be altered. But there shall be a substantial local decline of forest and the loss of flora and fauna but not any loss REET or Schedule I species.

4.3.5 Impact on Water Resources

- *Water Resources*

The water requirement for the proposed project is estimated at around 160 m^3/day and will be required only for makeup to engine cooling, yard cleaning, potable water and initial filling of fire water tank. All the water requirement for the plant will be met through the integrated water supply network proposed for GNI development.

- *Impact on Ground Water*

As no ground water is proposed to be used for plant during operation phase, there will be no impact on ground water resources during operation of the plant.

Impact on Drainage of the Area

The proposed power project area is located adjacent to the Andaman sea and there are no natural drainage streams flowing within the proposed project area.

Great Nicobar Islands is having good amount of rainfall all throughout the year. Hence, suitable measures for conserving rainwater through rain water harvesting mechanism will be adopted.

The proposed storm water drainage network will be designed in such a way that there will be no disturbance of natural drainage system. Hence, no major adverse impact is envisaged on the drainage and hydrology.

Wastewater Generation

Wastewater will be generated from regeneration waste from service water system, sanitary waste, filter backwash constitutes the main plant effluent and brine solution from desalination plant. The details of the wastewater generation and the proposed treatment are covered in Chapter-2D of township and area development project.

All the parameters of the final effluent from central effluent holding pond will meet the prescribed standards before marine discharge. This water will be used internally for plantation as much as required. The balance wastewater will be discharged into Andaman Sea through marine outfall pipeline. Thus, the impact on water quality will be insignificant. Refer chapter 2 – Township for details.

No wastewater will be discharge out of the plant premises without treatment. The project has air-cooled system and therefore there is no cooling tower required.

4.3.6 Impact of Solid Waste

As LNG will be used as fuel for the proposed power project, there will be no generation of major industrial solid waste.

Mitigation Measures:

The municipal solid waste generated from the plant employees and contractors will be collected and segregated in a designated area and will be treated and disposed through the integrated waste management system for GNI development (refer chapter 2 – township and area development for details). This will also include the hazardous wastes which will be generated during the operation of the power plant (waste oil/used oil, lubricants, paints, chemicals, empty containers and used batteries etc.).

4.3.7 Impact on Marine Environment

The proposed project will be developed on land and therefore no marine ecology will be disturbed. The Galathea river water which flows nest to the power station, will not be used for any purpose in the plant operation. Since, the Galathea river remains untouched, the estuarine conditions of the Galathea bay will not be disturbed due to the power plant. However due to the breakwaters constructed for the port operations will restrict the wave and tide conditions within the bay and therefore, there could be minor change in the salinity of the bay.

➢ *Impact on Terrestrial Ecosystems*

many of the loss of ecosystems during the construction period will be restored during the operation phase. All efforts will be made to re-densify the vegetation if any of the surrounding area is affected during the construction stage.

4.3.8 Impact on Noise Levels

The main sources of noise and vibration during operations will be:

- Operation of generators and gas engines inside the power house; and
- Operation of various pumps, fans and motors.

Scheduling deliveries to daytime as much as possible would minimize noise generation by truck movement. Gas engines, transformers, compressors, pumps, vehicles and miscellaneous equipment during plant operation, will generate noise. However, proper acoustic enclosures would be provided to control the noise level within 90 dB(A) for all workers for an 8 hour/day, as per the requirement of Occupational Safety and Health Administration Standard (OSHA). The noise levels at the source for these units will be in the range of 80-90 dB (A). The adoption of modern building design and the use of sound-absorbing materials will minimize noise and vibration from the powerhouse.

4.3.8.1 Noise Modeling for Plant Machinery

Noise modeling was carried out using dhwaniPro software version 9.0.274. The software considers the point, line and areas type noise generating sources, and surrounding environment temperature, humidity and frequency, and also barriers if any such as vegetation, water bodies and buildings. Geo-referenced based map downloadable future, and gridding of study region facility is available in dhwaniPro. The model simulation results determine the impact zones to develop the mitigation measures in compliance with noise emissions from multiple noise sources.

The impact from a continuous stationary noise source at observer's place, considering the hemispherical propagation of sound waves is represented by the following equation:

LR = LS + DI – 20 Log(r) – Ae – 8

Where,

LR: Sound pressure level at a receptor located at radial 'r', dB (A)
LS: Sound pressure level at the source, dB (A)
DI: Directivity index of the source (for hemispherical radiation DI = 3dB (A)
R: Radial distance of the receptor from the source, m
Ae: represents excess attenuation of sound caused by the environmental conditions such as:

- Absorption in air;
- Effect of rain, snow and fog;
- Reflections and refractions at barriers and buildings;
- Effect of the terrain, grass, shrubs, trees etc.; and
- Effect of wind and temperature gradient.

The absorption of the sound is generally a complex phenomenon. In general, for homogeneous loss free atmosphere Ae = 0.

The cumulative impact of multiple stationary noise sources (through hemispherical wave propagation) at a particular place can be calculated by:

NLp (Total) = 10 Log [_ 10(Lpi/10)]
Where, i=1

Lp (Total) is the resultant cumulative sound pressure level due to N separate sources. The cumulative impact from different stationary noise sources at proposed project site has been predicted at 1m distance using the above model.

The major noise generating sources from the proposed plant are identified and listed in **Table-4.6**. These are considered as input to the noise modelDhwaniPro version-9.0.274**.**

Table-4.6: Major Noise Generating Sources

Sr. No.	Sources	Noise Level in dB(A) [1 m away]	Nature of Noise
1	Gas engines	85	Continuous
2	Air compressors	85	Continuous

These are considered as input to the noise model.

4.3.8.2 Presentation of Results

The predicted ambient noise levels of <40 dB(A) are observed in 0.4 km radius from the source of the plant and falls within the plant boundary. There will not be any adverse impact on the nearby villages as the local residents will be exposed to a noise level of <30 dB(A).

The incremental noise levels are computed at proposed project site at 500 m x 500m grid intervals over an area of 2 kmx2 km study area. The predicted results of incremental noise levels at each grid points are used to draw noise contours. The predicted noise contours around proposed sources are shown in **Figure-4.6.** The predicted noise levels at the boundary due to various plant activities will be ranging about 40 dB(A). The incremental noise levels will be less than 30 dB(A)

at all the surrounding habitations. It is seen from the simulation results that the incremental noise levels will be well within the CPCB standards.

Mitigation Measures:

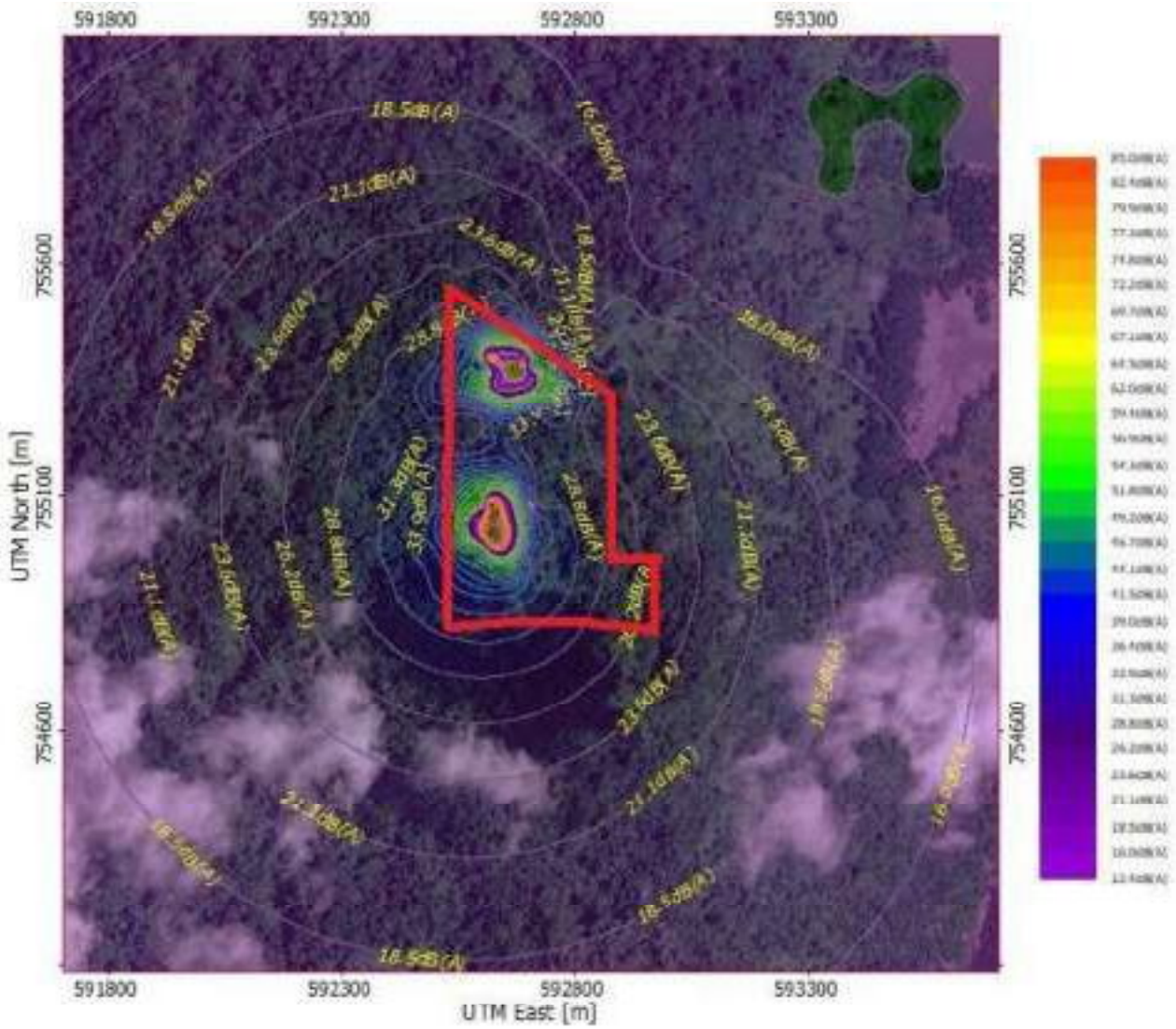
- Reduction in noise levels in the high noise machinery areas will be achieved by adoption of suitable preventive measures such as suitable building layout in which the equipment are to be located, adding sound barriers, use of enclosures with suitable absorption material, etc.
- All the gas engines will be provided with acoustic enclosures to reduce the noise level.
- Adequate protective measures in the form of ear muffs/ear plugs to the workers working in high noise areas need to be provided.

4.3.8.3 Impact on Work Zone and Community

Gas engines and air compressors are the high noise generating equipment in the proposed LNG based power plant. However, impacts on the working personnel are not expected to be significant on account of the high level of automation of the plant, which means that lesser man power near the equipment will be exposed for short duration only and that too intermittently with suitable protection equipment for working in noisy area. The noise generation during operational phase would be at source itself through different measures such as inspection, operation and maintenance at regular intervals. The noise control measures as described in EMP will be fully followed.

The operators, workers and other personnel within the plant, however, may be affected unless protective measures are taken. According to the Occupational Safety and Health Administration (OSHA) Standards, the allowable noise level for the workers is <90 dB(A) for 8 hours exposure a day. It could be seen that in the plant premises the major noise generating source are gas engines and air compressors which will generate around 85 dB(A) continuously. Hence, the impact on occupational health of workers would be less significant.

Figure-4.6: Noise Dispersion Contours



4.3.8.4Impacts due to Transportation

LNG will be transported using pipeline, hence, no significant traffic movement due to this is envisaged in the proposed project on existing public road network. The various material like chemicals, spares etc. will also be brought periodically by sea route. In addition, the roadways to the project site will also be strengthened to cater the increased vehicular traffic. This in-turn will increase the job opportunity for drivers, attendants and technicians.

Effective implementation of the pollution emission compliance prescribed under Motor Vehicles Act by the transport authorities will minimize the vehicular pollution impact.

4.3.9 Impact on Occupational Health

The damage risk criteria as enforced by Occupational Safety and Health Administration (OSHA) to reduce hearing loss, stipulates that the noise levels up to 90 dB(A) are acceptable for 8hour working per shift per day.

There is no high noise equipment in the proposed power plant, except gas engines. However, impacts on the working personnel are not expected to be significant on account of the high level of automation of the plant, which means that workers will be exposed for short duration only that too intermittently. Equipment will be provided with silencers. Workers will be provided with necessary protection devices such as ear plugs, ear muffs etc.

4.3.10 Prediction of Impacts on Socio-Economics

The plant will be operated with very minimal workforce as the whole system will be automated.

One of the basic problems that causes interaction with tribal during construction& operation relates to the behaviour of the workers. The plant operators are supposed to be restricted only to plant area during workhours as the surrounding plant area is sociologically sensitive due to the presence of the Shompens nearby.

Very few unskilled labours will be required for the plant operation and will be met from nearby villages depending on the availability during operation phase. The proposed project will result in considerable growth of service sector and will also generate new industrial and business opportunities in the area. Hence, the project will help in generation of the indirect employment apart from direct employment. This will also help in reduction of out migration for employment due to better economic opportunities available in the area.

4.3.11 Impacts on Public Health and Safety

Impact on public health, if any will be primarily due to emissions of NOx and noise generation. However, as explained above, the impact due to air and noise pollution will be well within the permissible limits. The incremental GLC's will be insignificant for NOx. The public health and safety are dependent on the effective implementation of control measures suggested for pollution control. Hence, there will not be any health hazards from the proposed project.

4.4 Summary of Environmental Impacts and Mitigation Measures during Construction and Operation Phase

Summary of environmental impacts and mitigation measures during construction and operational phase of the project is given in **Table-4.7.**

Table-4.7: Summary of Anticipated Adverse Environmental Impacts and Mitigation Measures During Construction & Operation Phase

Discipline	Potential Negative Impacts	Probable Source	Mitigation Measures	Remarks
Construction Phase				
Water quality	Increase in suspended solids due to soil run- off during heavy precipitation	Loose soil at construction site	During monsoon season run off from construction site will be routed to a temporary sedimentation tank for settlement of suspended solids.	-
Air quality	Increase in dust and gaseous emissions such as CO, NO_X, SO_2 concentrations	Leveling activity and heavy vehicular movement	Sprinkling of water in the construction area and on unpaved roads. Proper maintenance of vehicles will be done.	The impact will be low, as the main approach road will be tarred.
Noise	Increase in noise level	Construction equipment	Equipment will be kept in good condition to keep the noise level within 90dB(A).	Workers will be Provided necessary Protective equipment e.g. Ear plug, earmuffs.
Terrestrial ecology	Clearing of vegetation	Soil enabling activities	Plantation after completion of construction.	-
Socio-economics	Influx of people	No displacement and loss of livelihood	During construction, due to influx of labour, economic activities in surrounding areas will be increased.	-
Operation Phase				
Air Quality	Increase in $SO_2$and NOx levels in ambient air	Stack emissions	Single stack with 30 m height will be provided for the proper dispersion of pollutants.	The resultant air quality will conform to the stipulated standards
Water Quality	Deterioration of marine water quality	Brine water Discharge	Periodic monitoring at outfall location	-
Solid Waste	Deterioration of soil, ground & marine water quality	The general solid waste generated from the plant employees and contractors	Waste will be collected and segregated in a designated area and will be disposed through authorized agency.	-
Hazardous wastes	Deterioration of soil, ground & marine water quality	Discharge from various plant units	Waste will be segregated and properly stored in a designated area. Finally, these materials will be disposed-off through authorized recyclers.	-
Ecology				
a. Terrestrial	Impact on plant species	Emissions from stack	Emission will be controlled as well as dispersed through appropriate design.	As ambient air quality will be within limits, no Impact on the vegetation is expected.
b. Aquatic	Impact on marine water	not applicable		

Discipline	Potential Negative Impacts	Probable Source	Mitigation Measures	Remarks
Noise	Increase in noise levels in the plant area.	Equipment in main plant and auxiliaries.	Equipment will be designed to conform to noise levels prescribed by regulatory agencies.	Employees working in high noise areas would Be provided earplugs/earmuffs as protective device.
Demography and socio-economics	Strain on amenities like housing, water sources and sanitation, medical and infrastructure facilities.	Influx of people of proposed power plant employees as well as contractor's employees/labourers .	Local population will be given preference in awarding work. No significant impact is envisaged.	Overall socioeconomic status of the area is expected to improve.

Table-4.8: Monitoring cost summary table for all four projects

EMP cost Towards Monitoring

All cost in INR Lacs

Monitoring Cost per Year				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment/Soil Erosion	SPV	2	Per Year
2	Changes in Coastline/Shore line	SPV	100	Per Year
3	Meterology	SPV	500	Per Year
4	Ecology	SPV	190	Per Year
5	Air Emission	SPV	800	Per Year
6	Noise Pollution	SPV	300	Per Year
7	Waste Water	SPV	750	Per Year
8	Solid Waste	SPV	10	Per Year
9	Social	SPV	20	Per Year
10	Drainage and Effluent Management	SPV	1	Per Year
11	Non-Routine Events/Mock up Drill / Contingency	SPV	10	Per Year
12	Health check-ups	SPV	20	Per Year
13	Public Information System/Display	SPV	70	Per Year
14	Non-Routine Events/Mock up Drill / Contingency	SPV	10	Per Year
Total Monitoring Cost			**2786**	**Per Year**

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Annexure R-4(Continued)

Extract of Chapter 6 & 10 of final EIA report and extract of submission made to EAC in its meeting held on 24-25th May, 2022 with relevant enclosures.

CHAPTER 6

6.0 ENVIRONMENTAL MONITORING PROGRAM

6.1 Introduction

Regular monitoring of environmental parameters is of immense importance to assess the status of environment during project operation. With the knowledge of baseline conditions, the monitoring programme will serve as an indicator for any deterioration in environmental conditions due to operation of the project, to enable taking up suitable mitigatory steps in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficiency of control measures can only be determined by monitoring.

Generally, an impact assessment study is carried over for a short period of time and the data cannot bring out all variations induced by the natural or human activities. Therefore, regular monitoring programme of the environmental parameters is essential to take into account the changes in the environmental quality.

6.2 Environmental Monitoring and Reporting Procedure

Monitoring shall confirm that commitments are being met. This may take the form of direct measurement and recording of quantitative information, such as amounts and concentrations of discharges, emissions and wastes, for measurement against corporate or statutory standards, consent limits or targets. It may also require measurement of ambient environmental quality in the vicinity of a site using ecological/biological, physical and chemical indicators. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints.

6.2.1 Objectives of Monitoring

The objectives of environmental post-project monitoring are to:

- Verify effectiveness of planning decisions;
- Measure effectiveness of operational procedures;
- Confirm statutory and corporate compliance; and
- Identify unexpected changes.

6.3 Environmental monitoring structure

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. Cost for environmental monitoring cell and its infrastructure will be a part of the total project cost.

6.4 Monitoring Schedule

Environmental monitoring schedules are prepared, covering various phases of project advancement, such as constructional phase and regular operational phase.

6.4.1 Monitoring Schedule during Construction Phase

The generic environmental measures that need to be undertaken during project construction stage are given in **Table-6.1.**

Table-6.1: Environmental Monitoring During Project Construction Stage

Sr. No.	Potential Impact	Action to be Followed	Parameters for Monitoring	Frequency of Monitoring	Location	Broad cost in INR Lacs/ Yr	Remarks
1	Meteorology	Meteorological station in the proposed project site	Wind speed, direction, temperature, relative humidity and rainfall.	Continuous monitoring at the airport site using GPS SONDE and Radio Acoustic Doppler SODAR	Met Station at the airport site.	500	
2	Air Emissions	All construction equipment is operated within specified design parameters.	Random checks of equipment logs/ manuals	Once in 6 months including the tension check of the cane cables		800	All the data generated will be transmitted to centralised Command and Control centre. The cost has been considered in the overall development cost. Air emission monitoring will continue during the operation phase also.
		Vehicle trips to be minimized to the extent possible	Vehicle logs	Periodic during site clearance & construction activities	GPS sonde data twice a day for 365 days. One.		
		Maintenance of DG set emissions to meet stipulated standards	Gaseous emissions (SO_2, HC, CO, NO_2)	Once a month	All DG set locations		
		Ambient air quality to be monitored.	The ambient air quality will conform to the standards for PM_{10}, $PM_{2.5}$, SO_2, NO_2, and CO and other parameters as specified in CPCB, 2009 standard	Three automatic continuous ambient Monitoring Stations one at Campbell bay and the other at the airport sites. AQ sampling at 10 locations using HVS as per CPCB/ SPCB requirement or on monthly basis whichever is earlier	Campbell Bay, Port-Power plant and Airport site Locations to be decided		
3	Noise Levels	List of all noise generating machinery onsite along with age to be prepared. Equipment to be maintained in good working order.	Equipment logs, noise reading	Once in six months	All work faces and construction sites	300	Noise monitoring data will be transmitted to the centralised Command and Control centres. Noise monitoring will continue during the operation phase also.
		Night working is to be minimized.	Working hour records	Daily records			

		Generation of vehicular noise	Maintenance of records of vehicles	Daily records			
		Noise to be monitored	Automatic noise monitoring centre at 5 stations. Spot Noise recording at 50 locations twice a week.	As per CPCB/SPCB requirement or on quarterly basis whichever is earlier			
4	Wastewater Discharge	No untreated discharge to be made to surface water, groundwater or soil.	No discharge hoses shall be in vicinity of watercourses.	Automatic water quality monitoring station at the main discharge points of ICTT, Airport, Power plant & Township and final discharge from the integrated wastewater treatment plant. Daily for few key parameters like BOD, TDS, pH, and bacteria at minor arterial discharge points on a daily basis	All discharge points	750	All the data generated will be transmitted to centralised Command and Control centre. Wastewater monitoring will continue during the operation phase also.
5	Soil Erosion	Protect topsoil stockpile where possible at edge of site.	Effective cover in place.	Once a year construction activity	All work faces and construction sites	2	
6	Drainage and effluent Management	Ensure drainage system and specific design measures are working effectively. The design to incorporate existing drainage pattern and avoid disturbing the same.	Visual inspection of drainage and records thereof	Once in six months	All drainage locations	1	
7	Solid Waste Management	Implement waste management plan that identifies and characterizes every waste arising associated with proposed activities and which identifies the procedures for collection, handling & disposal and disposal of each waste stream	Comprehensive Waste Management Plan should be in place and available for inspection on-site. Compliance with the MSW Rules, and the Hazardous & other Wastes (Management and Transboundary Movement Rules).	Once in a month	All labour colonies and construction sites	10	SWM monitoring will continue during the operation phase also.
8	Non-routine events and accidental releases	Plan to be drawn up, considering likely emergencies and steps required to prevent/limit consequences.	Mock drills and records of the same	Once a month		10	
9	Health	Employees and migrant labour health check ups	All relevant parameters including HIV	Once a month		20	

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 Development site with special reference to Galathea Bay, Pamaya Bay, Joginder nagar beach.	190	
12	Changes in Coastline/Shore 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 development 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 Administrative 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:

- Source emissions and ambient air quality;
- Groundwater Levels and ground water quality;
- Water and wastewater quality (water quality, effluent & sewage quality etc);
- Solid and hazardous waste characterisation;
- Soil quality;
- Noise levels (equipment and machinery noise levels, occupational exposures and ambient noise levels); and
- Ecological preservation.

Socio-economic aspects of rehabilitation and resettlement.

The following monitoring programme as detailed in **Table-6.2** shall be implemented at site. Besides to this monitoring, the compliances to all environmental clearance conditions and regular permits from SPCB/MoEFCC shall be monitored and reported periodically.

Table-6.2: Environmental Monitoring During Operation Phase

Sr. No.	Potential Impact	Action to be Followed	Parameters for Monitoring	Frequency of Monitoring	Location	Broad cost in INR Lacs/ Yr	Remarks
1	Air Emissions from stacks	On-line continuous monitoring system shall be installed in Power plant & Incinerator stack	PM, SO_2, CO, NOx. Dioxine, Furan, Ammonia.	Continuous recording of these parameters in the power plant and incinerators	Stack	300	Data will be transmitted to centralised command and control centres
		In addition, stack monitoring will be carried out manually by MOEF&CC accredited third party agency. The DG set stack shall be provided with sampling ports.	PM, SO_2, CO, NOx.	The manual stack monitoring shall be carried out for 24 hrs on alternate days.	DG set Exhaust	50	
2	Ambient air quality	Ambient air quality within the premises of the proposed unit and nearby habitations to be monitored.	PM_{10}, $PM_{2.5}$, SO_2, NO_2 as per CPCB notification, 2009.	Three automatic continuous monitoring stations with display of results in all important junctions.	Continuous AQ monitoring station at Three location one at Campbell, Airportand Port-Power plant site. Site to be selected at a sslater date	700	Data will be transmitted to centralised command and control centres

				At 10 sites using HVS once a month or as per CPCB/ Nicobar Pollution Control Committee requirement or on weekly basis.			
3	Work Zone Noise levels in plant	Noise levels of the operating machinery to be recorded at 1 m distance.	L_{max} and L_{min} using noise meter	The noise levels shall be recorded every week at high noise generating areas.	At Gas engines, air compressor and desalination plant.		Cost has been included in the construction cost. Data will be transmitted to centralised command and control centres.
4	Ambient noise levels	Ambient noise levels within plant and surrounding habitation. Automatic noise monitoring centre at 5 stations. Spot Noise recording at 50 locations twice a week.	L_{day}, L_{night}, L_{DN}	Continuous monitoring	Port, Airport & Campbell bay		Cost has been included in the construction cost. Data will be transmitted to centralised command and control centres
5	Wastewater Discharge	No untreated discharge to be made to surface water, groundwater or soil.	No discharge hoses shall be in vicinity of watercourses.	Automatic water quality monitoring station at the main discharge points of ICTT, Airport, Power plant & Township and final discharge from the integrated waste water treatment plant. Daily for few key parameters like BOD, TDS, pH, and bacteria at minor arterial discharge points on a daily basis	All discharge points		All the data generated will be transmitted to centralised Command and Control centre. Cost is included in the construction monitoring cost.

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.

6.5 Infrastructure for Monitoring

All environmental monitoring and relevant operational data will be stored in a command and control centre. This will enable efficient retrieval and storage and interpretation of the data. Regular data extracts and interpretive reports will be sent to the regulator.

6.6 Reporting Schedules of the Monitoring Data

It is proposed that reporting of environmental performance with reference to the EMP should be undertaken.

The environmental monitoring cell shall co-ordinate all monitoring programmes at site and data thus generated shall be regularly furnished to the state regulatory agencies.

The frequency of reporting shall be six monthly basis to the Pollution Control officials and to regional office of MoEF&CC. The environmental audit reports shall be prepared for the entire year of operations and shall be regularly submitted to regulatory authorities.

CHAPTER 10

10.0 ENVIRONMENT MANAGEMENT PLAN (EMP)

10.1 Introduction

The management action plan aims at controlling pollution at the source level to the possible extent with the best available technology followed by treatment measures before they are discharged to the environment.

10.2 Environmental Management System

The earlier chapters identified measures for environmental protection especially for providing the necessary pollution control to comply with the standards stipulating the limits for emitting pollutants in air, water or on land so that the assimilative capacity is not exceeded. Standards are stipulated by various regulatory agencies to limit the emission of pollutants in air and water. Similarly, a mandatory practice is recommended for preparing an Environment Statement each year in order to reduce the quantities of wastes. This in itself is not sufficient since this does not provide an assurance that its environmental performance not only meets, but also will continue to meet legislative and policy requirements.

In the present report, the Environmental Management Systems (EMS) is discussed for the proposed integrated development, including facilities to ensure that the activities and services of the region conform to the carrying capacity (supportive and assimilative capacity). This is based on Bureau of Indian Standard Specification IS: 13967 (1993): Environmental Management Systems - Specification (equivalent to British Standard BS 7750).

The Environment Management system will be implemented for all the projects related to Holistic Development of Great Nicobar Island. However, there would be separate environmental management cell for each project.

10.2.1 Formation of an Environmental Management System

The environmental management system will enable to maximize its beneficial effects and minimize its adverse effects - with emphasis on prevention. It will:

- Identify and evaluate the environmental effects arising from the proposed activities, and services to determine those of significance;
- Identify and evaluate the environmental effects arising from incidents, accidents and potential emergency situations;
- Identify the relevant legislative and regulatory requirements;
- Enable priorities to be identified and pertinent environmental objectives and targets to be set;
- Facilitate planning, control, monitoring, auditing and review activities to ensure that the policy is complied with; and

- Allow periodic evaluation to suit changing circumstances so that it remains relevant.

10.2.2 Implementation of an Environmental Management System

It is essential that the top management is committed to development of its activities in an environmentally sound manner and supports all efforts in achieving this objective.

Initial Environmental Review

Preparatory environmental review for the proposed project facilities will cover four areas:

- Legislative and regulatory requirements;
- Evaluation and registration of significant parameters and their environmental impacts;
- Review of existing environmental management practices and procedures; and
- Assessment of feedback from investigation of previous environmental incidents and non-compliance with legislation, regulations or existing policies and procedures.

The resulting report will address:

- The nature and extent of problems and deficiencies;
- The priorities to be accorded to rectify them; and
- An improvement program designed to ensure that the personnel and material resources required are identified and made available.

Environmental Policy

The management will actively initiate, develop and support the environmental policy, which is relevant to its proposed activities and services and their environmental effects.

Broadly, this will cover the following:

- Commitment to the environment.
- Formulation of an Environmental Management System (EMS) which is feasible to implement.
- Abide by all the legal framework of the country. However, UT may make the regulation more stringent in view of the environmental sensitivity of GNI.
- Will contain standard operating process / procedures.
- Communication and implementation procedures at all levels of the operation
- Publishes widely and include in the company website.
- Should have an environmental compliance management system.
- Conduct yearly environmental audit as per international standards.
- Reduce the carbon footprints of GNI as per India commitment to International agencies.

One of the directors of the board should have rich background in environmental discipline.

The policy for Environment Management has been proposed to create sound and eco-friendly environment for sustainable development.

Organization and Personnel

To facilitate the implementation of the EMS, one of the most important aspects relate to the organization and personnel. The related issues are:

- Define and document the responsibility, authority and inter-relations of key personnel involved in the implementation of the environmental policy, objectives and environmental management system;
- Identify the in-house verification requirements and procedures including resources and personnel;
- Communicate to employees at all levels the importance of compliance with the environmental policy, their role and responsibilities in achieving compliance, the potential consequences of departures from the specified procedures and identify and provide appropriate training; and
- Establish and maintain procedures to ensure that contractors are made aware of the environmental management system requirements and provisions.

Environmental Aspects and Impacts

The authorities will establish and maintain procedures for:

- Receiving, documenting and responding to internal as well as external communications concerning environmental aspects and management;
- Identifying, examining and evaluating the environmental effects of its activities under normal and abnormal/emergency situations (including risk assessment) and compiling significant effects in a register; and
- Recording all legislative, regulatory and other policy requirements and codes in a register.

Environmental Objectives and Targets

The objectives will be set with a view to realizing gradual and steady improvements in environmental performance through application of best available and economically viable practices. The areas targeted for improvement will be those where improvements are most necessary to reduce risks (to environment) and liabilities. These will be identified through cost-benefit analysis wherever practicable.

Environmental Management Manual and Documentation

The documentation is intended to provide an adequate description of the environmental management system. The manual is expected to provide a reference to the implementation and maintenance of the system.

Operational Control

With respect to the proposed additional facilities, the management responsibilities will be defined to ensure that the control, verification, measurement and testing of environmental parameters within the port complex will be adequately coordinated and effectively performed.

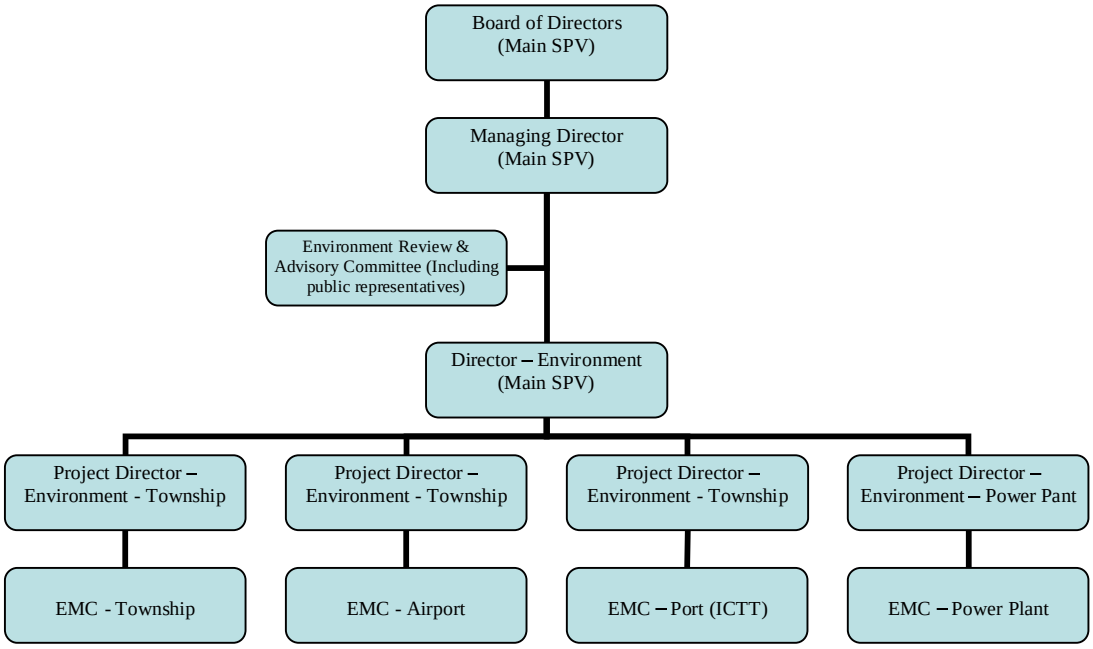
The control, verification, measurement and testing will be made through documented procedures and work instructions defining the manner of conducting activities, the absence of which can lead to violation of the environment policy.

In the event of non-compliance, procedures for investigation of the causative mechanism will be established and the factors reported for corrective actions.

Reporting Structure

The purpose of Environment Management plan (EMP) is to establish and maintain a system of records to demonstrate compliance with the environmental

Structure of ***Environment Management system***



The purpose of Environment Management plan (EMP) is to establish and maintain a system of records to demonstrate compliance with the environmental management

systems and the extent of achievement of the environmental objectives and targets. In addition, the other records (legislative, audit and review reports) and management records will address the following:

- Details of failure in compliance and corrective action;
- Details of incidents and corrective action;
- Details of complaints and follow-up action;
- Appropriate contractor and supplier information;
- Inspection and maintenance reports;
- Monitoring data;
- Environmental training records; and
- Housekeeping.

Environmental Statement

As a mandatory requirement under the Environment Protection Rules (1986) as amended through the Notification issued by the Ministry of Environment and Forests in April 1993, an Environmental Statement will be prepared annually. This will include the consumption of total resources (e.g. water), quantity and concentration of pollutants (air and water) discharged, quantity of hazardous and solid waste generation, pollution abatement measures, conservation of natural resources and cost of production vis-à-vis the investment on pollution abatement. The intention of this statement is:

- To identify the areas where resources can be used more efficiently through a comparison with the figures of a similar project (thereby reducing the consumption of resources);
- To determine the areas where waste generation can be minimized at source and through end of pipe treatment (thereby reducing the wastes generated and discharged); and

- To initiate a self-correcting/improvement system through an internal analysis to achieve cost reduction through more efficient practices.

Environmental Management Reviews

The senior management will periodically review the Environment Management System (EMS) to ensure its suitability and effectiveness. The need for possible changes in the environmental policy and objectives for continuous improvement will be ascertained and revisions made accordingly. EMS based on the above objectives will be formulated and implemented at the industry level.

10.3 Environment Management Cell

An Environment Management Cell has to be created consisting of officers from various disciplines to co-ordinate the activities concerned with the management and implementation of the environmental control measures. This Environment Management Cell will be the nodal agency to co-ordinate and provide necessary services on environmental issues during operation of the project. This department interacts with PCB and other environment regulatory agencies.

The Environment Management Cell will be responsible to obtain/renewed Consent for Operation under Water Act, 1974 and 1981 Air Act from PCB.

This cell will supervise the monitoring of environmental pollution levels viz. ambient air quality, water and effluent quality; noise level etc.. Monitoring will be done in line with regulatory compliance so as to ensure that the pollution is limited to allowable values and to take corrective action by either enforcing use of new equipment or by improving the performance of the pollution control equipment by the users.

Environment management cell will submit the compliance to the environmental clearance report to MoEF&CC as per the clearance conditions.

In case the monitored results of environmental pollution are found to exceed the allowable values, the Environment Management Cell will suggest remedial action and get these suggestions implemented through the concerned port authorities. The Environment Management Cell will also co-ordinates all the related activities such as collection of statistics of health of workers and population of the region, afforestation and green belt development.

As the Holistic Development consist of four major projects including Port (ICTT), Airport, Power Plant and Township, Specific environment management plan for each of the project are mentioned in the subsequent sections for construction phase and operational phase.

10.4 Environmental Management Plan for ICTT

Environmental Management Plan for ICTT is given below

10.4.1 Management Plan for Construction Phase

The impacts of construction activities would be temporary and will reduce gradually with the completion of the construction activities. Various mitigation measures proposed to be implemented during construction phase are described in **Table-10.1.**

10.4.2 Management Plan for Operation Phase

The impacts of operation phase will be long term in nature. **Table-10.2** describes various mitigation measures, being implemented during operation phase.

Table-10.1: Environment Management Measures – ICTT Project (Construction phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	The proposed project facilities berth and harbor area with breakwater will be developed within the offshore. Other infrastructure facilities like Container Storage, Internal Roads, Port & Utility Buildings, parking etc. will be developed on the landside adjacent to the reclaimed land of the port. Overall, for the all phases put together, total 3.27km (2.53 East & 0.74 West) breakwater will be constructed.	The planning will be in accordance with landscape planning concepts to minimise major landscape changes. Land reclamation and change in land use pattern will be limited to the proposed port limits and will be carried out in such a way that to ensure the proper drainage by providing surface drainage systems including storm water network, etc.	Project SPV	500	This is one-time cost and will be included in the Projects cost
		The breakwaters often serve as an anchor for growth of corals, sea grasses, and forms the habitat of benthic animals.				

		The breakwater also provided calmer environment for growth of fishes.				
2	**Reclamation**	The back-up area will have to be developed by reclamation which will extend up to the intertidal zone. The total reclaimed land (227 ha) has been redistributed between berths (13%), container storage (71%), building & utilities (1%), road & pavements (9%) & Green areas (6%). During the dredging there is a possibility of increase in the TSS in the water which will affect the benthic flora & fauna near the dredging site	The dredge fill will be covered by gravel before hard standing. After completion of the reclamation and hard standing, necessary development will be carried out. In order to prevent the seepage of return sea water into the groundwater, suitable impervious liners such as LDPE will be provided all along the return water channel if required. The TSS is likely to settle down within a short period; thus, no significant of impact is expected on the benthic flora & fauna.	Project SPV	1000	This is one-time cost and will be included in the Projects 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

			to the possible extend.			
		Presence of Megapode nesting sites are under investigation. No crocodile nests in the port location	ZSI has undertaken long term study of megapods at GNI. If the study concludes that the translocation of Megapods is necessary, the same could be undertaken under expert supervision and guidance		2	
		The coastal stretch of the port area has mangroves and associated species. The mangroves on the eastern flank will be affected due to port construction.	Between 12-20 ha of mangroves might get affected due to the construction. The extent of loss of mangroves may be compensated in GNI by re-densification of existing mangroves or planting of mangroves to non-forest area as per the principals of compensatory afforestation.	Project SPV (ICTT) & Forest Department of UT Administration	400	This is one time cost
			The coastal vegetation on the	Project SPV (ICTT)	300	This is one-time cost

			western side is to be densified with the same existing species to avoid erosion during high wave incidence and also to ensure that any future development at inland area of west coast have no impact on the turtle nesting site.			
4	**Coral Reefs**	As per the ZSI report, coral do not exist in the Galathea Bay area, however, on the eastern peninsula part (Outside the construction area) some corals were noticed.	Translocation of corals: If the coral colonies in the proposed transhipment areas and dredging channels area is affected then it needs to be translocated in suitable place.	SPV	2000	This is one-time cost for Coral translocation cost for entire project has been included under the Airport operation EMP
		Dredging activities in the nearshore waters of the developmental projects during the construction phase may affect some corals patches				

5	**Lighting**	Artificial illumination on the beach can affect the sea turtle nesting and hatchlings	Light pollution to be avoided as turtles are sensitive to lights. Sea turtles are less affected by red, yellow and low pressure sodium vapor lights. Wherever possible, sodium vapor lights should be used for lightings.	Project SPV		Cost is included in the construction cost
			repositioning, shielding, redirecting, lowering, or recessing fixtures are some of the available options for reducing illumination to the beach			
6	**Road construction**	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 any wildlife is encountered during construction of roads, it needs to be reported to the forest department for relocation.	Contractor + SPV	10	Amount designated during the construction period

7	**Air Emission**	The sources of air pollutants from port construction include combustion emissions from ships" propulsion and auxiliary engines and boilers, mainly consisting of Sulphur dioxide (SO2), nitrogen oxides (NOX), greenhouse gases (e.g. carbon dioxide [CO2] and carbon monoxide [CO]), fine particulate matter [PM], and volatile organic compounds [VOC]), followed by combustion source emissions from vehicles, port equipment and land-based engines and boilers contributing similar pollutants. Volatile organic compounds (VOC) may also be emitted fuel storage and transfer.	Transportation vehicles to be properly and timely maintained and serviced regularly to control the emission of air pollutants in order to maintain the emissions of PM, CO, NOx and SOx within the limits. All the vehicles engaged for construction should have valid pollution check certificate as per the motor vehicle act. Further, any regulations related to vehicle emission issued by local government should also be adhered to.	Project SPV + Contractor		this will be part of the contractor's obligation through agreement
			Use of good quality fuel and lubricants to be promoted. Moreover, low sulphur content diesel to be used as			

			fuel for generator sets to control emission of SO2.			
			Generators and machineries are to be serviced and maintained regularly to avoid generation of dust and other air pollutants.			
		Dust suppression during construction	2 No. of APCE at crusher & conveying system, 2 No. of Dust suppression system at crusher, 2 No. of Mobile water sprinklers including Mist canons	Contractor	70	This is one time cost and will be included in the project construction cost.
8	**Noise Pollution**	From operation of equipment including the dredger and associated tugs, piling equipment, tracked excavators, Lorries, dump trucks, and other earth-moving equipment, cranes, and generators / lighting equipment.	Under water noise generation should be restricted with modified equipment. If necessary, the project authorities will issue directives to ensure compliance to low under water noise norms.	Project SPV	-	
			All contractors and subcontractors involved in the port			

			construction phase should comply with the relevant international noise standards			
9	**Waste Water**	Galathea Bay water may be impacted due to non-point discharges of waste water from the sewage generated from the construction work force stationed at the site	Temporary sanitation facilities (septic tanks) will be set-up for disposal of sewage generated by the work force	Project SPV	4	cost included in the project construction cost
10	**Solid Waste**	The wastes from the labour colonies include human wastes, wastes from kitchens and other wastes like food packets, drinking water bottles, boxed from consumables etc.	During the initial stages of construction, the municipal waste will be segregated and the organic portion will be treated through OWCs.	Project SPV	100	1 OWC is proposed. This is one-time cost and including operational cost.
			The recyclable part will be collected and sold to the authorized vendors.			
			An Integrated Solid waste management system has been planned in GNI development for collection, transportation,			

			treatment and disposal. The same will be used for waste generated from the port once the integrated waste management system is in place			
11	**Social**	Shompen habitation exist in the upstream of the Galathea river.	There will not be any disturbance to the existing tribes. Strict measures will be adopted to ensure that none of the labours ever trespasses the Shompen area. Adequate number of control points will be established to monitor the movement of the labours during working and non-working hours (24x7x365).	SPV	30	Two control points with two porta cabins and with 3 shifts total 6 person to be employed

Table-10.2: Environment Management Measures – ICTT Project (Operation phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	Deleterious impact after construction with be remediated.	Plantation on the denuded area.	Project SPV	2000	This is one-time cost and will be included in the project construction cost
			Landscaping within the port area			
			Clearing of any temporary shelters/ temporary storage established for construction			
			Clearance of construction wastes			
2	**Changes in Coastline/Shore line**	Change in Coastline / Shoreline	Training of the erosion area of the coastline, if any	Project SPV	5000	This is a one-time cost. Cost will be included in the project construction cost

3	**Ecology**	Impacts on turtle nesting sites	Reduction of underwater noise by providing appropriate propels to the tuck boats, pilot boats and service boats and cargo ships	Project SPV		Cost is included in project construction cost
		Impact on birds & Turtles	Light pollution to be avoided as turtles are sensitive to lights. Sea turtles are less affected by red, yellow and low-pressure sodium vapor lights. Wherever possible, sodium vapor lights should be used for lightings.			
			repositioning, shielding, redirecting, lowering, or recessing fixtures are some of the available options for reducing illumination to the beach Halt on offshore construction activities to the extent possible between November to February months which is the nesting seasons for the			

			Turtles.			
		Oil spill contingency plan	Containment and skimming of the oil		15000	The cost will be part of the contractor/ Operator agreement
4	***Air Emission***	The sources of air pollutants from port operation include combustion emissions from ships" propulsion and auxiliary engines and boilers, mainly consisting of sulphur dioxide (SO_2), nitrogen oxides (NO_X), greenhouse gases (e.g. carbon dioxide [CO_2] and carbon monoxide [CO]), fine particulate matter [PM], and	Transportation vehicles to be properly and timely maintained and serviced regularly to control the emission of air pollutants in order to maintain the emissions of PM, CO, NOx and SOx within the limits. All the vehicles engaged for construction should have valid pollution check certificate as per the motor vehicle act. Further, any regulations related to vehicle emission issued by local government should also be adhered to.	Project SPV		this will be an operational cost of project SPV

		volatile organic compounds [VOC]), followed by combustion source emissions from vehicles, port equipment and land-based engines and boilers contributing similar pollutants. Volatile organic compounds (VOC) may also be emitted fuel storage and transfer.	Use of good quality fuel and lubricants to be promoted. Moreover, low sulphur content diesel to be used as fuel for generator sets to control emission of SO2. Generators and machineries are to be serviced and maintained regularly to avoid generation of dust and other air pollutants.			
5	**Solid Waste**	Waste generation at port site	An Integrated Solid waste management system has been planned in GNI development for collection, transportation, treatment and disposal. The same will be used for waste generated from the port.	Project SPV		Cost is included in township project cost. The waste which cannot be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available.

						Details and estimated cost is included in EMP of township.
6	**Social**	Shompen habitation exists in the upstream of the Galathea river	There will not be any disturbance to the existing tribes.	SPV		Two check points are proposed, and the cost included in construction EMP cost.
			Strict measures will be adopted to ensure that none of the worker ever trespasses the Shompen area.			
			Adequate number of control points will be established to monitor the movement of the worker during working and non-working hours (24x7x365).			
			Full operation of infrastructure facility line Health, education, community and basis services will be available within walking distance.			
7	**Fire and explosion hazards**	Impact on Structure	On-site and off-site emergency planning, which should include, at a minimum, the preparation	Project SPV	30	This is a one-time cost for preparation of emergency

			and implementation of an Emergency Management Plan and a Communication Plan prepared with the participation of local authorities and potentially affected communities			management plan. The cost of the equipment's for emergency management system are included in township EMP. All the buildings and development will be as per Indian safety standards & codes and cost will be included in project cost

10.5 Environmental Management Plan for Airport

Environmental Management Plan for Airport is given below

10.5.1 Management Plan for Construction Phase

The impacts of construction activities would be temporary and will reduce gradually with the completion of the construction activities. Various mitigation measures proposed to be implemented during construction phase are described in **Table-10.3.**

10.5.2 Management Plan for Operation Phase

The impacts of operation phase will be long term in nature. **Table-10.4** describes various mitigation measures, being implemented during operation phase**.**

Table-10.3: Environment Management Measures – Airport Project (Construction phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	The proposed area is sparsely populated and there are only two villages in the area of proposed airport where form families may be displaced	R&R measure as per RFCTLAR&R (Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement), Act 2013.	SPV		Cost will be provided by UT Administration after SIA as per RFCTLAR&R Act 2013
2	**Reclamation**	Area for runway extending into sea. The options for selecting of a site for an airport are very limited on this island. the present site needs to reclaim land approximately 71 Ha of land in order to establish an operational airport.	Coral restoration, if corals are affected during the reclamation activity.	SPV	3200	This is one-time cost. Approximately 4ha of Coral restoration has been considered. This cost though apportion to the Airport, involves restoration for the entire project including Port, Power plant and Township

3	**Air Environment**	Construction material storage also contributes to the degradation of the air quality especially during the high wind conditions.	Care will be taken to ensure that dust generated during construction is suppressed with water sprays	Project SPV	50	Cost included in the project construction cost for construction period.
		Dust suppression during construction	2 No. of APCE at crusher & conveying system, 2 No. of Dust suppression system at crusher, 2 No. of Mobile water sprinklers including Mist canons	Contractor	70	Cost will be included in the project construction cost and for construction period.
4	**Water quality /Wastewater Generation**	Water quality deterioration during construction phase is possible along the beaches of Shastri Nagar and Gandhinagar due to sewage generated from the construction workforce stationed at the site	Temporary sanitation facilities (septic tanks) will be set-up for disposal of sewage generated by the work force	Project SPV	4	This is a one-time cost. Cost will be included in the project construction
5	**Noise Environment**	Noise generation from operating equipment	Provision of silencers, ear plugs and mufflers at the exit of noise source on the machineries like generators, pumps. vehicles etc	Project SPV	10	Cost of ear plugs

6	**Ecology**	Few crocodiles have been reported from the creek area that would reclaimed have few crocodiles. While reclaiming the creek area, the crocodiles will have to be relocated	relocation of crocodiles to suitable habitat in consultation with the forest / wildlife department	SPV	10	
7	**Solid Waste**	Waste from labour colonies and construction site	Organic fraction to be treat through OWC and recydable fraction will be sold to authorised handlers	Project SPV	100	1 OWC is proposed, this is one-time cost & will be including in project cost.

Table-10.4: Environment Management Measures – Airport Project (Operation phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	The area has high rainfall and the soil is generally fertile. Under these circumstances there will be a tendency for growth of luxurious vegetation. Trees, bushes etc attract birds which	No fruiting trees, which attract birds, should be planted within 1 km from the airport boundary. No trees within the operational area of the airport Suitable bird	Project SPV	-	

		might compromise flight safety	deterrent system will be adopted to scare off the birds for the safety of the Aircraft and the passengers.			
2	**Air Emission**	Major pollutants envisaged from the proposed project will be from aircraft exhaust, ground service equipment, vehicular traffic (airside and landside) and from DG sets.	Strict adherence to DGCA/ICAO prescribed environmental guidelines & circulars on airport operations. Vehicles and service equipment must be maintained at prescribed standards. All the vehicles engaged for the airport should have valid pollution check certificate as per the motor vehicle act. Further, any regulations related to vehicle emission issued by local government should also be adhered to.	Project SPV	-	Cost is part of the Operation cost of the Airport
			Shut down engines during idling and			

			taxing. Towing the aircraft up to runway by specialized ground vehicles			
3	**Water & Wastewater**	The wastewater generation mainly consists of sanitary waste, sewage from airport terminal, flight kitchen etc.	The wastewater generated from the Airport area will be sent to the integrated wastewater treatment facility. There is no discharge of any wastewater outside the airport premises.	SPV + Project SPV		Cost included in the Township cost
4	**Noise Pollution**	Aircraft movements will be the major source of noise pollution from the proposed airport project	Strict adherence to DGCA/ICAO prescribed environmental guidelines & circulars on airport operations. Restricted usage of ground engine run-ups to reduce noise Ear plugs will be provided for the Ground staff.	Project SPV	10	

			Use of proper personal protective equipment to all ground workers Towing the aircraft up to runway by specialized ground vehicles			
5	**Solid Waste**	Solid waste generation from aircrafts.	No uncovered waste in the vicinity of 5 km. An Integrated Solid waste management system has been planned in GNI development for collection, transportation, treatment and disposal. The same will be used for waste generated from the Airport.	SPV + Project SPV		Cost included in the Township cost. The waste which cannot be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available. Details and estimated cost is included in EMP of township.

6	**Fire and explosion hazards**	Impact on Structure	On-site and off-site emergency planning, which should include, at a minimum, the preparation and implementation of an Emergency Management Plan and a Communication Plan prepared with the participation of local authorities and potentially affected communities	Project SPV	30	This is a one-time cost for preparation of emergency management plan. The cost of the equipment's for emergency management system are included in township EMP. All the buildings and development will be as per Indian safety standards & codes and cost will be included in project cost.

10.6 Environmental Management Plan for Power Plant

Environmental Management Plan for Power Plant is given below

10.6.1 Management Plan for Construction Phase

The impacts of construction activities would be temporary and will reduce gradually with the completion of the construction activities. Various mitigation measures proposed to be implemented during construction phase are described in **Table-10.5.**

10.6.2 Management Plan for Operation Phase

The impacts of operation phase will be long term in nature**. Table-10.6** describes various mitigation measures, being implemented during operation phase**.**

Table-10.5: Environment Management Measures – Power Plant (Construction phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	The proposed project site is located near the mouth of the Galathea river and 39 hectares of forest land which will be diverted for non-forest purposes	SPV proposed compensatory afforestation	UT Administration		Cost has been factored in the project development cost.
2	**Soil Environment**	Due to loss of top soil in the construction areas and contamination of the soils of surrounding area due to construction materials such as cement, sand etc	Appropriate soil conservation measures associated with improved construction techniques would minimize such impacts. The top soil should be collected separately and stored and used for landscaping.	Project SPV	30	Cost is included in the project construction cost

3	**Air Quality**	Main sources of emission during the construction period are the movement of equipment at site and dust emission during the excavation, levelling, grading, earthwork and foundation works	All the vehicles engaged for construction should have valid pollution check certificate as per the motor vehicle act. Further, any regulations related to vehicle emission issued by local government should also be adhered to. Proper maintenance of vehicles and construction equipment Water spray at the construction site for dust suppression.	Project SPV		cost to be included in the project construction cost
		Dust suppression during construction	1 No. of APCE at crusher & conveying system, 1 No. of Dust suppression system at crusher, 1 No. of Mobile water sprinklers including Mist canons	Contractor	40	Cost will be included in the project construction cost.
4	**Water Quality**	River water may be impacted due to non-point discharges of solids from soil loss and sewage generated from the construction work force stationed at the site	Temporary sanitation facilities (septic tanks) will be set-up for disposal of sewage generated by the work force	Project SPV	10	Cost included in the project construction cost
5	**Noise Levels**	Emission from Vehicular traffic, construction equipment like dozers, scrapers, concrete mixers, cranes, generators, pumps, compressors, rock drills, pneumatic tools, saws,	Proper maintenance of vehicles and construction equipment Use of ear plugs / mufflars to all construction workers exposed to noise	Project SPV	2	Cost considered for ear plugs and rest is included in the project cost

		vibrators etc				
6	**Solid Waste**	Waste from labour colonies and construction site	Organic fraction to be treat through OWC and recyclable fraction will be sold to authorised handlers	Project SPV	100	1 OWC is proposed, this is one-time cost including operational cost
7	**Terrestrial Ecology**	The plant is in dense to riverine grass land area	Trees will be cut only from the area where construction enabling works is required.	Project SPV	-	
8	**Aquatic Ecology**	The power plant is located near to the Galathea river mouth. 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.	No untreated effluent from the construction site will be dispose outside the project boundary without treatment. A temporary treatment facility will be created during the construction.	Project SPV	100	This in one-time cost and will be included in the project construction cost
9	**Socio-Economics**	The power project site is the nearest site to the Shompen habitat compared to any other project appurtenant, therefore there is a possibility of trespassing of construction works into tribal areas.	Strict measures will be adopted to ensure that none of the labours ever trespasses the Shompen area. Adequate number of control points will be established to monitor the movement of the labours during working	SPV	60	Four control points with four porta cabins and with 3 shift, total 12 person to be employed

			and non-working hours (24x7x365).			
			The forest and tribal area should be guarded and even barricaded with barbwires if necessary, to ensure that there is no interaction with the tribal during the construction phase.			
			Full operation of infrastructure facility line Health, education, community and basis services will be available within walking distance.			
			Multiple economic activities will be provided number of jobs locally.			

Table-10.6: Environment Management Measures – Power Plant (Operation phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	Deleterious impact after construction with be remediated.	Plantation on the denuded area. Landscaping within the port area Clearing of any temporary shelters/ temporary storage established for construction Clearance of construction wastes and equipments	Project SPV	15	This is one-time cost and will be included in the Project cost. The waste which cannot be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available. Details and estimated cost are included in EMP of township.
2	**Air Emissions**	The fugitive emission is envisaged from the chimney, DG sets and vehicle movement within the project site	The pollution control equipment like Low-Nox burner, DM plant, etc. will be an integral part of the	Project SPV		This is part of the construction cost.

			power project and the cost will be included in the project cost.			
			The emission from LNG chimney and DG sets will not exceed the prescribed ambient air quality			
			Use of low Sulphur fuel for power generation.			
			Proper maintenance of vehicles and operation equipment			
3	**Ecology**	Deleterious impact after construction will be remediated. Many of the loss of ecosystems during the construction period will be restored during the operation phase. All efforts will be made to re-densify the vegetation if any of the surrounding area is affected during the construction stage.	Maintain a thick green buffer between western flank of the Galathea beach between turtle nests and the power plant Re-densification of the vegetation if require in consultation with forest department. Species for re-densification will have to be chosen judiciously in consultation with the forest department so as to maintain the biodiversity of the forest	Project SPV Project SPV + Forest Department of UT Administration	25	This is one-time Cost and to be included in the Project cost

4	**Water & Wastewater**	Wastewater will be generated from DM regeneration waste from service water system, sanitary waste etc which can pollute the Galathea river	No wastewater will be discharged out of the plant premises without treatment. The project has air-cooled system and therefore there is no cooling tower required.	SPV + Project SPV		To be included in the Project cost. The design of power plant includes treatment facility.
5	**Solid Waste**	Sewage waste generation at power plant site which might pollute the adjacent water bodies	An Integrated Solid waste management system has been planned in GNI development for collection, transportation, treatment and disposal. The same will be used for waste generated from the power plant.	SPV + Project SPV		Cost is included in the Township cost. The waste which cannot be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available. Details and estimated cost are included in EMP of township.
6	**Noise**	Operation of generators and gas engines inside the power house	The adoption of modern building design and the use of sound-absorbing materials will minimize noise and vibration from the	Project SPV	10	For Ear plugs etc. Rest of the cost is part of the project cost.

			powerhouse Ear plugs Mufflars at the sound generating sites			
7	**Fire and explosion hazards**	Impact on Structure	On-site and off-site emergency planning, which should include, at a minimum, the preparation and implementation of an Emergency Management Plan and a Communication Plan prepared with the participation of local authorities and potentially affected communities	Project SPV	30	The cost considered for the emergency Management Plan preparation. All the buildings and development will be as per Indian safety standards and cost will be included under project cost

10.7 Environmental Management Plan for Township

Environmental Management Plan for Township is given below

10.7.1 Management Plan for Construction Phase

The impacts of construction activities would be temporary and will reduce gradually with the completion of the construction activities. Various mitigation measures proposed to be implemented during construction phase are described in **Table-10.7.**

10.7.2 Management Plan for Operation Phase

The impacts of operation phase will be long term in nature. **Table-10.8** describes various mitigation measures, being implemented during operation phase**.**

Table-10.7: Environment Management Measures – Township (Construction phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	Construction involves cut and fill earthworks. The cut and fill works will normally change the natural topography of the land which will result in a disruption of the natural drainage of the land and the surrounding vicinity	The top soil will be extracted, stored and shall be reused for greenbelt development and landscaping.	Project SPV		Cost Included in the project cost
			Citywide stormwater drain has been planned to cater the storm drainage			Cost Included in the project cost
			Several landslides were noted at the construction sites of the new road connecting Galethea bay and existing road. There were small to significant landslides due to slipping of soil and fragmented rock overlaying the undegraded parent rock. This was more severe where the hills were steep and trees on the slopes were tall and large. Hence, it was identified as a	Project SPV & Construction Contractor/s	200	Cost included for the slope protection measures. This cost will be included in the project cost.

			major problem and preventive measures should be made a part of development plan and to be included in the construction contract agreements. Slope stabilisation measures, needs to be undertaken wherever there is a possibility of landslides.			
		A small part of the proposed road falls under the plot having private ownership where part of the land to be acquired and form families may be displaced	R&R measure as per RFCTLAR&R (Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement), Act 2013.	SPV		Cost will be provided by UT Administration after SIA as per RFCTLAR&R Act 2013
2	**Air Emissions**	Dusts include brick and silica dusts and from earth moving and other vehicle movements within the site	All the vehicles engaged for construction should have valid pollution check certificate as per the motor vehicle act. Further, any regulations related to vehicle emission issued by local government should also be adhered to. Sprinkling of water and atomised spray through foggy nozzle to suppress the dust.	Project SPV	25	Cost will be included in the project construction cost

		Dust suppression during construction	2 No. of APCE at crusher & conveying system, 2 No. of Dust suppression system at crusher, 2 No. of Mobile water sprinklers including Mist canons	Contractor	70	Cost will be included in the project construction cost.
3	**Water & Wastewater generation**	In the initial stages, due to non-point discharges of sewage generated at the project site by the construction workforce After the infrastructure for Integrated waste water treatment is ready, all the waste will be connected with the integrated facility	At the construction site, adequate number of toilets with hygienic environment will be provided with Septic tanks	Project SPV	28	Cost will be included in the project construction cost. Estimated 7 No. of septic tanks.
4	**Noise Levels**	Due to operation of heavy equipment such as drills, pneumatic tools, concrete mixers, cranes, generators, pumps, compressors, vibrators, etc and increased frequency of vehicular traffic	Shock absorbing techniques should be adopted to reduce impact. Effective barricading to requisite heights shall be provided to limit transmission of noise to adjacent to habitat areas and within permitted decibels	Project SPV	100	Cost included in the project construction cost
5	**Solid waste generation**	Domestic waste from labour colonies Construction and demolition waste	all the solid waste generated from the construction colonies, the organic fraction will be treated through the 7 OWCs	Project SPV	700	7 OWCs considered. This is one-time cost

			and recyclable will be sold to the authorised handlers Construction and demolition waste should be used for making pavement tiles etc, which can be used in the construction.			
6	**Natural Hazard vulnerability and Disaster Management system**	The development is in High probability seismic area	Development of an App for prediction of Tsunami linked to Indian tsunami early warning system (ITEWS). This app is mandatory for everybody entering the GNI development area. As a mitigation measure, it its strongly suggested that Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Buildings (IS 13827), Bureau of Indian Standards (IS 1893, 2002) and Indian Standard Criteria for Earthquake Resistant Design of Structures (IS 4326, 1993) along with NBC guidelines shall be followed while designing the various building structures as part	Project SPV	70	This is a one-time cost.

			of the Holistic development of GNI.			
7	**Command & Control centre**	-	All the environmental data like Met station, Air quality, Water quality, SWM, Noise etc. will be transmitted automatically to a command and control centre	Project SPV	10000	The cost for the Command and control centre will be considered in the total development cost

Table-10.8: Environment Management Measures – Township (Operation phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Air Emissions**	Emissions will be from proposed DG sets and incinerators	The proposed township will be excellently landscaped with proper terracing and benching and will be provided with pucca roads The incinerator will strictly follow the regulatory emission guidelines.	Project SPV		Monitoring cost has been included in the Chapter No. 6.

			The equipment will be fitted with automatic emission monitoring system			
2	**Water & Wastewater**	The domestic wastewater generated from township	100% wastewater generated (from ICTT, Power Plant, Airport & Township) will be collected and treated in three sewage treatment plants and the treated water will be reused for flushing, watering and landscaping purposes in the township.	Project SPV	35000	Cost is included in the township project cost
3	**Solid Waste**	Integrated solid waste management	Will be routed to Integrated waste management facility for treatment and disposal. Waste from ICTT, Power Plant, Airport & Township will be treated in the integrated solid waste management facility	Project SPV	90000	Cost is included in the township project cost
		Waste generated during construction and operation of Port, Airport, Power plant and Township which can't be treated or reused.	The waste which can't be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available.	Project SPV	5000	A separate contract will be issued for clearing and transportation

4	**Socio-Economics**	Great Nicobar Island is inhabited by aboriginal mongoloid Shompen. The Shompen are hunter-gatherers and depend on the forest and marine resources for sustenance	Ten control points to be established on 24X7X365 basis to ensure that no one trespassed the Trible area.	SPV	150	Ten control points with 10 porta cabins and with 3 shift, total 30 person to be employed
			Full operation of infrastructure facility line Health, education, community and basis services will be available within walking distance.			
			Multiple economic activities will be provided number of jobs locally.			
5	**Fire and explosion hazards**	Impact on Structure	On-site and off-site emergency planning, which should include, at a minimum, the preparation and implementation of an	Project SPV	30	The cost considered for the emergency Management

			Emergency Management Plan and a Communication Plan prepared with the participation of local authorities and potentially affected communities			Plan preparation. All the buildings and development will be as per Indian safety standards and cost will be included under each / specific projects
6	**Ecology**	Long tailed Macaques are exist in a nd around the project sites.	In case of severe monkey menace, the forest department should be informed to take appropriate steps	Project SPV	2	

Table-10.9: Cost summary table for EMP for all projects - Construction

EMP cost during Construction Phase

All cost in INR Lacs

ICTT				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment/Soil Erosion	Project SPV	500	One Time
2	Changes in Coastline/Shore line	Project SPV	5000	One Time
3	Reclamation	Project SPV	1000	One Time
4	Ecology	SPV	10	Per Year
		Project SPV (ICTT) & UT Administration	400	One Time
		Project SPV (ICTT)	300	One Time
5	Coral Reefs	SPV	2000	One Time
6	Lighting	Project SPV		Part of Project Cost
7	Road construction	Contractor + SPV	10	Per Year
8	Air Emission	Project SPV + Contractor		Included in Monitoring Cost
		Contractor	70	One Time
9	Noise Pollution	Project SPV		Included in Monitoring
10	Waste Water	Project SPV	4	Per Year
11	Solid Waste	Project SPV	100	One Time
12	Social	SPV	30	Per Year
Total Capital Expenditure on EMP for ICTT (Construction Period 8 Years)			**9770**	

Airport				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	SPV		To be finalised and borne by UT
2	Reclamation	SPV	3200	One Time
3	Air Environment	Project SPV	50	Per Year
4	Water quality /Wastewater Generation	Project SPV	4	One Time
5	Noise Environment	Project SPV	10	Per Year
6	Ecology	SPV	10	Per Year
7	Solid Waste	Project SPV	100	One Time
Total Capital Expenditure on EMP for Airport (Construction Period 4 Years)			**3380**	

Power Plant				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	UT Administration		To be finalised by UT
2	Soil Environment	Project SPV	30	Per Year
3	Air Quality	Project SPV		Included in monitoring
		Contractor	40	Per Year
4	Water Quality	Project SPV	10	Per Year
5	Noise Levels	Project SPV	2	Per Year
6	Solid Waste	Project SPV	100	One Time
7	Terrestrial Ecology	Project SPV	-	Per Year
8	Aquatic Ecology	Project SPV	100	One Time
9	Socio-Economics	SPV	60	Per Year
Total Capital Expenditure on EMP for Power Plant (Construction Period 7 years)			**1080**	

Township				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	Project SPV		To be finalised and borne by UT
		Project SPV & Construction Contractor/s	200	Per Year
2	Air Emissions	Project SPV	25	Per Year
		Contractor	70	Per Year
3	Water & Wastewater generation	Project SPV	28	Per Year
4	Noise Levels	Project SPV	100	Per Year
5	Solid waste generation	Project SPV	700	One Time
6	Natural Hazard vulnerability and Disaster Management system	Project SPV	70	One Time
7	Command & Control centre	Project SPV	100	Per Year
Total Capital Expenditure on EMP for Township (Construction Period 12 Years)			**6410**	

Total Capital Expenditure on EMP		**20640**	

Table-10.10: Cost summary table for EMP for all projects - Operation

EMP cost during Operations Phase

All cost in INR Lacs

ICTT				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	Project SPV	2000	One Time
2	Changes in Coastline/Shore line	Project SPV	5000	One Time
3	Ecology	Project SPV	15000	
4	Air Emission	Project SPV		Included in Monitoring
5	Solid Waste	Project SPV		Included in Monitoring
6	Social	SPV		Included in Monitoring
7	Fire and explosion hazards	Project SPV	30	
One Time EMP Cost for ICTT during Operations Phase			**7000**	**One Time**
Annual EMP Cost for ICTT during Operations Phase			**15030**	**Per Year**

Airport				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	Project SPV	-	
2	Air Emission	Project SPV	-	Included in monitoring
3	Water & Wastewater	SPV + Project SPV		included in township
4	Noise Pollution	Project SPV	10	
5	Solid Waste	SPV + Project SPV		included in township
6	Fire and explosion hazards	Project SPV	30	One Time
One Time EMP Cost for Airport during Operations Phase			**30**	**One Time**
Annual EMP Cost for Airport during Operations Phase			**10**	**Per Year**

Power Plant				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	Project SPV	15	One Time
2	Air Emissions	Project SPV		Part of Project Cost
3	Ecology	Project SPV	25	One Time
4	Water & Wastewater	SPV + Project SPV		part of Township project
5	Solid Waste	SPV + Project SPV		part of Township project
6	Noise	Project SPV	10	
7	Fire and explosion hazards	Project SPV	30	
One Time EMP Cost for Airport during Operations Phase			**40**	**One Time**
Annual EMP Cost for Airport during Operations Phase			**40**	**Per Year**

Township				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	Project SPV		To be finalised and borne by UT
		Project SPV & Construction Contractor/s	200	
2	Air Emissions	Project SPV	25	
		Contractor	70	
3	Water & Wastewater generation	Project SPV	28	
4	Noise Levels	Project SPV	100	
5	Solid waste generation	Project SPV	700	One Time
6	Natural Hazard vulnerability and Disaster Management system	Project SPV	70	One Time
7	Command & Control centre	Project SPV	100	
One Time EMP Cost for Airport during Operations Phase			**770**	**One Time**
Annual EMP Cost for Airport during Operations Phase			**470**	**Per Year**

Total One Time EMP Cost during Operations Phase	**7840**	**One Time**
Total Annual EMP Cost during Operations Phase	**15550**	**Per Year**

Additional details sought by EAC regarding Integrated development of International Container Transshipment Terminal (ICTT), Township & Area Development and Power Plant in Great Nicobar Island

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Additional details sought by EAC regarding Integrated development of International Container Transshipment Terminal (ICTT), Township & Area Development and Power Plant in Great Nicobar Island

International Container Transhipment Terminal (ICTT)

EAC Comment (vi):

The EMP for the entire project need to be revised. Specific mitigation measures for Leatherback Turtle be prepared and a conservation plan for the same be submitted.

Response (vi)

Detailed mitigation measures necessary for minimizing impact on leather back turtles are updated in the revised Environmental Management Plan (EMP). refer ***Enclosure I***

Studies report that India and Sri Lanka having large nesting populations of the leatherbacks. Since 2009 studies have been carried out to assess the recovery of the leatherback population after tsunami. Monitoring of leather back turtles using satellite transmitters were carried out in the islands. A majority of turtles moved from little Andaman towards Southeast Asia and Australia.

Considering the increment in the population size of the leatherback turtle across the world, since 2013 onwards the species is categorized as Vulnerable (2013 – 2022) under IUCN. Earlier, it was under Critically Endangered in the year 2000 and Endangered during 1982-1996 as per IUCN assessment. Further, nesting beaches in Great Nicobar received only about 1% of the global population of leatherback turtles.

Leather backs generally nests in wide sandy beaches with no gravel or rocks. The other islands besides Great Nicobar and Little Nicobar in Nicobar Group include Kamorta, Katchal and Nancowry Islands where leatherback turtle nesting have been reported. In Great Nicobar Island, nesting of leather back turtles have been reported in East of Indira point, West of Indira point, Koshindon, Laxmi Nagar, North of Alexandria, South of Alexandria, North of Dogmar, South of Dogmar, Pulo Bed, PuloKunji, Re Pinsuot, Renhong, SafedBalu, Patatiyo and South of Galathea to Rock besides Galathea.

Studies carried out in 2016 by Adith Swamnathan et.al show that the population is continued to thrive with little or no intervention. The population once considered declining has exhibited resilience to changes and natural calamities. The studies further revealed that there is a stable increase in nesting population, with over hundreds of nests laid every year and also on the information on turtle nesting beaches.

The breeding grounds of leatherback turtles are in no way altered due to the project. However, only a portion of the Galathea bay (Eastern flank) is to be developed as ICTT and the large nesting areas (Western flank) are kept as such for nesting of leather backs and efforts and strategies will be put in place to actively use the Galathea beach area for nesting by leatherback turtles.

Other potential nesting areas in Great Nicobar Island, Little Nicobar Island, etc., will be protected and conserved. The Department of Environment and Forests, A&N administration will establish base camps in the nesting beaches in Little Nicobar Island, Great Nicobar Islands, Little Andaman Island and all other nesting sites in Andaman Group of Islands and a long term monitoring programme will be established to monitor the nesting beaches and to understand the long term trends in nesting and reproductive efforts will be carried out from October to April every year and thereby establish baseline data collection and monitoring programmes. Studies on remigration intervals, migration patterns, and population structure will be carried out in all the nesting beaches by the department through the scientific and research organisations. Successful hatchery will be established in all nesting beaches to provide additional protection for nests to avoid predation from water monitor lizards, wild and feral pigs, stray dogs and egg collectors. As the turtles are susceptible to fishing pressure, fishermen will be sensitized to release the turtles accidently caught in trawl nets and long lines and use of turtle excluding devices.

The National Marine Turtle Action Plan of the Govt. of India 2021-26 aims to identifying the threats to marine turtles and activities identified to mitigate the threat include collate and organize data on existing threats, establish baseline data collection and monitoring programmes, determine the population affected by incidental capture in fisheries and other sources of mortality. All the above activities will be included as part of monitoring the nesting beaches in Nicobar Group of Islands, Little Andaman and other Islands in Andaman Group

A leatherback conservation Plan will be prepared as part of the Biodiversity Management Plan for the Nicobar Group of Islands and implemented to conserve and protect the nesting beaches, feeding grounds of turtles. An amount of 100 Crores will be earmarked and to be kept in the Environment Management Plan.

UT Administration has notified three Wildlife Sanctuaries (for Leatherback Turtles, Magapodes and Corals) as part of the conservation of these species. Refer ***Enclosure II-a*** of this documents.

EAC Comment (vii):

ZSI studies identify environmental impacts that are purely speculative covering 9 bullet points. It seems that there are no impact studies carried out and suggested only generalist measures. Galathea being key Leatherback Turtle nesting and ICTT and the development of support infrastructure on the east and west flank of it will destroy it fully. Thus, the report expected to envisage strong mitigation measures for other nesting sites that are completely lacking currently. WII report also not dwell on mitigation measures and in fact only recommends need for developing and implementing mitigation plans.

Response (vii)

Considering the increment in the population size of the leatherback turtle across the world, since 2013 onwards the species is categorized as Vulnerable (2013 – 2022) under IUCN. Earlier, it was under Critically Endangered in the year 2000 and Endangered during 1982-1996 as per IUCN assessment. Further, nesting beaches in

Great Nicobar received only about 1% of the global population of leatherback turtles.

Further, leatherback turtles are known to have poor fidelity to the nesting sites. Also, there are case examples which clearly state that co-existence of port and turtle conservation is possible. Due to the poor fidelity to nesting sites, it is also possible that leatherback turtles might use other beaches of Andaman & Nicobar group of Island. However, strong mitigation measures have been listed to protect the existing nesting ground at western flank of Galathea Bay. The mitigation measures also suggest conservation of other potential beaches where these turtles' nesting sites have been noticed. Summary of the suggested mitigation measures are listed below:

- Lighting can be minimized through reduction, shielding, lowering, and/or use of turtle-friendly lights without compromising people and operations safety.
- Monitoring and protection of coastal environments include Nests identification and protection, Eggs counting, Incubation period monitoring, Hatchling success, Collection of biometric data from individuals, Record of non-reproductive events, Veterinary center for treating animals, and Contribution to scientific knowledge
- Environmental education programs for port team as well as for locals to address the effects of pollution due to artificial light intensity on turtle nesting beaches
- A standard plan and Technical Guidelines for Photopollution as well as photomitigation to be adapted.
- Community outreach and scientific research
- Daily patrolling including night patrols along with the project site with a 2km stretch to document the impact and to reduce the same and to ensure the safeguard and relocation of eggs for hatching.
- Special protection and care to be taken for turtle eggs to provide safeguard those against the threats like poaching, predation, inundation, or erosion in their natural environment
- Protecting in situ or safely relocated into a hatchery until they hatch, and then hatchlings to be safely released into the sea.
- Community engagement and habitat improvement activities at the offset site.
- Conservational program, UN - Sustainable Development Goals (SDGs)- 4, 6, 8, 14, 15, and 17 should be adopted and managed sustainably.
- Dredging protocol and the operational protocol needs to be established in consultation with Specialist Group or agencies.
- Use of "trailing suction hopper dredgers" procedures to be adopted to develop regulatory measures and to ensure effectiveness.
- Installation of deflectors to clear turtles from the path of the suctioning equipment.
- Installations of inflow and outflow screens to monitor and detect turtles
- Natural calamities, physicochemical parameters, and oceanic actions should be considered for the dredging operation.
- Introducing a unique lighting system in the port area including the types of light and the intensity control of emitted light to decrease the potential downstream impacts on nestling adult turtles and emerging hatchlings at the nestling site.

- Use of low-pressure sodium vapor lamps or other light sources that exclude wavelengths less than 520 nm as these wavelengths are not visible to turtles. Lighting, for roadway, wharf, mast, or elevated structure lights should use full 90° cutoff light fixtures. To minimize light spill to the sky, fixtures were to be installed at around 15° below the horizontal plane.
- All lighting should be of minimum lamp wattage
- There should be no use of fluorescent, mercury vapor, metal halide, or other broad-spectrum high-intensity discharge lamps.
- There should be no floodlighting, up-lighting, or other forms of directional lighting aimed above the horizon.
- Conservation plan for other beaches where turtle nesting are observes.
- Protection and improvement of the habitat to support turtle nesting.

Refer to ***Enclosure III*** as provided by ZSI

Further, UT Administration has notified three Wildlife Sanctuaries (for Leatherback Turtles, Magapodes and Corals) as part of the conservation of these species. Refer ***Enclosure II-a*** of this documents.

UT Administration has also proposed and approved wildlife management plan / conservation plan for Leatherback turtles and Megapodes including research, monitoring, training and documentary. Appropriate fund is also allotted for the above-mentioned work.

Refer minutes of 2nd steering committee meeting held on 2nd April 2022 as ***Enclosure II-b***

EAC Comment (viii):

ZSI should provide details of coral restoration in GoK which they used as an example to illustrate in EIA-EMP. Total area restored? which areas restored? total cost involved in the same? survival rate of corals? and ecological functions achieved through the restoration? with hard peer reviewed evidence. This will help understand the costs and effectiveness of coral transplantation and draw specific conservation plan for coral translocation and restoration at Galathea Bay and other impact areas. These specific details are completely lacking in the current conservation plan. All corals being in Schedule 1, these details will be essential since the transshipment terminal may have major impact on over 117 species that are present in the Galathea Bay as per ZSI report.

Response (viii)

Refer to ***Enclosure III*** as provided by ZSI

Zoological Survey of India has the distinction of carrying out prestigious and unique first of its kind Ecological Restoration in coral reef areas in the recent past in the present study site (Gulf of Kachchh) itself with the able support of the Marine National Park Authority of Gujarat Forest Department, while a couple of agencies have tried and given up.

ZSI restored a total of about 2000 square meter degraded coral reef area along the Gulf of Kachchh region by employing site specific strategies and multidisciplinary approaches and by involving local community (Satyanarayana and Chandran, 2017).

A total of 232 cement structures with 2320 native coral and branching coral transplant were restored in Pirotan site. In Narara site, 1170 native coral transplants were restored in 214 cement structures and a total of 110 cement structures, 50 iron frames were used to restore 1050 native coral transplants at Mithapur restoration site. Although high survival rates of transplanted native coral species were recorded in all restoration sites after one year of continuous monitoring, Pirotan site recorded maximum (97.24%), than the Narara (96.50%) and Mithapur (96.57%) restoration sites (Fig. 1). As far as concern with the restored branching coral transplants, survival rate of Acropora transplants was recorded 85.25% at Mithapur restoration site and 68.75% at the Pirotan site. But the survival rate of Montipora transplants was recorded higher in Pirotan restoration site 78.57% than the Mithapur site (59.40%) (Satyanarayana and Chandran, 2017).

Pirotan recorded highest survivorship (97.24%) than the other two sites. Coral fragments attached on the artificial cement/iron/pvc structures were found started encrusting on the cement plates by overgrowing on the tied nylon and copper tags from the 2nd month %) (Satyanarayana and Chandran, 2017).

Restoration is being done on in Gulf of Kachchh area (Narare Reef, Kalubar Island). About 9000 corals from 49,000 m² area (40 times bigger than the MNP-ZSI ICZM transplantation effort carried out from 2012-2018) will be translocated.

The present work budget around Rs. 4,00,00,000.00 (only for salary and some consumable) whereas other all the support will be made by the sponsoring agency. However, the per hectare cost of coral translocation is estimated as INR 5.34 crores.

UT Administration has notified Wildlife Sanctuaries for Corals as part of the conservation of these species. Refer ***Enclosure II-a*** of this documents.

EAC Comment (ix):

Handling of Hazardous waste at Transshipment Terminal require detailed hazard mitigation plan. Without any cargo details, the current plan is very generalist in nature.

Response (ix)

No hazardous industries are envisaged at GNI. However, hazardous wastes like used oil, batteries, insecticide/ herbicides, paints, lubricant wastes etc. would be generated. Whatever cannot be recycled due to lack of demand at GNI or nearby islands, will be fed to the incinerator for safe disposal in the landfill.

Chance spill of substances like diesel, solvents etc cannot be ruled out during transportation and transfers. Spillage of any substance will be remediated immediately as per the Dutch Standards (Dutch Target and Intervention Values, 2000.

- There should be no floodlighting, up-lighting, or other forms of directional lighting aimed above the horizon.

EAC Comment (xii):

There are no studies on the impact of this mega project on Shompen. The public hearing also under-represented with institutes and NGOs who worked on Shompen and who can share their views specific to Shompen. How will this aboriginal community will be affected due to introduction of human diseases, crime with influx of millions of people as envisaged as well as residential population of 400000?

Response (xii)

There are six Scheduled Tribes i.e., the Andamanese, Onges, Jarawas, Sentinelese, Nicobarese and Shompens notified by the President of India under Article 342 (1) of the Indian Constitution (Andaman & Nicobar Islands Scheduled Tribes Order No. 58, dated 31.03.1959. Except Nicobarese the rest of the 05 tribes are categorized into Particularly Vulnerable Tribal Groups (PVTGs).

The tribes of A&N Islands are in different stages of socio-economic condition. The Nicobarese have joined the mainstream and the Sentinelese are still in isolation practicing primordial hunting and gathering way of life. The other tribes namely Jarawa, Onge, Andamanese and Shompen are partly in contact with the outside population but they prefer to remain in their own abode particularly Shompen, Sentinelese and the Jarawa.

The Administration is granting maximum autonomy to the PVTGs especially Jarawa and Shompen with minimum and regulated intervention and that there shall be no intervention in their cultural life and that they will be left at liberty to develop according to their own genius and at their own pace. The Administration is not making any attempt to bring them to the mainstream society against their conscious will.

The only habitation of Shompens or Nicobarese in the project area is at New Chingen, Rajiv Nagar (Nicobarese of west coast settled after Tsunami) (both are outside the tribal reserved area), old Chingen and Temporary hut (an interaction point only) at Laxmi Nagar. Only 04 Shompens are living in Old Chingen though they frequently interact with their relatives at New Chingen. Further, the Administration is not proposing displacement of any tribal habitations.

The A&N Administration is fully committed for the wellbeing and welfare of the PVTGs of the islands. They are the heritage of mankind not for the islands only but for the world. The Administration has constituted an Autonomous Body i.e. Andaman Adim Janjati Vikas Samiti (AAJVS) and the General Body and Executive Committee are chaired by the Hon'ble Lt Governor and the Chief Secretary. The Shompens generally live in deep forest. The Administration through AAJVS is providing the following welfare measures for the wellbeing of Shompens

a) One Medical Sub-centre with ANM at New Chingen village

b) A Pharmacist of AAJVS provides the primary health care to Shompens in the field.
c) A special ward has been constructed at PHC Campbell Bay to provide treatment by Medical Officer.
d) Specialized medical care is provided at GB Pant Hospital, Port Blair and hospitals in mainland, as and when required.
e) Primary School at New Chingen village.
f) Rice, Dal, Salt & Match Box are provided to the Shompens at Chingen and Laful Bay regularly as per the Shompen Policy of 2015.
g) Supply of Iron and other material for fishing, hunting & agriculture activities is supplied
h) Fruit bearing crops have been raised at Trinket/ Laful Bay

The Andaman and Nicobar Administration notified the Policy on Shompen Tribe of Great Nicobar Island on 22.05.2015 with the approval of the Government of India, Ministry of the Tribal Affairs. The Shompen Policy set out the following objectives:- (i) Recognize the social, ecological and economic diversity among Shompen. (ii) Eliminate through phased reduction, any exploitation and unsustainable dependency (iii) Provide appropriate opportunity for health and medical requirements. (iv) Ensure their integrity and wellbeing through developing channels of consultation and participation only based on their willingness (v) Preserve and protect their cultural heritage including language.

The Administration is strictly implementing the Shompen Policy without any undue interference with their lifestyle. Further, the Administration follows the objective to ensure their integrity and wellbeing through developing channels of communication, consultation and participation only based on their willingness.

Regarding representation of tribal groups during public consultation, it is clarified again that the representation of tribal groups was made by "Andaman Adim Janjati Vikas Samiti (AAJVS). It is also clarified that the public consultation was conducted as per EIA notification 2006 and there was no restriction for any NGO/ agencies/ individual to participate.

The Administration shall ensure that the project will not disturb or displace any Shompen tribal or their habitation. There will be a clear demarcation of land so that there is no scope of conflict that would arise in future. 16 check points have been proposed which will be guarded 24x7x365 to ensure no trespassing by the outsiders. Necessary budgetary provisions for the same have been provided in the Environment Management Plan (Chapter 10 of EIA Report).

As part of their safety and protection, the Administration proposes to create a security and surveillance mechanism for the wellbeing of the PVTGs of these Islands. In this regard, a proposal regarding installation of Geo-fencing-cum-surveillance towers in the tribal settlements is under consideration to protect the PVTGs from poachers, trespassers, transit of narcotics, encroachment, preserving/conserving forest and marine resources and contain spread diseases alien to the tribes. 15 tribal locations have been identified for installation of Geo-fencing-cum-surveillance towers which includes the Shompen settlements at 13 Km East-West Road, 27 Km East-West Road and Galathea.

All the considerations will be undertaken by Department of Tribal Welfare, as per the Andaman and Nicobar Islands (Protection of Aboriginal Tribes) Regulation, 1956 (commonly known as PAT Regulation), Policy on Shompen Tribes, defined below will be part of the overall management plan for the project.

- Andaman and Nicobar Islands (Protection of Aboriginal Tribes) Regulation, 1956
- Andaman and Nicobar Islands (Protection of Aboriginal Tribes) amended Regulation, 2012
- Andaman and Nicobar Islands (Protection of Aboriginal Tribes) Rules, 1957
- Policy on Shompen Tribe of Great Nicobar Island

EAC Comment (xiii):

LNG terminal is it a FSRU or land based storage facility. Details of the same to be provided

Response (xiii)

It is FSRU (Floating Storage and Regasification Unit).

There will be dedicated FSRU at proposed Transshipment Terminal. Transportation of gas from port to proposed power plant shall be through Gas pipeline network.

Power plant is proposed near to the port area for sustainable transportation of gas to reduce long distance conveyance.

Storage of gas shall be in above-ground low-pressure tanks. The tank shall be double-walled, with a carbon steel outer wall and a nickel-steel inner tank as per specifications for gas storage. Tank shall be constructed in power plant area.

Regasification units shall be placed in the proposed power plant area so that they can exchange heat to vaporize the LNG with cooling energy for the plant's sustainable efficiency.

Refer ***Enclosure VI*** showing location map of FSRU along with the LNG transmission pipeline.

EAC Comment (xiv):

The shoreline change at island is complex with rocky outcrops with pocket beached and hence the impact should be studied using observations and specific hydrodynamic models applied to islands.

Response (xiv)

The data (wave, current, etc.) has been collected during the survey as well as long term data collected and formed part of the hydrodynamic and numerical model along with other inputs. The tranquillity studies were also conducted as part of the study.

The detailed study report is available as attachment 3 of the EIA report.

GENERAL

EAC Comment (xxxiv):

ZSI and WII studies only identified flora and fauna and physico-chemical aspects. None of the reports provides any specific mitigation measures for core impact areas such as ecology, biodiversity and endangered and endemic species. The report did not mention on the impact of these development on nocturnal fauna. Revised report addressing above observations may be submitted.

Response (xxxiv):

Inputs and response from ZSI regarding impact on ecology, biodiversity and nocturnal fauna is enclosed as ***Enclosure III.*** *Summary of the suggested mitigations are listed below:*

Summary of possible impact on nocturnal animals:

- Artificial light is considered one of the significant pollutants which create notable disturbance to the variety of faunal communities
- The artificial light makes significant changes in the foraging, reproduction, migration, and communication pattern of the wildlife with negative consequences
- Some nocturnal animals migrate and navigate by moonlight and starlight. The use of artificial light disrupts the biological clock and orientation of those species and as a result millions of birds die colliding with needlessly illuminated buildings and towers.
- Artificial lights can cause them to migrate too early or too late and miss ideal climate conditions for nesting, foraging and other behaviors.
- The impacts of light pollution on the sea turtles are notably high and make serious damage to their biological courses.
- The natural lights are providing the signal to the hatchlings for their general movement toward the sea whereas the presence of artificial light confuses their inherent behavior in finding the sea and causes tiredness, dehydration and the loss of energy that is vital to their first step of migration
- Presence of artificial light also enhances the scope of predation and make their life vulnerable
- Artificial lights attract plenty of insects which can be seen as a fatal attraction.
- Majority of the frogs are nocturnal. Alteration in nest hiding behaviour, reproductive behaviour, and possibly calling, breeding success are recorded due to the presence of artificial lights.
- Several mammals are nocturnal. The impact of artificial light can be seen to create major alteration in the circadian rhythm of some mammals.
- Artificial lights are making serious damages to various reptiles like lizard and gecko

Summary of suggested Mitigations:

- Steps would be taken to reduce the intensity and percentage of artificial light in the vicinity of nesting ground and port
- Turn off lights visible on nesting beaches or use special fixtures to shield the lights from the beach;
- 1st option- use of low-pressure sodium-vapor lighting (LPS) only.
- 2nd option-use of a light source lesser than 520 nm wavelength which is not within visible range of turtles.
- Use of Turtle Safe Lighting – these red lights emit a very narrow portion of the visible light spectrum, which is less intrusive to nesting sea turtles and hatchlings
- Introduction of unique sodium-vapor lighting light in consultation with expert/ specialist group.
- Detailed step-wise lighting plan including types of light, the intensity during construction and operational phase of ICTT, and in accordance with the breeding season of turtles.
- Preparation of lightning guidelines and making awareness among the employees and workers of the ICTT project.
- Detailed lighting plan for roadway, wharf, mast, or elevated structure lights with full 90°cutoff light fixtures.
- Steps should be taken to control the light spill to the sky by installing fixtures installed at around 15° below the horizontal plane.
- Use of minimum lights with low lamp wattage.
- A complete ban on the use of fluorescent, mercury vapor, metal halide, or other broad-spectrum high-intensity discharge lamps.
- Ban on floodlighting, up lighting, or other forms of directional lighting aimed above the horizon.

EAC Comment (xxxv):

There is no mention of the impact of invasive species in the area with extremely high endemism. It only states ballast treatment for marine invasives. There is no mention of terrestrial invasives.

Response (xxxv):

As part of the terrestrial invasive species management, Prevention, Early detection & response, Control & restoration and collaboration has been elaborated and detailed out. Refer ***Enclosure XIV*** of this document.

EAC Comment (xxxvi):

Baseline water quality parameters, viz salinity, pH, Ammonia, etc are not mentioned.

Response (xxxvi):

Details are available in section 3.7.3 (Chapter 3) of the EIA report and same is reproduced in ***Enclosure XV*** of this document.

EAC Comment (xxxvii):

Mangrove cover loss is not mentioned. Coral reef protection measures are not clear.

Response (xxxvii):

12-20ha of mangrove cover loss has been identified and mentioned in table 10.1 of Chapter 10 of the EIA report.

The extent of loss of mangroves may be compensated in GNI by re-densification of existing mangroves or planting of mangroves to non-forest area as per the principals of compensatory afforestation.

There is no impact on coral reefs due to the proposed project activities. However, if the coral colonies (if any) in the proposed areas are impacted due to proposed construction activities, it shall be translocated at suitable place after conducting detailed investigations on the type of corals getting impacted.

EAC Comment (xxxviii):

The consultant needs to clearly disclose what does 'suitable' dredged material stands for? Detailed property of such material being used for reclamation with evaluation that it will have minimum impacts on fragile ecology of the area needs to be included.

Response (xxxviii):

Only naturally occurring Granular /sandy material having fines less than 30% is considered suitable for reclamation. Materials from marine deposit, marine clay, silt, peat, concrete and construction rubble will not be used for reclamation.

EAC Comment (xxxix):

More than the pollution check which is required to contain the exhaust emissions from vehicles used for construction, it is required to maintain below the ambient standards the emissions from 'vehicle tyres' and 'resuspension of road dust'. The consultant needs to explain these emission sources – evaluation of these sources.

Response (xxxix):

Details regarding air pollution is included in Section 4.6 of Chapter 4A of the EIA report

EAC Comment (xl):

Generators run by diesel fuel in such fragile island environment needs to be relooked. The fuel use in such generators when run also produce gaseous pollutants. The higher ambient humidity present in the surrounding environment shall convert these gases either into 'acid rain' or 'acid mist'. It may harm the fragile eco system. Generators using CNG as its fuel with pollution control device to minimize NOx emissions, should be used. Clarification is needed for the same.

Response (xl):

All necessary provision regarding DG sets is mandated in the detail specification of DG sets to be installed.

Further, all the DG sets emissions (for port, airport, power plant and township) have been modelled, refer chapter 4 of the EIA report. The results of the model indicate that ambient air quality is well within the standards even when all the DG sets are under operation.

Also, it may please be noted that all the remote islands in the Andaman and Nicobar group of islands are operating of DG sets only.

EAC Comment (xli):

No information of coral transplantation is provided. How many colonies required to be translocated? How many species? Location of transplantation? Viability of new location for translocation? What method will be used for translocation? How massive and sub-massive corals will be translocated? What is the cost involved in translocation? etc. remains to be unknown. EMP cost allocation appears arbitrary.

Response (xli):

There is no impact on coral reefs due to the proposed project activities. However, if the coral colonies (if any) in the proposed areas are impacted due to proposed construction activities, it shall be translocated at suitable place after conducting detailed investigations on the possible locations and type of corals getting impacted.

Detail Case Study from ZSI is enclosed as ***Enclosure III***

EAC Comment (xlii):

ZSI and WII reports do not provide conservation plan for any species that will get affected. The few points specified in both the report are too generalist and of little or no help. WII report infact conclude saying 'mitigation plan for sea turtles needs to be developed considering all five sites are ecologically very sensitive.

Response (xlii):

The EIA report is in compliance with the ToR issued on 25th May 2021 by MoEFCC.

The studies conducted by WII and ZSI are covering majority of the ToR conditions. There was no requirement for preparation of conservation plan and only impact and mitigation were mandated.

UT Administration has notified three Wildlife Sanctuaries (for Leatherback Turtles, Magapodes and Corals) as part of the conservation of these species. Refer ***Enclosure II-a*** of this documents.

Further, UT Administration has also proposed and approved wildlife management plan / conservation plan for Leatherback turtles and Megapodes including research,

Enclosure I

Updated Environmental Management Plan (EMP)

1.0 ENVIRONMENT MANAGEMENT PLAN (EMP)

1.1 Introduction

The management action plan aims at controlling pollution at the source level to the possible extent with the best available technology followed by treatment measures before they are discharged to the environment.

1.2 Environmental Management System

The earlier chapters identified measures for environmental protection especially for providing the necessary pollution control to comply with the standards stipulating the limits for emitting pollutants in air, water or on land so that the assimilative capacity is not exceeded. Standards are stipulated by various regulatory agencies to limit the emission of pollutants in air and water. Similarly, a mandatory practice is recommended for preparing an Environment Statement each year in order to reduce the quantities of wastes. This in itself is not sufficient since this does not provide an assurance that its environmental performance not only meets, but also will continue to meet legislative and policy requirements.

In the present report, the Environmental Management Systems (EMS) is discussed for the proposed integrated development, including facilities to ensure that the activities and services of the region conform to the carrying capacity (supportive and assimilative capacity). This is based on Bureau of Indian Standard Specification IS: 13967 (1993): Environmental Management Systems - Specification (equivalent to British Standard BS 7750).

The Environment Management system will be implemented for all the projects related to Holistic Development of Great Nicobar Island. However, there would be separate environmental management cell for each project.

1.2.1 Formation of an Environmental Management System

The environmental management system will enable to maximize its beneficial effects and minimize its adverse effects - with emphasis on prevention. It will:

- Identify and evaluate the environmental effects arising from the proposed activities, and services to determine those of significance;
- Identify and evaluate the environmental effects arising from incidents, accidents and potential emergency situations;
- Identify the relevant legislative and regulatory requirements;
- Enable priorities to be identified and pertinent environmental objectives and targets to be set;
- Facilitate planning, control, monitoring, auditing and review activities to ensure that the policy is complied with; and

- Allow periodic evaluation to suit changing circumstances so that it remains relevant.

1.2.2 Implementation of an Environmental Management System

It is essential that the top management is committed to development of its activities in an environmentally sound manner and supports all efforts in achieving this objective.

Initial Environmental Review

Preparatory environmental review for the proposed project facilities will cover four areas:

- Legislative and regulatory requirements;
- Evaluation and registration of significant parameters and their environmental impacts;
- Review of existing environmental management practices and procedures; and
- Assessment of feedback from investigation of previous environmental incidents and non-compliance with legislation, regulations or existing policies and procedures.

The resulting report will address:

- The nature and extent of problems and deficiencies;
- The priorities to be accorded to rectify them; and
- An improvement program designed to ensure that the personnel and material resources required are identified and made available.

Environmental Policy

The management will actively initiate, develop and support the environmental policy, which is relevant to its proposed activities and services and their environmental effects.

Broadly, this will cover the following:

- Commitment to the environment.
- Formulation of an Environmental Management System (EMS) which is feasible to implement.
- Abide by all the legal framework of the country. However, UT may make the regulation more stringent in view of the environmental sensitivity of GNI.
- Will contain standard operating process / procedures.
- Communication and implementation procedures at all levels of the operation
- Publishes widely and include in the company website.
- Should have an environmental compliance management system.
- Conduct yearly environmental audit as per international standards.
- Reduce the carbon footprints of GNI as per India commitment to International agencies.

One of the directors of the board should have rich background in environmental discipline.

The policy for Environment Management has been proposed to create sound and eco-friendly environment for sustainable development.

Organization and Personnel

To facilitate the implementation of the EMS, one of the most important aspects relate to the organization and personnel. The related issues are:

- Define and document the responsibility, authority and inter-relations of key personnel involved in the implementation of the environmental policy, objectives and environmental management system;
- Identify the in-house verification requirements and procedures including resources and personnel;
- Communicate to employees at all levels the importance of compliance with the environmental policy, their role and responsibilities in achieving compliance, the potential consequences of departures from the specified procedures and identify and provide appropriate training; and
- Establish and maintain procedures to ensure that contractors are made aware of the environmental management system requirements and provisions.

Environmental Aspects and Impacts

The authorities will establish and maintain procedures for:

- Receiving, documenting and responding to internal as well as external communications concerning environmental aspects and management;
- Identifying, examining and evaluating the environmental effects of its activities under normal and abnormal/emergency situations (including risk assessment) and compiling significant effects in a register; and
- Recording all legislative, regulatory and other policy requirements and codes in a register.

Environmental Objectives and Targets

The objectives will be set with a view to realizing gradual and steady improvements in environmental performance through application of best available and economically viable practices. The areas targeted for improvement will be those where improvements are most necessary to reduce risks (to environment) and liabilities. These will be identified through cost-benefit analysis wherever practicable.

Environmental Management Manual and Documentation

The documentation is intended to provide an adequate description of the environmental management system. The manual is expected to provide a reference to the implementation and maintenance of the system.

Operational Control

With respect to the proposed additional facilities, the management responsibilities will be defined to ensure that the control, verification, measurement and testing of environmental parameters within the port complex will be adequately coordinated and effectively performed.

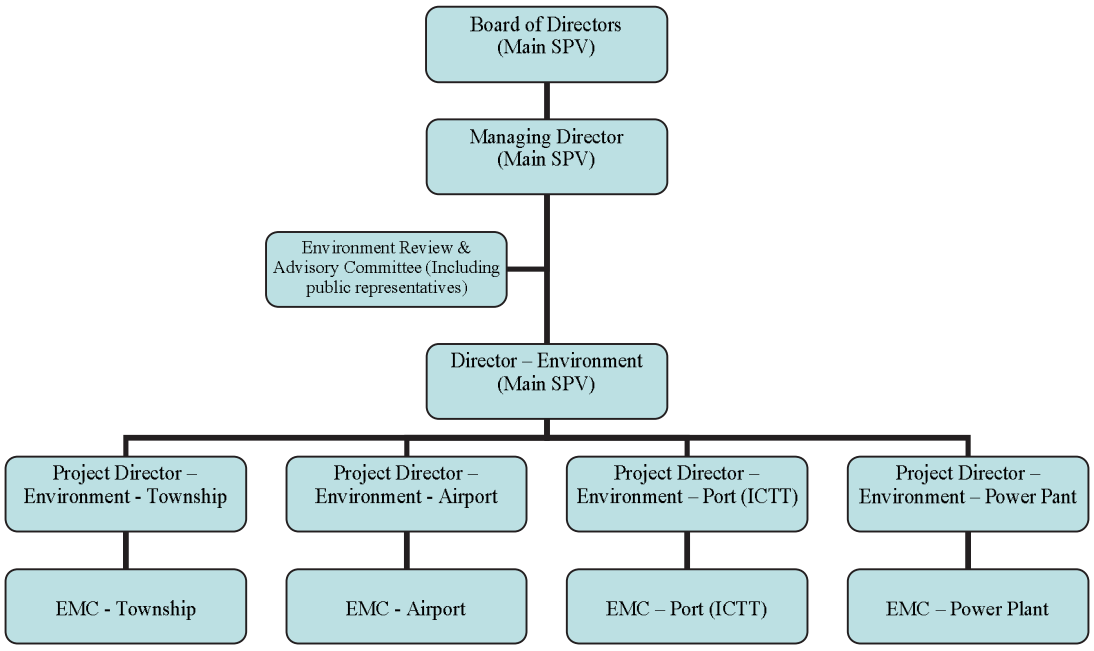
The control, verification, measurement and testing will be made through documented procedures and work instructions defining the manner of conducting activities, the absence of which can lead to violation of the environment policy.

In the event of non-compliance, procedures for investigation of the causative mechanism will be established and the factors reported for corrective actions.

Reporting Structure

The purpose of Environment Management plan (EMP) is to establish and maintain a system of records to demonstrate compliance with the environmental

Structure of ***Environment Management system***



The purpose of Environment Management plan (EMP) is to establish and maintain a system of records to demonstrate compliance with the environmental management

systems and the extent of achievement of the environmental objectives and targets. In addition, the other records (legislative, audit and review reports) and management records will address the following:

- Details of failure in compliance and corrective action;
- Details of incidents and corrective action;
- Details of complaints and follow-up action;
- Appropriate contractor and supplier information;
- Inspection and maintenance reports;
- Monitoring data;
- Environmental training records; and
- Housekeeping.

Environmental Statement

As a mandatory requirement under the Environment Protection Rules (1986) as amended through the Notification issued by the Ministry of Environment and Forests in April 1993, an Environmental Statement will be prepared annually. This will include the consumption of total resources (e.g. water), quantity and concentration of pollutants (air and water) discharged, quantity of hazardous and solid waste generation, pollution abatement measures, conservation of natural resources and cost of production vis-à-vis the investment on pollution abatement. The intention of this statement is:

- To identify the areas where resources can be used more efficiently through a comparison with the figures of a similar project (thereby reducing the consumption of resources);
- To determine the areas where waste generation can be minimized at source and through end of pipe treatment (thereby reducing the wastes generated and discharged); and

- To initiate a self-correcting/improvement system through an internal analysis to achieve cost reduction through more efficient practices.

Environmental Management Reviews

The senior management will periodically review the Environment Management System (EMS) to ensure its suitability and effectiveness. The need for possible changes in the environmental policy and objectives for continuous improvement will be ascertained and revisions made accordingly. EMS based on the above objectives will be formulated and implemented at the industry level.

1.3 Environment Management Cell

An Environment Management Cell has to be created consisting of officers from various disciplines to co-ordinate the activities concerned with the management and implementation of the environmental control measures. This Environment Management Cell will be the nodal agency to co-ordinate and provide necessary services on environmental issues during operation of the project. This department interacts with PCB and other environment regulatory agencies.

The Environment Management Cell will be responsible to obtain/renewed Consent for Operation under Water Act, 1974 and 1981 Air Act from PCB.

This cell will supervise the monitoring of environmental pollution levels viz. ambient air quality, water and effluent quality; noise level etc.. Monitoring will be done in line with regulatory compliance so as to ensure that the pollution is limited to allowable values and to take corrective action by either enforcing use of new equipment or by improving the performance of the pollution control equipment by the users.

Environment management cell will submit the compliance to the environmental clearance report to MoEF&CC as per the clearance conditions.

In case the monitored results of environmental pollution are found to exceed the allowable values, the Environment Management Cell will suggest remedial action and get these suggestions implemented through the concerned port authorities. The Environment Management Cell will also co-ordinates all the related activities such as collection of statistics of health of workers and population of the region, afforestation and green belt development.

As the Holistic Development consist of four major projects including Port (ICTT), Airport, Power Plant and Township, Specific environment management plan for each of the project are mentioned in the subsequent sections for construction phase and operational phase.

1.4 Environmental Management Plan for ICTT

Environmental Management Plan for ICTT is given below

1.4.1 Management Plan for Construction Phase

The impacts of construction activities would be temporary and will reduce gradually with the completion of the construction activities. Various mitigation measures proposed to be implemented during construction phase are described in **Table-1.1.**

1.4.2 Management Plan for Operation Phase

The impacts of operation phase will be long term in nature. **Table-1.2** describes various mitigation measures, being implemented during operation phase.

Table-1.1: Environment Management Measures – ICTT Project (Construction phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	The proposed project facilities including infrastructures like Container Storage, Internal Roads, Port & Utility Buildings, parking etc. will be developed on the landside. This will impact part of the existing forest land. The development likely to impact the existing landscape and topsoil.	Compensatory afforestation is proposed as per the Forest Act. The planning will be in accordance with landscape planning concepts to minimise major landscape changes. the topsoil will be stored separately and utilized for landscaping.	UT Administration Project SPV + Contractor	273900 1500	This cost includes cost of total CA for 130.75sqkm area. One time cost (100 lacs/ha for 15ha)
2	**Reclamation and breakwaters**	The back-up area of 3.8 ha will have to be developed for dumping of dredged reclamation material.	The dredge material will be covered by gravel before hard standing. Suitable impervious liners such as LDPE will be	Project SPV	1000	This is one-time cost and will be included in the Projects

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			provided at the dumping area. The TSS is likely to settle down within a short period; thus, no significant of impact is expected on the benthic flora & fauna.			cost
3	**Ecology**	Turtle nesting sites are observed on the Western flank of Galathea Bay.	As per ZSI and WII study, the leather back turtles have less fidelity to the nesting sites. Currently no development has been planned at the western flank of the Galathea Bay which is the reported site for turtle nesting. Protection, monitoring and documentation of leatherback turtles by institutes like ZSI/ WII shall be undertaken during construction Phase	SPV	10000	Cost includes radio tagging of turtles, megapode monitoring and crocodile and other endanger species

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			UT administration has notified a Wildlife Sanctuary for Leatherback turtles at Little Nicobar Island. Conservation / Management plan will be prepared for Biodiversity of Great Nicobar Island. During the breading seasons construction activities on the offshore to be halted to the possible extend. It will be mandatory for the construction contractor to sstrictly adhere to the dredging protocol as prepared by IUCN experts and Species Survival Commission's Marine Turtle Specialist Group and revision, scrutiny, and follow-up of the processing,			

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			time to time as per the expert opinion. Installation of deflectors to clear turtles from the path of the suctioning equipment. Continuation of Turtles and their eggs protection efforts against the poaching, predation, inundation, or erosion in their natural environment by protecting those in situ or safely relocating into a hatchery until they hatch, and releasing them into the sea Development of Quick Response Team (QRT) with the participation of local communities and experts during the nesting period to safeguard the turtles and eggs from natural as well as anthropogenic predators.			

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			Lighting during construction phase will be minimized through reduction, shielding, lowering and/or use of turtle friendly lights. Lighting guidelines will be enforced which will include use of down-facing fixtures and bulbs with wavelengths attuned to avoid the visual spectrum of the turtles. This control measure is necessary in order to reduce potential disorientation effects on female turtles when approaching beaches for nesting and on sea turtle hatchlings making their way seaward. These lighting control measures shall also apply for vessels used during dredging including dredgers and its support vessels			

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			Mandatory Daily patrols during the construction phase including night patrols along with the project site to reduce any impact on turtles nesting in the area and to ensure the safeguard and relocation of eggs for hatching. Establishment of Advisory Committee including experts of turtle biologist, marine ecosystem, benthic ecosystem, and physical oceanography, port engineer to ensure the safety and safeguard of turtles in the proposed project area. An expert from IUCN may be involved in the Committee			
		Impact of artificial lighting on turtles	Light pollution to be avoided as turtles are sensitive to			

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			lights. Sea turtles are less affected by red, yellow and low pressure sodium vapor lights. Wherever possible, sodium vapor lights should be used for lightings. It will be mandatory for contractors to adhere to IUCN recommendations for using low-pressure sodium vapor lamps or other light sources that exclude wavelengths less than 520 nm as these wavelengths are not visible to turtles. The recommended IUCN area lighting should use full 90° cutoff light fixtures. To minimize light spill to the sky, fixtures to be installed at around 15° below the horizontal plane. All lighting should be of minimum lamp wattage.			

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			There should be no use of fluorescent, mercury vapor, metal halide, or other broad-spectrum high-intensity discharge lamps. There should be no floodlighting, up-lighting, or other forms of directional lighting aimed above the horizon. Repositioning, shielding, redirecting, lowering, or recessing fixtures are some of the other available options for reducing illumination to the beach			
		Presence of Megapode nesting sites area under investigation.	A new Megapode sanctuary has been notified by the UT Administration at Menchal Island as per notification dated 21st April 2022. Translocation of Megapods may be necessary, the same could be undertaken under expert supervision and	UT Administration (Forest Department)	50	

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			guidance of forest department of UT Administration.			
		The coastal stretch of the port area has mangroves and associated species. The mangroves (12-20 ha) on the eastern flank may be affected due to port construction.	The extent of loss of mangroves will be compensated in GNI by re-densification of existing mangroves or planting of mangroves to non-forest area as per the principals of compensatory afforestation.	Project SPV (ICTT) & Forest Department of UT Administration	400	This is one time cost
			The coastal vegetation on the western side is to be densified with the same existing species to avoid erosion during high wave incidence and also to ensure that any future development at inland area of west coast have no impact on the turtle nesting site.	Project SPV (ICTT)	300	This is one time cost
4	**Coral Reefs**	As per the ZSI report, coral do not exist in the Galathea Bay area, however, on the eastern peninsula part (Outside	Translocation of corals: There is no impact on coral reefs due to the proposed project activities. However, if the coral colonies (if any)	SPV	4000	This is one-time cost for Coral translocation for

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
		the construction area) some corals were noticed. Dredging activities in the nearshore waters of the developmental projects during the construction phase may affect some corals patches	in the proposed areas are impacted due to proposed construction activities, it shall be translocated at suitable place after conducting detailed investigations on the type of corals getting impacted.			approximately 4 ha. This cost also includes cost for coral restoration for Airport Project
5	**Road construction**	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 any wildlife is encountered during construction of roads, it needs to be reported to the forest department for appropriate action of the relocation.	Contractor + SPV	10	Amount designated during the construction period
6	**Air Emission**	The sources of air pollutants from port construction include emissions from vehicles , ships" propulsion and auxiliary engines and boilers, mainly consisting	Use of good quality fuel and lubricants to be promoted. Moreover, low sulphur content diesel to be used as fuel for generator sets to control emission of SO2.	Project SPV + Contractor		this will be part of the contractor's obligation through agreement

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
		of Sulphur dioxide (SO2), nitrogen oxides (NOX), greenhouse gases (e.g. carbon dioxide [CO2] and carbon monoxide [CO]), fine particulate matter [PM], and volatile organic compounds [VOC]), followed by combustion source emissions from vehicles, generator, port equipment and land-based engines and boilers contributing similar pollutants. Volatile organic compounds (VOC) may also be emitted fuel storage and transfer.	Generators and machineries are to be serviced and maintained regularly to avoid generation of dust and other air pollutants. Transportation vehicles to be properly and timely maintained and serviced regularly to control the emission of air pollutants in order to maintain the emissions of PM, CO, NOx and SOx within the limits. All the vehicles engaged for construction should have valid pollution check certificate as per the motor vehicle act. Further, any regulations related to vehicle emission issued by local government should also be adhered to.			

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
		Dust suppression during construction	2 No. of APCE at crusher & conveying system 2 No. of Mobile water sprinklers including Mist canons	Contractor	90	This is one time cost and will be included in the project construction cost.
7	**Noise Pollution**	From operation of equipment including the dredger and associated tugs, piling equipment, tracked excavators, Lorries, dump trucks, and other earth-moving equipment, cranes, and generators / lighting equipment. Underwater noise may affect leatherback turtle nesting.	Noise mufflers, noise barriers, noise enclosures to be provided for noise generating equipment. Ship with low underwater noise shall be allowed during the breeding season of leatherback turtle. If necessary, the project authorities will issue directives to ensure	Project SPV	-	Cost is included in the equipment cost.

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			compliance to low under water noise norms. All contractors and subcontractors involved in the port construction phase should comply with the relevant international noise standards			
8	**Wastewater**	Galathea Bay water may be impacted due to non-point discharges of wastewater from the sewage generated from the construction colonies	Temporary sanitation facilities (septic tanks) will be provided for disposal of sewage generated by the work force till the centralized system in place.	Project SPV	4	cost included in the project construction cost
9	**Solid Waste**	The wastes from the labour colonies include human wastes, wastes from kitchens and other wastes like food packets, boxed from consumables etc. Plastic waste and plastic bottles	During the initial stages of construction, the municipal waste will be segregated and the organic portion will be treated through OWCs. It will be made mandatory for construction contractors to carry the solid waste which cannot be treated	Project SPV	10	1 OWC is proposed. This is one-time cost and including operational cost.

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			through OWC to the nearest waste disposal facility.			
			An Integrated Solid waste management system has been planned in GNI development for collection, transportation, treatment and disposal. The same will be used for waste generated from the port once the integrated waste management system is in place			
10	**Social**	Shompen habitation exist in the upstream of the Galathea river.	There will not be any disturbance to the existing tribes.	SPV	50	Two control points with two porta cabins and with 3 shifts total 6 person to be employed One time cost of porta cabin and operation cost for one
			Strict measures will be adopted to ensure that none of the labours ever trespasses the Shompen area.			
			Adequate number of control points will be established to monitor the movement of the labours during working and non-working hours			

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
			(24x7x365).			year

Table-1.2: Environment Management Measures – ICTT Project (Operation phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	Deleterious impact after construction with be remediated.	Plantation on the denuded area.	Project SPV	2000	This is one-time cost for and will be included in the project construction cost
			Landscaping within the port area			
			Clearing of any temporary shelters/ temporary storage established for construction			
			Clearance of construction wastes and scraps			
2	**Changes in Coastline/Shore line**	Change in Coastline / Shoreline	Training of the erosion area of the coastline, if any	Project SPV	5000	This is a one-time cost. Cost will be included in the project construction cost

3	**Ecology**	Impacts on turtle nesting sites	Protection, monitoring and documentation of leatherback turtles from the aforementioned areas will be undertaken through national institutes like WII and ZSI. Turtle protection programme including Collection of data on coastal environments, nest ecology and physiology, counting of eggs, safeguarding of eggs, incubation period monitoring, hatchling success, collection of biometric data from individuals, and record of non-reproductive events. Protection of turtles and their eggs against the poaching, predation, inundation, or erosion in their natural environment by protecting those in situ or safely relocating into a hatchery until they hatch,	Project SPV		Cost is included in project construction cost

			and releasing them into the sea. Establishment of a Long-Term continuous Monitoring Programme with satellite telemetry study should be made on the turtles to understand their migratory route and the selection of site and arrival to the same area or their relocation for nesting. Development of Quick Response Team (QRT) with the participation of local communities and experts during the nesting period to safeguard the turtles and eggs from natural as well as anthropogenic predators. Establishment of Advisory Committee including experts of turtle biologist, marine ecosystem, benthic ecosystem, and physical oceanography, port			

			engineer to ensure the safety and safeguard of turtles in the proposed project area. An expert from IUCN may be involved in the Committee. Development of single window system software for monitoring turtle nesting and hatchlings details where everyone can see and access the population status data on leatherback turtles for all the beaches identified. Outreach programs to create awareness among the local fishing communities, local people, students, and tourists about turtle conservation. Reduction of underwater noise by providing appropriate propels to the tuck boats, pilot boats and service boats and cargo ships			

			Lighting impact on Turtles	Light pollution to be avoided as turtles are sensitive to lights. Sea turtles are less affected by red, yellow and low-pressure sodium vapor lights. Wherever possible, sodium vapor lights should be used for lightings. repositioning, shielding, redirecting, lowering, or recessing fixtures are some of the available options for reducing illumination to the beach. Development of standard photomitigation plan to avoid photopollution. Implementation of IUCN recommendation using low-pressure sodium vapor lamps or other light sources that exclude wavelengths less than 520 nm as these wavelengths are not visible to turtles. The recommended IUCN		

			area lighting, for roadway, wharf, mast, or elevated structure lights will use full 90° cutoff light fixtures. To minimize light spill to the sky, fixtures will be installed at around 15° below the horizontal plane. All lighting will be of minimum lamp wattage. There should be no use of fluorescent, mercury vapor, metal halide, or other broad-spectrum high-intensity discharge lamps. There should be no floodlighting, up-lighting, or other forms of directional lighting aimed above the horizon			
		Oil spill contingency plan	Oil spill contingency plan for tier 1, Tier 2 & tier 3 is prepared with the responsibility matrix. Containment, collection and skimming of the oil will be used.		15000	The cost will be part of the contractor/ Operator agreement

4	***Air Emission***	The sources of air pollutants from port operation include emissions from ships" propulsion and auxiliary engines and boilers, vehicles, DG sets, port equipment and land-based engines and boilers contributing similar pollutants. Volatile organic compounds (VOC) may also be emitted fuel storage and transfer.	Use of good quality fuel and lubricants to be promoted. Moreover, low sulphur content diesel to be used as fuel for generator sets to control emission of SO2. Generators and machineries are to be serviced and maintained regularly to avoid generation of dust and other air pollutants. Transportation vehicles to be properly and timely maintained and serviced regularly to control the emission of air pollutants in order to maintain the emissions of PM, CO, NOx and SOx within the limits. All the vehicles engaged for construction should have valid pollution check certificate as per the motor vehicle act.	Project SPV		this will be an operational cost of project SPV

			Further, any regulations related to vehicle emission issued by local government should also be adhered to.			
5	**Solid Waste**	Waste generation at port site	An Integrated Solid waste management system has been planned in GNI development for collection, transportation, treatment and disposal. The same will be used for waste generated from the port.	Project SPV		Cost is included in township project cost. The waste which cannot be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available. Details and estimated cost is included in EMP of township.
6	**Social**	Shompen habitation exists in the upstream of the Galathea river	There will not be any disturbance to the existing tribes. Strict measures will be adopted to ensure that none of the worker ever trespasses the Shompen area in line with the Shompen policy.	SPV		Two check points are proposed, and the cost included in construction EMP cost.

			Adequate number of control points will be established to monitor the movement of the worker during working and non-working hours (24x7x365). Full operation of infrastructure facility line Health, education, community and basis services will be available within walking distance.			
7	**Fire and explosion hazards**	Impact on Structure	On-site and off-site emergency planning, which should include, at a minimum, the preparation and implementation of an Emergency Management Plan and a Communication Plan prepared with the participation of local authorities and potentially affected communities	Project SPV	30	This is a one-time cost for preparation of emergency management plan. The cost of the equipment's for emergency management system are included in township EMP. All the buildings and development will be as per Indian safety standards & codes and cost

						will be included in project cost

1.5 Environmental Management Plan for Airport

Environmental Management Plan for Airport is given below

1.5.1 Management Plan for Construction Phase

The impacts of construction activities would be temporary and will reduce gradually with the completion of the construction activities. Various mitigation measures proposed to be implemented during construction phase are described in **Table-10.3.**

1.5.2 Management Plan for Operation Phase

The impacts of operation phase will be long term in nature. **Table-1.4** describes various mitigation measures, being implemented during operation phase.

Table-1.3: Environment Management Measures – Airport Project (Construction phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	The proposed area is sparsely populated and there are only two villages in the area of proposed airport where form families may be displaced	R&R measure as per RFCTLAR&R (Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement), Act 2013.	SPV		Cost will be provided by UT Administration after SIA as per RFCTLAR&R Act 2013
2	**Reclamation**	The present site needs to reclaim land approximately 71 Ha in order to establish an operational airport.	Coral restoration, if corals are affected during the reclamation activity.	SPV		Coral restoration cost is one-time cost. the cost of coral restoration is considered in the ICTT – Construction EMP.
3	**Air Environment**	Construction material storage also contributes to the degradation of the air quality especially during the high wind conditions.	Care will be taken to ensure that dust generated during construction is suppressed with water sprays	Project SPV	50	Cost included in the project construction cost for construction period.

		Dust suppression during construction	2 No. of APCE at crusher & conveying system 2 No. of Mobile water sprinklers including Mist canons	Contractor	90	Cost will be included in the project construction cost and for construction period.
4	**Water quality /Wastewater Generation**	Water quality deterioration during construction phase is possible along the beaches of Shastri Nagar and Gandhinagar due to sewage generated from the construction workforce stationed at the site	Temporary sanitation facilities (septic tanks) will be set-up for disposal of sewage generated by the work force	Project SPV	4	This is a one-time cost. Cost will be included in the project construction
5	**Noise Environment**	Noise generation from operating equipment	Provision of silencers, and mufflers at the exit of noise source on the machineries like generators, pumps. vehicles etc. Ear plugs for the workers.	Project SPV	10	silencers, and mufflers are part of the equipment and no sperate cost is being apportioned. Cost of ear plugs
6	**Ecology**	Few crocodiles have been reported from the creek area that would be reclaimed . While	Great Nicobar has a wider habitat for saltwater crocodiles.	SPV+Ut Adminstration	20	

		reclaiming the creek area, the crocodiles will have to be relocated	Relocation of crocodiles, if found, during construction shall be handled as per provisions of wildlife act through Department of Forest and through the "An Action plan of mitigation of human-crocodile conflicts in the Andaman and Nicobar Islands" prepared by WII			
7	**Solid Waste**	Waste from labour colonies and construction site	Organic fraction to be treat through OWC and recyclable fraction will be sold to authorised handlers	Project SPV	10	1 OWC is proposed, this is one-time cost

Table-1.4: Environment Management Measures – Airport Project (Operation phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	The area has high rainfall and the soil is generally fertile. Under these circumstances there will be a tendency for growth of luxurious vegetation. Trees, bushes etc which may attract birds and might compromise flight safety	No fruiting trees, which attract birds, should be planted within 1 km from the airport boundary. No trees within the operational area of the airport Suitable bird deterrent system (like Wailer-electronic bird deterrent, Gas Exploder) will be adopted to scare off the birds for the safety of the Birds, Aircraft and the passengers.	Project SPV	3	6 Wailer-electronic bird deterrent has been considered.

2	**Air Emission**	Major pollutants envisaged from the proposed project will be from aircraft exhaust, ground service equipment, vehicular traffic (airside and landside) and from DG sets.	Strict adherence to DGCA/ICAO prescribed environmental guidelines & circulars on airport operations. Vehicles and service equipment must be maintained at prescribed standards. All the vehicles engaged for the airport should have valid pollution check certificate as per the motor vehicle act. Further, any regulations related to vehicle emission issued by local government should also be adhered to.	Project SPV	-	Cost is part of the Operation cost of the Airport
			Shut down engines during idling and taxing.			
			Towing the aircraft up to runway by specialized ground vehicles			

			Low sulphur fuel to be used for DG sets Low NoX system for DG sets			
3	**Water & Wastewater**	The wastewater generation mainly consists of sanitary waste, sewage from airport terminal, flight kitchen etc.	The wastewater generated from the Airport area will be sent to the integrated wastewater treatment facility. There is no discharge of any wastewater outside the airport premises.	SPV + Project SPV		Cost included in the Township EMP cost
4	**Noise Pollution**	Aircraft movements will be the major source of noise pollution from the proposed airport project	Strict adherence to DGCA/ICAO prescribed environmental guidelines & circulars on airport operations. Restricted usage of ground engine run-ups to reduce noise Ear plugs will be provided for the Ground staff.	Project SPV	10	

			Use of proper personal protective equipment to all ground workers Towing the aircraft up to runway by specialized ground vehicles			
5	**Solid Waste**	Solid waste generation from aircrafts.	No uncovered waste in the vicinity of 5 km. An Integrated Solid waste management system has been planned in GNI development for collection, transportation, treatment and disposal. The same will be used for waste generated from the Airport.	SPV + Project SPV		Cost included in the Township EMP cost. The waste which cannot be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available. Details and estimated cost is included in EMP of township.

6	**Fire and explosion hazards**	Impact on Structure	On-site and off-site emergency planning, which should include, at a minimum, the preparation and implementation of an Emergency Management Plan and a Communication Plan prepared with the participation of local authorities and potentially affected communities	Project SPV	30	This is a one-time cost for preparation of emergency management plan. The cost of the equipment's for emergency management system are included in township EMP. All the buildings and development will be as per Indian safety standards & codes and cost will be included in project cost.

1.6 Environmental Management Plan for Power Plant

Environmental Management Plan for Power Plant is given below

1.6.1 Management Plan for Construction Phase

The impacts of construction activities would be temporary and will reduce gradually with the completion of the construction activities. Various mitigation measures proposed to be implemented during construction phase are described in **Table-1.5.**

1.6.2 Management Plan for Operation Phase

The impacts of operation phase will be long term in nature. **Table-1.6** describes various mitigation measures, being implemented during operation phase.

Table-1.5: Environment Management Measures – Power Plant (Construction phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	The proposed project site is located near the mouth of the Galathea river and 39 hectares of forest land which will be diverted for non-forest purposes	SPV proposed compensatory afforestation	UT Administration		Cost has been factored in the ICTT Construction EMP.
2	**Soil Environment**	Due to loss of top soil in the construction areas and contamination of the soils of surrounding area due to construction materials such as cement, sand etc	Appropriate soil conservation measures associated with improved construction techniques would minimize such impacts. The top soil should be collected separately and stored and used for landscaping.	Project SPV	30	Cost is included in the project construction cost

3	**Air Quality**	Main sources of emission during the construction period are the movement of equipment at site and dust emission during the excavation, levelling, grading, earthwork and foundation works	All the vehicles engaged for construction should have valid pollution check certificate as per the motor vehicle act. Further, any regulations related to vehicle emission issued by local government should also be adhered to. Proper maintenance of vehicles and construction equipment	Project SPV		cost to be included in the project construction cost
		Dust suppression during construction	1 No. of APCE at crusher & conveying system, 1 No. of Mobile water sprinklers including Mist canons	Contractor	45	Cost will be included in the project construction cost.
4	**Wastewater**	River water may be impacted due to non-point discharges of solids from soil loss and sewage generated from the construction work force stationed at the site	Temporary sanitation facilities (septic tanks) will be set-up for disposal of sewage generated by the work force No water will be discharged into the Galathea River	Project SPV	10	Cost included in the project construction cost
5	**Noise Levels**	Emission from Vehicular traffic, construction equipment like dozers, scrapers, concrete mixers, cranes, generators, pumps, compressors,	Proper maintenance of vehicles and construction equipment Use of ear plugs / mufflers to all construction workers	Project SPV	2	Cost considered for ear plugs and rest is included in the equipment

		rock drills, pneumatic tools, saws, vibrators etc	exposed to noise			cost
6	**Solid Waste**	Waste from labour colonies and construction site	Organic fraction to be treat through OWC and recyclable fraction will be sold to authorised handlers	Project SPV	10	1 OWC is proposed, this is one-time cost
7	**Terrestrial Ecology**	The plant may have an impact on dense forest and riverine grass	Trees will be cut only from the area where construction enabling works is required.	Project SPV	-	Compensatory afforestation cost has been factored in the ICTT Construction EMP.
8	**Aquatic Ecology**	The power plant is located near to the Galathea river mouth. 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 productivity.	No untreated effluent from the construction site will be dispose outside the project boundary without treatment. A temporary treatment facility will be created during the construction.	Project SPV	100	This in one-time cost and will be included in the project construction cost
9	**Socio-Economics**	The power project site is the nearest site to the Shompen habitat compared to any other project appurtenant, therefore there is a	Strict measures will be adopted to ensure that none of the labours ever trespasses the Shompen area.	SPV	100	Four control points with four porta cabins

		possibility of trespassing of construction works into tribal areas.	Adequate number of control points will be established to monitor the movement of the labours during working and non-working hours (24x7x365).			and with 3 shift, total 12 person to be employed
			The forest and tribal area should be guarded and even barricaded with barbwires if necessary, to ensure that there is no interaction with the tribal during the construction phase.			
			Full operation of infrastructure facility line Health, education, community and basis services will be available within walking distance.			

Table-1.6: Environment Management Measures – Power Plant (Operation phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	Deleterious impact after construction will be remediated.	Plantation on the denuded area. Landscaping within the port area Clearing of any temporary shelters/ temporary storage established for construction Clearance of construction wastes and scrap equipment	Project SPV	15	This is one-time cost and will be included in the Project cost. The waste which cannot be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available. Details and estimated cost are included in EMP of township.
2	**Air Emissions**	The fugitive emission is envisaged from the power plant chimney, DG sets and vehicle movement within the project	The pollution control equipment like Low-Nox burner, etc. will be an integral part of the power	Project SPV		This is part of the construction cost.

		site	project and the cost will be included in the project cost. The emission from power plant chimney and DG sets will not exceed the prescribed ambient air quality Use of low Sulphur fuel for power generation through DG sets. Proper maintenance of vehicles and operation equipment			
3	**Ecology**	Deleterious impact after construction will be remediated. Many of the loss of ecosystems during the construction period will be restored during the operation phase. All efforts will be made to re-densify the vegetation if any of the surrounding area is affected during the construction stage.	Maintain a thick green buffer between western flank of the Galathea beach between turtle nests and the power plant Through re-densification Re-densification of the vegetation if require in consultation with forest department. Species for re-densification will have to be chosen judiciously in consultation with the forest department so as to maintain the biodiversity of the forest	Project SPV Project SPV + Forest Department of UT Administration	25	This is one-time Cost and to be included in the Project cost

4	**Water & Wastewater**	Wastewater will be generated from DM regeneration plant, waste from service water system, sanitary waste etc which can pollute the Galathea river	No wastewater will be discharged out of the plant premises without treatment. The project has air-cooled system and therefore there is no cooling tower required.	SPV + Project SPV		To be included in the Project cost. The design of power plant includes treatment facility.
5	**Solid Waste**	Sewage waste generation at power plant site which might pollute the adjacent water bodies	An Integrated Solid waste management system has been planned in GNI development for collection, transportation, treatment and disposal. The same will be used for waste generated from the power plant.	SPV + Project SPV		Cost is included in the Township cost. The waste which cannot be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available. Details and estimated cost are included in EMP of township.
6	**Noise**	Operation of generators and gas engines inside the power house	The adoption of modern building design and the use of sound-absorbing materials will minimize noise and vibration from the	Project SPV	10	For Ear plugs etc. Rest of the cost is part of the project cost.

			powerhouse Ear plugs Mufflers at the sound generating sites			
7	**Fire and explosion hazards**	Impact on Structure	On-site and off-site emergency planning, which should include, at a minimum, the preparation and implementation of an Emergency Management Plan and a Communication Plan prepared with the participation of local authorities and potentially affected communities	Project SPV	30	The cost considered for the emergency Management Plan preparation. All the buildings and development will be as per Indian safety standards and cost will be included under project cost

1.7 Environmental Management Plan for Township

Environmental Management Plan for Township is given below

1.7.1 Management Plan for Construction Phase

The impacts of construction activities would be temporary and will reduce gradually with the completion of the construction activities. Various mitigation measures proposed to be implemented during construction phase are described in **Table-1.7.**

1.7.2 Management Plan for Operation Phase

The impacts of operation phase will be long term in nature. **Table-1.8** describes various mitigation measures, being implemented during operation phase.

Table-1.7: Environment Management Measures – Township (Construction phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Land Environment**	Construction involves cut and fill earthworks. The cut and fill works will normally change the natural topography of the land which will result in a disruption of the natural drainage of the land and the surrounding vicinity This also impact the top soil. Several landslides were noticed at ongoing road construction sites near Galethea River.	The topsoil will be extracted, stored and shall be reused for landscape development.	Project SPV		Cost Included in the project cost
			Citywide stormwater drain has been planned to cater the storm drainage			Cost Included in the project cost
			Slope stabilisation measures have been proposed wherever there is a possibility of landslides.	Project SPV & Construction Contractor/s	200	Cost included for the slope protection measures. This cost will be included in the project cost.
		A small part of the proposed road falls under the plot having private ownership where part of the land to be acquired and form families may be displaced	R&R measure as per RFCTLAR&R (Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement), Act 2013.	SPV		Cost will be provided by UT Administration after SIA as per RFCTLAR&R Act 2013

2	**Air Emissions**	Dusts emission during construction from earth moving and other vehicle movements within the site	All the vehicles engaged for construction should have valid pollution check certificate as per the motor vehicle act. Further, any regulations related to vehicle emission issued by local government should also be adhered to. Sprinkling of water through foggy nozzle to suppress the dust. 2 No. of APCE at crusher & conveying system, 2 No. of Mobile water sprinklers including Mist canons	Project SPV	90	Cost will be included in the project construction cost
3	**Water & Wastewater generation**	In the initial stages, due to non-point discharges of sewage generated at the project site by the construction workforce After the infrastructure for Integrated wastewater treatment is ready, all the waste will be connected with the integrated facility	At the construction site, adequate number of toilets with hygienic environment will be provided with Septic tanks	Project SPV	28	Cost will be included in the project construction cost. Estimated 7 No. of septic tanks.
4	**Noise Levels**	Due to operation of heavy equipment such as drills, pneumatic tools, concrete mixers, cranes, generators, pumps, compressors, vibrators,	Effective isolation / barricading to requisite heights shall be provided to limit transmission of noise to adjacent habitat areas	Project SPV	100	Cost included in the project construction cost

		etc and increased frequency of vehicular traffic	and within permitted decibels			
5	**Solid waste generation**	Domestic waste from labour colonies Construction and demolition waste	all the solid waste generated from the construction colonies, the organic fraction will be treated through the 7 OWCs and recyclable will be sold to the authorised handlers Construction and demolition waste should be used for making pavement tiles etc, which can be used in the construction.	Project SPV	700	7 OWCs considered. This is one-time cost
6	**Natural Hazard vulnerability and Disaster Management system**	The township development in High probability seismic area	Development of an App for prediction of Tsunami linked to Indian tsunami early warning system (ITEWS). This app is mandatory for everybody entering the GNI development area. As a mitigation measure, it its strongly suggested that Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Buildings	Project SPV	1070	70 lacs is a one-time cost for app building 1000 lacs for two earthquake resistant tsunami shelters of 1500 sqm of built-up each.

			(IS 13827), Bureau of Indian Standards (IS 1893, 2002) and Indian Standard Criteria for Earthquake Resistant Design of Structures (IS 4326, 1993) along with NBC guidelines shall be followed while designing the various building structures as part of the Holistic development of GNI. Tsunami Shelters have been proposed. The number of Tsunami shelters will depend of the population during the construction phase.			
7	**Command & Control centre**	-	All the environmental data like Met station, Air quality, Water quality, SWM, Noise etc. will be transmitted automatically to a command and control centre	Project SPV	10000	The cost for the Command and control centre will be considered in the total development cost

Table-1.8: Environment Management Measures – Township (Operation phase)

Sr. No	Attribute	Potential Impact	Mitigation Measure	Responsibility	Broad cost in INR Lacs/ Yr	Remarks
1	**Air Emissions**	Emissions will be from proposed DG sets and incinerators	The proposed township will be excellently landscaped with proper terracing and benching and will be provided with pucca roads The incinerator will strictly follow the regulatory emission guidelines. The equipment will be fitted with automatic emission monitoring system	Project SPV		Monitoring cost has been included in the Chapter No. 6. Incinerator cost is included in waste management cost
2	**Water & Wastewater**	The domestic wastewater generated from township	100% wastewater generated (from ICTT, Power Plant, Airport & Township) will be collected and treated in three sewage treatment plants and the treated water will be reused for flushing, watering and landscaping purposes in the township.	Project SPV	35000	Cost is included in the township project cost

3	**Solid Waste**	Integrated solid waste management	Will be routed to Integrated waste management facility for treatment and disposal. Waste from ICTT, Power Plant, Airport & Township will be treated in the integrated solid waste management facility which includes bio methanation plant and an Incinerator	Project SPV	15000	Cost is included in the township project cost
		Waste which can't be treated or reused.	The waste which can't be treated or reused will be transported to the Port Blair or Mainland where scrapping facility is available.	Project SPV	5000	A separate contract will be issued for clearing and transportation

4	**Socio-Economics**	Great Nicobar Island is inhabited by aboriginal mongoloid Shompen. The Shompen are hunter-gatherers and depend on the forest and marine resources for sustenance	Ten control points to be established on 24X7X365 basis to ensure that no one trespassed the Trible area.	SPV	250	Ten control points with 10 porta cabins and with 3 shift, total 30 person to be employed
			Full operation of infrastructure facility line Health, education, community and basis services will be available within walking distance.			
5	**Fire and explosion hazards**	Impact on Structure	On-site and off-site emergency planning, which should include, at a minimum, the preparation and implementation of an Emergency Management Plan and a Communication Plan prepared with the participation of local	Project SPV	480	The cost considered for the emergency Management Plan preparation. All the buildings and

			authorities and potentially affected communities			development will be as per Indian safety standards and cost will be included under each / specific projects Additional cost of 450 lacs for 9 fire tenders has been considered.
6	**Ecology**	Long tailed Macaques are exist in a nd around the project sites.	In case of severe monkey menace, the forest department should be informed to take appropriate steps	Project SPV	2	

Table-1.9: Cost summary table for EMP for all projects - Construction

EMP cost during Construction Phase

All cost in INR Lacs

ICTT				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment/Soil Erosion	Project SPV	275400	One Time
2	Reclamation & Breakwaters	Project SPV	1000	One Time
3	Ecology - Turtle	SPV	10000	Per Year
	Ecology -Megapode	Project SPV (ICTT) & UT Administration	50	One Time
	Ecology - Mangroves	Project SPV (ICTT)	400	One Time
	Ecology – Coastal vagitation	Project SPV (ICTT)	300	One time
4	Coral Reefs	SPV	4000	One Time
5	Lighting	Project SPV		Part of Project Cost
6	Road construction	Contractor + SPV	10	Per Year
7	Air emission	Contractor	90	One Time
8	Noise Pollution	Project SPV		Included in Monitoring
9	Wastewater	Project SPV	4	Per Year
10	Solid Waste	Project SPV	10	One Time
11	Social	SPV	50	Per Year
Total Capital Expenditure on EMP for ICTT (Construction Period 8 Years)			**291764**	

Airport				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	SPV		To be finalised and borne by UT
2	Reclamation	SPV		One Time
3	Air Environment	Project SPV	140	Per Year
4	Water quality /Wastewater Generation	Project SPV	4	One Time
5	Noise Environment	Project SPV	10	Per Year
6	Ecology	SPV	20	Per Year
7	Solid Waste	Project SPV	10	One Time
Total Capital Expenditure on EMP for Airport (Construction Period 4 Years)			**184**	

Power Plant				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	UT Administration		To be finalised by UT
2	Soil Environment	Project SPV	30	Per Year
3	Air Quality	Project SPV		Included in monitoring
		Contractor	45	Per Year
4	Water Quality	Project SPV	10	Per Year
5	Noise Levels	Project SPV	2	Per Year
6	Solid Waste	Project SPV	10	One Time
7	Terrestrial Ecology	Project SPV	-	Per Year
8	Aquatic Ecology	Project SPV	100	One Time
9	Socio-Economics	SPV	100	Per Year
Total Capital Expenditure on EMP for Power Plant (Construction Period 7 years)			**297**	

Township				
SN	**Attribute**	**Responsibility**	**Broad cost**	**Remarks**
1	Land Environment	Project SPV		To be finalised and borne by UT
		Project SPV & Construction Contractor/s	200	Per Year
2	Air Emissions	Project SPV		Per Year
		Contractor	90	Per Year
3	Water & Wastewater generation	Project SPV	28	Per Year
4	Noise Levels	Project SPV	100	Per Year
5	Solid waste generation	Project SPV	700	One Time
6	Natural Hazard vulnerability and Disaster Management system	Project SPV	1070	One Time
7	Command & Control centre	Project SPV	10000	Per Year
Total Capital Expenditure on EMP for Township (Construction Period 12 Years)			**12188**	

Total Capital Expenditure on EMP		**304433**	

Table-1.10: Cost summary table for EMP for all projects - Operation

EMP cost during Operations Phase

All cost in INR Lacs

ICTT			
SN	**Attribute**	**Responsibility**	**Broad cost**
1	Land Environment	Project SPV	2000
2	Changes in Coastline/Shore line	Project SPV	5000
3	Ecology	Project SPV	15000
4	Air Emission	Project SPV	
5	Solid Waste	Project SPV	
6	Social	SPV	
7	Fire and explosion hazards	Project SPV	30
EMP Cost for ICTT during Operations Phase			**22030**

Airport			
SN	**Attribute**	**Responsibility**	**Broad cost**
1	Land Environment	Project SPV	3
2	Air Emission	Project SPV	-
3	Water & Wastewater	SPV + Project SPV	
4	Noise Pollution	Project SPV	10
5	Solid Waste	SPV + Project SPV	
6	Fire and explosion hazards	Project SPV	30
EMP Cost for Airport during Operations Phase			**43**

Power Plant			
SN	**Attribute**	**Responsibility**	**Broad cost**
1	Land Environment	Project SPV	15
2	Air Emissions	Project SPV	
3	Ecology	Project SPV	25
4	Water & Wastewater	SPV + Project SPV	
5	Solid Waste	SPV + Project SPV	
6	Noise	Project SPV	10
7	Fire and explosion hazards	Project SPV	30
EMP Cost for Airport during Operations Phase			**80**

Township			
SN	**Attribute**	**Responsibility**	**Broad cost**
1	Land Environment	Project SPV & Construction Contractor/s	
2	Air Emissions	Project SPV	
3	Water & Wastewater generation	Project SPV	35000
4	Noise Levels	Project SPV	
5	Solid waste generation	Project SPV	20000
6	Natural Hazard vulnerability and Disaster Management system	Project SPV	480
7	Command & Control centre	Project SPV	100
8	Socio Economic	Project SPV	250
9	Ecology	Project SPV	2
EMP Cost for Airport during Operations Phase			**55732**

Total One Time EMP Cost during Operations Phase	**77885**

Enclosure II-a

Wildlife Sanctuaries Notifications

अण्डमान तथा निकोबार राजपत्र

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ANDAMAN AND NICOBAR ADMINISTRATION

(पर्यावरण एवं वन विभाग)

(DEPARTMENT OF ENVIRONMENT & FORESTS)

NOTIFICATION

Port Blair, dated the 21st April, 2022

No. F.No CWLW/WL/245/217 -WHEREAS, the Andaman & Nicobar Administration considers that the area, the situation and limits of which are defined in the Schedule below is of great ecological, faunal, floral, geomorphological, natural and zoological significance;

AND WHEREAS, it appears to the Andaman and Nicobar Administration that the said area is needed to be constituted as a Wildlife Sanctuary for the purpose of protecting, propagating and developing wildlife therein especially the Leatherback Turtle, its habitat and environment;

NOW THEREFORE, in exercise of the powers conferred by sub-section (1) of section 18 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 declares his intention to constitute the said area, the situation and limits of which are specified in the schedule below, as Wildlife Sanctuary to be known as "Leatherback Turtle Sanctuary".

SCHEDULE

Leatherback Turtle Sanctuary

Total Area: 13.75 Sq. Km. (Approximately) at Little Nicobar Islands in the A & N Islands including 6.67 Sq.km of water area within the baseline system.

Description of boundary:

The boundary of theLeatherback Turtle Sanctuary will be as follows:

North: Starting from a point **'A'** at 7° 20' 15.02" N, 93° 37' 59.26" E, the boundary runs eastwards along an imaginary line till it meets point **'B'** at 7° 20' 15.00" N, 93° 38' 37.57" E.

East: From the point **'B'** the boundary runs Southwards along an imaginary line passing through point **'C'** at 7° 19' 53.12" N, 93° 38' 37.54" E, point **'D'** at 7° 18' 32.98" N, 93° 38' 22.81" E, point **'E'** at 7° 15' 52.74" N, 93° 38' 22.56" E, and meets point **'F'** at 7° 14' 55.22" N, 93° 38' 46.74" E.

South: From the point **'F'**, the boundary moves southwest along an imaginary line till it touches the low tide line at point **'G'** at 7° 14' 48.52" N, 93° 38' 38.60" E.

West: From the point **'G'** the boundary runs northwest along an imaginary line in the Bay of Bengal till it touches the coastline at point **'H'** at 7° 15' 49.61" N, 93° 37' 47.17" E, thence further the boundary runs along the coastline till it meets point **'I'** at 7° 16' 1.41" N, 93° 37' 44.46" E. From the point **'I'** the boundary moves northwards along an imaginary line and touches low tide line at point **'J'** at 7° 18' 31.9" N, 93° 37' 20.70" E, then the boundary follows the low tide line and touches point **'K'** at 7° 18' 34.63" N, 93° 37' 20.89" E. From point **'K'** the boundary further moves northeast and culminates at point **'A'**.

Admiral D.K. Joshi, PVSM, AVSM, YSM, NM, VSM (Retd.)
Lieutenant Governor,
Andaman & Nicobar Islands.

By order and in the name of the Lieutenant Governor,
Andaman & Nicobar Islands.

(Dr. V. Candavelou)
Principal Secretary (Environment & Forests)

अण्डमान तथा निकोबार राजपत्र

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ANDAMAN AND NICOBAR ADMINISTRATION

(पर्यावरण एवं वन विभाग)

(DEPARTMENT OF ENVIRONMENT & FORESTS)

NOTIFICATION

Port Blair, dated the 21st April, 2022

No. F.No CWLW/WL/243/218 - WHEREAS, the Andaman & Nicobar Administration considers that the uninhabited Island, the situation and limits of which are defined in the Schedule below is of great ecological, faunal, floral, geomorphological, natural and zoological significance;

AND WHEREAS, it appears to the Andaman and Nicobar Administration that the said uninhabited Island is needed to be constituted as a Wildlife Sanctuary for the purpose of protecting, propagating and developing wildlife therein especially the Megapode, its habitat and environment;

NOW THEREFORE, in exercise of the powers conferred by sub-section (1) of section 18 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 declares his intention to constitute the said uninhabited Island, the situation and limits of which are specified in the schedule below, as Wildlife Sanctuary to be known as "Megapode Sanctuary".

SCHEDULE

Megapode Sanctuary:

The entire Island of Menchal Island covering an area of 1.29 Sq. Km. situated in between 93°45'44.5" and 93°46'19" East Longitude and 7°24'11"N and 7°23'38" North Latitude in the Bay of Bengal.

Admiral D.K. Joshi, PVSM, AVSM, YSM, NM, VSM (Retd.)
Lieutenant Governor,
Andaman & Nicobar Islands.

By order and in the name of the Lieutenant Governor,
Andaman & Nicobar Islands.

(Dr. V. Candavelou)
Principal Secretary (Environment & Forests)

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ANDAMAN AND NICOBAR ADMINISTRATION

(पर्यावरण एवं वन विभाग)

(DEPARTMENT OF ENVIRONMENT & FORESTS)

NOTIFICATION

Port Blair, dated the 21st April, 2022

No. F.No CWLW/WL243/219 -WHEREAS, the Andaman & Nicobar Administration considers that the uninhabited Island, the situation and limits of which are defined in the Schedule below is of great ecological, faunal, floral, geomorphological, natural and zoological significance;

AND WHEREAS, it appears to the Andaman and Nicobar Administration that the said uninhabited Island is needed to be constituted as a Wildlife Sanctuary for the purpose of protecting, propagating and developing wildlife (terrestrial and marine) therein especially the Corals, its habitat and environment;

NOW THEREFORE, in exercise of the powers conferred by sub-section (1) of section 18 read with clause (28) of Section 2 of the Wildlife (Protection) Act, 1972 (Act 53 of 1972), the Lieutenant Governor (Administrator), Andaman and Nicobar Islands hereby declares his intention to constitute the said uninhabited Island, the situation and limits of which are specified in the schedule below, as Wildlife Sanctuary to be known as "Coral Sanctuary"

SCHEDULE

Coral Sanctuary

The entire Island of Mercie Island including the surrounding marine area, covering an extent of 2.73 Sq. Km. situated in between Latitudes 7° 30' 32.20" N to 7° 31' 36.0" N and Longitudes 93° 32' 18.50" E and 93° 33' 4.00" E.

Admiral D.K. Joshi, PVSM, AVSM, YSM, NM, VSM (Retd.)
Lieutenant Governor,
Andaman & Nicobar Islands.

By order and in the name of the Lieutenant Governor,
Andaman & Nicobar Islands,

(Dr. V. Candavelou)
Principal Secretary (Environment & Forests)

Enclosure II-b

Minutes of second steering committee (UT Administration)

MINUTES OF THE 2ND STEERING COMMITTEE MEETING OF THE STATE COMPENSATORY AFFORESTATION FUND MANAGEMENT AND PLANNING AUTHORITY (STATE AUTHORITY) HELD ON 02.02.2022 UNDER THE CHAIRMANSHIP OF CHIEF SECRETARY, A&N ADMINISTRATION

The Steering Committee under the chairmanship of the Chief Secretary, A& N Islands has deliberated the Annual Plan of Operation (APO) for the year 2022-23 under CAMPA during the meeting held on 2.02.2022 at Conference Hall, Secretariat. The part I detailing with the brief history and past performance of the activities related to State CAMPA and the forestry sector of the Andaman & Nicobar Islands are given in Table I to 5. The Part II deals with the activities to be undertaken under Compensatory Afforestation (CA) consist of new CA plantations, Penal CA and maintenance of CA plantations and are included in Table 6 and Table 7. Part III includes activities to be undertaken from Net Present Value (NPV) presented in Table 8 and the activities proposed to be undertaken under interest component mentioned in Table 9. Part IV is about the measurable output of all permissible activities proposed to be undertaken during 2022-23 and is outlined in Table 10. All the tables mentioned above have been placed at Annexure I to X.

The Steering Committee approved an amount of Rs. 149.69 lakhs under the CA component towards creation of new CA plantation in 56.16 ha and maintenance of 66.83 ha of old CA plantations.

Under the NPV component, the Steering Committee approved activities to raise seedling/planting stock of 26 lakhs fruit bearing species in Andaman and Nicobar Islands through the forest nurseries of all divisions to improve the food and wood availability in the islands besides increasing the green cover outside the notified forest areas, and also planting of 6 lakhs fruit bearing seedlings proposed at an estimated cost of Rs. 532 lakhs. Conservation of wildlife and management of Protected Area has been given a priority and the activities have been proposed in Great Nicobar Islands and others which have been approved by the Steering Committee for an amount of Rs. 379 lakhs which include consolidation of Wildlife Sanctuary areas, strengthening the protection measures in WLS, Habitat improvement and management, research and monitoring, turtle management programme, education and outreach activities. The Steering Committee approved the activities for an amount of Rs. 385 lakhs to improve and strengthen the communication network for protection of coastal forest areas viz. creation of inspection paths in inaccessible forest areas from North Bay to Shoal Bay-19 in South Andaman and Badakhadi to Jahaji Beach in Rutland Island and establishment of protection camps and inspection huts in remote areas South. Middle and North Andaman Islands. Further, to enhance the forest / wildlife

protection efforts the Steering Committee approved field vehicles/machineries/ equipments for frontline staff for an amount of Rs. 100 lakhs.

Under the interest component, the Steering Committee approved an amount of Rs. 28 lakhs towards state CAMPA office expenses and other charges including engaging consultants on contractual basis.

The Annual Plan of Operation under CAMPA for the year 2022-23 is approved by the Steering Committee for an amount of Rs. 1588.69 lakhs. The abstract of the APO 2022-23 is as below.

S.No	Division wise Activities proposed to be undertaken	Physical target	Financial target
CA COMPONENT			
I	Compensatory Afforestation		
A	Creation of New Plantation	56.16 ha	115.35
B	Maintenance of plantations	66.83 ha	34.34
	Total I (A+B)	**122.99 ha**	**149.69**
NPV COMPONENT			
II	Raising of Fruit bearing seedlings and its planting in outside forest areas to improve the availability of food and wood		
II A	Raising of fruit bearing seedlings/planting stock to take up roadside plantation, avenue plantation, plantation in public premises, institutions, Govt. lands, private lands and in homesteads		
1	Diglipur Division	4,00,000	068.00
2	Mayabunder Division	4,00,000	068.00
3	Middle Andaman	4,00,000	068.00
4	Baratang	2,00,000	034.00
5	South Andaman	6,00,000	102.00
6	Havelock	2,00,000	034.00
7	Little Andaman	1,00,000	017.00
8	Nicobar Islands	3,00,000	051.00
	Total	26,00,000	442.00
II B	Planting of Fruit bearing seedlings/plants on roadside plantation/Avenue plantation/Public premises/Institutions/public lands / private lands / Homestead		
1.	Diglipur Division	1,00,000	15.00
2	Mayabunder Division	1,00,000	15.00
3	Middle Andaman	1,00,000	15.00
4	Baratang	50,000	07.50
5	South Andaman	1,00,000	15.00
6	Havelock	50,000	07.50

7	Little Andaman	50,000	07.50
8	Nicobar Islands	50,000	07.50
	Total	6,00,000	90.00
	Total II (A+B)		532.00
III	Conservation of Wildlife and Management of Protected Areas in Great Nicobar Island/Nicobar Islands		
A	Consolidation of Sanctuary area		
i	Survey and demarcation of Sanctuary boundaries (@ Rs. 5 lakhs for each PA)	Entire area	10.00
ii	Erection of boundary pillars of 1.2m X1.2Mx1.0m masonry structure in land areas and floating buoys in water areas (@ Rs. 10 lakhs for each PA)	All major points	20.00
	Sub total III A (i+ii)		30.00
B	Strengthening of Protection measures		
1	Establishment of Protection Camps in GNI	4	30.00
ii	Construction of Watch towers	2	20.00
iii	Establishment of a Camp office	1	20.00
iv	Procurement of boat	1	75.00
v	Procurement of Dugout Dinghies	2	15.00
vi	Procurement of utility vehicle	2	20.00
vii	Establishment of wireless stations including repeater/mobile facility with handheld sets	2	10.00
	Sub total III B (i+ii+iii+iv+v+vi+vii)		190.00
C	Habitat Improvement and Management activities		
i	Forests, Near Shore Habitats, Intertidal Habitats, Pelagic habitats, Coral Reefs and Seafloor Habitats	Entire area	10.00
ii	Identification and management of Megapode mounds including abandoned ones	Entire Area	10.00
	Sub total III C (i+ii)		20.00
D	Research and monitoring		
i	Survey and assessment of terrestrial animals, birds, benthic invertebrates, fishes, seabirds, and marine animals	1	10.00
ii	Monitoring studies on Coral Reefs and improvement of reef areas	1	15.00
iii	Monitoring studies on Nicobar Megapode and its habitat	1	15.00

iv	Procurement of Scuba Diving Equipment viz. BCDs, Depth gauge, Pressure gauge & Compass, Dive Computer, Scuba tanks/cylinders, masks, Snorkels, wetsuits, fins, gloves, weight belts, Tank Bangers, Defoggers, Dive knives, underwater lights, writing slates, and Dive log book, and one high pressure Scuba air Compressor portable and underwater camera	10 sets	15.00
v	Establishment of a weather station	1	03.00
	Sub total III D (i+ii+iii+iv+v)		58.00
E	Turtle Management Programme		
i	Beach management protection from predators	Entire area	05.00
ii	Hatchery Management Establishment of hatchery, Collection of eggs and its maintenance in Hatchery, release of hatchlings back into sea, Protection from predators	1	10.00
	Sub total III E(i+ii)		15.00
F	Education and outreach activities		
i	Preparation of Management Plan/ Conservation Plan for Leatherback turtles	1	20.00
ii	Preparation of management Plan/Conservation Plan for Megapode	1	20.00
iii	Training programmes for frontline staff and other stakeholders	2	02.00
iv	Documentary on Leatherback Turtle/Megapode	2	04.00
	Subtotal III F (i=ii+iii+iv)		46.00
G	Recreation and wildlife Tourism activities		
i	Visitor amenities – 4 umbrella huts and 2 wash rooms		15.00
ii	Nature Trail		05.00
	Subtotal III G (i+ii)		20.00
	Total III		**379.00**
IV	Infrastructure for Protection		
A	Inspection Path (6 feet wide) from North bay light House to Old Madhuban, Old Madhuban to Mirchidera, and Mirchidera to Shoal bay 19	26 km	130.00

B	Inspection Path from Badakhadri to Jhaji beach Rutland	10km	30.00
C	Inspection huts at Jhaji Beach	1	30.00
D	Inspection Log huts at Pongibalu	1	45.00
E	Protection Camp at Shoalbay 19	1	30.00
F	Protection Camp at Mirchi Dera	1	30.00
G	Protection Camp at Madhuban	1	30.00
H	Construction of Inspection Hut Diglipur	1	30.00
I	Construction of Inspection Hut Mayabunder	1	30.00
	Total IV		**385.00**
V	Field vehicles/machineries/Equipments for frontline staff to enhance the forest/ wildlife protection efforts		
A	Fiber coated Engine Dinghies with 20 hp engines	4	40.00
B	Procurement of Multi Utility Vehicle	4	40.00
C	Procurement of motorcycle	20	20.00
	Total V		**100.00**
	Total II+III+IV+V		**1396.00**
	INTEREST COMPONENT		
VI	Expenses for STATE CAMPA		
A	Procurement of Desktop Computers with 2 Printer and two Scanners for data processing& management	3	004.00
B	Office Expenses including sitting fee/allowances for non official members including wages for contractual staff engaged under CAMPA and third party monitoring	LS	007.00
C	Engagement of consultants on contractual basis for documentation and Accounts	2	011.00
D	Procurement of one DSLR camera with telescopic lens	LS	004.00
E	Contingency	LS	002.00
	Total VI		**028.00**
	Grand Total (I+II+III+IV+V+VI)		**1573.69**

The Steering Committee further decided to send the approved Annual Plan of Operation (APO) for the year 2022-23 to the Executive Committee of the National Authority for final approval.

Chief Executive Officer, State Authority
Member Secretary

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No. STATE CAMPA/ 14
अण्डमान तथा निकोबार प्रशासन
ANDAMAN AND NICOBAR ADMINISTRATION
वन एवंपर्यावरणविभाग
DEPARTMENT OF ENVIRONMENT & FORESTS
प्रधान मुख्य वन संरक्षक तटवर्ती अंचल एंव वन संरक्षण नोडल अधिकारी
वन,संरक्षणअधिनियमसदस्य सचिवअण्डमाननिकोबारतटवर्तीअंचलप्रबंध प्राधिकरण
PCCF (CRZ & FC) / NODAL OFFICER, FCA & MS, A&NCZMA
वनसदन,हैडो, पोर्टब्लेयर/**VAN SADAN, HADDO, PORT BLAIR**
****

पोर्टब्लेयर/ ***Port Blair*** दिनांक/ ***Dated*** 08th ***April, 2022***

/**Dr. K. Ravichandran**)
अपर प्रधानमुख्य वनसंरक्षक/ Additonal Principal Chief Conservator of Forests
तटवर्तीअंचल एंववनसंरक्षण/CRZ& FC
सदस्य सचिवअण्डमाननिकोबारतटवर्तीअंचलप्रबंध प्राधिकरण
and Member Secretary, A&N CZMA
वनसदन, हैडो, पोर्टब्लेयर/VanSadan, Haddo, Port Blair

प्रतिलिपि/ **Copy to:**

1. The SPS to the Chief Secretary, A & N Administration for the kind information of the Chief Secretary and Chairperson of the Steering Committee, State Authority.
2. The SPS to Principal Chief Conservator of Forest(ANI)/Principal Secretary (E&F), Member, Ex officio, Steering Committee, State Authority for kind information of the Pr. Secretary (E&F).
3. The PS to Principal Secretary (Finance) Member, Ex Officio, State Authority for kind information of the Principal Secretary (Finance).

4. The PS to Principal Secretary (Planning), Member, Ex Officio, State Authority for kind information of the Principal Secretary (Planning).
5. The PS to Pr. Secretary (Revenue), Member, Ex Officio, State Authority for kind information of Pr. Secretary (Revenue).
6. The SPS to Principal Chief Conservator of Forests (Wildlife)-cum-Chief Wildlife Warden, Member, Ex Officio, for kind information of Chief Wildlife Warden.
7. The PS to Secretary (Panchayati Raj and Rural Development) Member, Ex Officio, State Authority for kind information of Secretary (Panchayati Raj and Rural Development).
8. The PS to Secretary (Agriculture) Member, Ex Officio, State Authority for kind information of Secretary (Agriculture).
9. The PS to Secretary (Tribal Welfare) Member, Ex Officio, State Authority for kind information of Secretary (Tribal Welfare).
10. The PS to Secretary (Science and Technology) Member, Ex Officio, State Authority for information of Secretary (Science and Technology).
11. The PS to Nodal Officer (FC) Member, Ex Officio for kind information of Nodal Officer (FC).
12. The Head of Regional Office, MoEF & CC, Chennai, Member, Ex officio for kind information of Addl. Principal Chief Conservator of Forests(Central).
13. The Chief Executive Officer, Member Secretary, State Authority.
14. Office Order file.

Enclosure III

ZSI Report on mitigation measures

Holistic Development of Great Nicobar Island

Inputs of ZSI for EAC comments on EIA Report of Great Nicobar Island

Sl. No. ii

EAC Comment:

There are no studies on bird hazard for the airport. Air safety point is most essential. It was rather mentioned casually in just one para in 4.3.12 of EIA-EMP. This is a major assessment that is required to be undertaken. SACON may be commissioned the study as stated in TOR since bird hazard is a major risk for aviation.

ZSI input:

Birds of Great Nicobar Island:

A total of 71 species under 12 orders and 25 families were recorded from Great Nicobar Island including 35 species from Campbell Bay National Park, 32 species from Galathea Bay, 46 species from Campbell Bay, 35 species from Afra Bay, 31 species from Kopen Heat and 27 species from Indira Point (Rajeshkumar and Chandra, 2017). The study also mentioned a total of 13 endemic species from the study areas of Great Nicobar Island. The IUCN Red List status was also checked for these species which included 60 species under Least Concern (LC) followed by 8 species under Near Threatened (NT), 2 species under Vulnerable (VU) category whereas one species was not evaluated. The local occurrence of these 71 species was evaluated which indicated 26 species as resident with local migrant (R/LM), 22 species as winter migrant (WM), 21 species as resident (R), 1 species as passage and winter migrant, and 1 species as (R/WM).

Birds of Great Nicobar Island

Sl. No.	Species	Common Name	Campbell Bay National Park	Galathea National Park	Campbell Bay	Afra Bay	Kopen Heat	Indira Point	IUCN Status	Status	Migration Status	Nesting
	Order GALLIFORMES											
	Family MEGAPODIIDAE											
1.	*Megapodius nicobariensis abbotti* (Oberholser, 1919)	Nicobar Scrubfowl	•	•		•	•	•	VU	Endemic	R	Mound in ground
	Order PELECANIFORMES											
	Family ARDEIDAE											
2.	*Ardea alba* Linnaeus, 1758	Large Egret			•		•		LC		R/LM	Tree
3.	*Ardea purpurea* Linnaeus, 1766	Purple Heron			•	•		•	LC		R/LM	High tree

4.	*Ardeola grayii* (Sykes, 1832)	Indian Pond-Heron	•		•				LC		R/WM	Platforms of sticks in trees or shrubs
5.	*Ardrea intermedia* (Wagler, 1827)	Intermediate egret	•	•	•	•			LC			Standing trees in water
6.	*Bubulcus ibis* (Linnaeus, 1758)	Cattle Egret			•				LC		R/LM	Platforms of sticks in trees or shrubs
7.	*Butorides striata* (Linnaeus, 1758)	Little Green Heron			•	•		•	LC		R/LM	Forests and wooded areas of marshes, near the water
8.	*Egretta garzetta* (Linnaeus, 1766)	Little Egret		•	•				LC		R/LM	Platforms of sticks in trees or shrubs
9.	*Egretta sacra* (Gmelin, 1789)	Pacific Reef-Egret	•	•	•	•	•	•	LC		R	Trees in island woodlands, or on the ground under shrubs or rock ledges
10.	*Gorsachius melanolophus* (Raffles, 1822)	Malayan Night-Heron	•	•			•		LC		PM	Forests in trees and bamboo
11.	*Ixobrychus cinnamomeus* (Gmelin, 1789)	Chestnut Bittern			•				LC		WM	Platforms of reeds in shrubs
	Order ACCIPITRIFORMES											
	Family ACCIPITRIDAE											
12.	*Accipiter soloensis* (Horsfield, 1821)	Chinese Sparrowhawk		•	•				LC		WM	Tree, in fork or on lateral branch
13.	*Haliaeetus leucogaster* (Gmelin, 1788)	White-bellied Sea-Eagle	•	•	•	•	•	•	LC		R	Large & tall tree
14.	*Pernis ptilorhynchus* (Temminck, 1821)	Oriental Honey-Buzzard	•				•		LC		WM	Trees, high above the ground
15.	*Spilornis klossi* (Richmond, 1902)	Great Nicobar Serpent-Eagle	•	•		•	•	•	NT	Endemic	R	Large & tall tree
	Order GRUIFORMES											
	Family RALLIDAE											
16.	*Rallina* sp. Rajeshkumar, et al., 2012	Great Nicobar Crake			•				NE	Endemic	R	Dry location on the ground or low bush
17.	*Amaurornis phoenicurus* (Pennant, 1769)	White-breasted Waterhen			•	•	•	•	LC		R	On ground in some tangled growth near the water, Cup-shaped
18.	*Gallicrex cinerea* (Gmelin, 1789)	Watercock			•				LC		R/LM	Dry location on the ground

												in marsh vegetation
	Order CHARADRIIFORMES											
	Family CHARADRIIDAE											
19.	*Charadrius leschenaultii* Lesson, 1826	Greater Sand Plover			•				LC		WM	Shallow scrape on the ground
20.	*Charadrius mongolus* Pallas, 1776	Lesser Sand Plover			•	•			LC		WM	Scrape or cattle footprint in bare sand or shingle, sometimes besides bushes or big stones
21.	*Pluvialis fulva* (Gmelin, 1789)	Pacific Golden-Plover			•			•	LC		WM	Shallow scrapes in the ground, lined with lichen or moss
	Family SCOLOPACIDAE											
22.	*Actitis hypoleucos* Linnaeus, 1758	Common Sandpiper			•	•		•	LC		WM	Ground near freshwater
23.	*Arenaria interpres* (Linnaeus, 1758)	Ruddy Turnstone			•				LC		WM	Open areas near the water
24.	*Calidris minuta* (Leisler, 1812)	Little Stint	•				•	•	LC		WM	Tundra regions, commonly seen along shores and in wetlands
25.	*Numenius arquata* (Linnaeus, 1758)	Eurasian Curlew			•	•			NT		WM	Next to taller vegetation
26.	*Numenius phaeopus* (Linnaeus, 1758)	Whimbrel	•		•	•			LC		WM	Hummock or mound and near a dwarfed shrub
27.	*Tringa totanus* (Linnaeus, 1758)	Common Redshank			•	•	•		LC		WM	Shallow scrape or hollow at base of tall clump of grass
	Family GLAREOLIDAE											
28.	*Glareola maldivarum* J.R. Forster, 1795	Oriental Pratincole		•	•				LC		WM	Ground
	Family LARIDAE											
29.	*Sterna sumatrana* Raffles, 1822	Black-naped Tern	•			•	•	•	LC		R/LM	Unlined shallow depression in sand, gravel or in coral banks
	Order COLUMBIFORMES											
	Family COLUMBIDAE											

30.	*Caloenas nicobarica* (Linnaeus, 1758)	Nicobar Pigeon	•	•		•	•	•	LC	Endemic	R	Tree
31.	*Chalcophaps indica* (Linnaeus, 1758)	Emerald Dove		•	•		•		LC	Endemic	R	Tree up to five metres
32.	*Columba livia* Gmelin, 1789	Blue Rock Pigeon			•				LC	Introduced	R	Built on a cliff or any manmade structures
33.	*Columba palumboides* (Hume, 1873)	Andaman Wood-Pigeon		•			•	•	NT	Endemic	R	Tree, Forest
34.	*Ducula bicolor* (Scopoli, 1786)	Pied Imperial-Pigeon	•	•	•	•			LC		R	Forest, woodland, mangrove, plantations and scrub
35.	*Ducula nicobarica* (Pelzeln, 1865)	Nicobar Green Imperial-Pigeon	•	•			•	•	NT	Endemic	R	Forest, woodland, mangrove, plantations and scrub
36.	*Macropygia rufipennis* Blyth, 1846	Andaman Cuckoo-Dove	•	•		•	•		LC	Endemic	R	Forest, woodland, mangrove, plantations and scrub
37.	*Streptopelia tranquebarica* (Hermann, 1804)	Red Collared-Dove			•				LC		R/LM	Skimpy platform or saucer, on leafy branch between 3 and 8m above the ground
38.	*Treron pompadora* (Gmelin, 1789)	Pompadour Green-Pigeon		•		•	•		NT		R/LM	Stick nest in a tree
	Order PSITTACIFORMES											
	Family PSITTACIDAE											
39.	*Psittacula caniceps* (Blyth, 1846)	Nicobar Parakeet	•	•			•	•	NT	Endemic	R	Cavities of dead trees
40.	*Psittacula longicauda* (Boddaert, 1783)	Red-cheeked Parakeet	•		•	•			VU		R/LM	Cavities of dead trees
	Order CUCULIFORMES											
	Family CUCULIDAE											
41.	*Cuculus micropterus* Gould, 1838	Indian Cuckoo	•		•				LC		R	Trees
42.	*Eudynamys scolopacea* (Linnaeus, 1758)	Asian Koel	•	•			•	•	LC		R/LM	Other bird's nests
43.	*Hierococcyx sparverioides* (Vigors, 1832)	Large Hawk-Cuckoo			•				LC		WM	Other bird's nests
44.	*Surniculus lugubris* (Horsfield, 1821)	Square-tailed drongo-cuckoo		•					LC		WM	Other bird's nests
	Order STRIGIFORMES											
	Family STRIGIDAE											
45.	*Otus alius* Rasmussen, 1998	Nicobar Scops-Owl				•			NT	Endemic	R	Cavities in old trees and sometimes in abandoned buildings

46.	*Ninox scutulata* (Raffles, 1822)	Brown Hawk-Owl	•		•	•			LC		R/LM	Woodpecker holes and cavities in rotting tree stumps
	Order APODIFORMES											
	Family APODIDAE											
47.	*Collocalia esculenta* (Linnaeus, 1758)	White-bellied Swiftlet	•	•			•	•	LC		R/LM	Caves and manmade structures
48.	*Aerodramus fuciphagus* (Thunberg, 1812)	Common Edible-nest Swiftlet	•			•		•	LC		R/LM	Caves and manmade structures
	Order CORACIIFORMES											
	Family ALCEDINIDAE											
49.	*Alcedo atthis* (Linnaeus, 1758)	Small Blue Kingfisher				•			LC		WM	Clay, rock, or sandy ground
50.	*Ceyx erithaca* (Linnaeus, 1758)	Oriental Dwarf Kingfisher	•	•		•	•		LC		R/LM	Horizontal tunnel or burrow on a bank
51.	*Halcyon pileata* (Boddaert, 1783)	Black-capped Kingfisher			•				LC		R/LM	Earth banks, tree holes and termite mounds
52.	*Pelargopsis capensis* (Linnaeus, 1766)	Stork-billed Kingfisher	•			•			LC		R/LM	River banks, decaying trees, or tree termite mounds
53.	*Todiramphus chloris occipitalis* (Blyth, 1846)	Nicobar Collared Kingfisher		•		•		•	LC	Endemic	R	Burrows, excavated in rotten trees
	Order PASSERIFORMES											
	Family PITTIDAE											
54.	*Pitta sordida* (P.L.S. Muller, 1776)	Hooded Pitta	•	•			•	•	LC		R/LM	Ground
	Family LANIIDAE											
55.	*Lanius cristatus cristatus* Linnaeus, 1759	Brown Shrike			•				LC		WM	Open cup made from twigs, grass stalks, rootlets, dry leaves on trees
56.	*Lanius cristatus lucionensis* Linnaeus, 1766	Philippine Shrike			•	•			LC		WM	Open cup made from twigs, grass stalks, rootlets, dry leaves on trees
	Family ORIOLIDAE											
57.	*Oriolus chinensis* Linnaeus, 1766	Black-naped Oriole	•	•	•	•	•	•	LC		R/LM	Open cup made of leaves, grasses, strips of bark, straw,

												rootlets, fine banyan in trees
	Family DICRURIDAE											
58.	*Dicrurus paradiseus* (Linnaeus, 1766)	Greater Racket-tailed Drongo	•	•	•	•	•	•	LC		R/LM	Cup, placed in fork on tall tree
	Family MONARCHIDAE											
59.	*Hypothymis azurea* (Boddaert, 1783)	Black-naped Monarch-Flycatcher	•		•	•	•		LC		R/LM	Cup, placed in fork on tree
60.	*Terpsiphone paradisi* (Linnaeus, 1758)	Asian Paradise-Flycatcher							LC		R/LM	Cup, placed in fork on tree
	Family MUSCICAPIDAE											
61.	*Cyornis nicobaricus* (Richmond, 1902)	Nicobar Jungle-Flycatcher	•	•			•		NT	Endemic	R	Open, mossy cup nest, generally in epiphytes or spiny palms
62.	*Monticola solitarius* (Linnaeus, 1758)	Blue Rock-Thrush			•				LC		R/LM	Rock cavities and walls
	Family ZOSTEROPIDAE											
63.	*Zosterops palpebrosus* (Temminck, 1824)	Oriental White-eye	•	•	•	•			LC		R/LM	Barrel-shaped nest attached to surrounding branches with the help of spider's silk
	Family STURNIDAE											
64.	*Aplonis panayensis* (Scopoli, 1786)	Asian Glossy Starling	•	•	•	•	•	•	LC		R/LM	Woodpecker holes
65.	*Acridotheres tristis* (Linnaeus, 1766)	Common Myna			•				LC		R	Roofs of houses, holes of walls, holes of trees
66.	*Gracula religiosa* Linnaeus, 1758	Common Hill-Myna	•	•			•	•	LC		R/LM	Hole in a tree
	Family NECTARINIIDAE											
67.	*Aethopyga siparaja* (Raffles, 1822)	Crimson Sunbird	•	•	•		•		LC		R/LM	Pear shaped nest out of grass, moss and spider silk on shrubs
68.	*Nectarinia jugularis* Linnaeus, 1766	Olive-backed Sunbird	•	•	•	•	•	•	LC		R/LM	Flask-shaped, with an overhanging porch at the entrance, and a trail of hanging material at

												the bottom en
	Family MOTACILLIDAE											
69.	*Motacilla cinerea* Tunstall, 1771	Grey Wagtail			•	•	•	•	LC		WM	Near fast running streams or rivers on an embankment between stones and roots
70.	*Motacilla flava* Linnaeus, 1758	Yellow Wagtail			•	•			LC		WM	Grass cup lined with hair and placed on or close to the ground in a shallow scrape
	Family ESTRILDIDAE											
71.	*Lonchura striata* (Linnaeus, 1766)	White-rumped Munia	•	•	•			•	LC		WM	Globular structure of grasses with a lateral entrance hole in low bushes or trees
	Total Number of species		35	32	46	35	31	27		13		

Bird hazards:

The habitat availability, weather, the season of the year, and time of day are the major key factors for the occurrences of bird strikes though it is also dependent on the location of the airport (Godin, 1994). The availability of a variety of seeds, grass, insects, earthworms, small birds, and small mammals in the airport region attracts the birds like eagles, kites, pigeons, doves, sparrows, storks, etc. (Godwin, 1994). Apart from these, careless waste disposal practices also attract birds like crows, gulls, doves, and pigeons. The water bodies and wetlands near to airport attracts birds for drinking, bathing, feeding, loafing, roosting, etc. (Godwin, 1994). The trees, shrubs, weed patches, and even airport structures provide suitable habitats for birds like pigeons, sparrows, bulbul, etc. for their resting, loafing, roosting, nesting, and protection (Godwin, 1994). The establishment of an airport in the migratory route of the birds causes a major problem with the sudden appearance of the birds day and night time also (Godwin, 1994).

Mitigation measures for bird hazards:

In order to prevent the bird hazards in airport the following measures to be followed.

1. Habitat management like draining out of standing water, removing and thinning trees, controlling grass height within the range of 7-14 inches, and structure modification with the advice of the advisory team to decrease or eradicate roosting or nesting sites.

2. A complete ban on open disposal of waste in the airport or nearby areas of the airport, all around the airport area of 3 km.

3. Birds are attracted to available food, water, and cover. Hence an attractive environment may be created in the available areas nearly 8 km away from the airport area to distract the population from airport area especially for waders.

4. The establishment of a Wailer-electronic bird deterrent (with permissible limit) in and around airport areas will keep the birds away from the airport zone and will be safeguarding the bird's life from accidental death with the collision of aircraft.

5. Use of 10 gas exploder (Zongun), and pyrothecnics (with permissible limit) (with the cost of maximum 4 lakhs) be used during the operational phase prior to take-off and landing of aircraft to nullify wildlife strikes.

6. The complete ban on the use of high-intensity sound, microwaves, lazers, smoke, magnets, lights, and dyes to distract birds will create a severe problem for the birds.

7. Installation of Robin Radar is essential. This radar can detect birds at distances of up to 10 kilometres, all around, day and night. It has the capacity automatically detect and log hundreds of birds simultaneously, including their size, speed, direction, flight path, and location inaccurate meters which will be beneficial to managing the operational plan of aircraft.

8. Strict compliance of AERODROME ADVISORY CIRCULAR with the guidelines of Wildlife Hazard Management dated of Government of India dated 4th August 2017 and Revised on 19th November 2018.

In addition to that the best practices prescribed by SACON (Pramod and Karunakaran, 2020) are given below to be followed as a mitigation measure.

Habitat management

A short monoculture of grass inside an airport is better than tall grass cover or removal of grass.

- The height of the grass cover should be maintained at <15 cm. Maintaining this height might reduce the food supply and cover for mainly large and flocking bird species and make them easier to detect;.
- Grass species with larger grain size (e.g. *Dicanthium* spp.) should be eliminated systematically by cutting and removal before they flower.
- Removal of cut grass from the operating area of the airport is necessary since it may help reduce the extent of the habitat available for termites and other insects and for insectivorous birds in turn.
- Eradication of termite's within the airport through anti-termite.
- Treatment is suggested. The mounds should be completely destroyed physically after the treatment. The holes that are found near the runway should be filled with soil, or they will act as suitable habitats for reptiles and small mammals (hares, mongooses, etc).

- Sewage treatment plants or open canals passing through or near the airfield should be covered completely to avoid visits by birds in search of food,
- Water flows associated with irrigation and open stagnant water of any type should be prevented inside airfield and near airports.
- Location of slaughter houses and waste dumping yards very close to airports should be completely avoided or a scientific waste management system should be implemented to avoid attracting carnivores and scavenging birds such as the Black Kite and House Crow.
- Any ornamental plants and avenue trees that to be raised within the airport premises should be selected carefully. Planted trees and plants that provide roosts for flocking birds (Mynas, crows, parakeets et.) and plant species that produce fleshy fruits and showy flowers should be avoided.
- Feeding of birds by people close to the airport (Within a radius of 2 km) should be discouraged or stopped.

Air Traffic Control (ATC)

- Conducting ornithological training for the ATC staff focusing on the problematic birds will help them greatly in taking appropriate strategic decision from the ATC tower to reduce the number of bird hits.
- Understanding the relationships between bird flight patterns and the wind speed, wind direction and flight take-off and landing zones may helpful in mitigating the bird strike during periods of intense bird activity.
- Increasing the awareness of pilots about birds and their behaviors could also reduce the risk of accidents/birds strikes.

Bird Strike Control and Management

- A database of available bird species within 10km radius of the airport must be prepared during pre-constructional phase.
- Regular inspection of the runway and continuous monitoring of birds on the runway and in the landing and takeoff zones before and after flight activity may prevent bird strikes at lower altitudes.
- Pyrotechnics such as carbide bird scarers, cartridges, acoustic devices, shotgun blanks, started pistols and flare pistols have to be used in combination.
- Permanent placements of bird scarers and zon guns have proved to be little use in managing bird hazards. However, intelligent use of these devices, with regular changing of their positions, can be effective in reducing the movement of bird on the runway and in adjoining areas.
- Infrared light can be used at night as bird-hazard mitigation measure, Also flash light can be used in lesser power output. In USA and Africa, LED flash lights have been used to search and deter the nocturnal ground hiding birds and proved it has positive impact within the airport boundary limit. Limited use will be made.
- It is recommended that building in aerodromes be covered with bird-proofing barrier to prevent birds from perching on them regularly.

- Buildings at aerodromes should be designed such that they do not provide perches for birds (bird-unfriendly design should be adopted).
- Durable spike covers can be fitted on lampshades, poles, signboards, etc. in airfields to prevent birds form perching on them.
- Abandoned building, hangars, vehicles and containers that are not in use inside the airport premises should be removed without delay. Birds may use these facilities for
- roosting, nesting and hiding.
- An existing institutional facility may be used or an additional institutional mechanism established to regulate the land use pattern and cropping pattern or any bird attracting landscape use with the involvement of the stakeholders.

Documentation and informed Decision Making

- One of the most important factors in the long-term management of the hazards posed by birds to aircrafts is the availability of reliable, well curated data on the bird movement patterns at a location. Long term studies should be carried out during operational phase to record bird hazard related data.
- Appropriate real-time assessment of the data and decision making are critical for the management of bird strikes.
- There will be stochastic movements of bird flocks that are unpredictable due to many ecological reasons. An emergence system should be instituted to handle the situation arising from such bird movements.
- Conducting regular training programs for the Bird Hazard Combat Team of the airport to impart basic knowledge about common birds and problematic birds and their biology, ecology and behaviors will make a marked difference to the manner in which unexpected eventualities are managed.

Immediate Measures for Short-term Results

- Breeding of birds in the airport premises should be prevented by all means. Open soil patches are most suitable for the breeding of ground-nesting birds such as lapwings. Hence the maintenance of grass covers with an average height of <15 cm within the airport is advised.
- Periodic removal of visible eggs and nests from the airport can disturb the breeding birds and as a result they may search for alternate places. Bird eggs and nests should be searched regularly until all breeding efforts stop.
- Remote controlled drones fitted with silhouettes of birds of prey have been found to yield good results in the Netherlands, Canada, Russia, etc. The use of these devices can be attempted experimentally to chase birds away from the airfield.

Awareness Creation and Public Participation

Many activities of people living in the surrounding of airports are also a significant reason for the increased incidence of bird strikes in recent years. The waste dumping and bird-feeding practices of people (for various religious and recreation reasons) attract and keep very large flocks of birds in the vicinity of airports. Hence awareness should be created among the public

about the potential problems of bird hazards to aircraft arising from these activities. In this regard, the Airport Environment Management Committee should be proactive and representatives of the local administrative bodies and local community should be involved.

References:

Godin, A. J., 1994. Birds at Airports. The Handbook: Prevention and Control of Wildlife Damage. 56p.
Pramod, P. and Karunakaran, P.V., 2020. Best Practices for Mitigation of the Hazards posed by Birds to Aircrafts. Published by the Director, Salim Ali Centre for Ornithology and Natural History. Tamil Nadu, 13p

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EAC Comment:

The EMP for the entire project need to be revised. Specific mitigation measures for Leatherback Turtle be prepared and a conservation plan for the same be submitted.

ZSI input:

The leatherback turtles *Dermochelys coriacea* (Vandelli, 1761) are the largest sea turtles among the extant 7 species across the world. This is the only species without any hard shell or scales. The general body size ranged between 130 and 183 cm whereas the size can reach up to 305 cm with a weight of 916 kg and the general bodyweight ranged between 300 – 500 kg.

These animals are extremely migratory and usually swim over 10,000 miles in a year between nesting and foraging grounds. The leatherback turtles are known as one of the deep-diving faunal groups along with prolonged time. The majority of the dive of this turtle is restricted to 300 m while sometimes it can be seen up to 1250 m (Houghton *et al.*, 2008).

IUCN Status: Considering the increment in the population size of the leatherback turtle across the world, since 2013 onwards the species is categorized as Vulnerable (2013 – 2022) under IUCN. Earlier, it was under Critically Endangered in the year 2000 and Endangered during 1982-1996 as per IUCN assessment.

Reproduction: The female leatherback turtles are known to produce several (3-10) clutches of 60-90 eggs during every reproductive season and represent re-migration interval of multiple years (2+) between subsequent reproductive seasons (Eckert *et al.*, 2012).

Global Nesting: The giant Leatherbacks are reported in the Atlantic, Pacific, and Indian Oceans whereas the nesting is found maximally on the beaches in tropical latitudes around the world. Globally, the largest remaining nesting aggregations are reported in Trinidad and Tobago, West Indies (Northwest Atlantic), and Gabon, Africa (Southeast Atlantic). The basic requirements of leatherback turtle nesting are soft and sandy beach along with wide entry from the ocean.

Nesting in Andaman and Nicobar Islands: The leatherback turtles are found nesting in Little Andaman, Rutland, North Cinque, South Cinque, Karmatang Beach and Cuthbert bay in Andaman group of islands and Great Nicobar, Little Nicobar, Katchal, Kamorta, Nancowry, Teressa, and Tillanchong in Nicobar group of islands.

The Great Nicobar Island is known as one of the nesting grounds of leatherback turtles in Indian Ocean region. The leatherback turtles nested in Little Andaman Island indicated their movement in two corridors for migration such as south-eastern corridor towards Papua New Guinea and Australia, and south-western corridor towards Madagascar and east coast of Africa (Namboothri *et al.*, 2012; Swaminathan *et al.*, 2017). Presently, Zoological Survey of India has been working on this aspect and already tagged nearly 800 individual to understand their migration in Galathea Bay of Great Nicobar Island. The study was initiated in this year.

Baseline data on turtles and their general tagging is going on presently. No major migratory data is recorded till now.

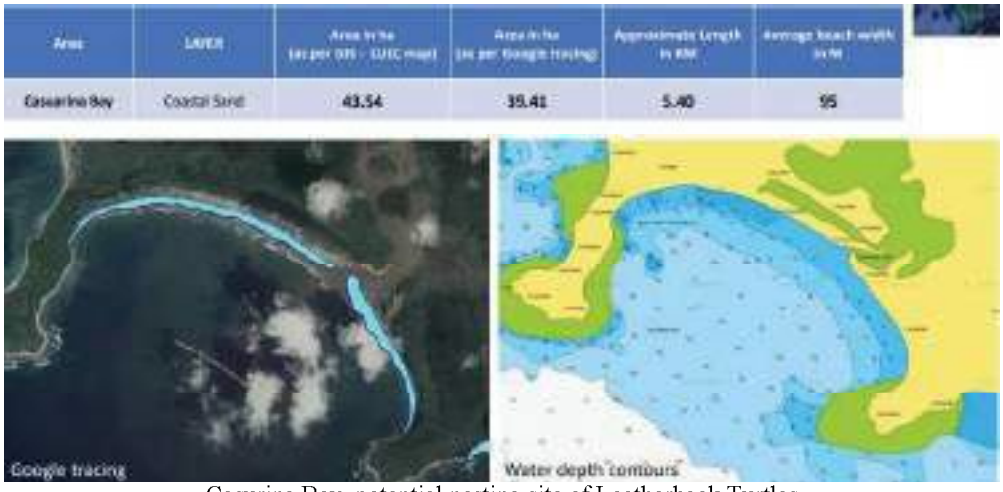
Mitigation measures:

The following measures are suggested to conserve the leatherback turtles in Great Nicobar Island to mitigate the expected impact expected to be caused by proposed ICTT project at Galathea Bay.

1. Apart from the Galathea Bay, the nesting of the giant leatherback turtles were reported from East to Indira Point, Koshindon, Laxmi Nagar, North of Alexandria, South of Alexandria, North of Dagmar, South of Dagmar, Pulo Bed, Pulo Kunji, Re Pinsuöt, Renhong, Safed Balu, Patatiyö, and West of Indira Point of Great Nicobar Island (Swaminathan *et al.,* 2017). Protection, monitoring and documentation of leatherback turtles from the aforementioned areas can be seen as potential nesting ground. The details of these places in Casurina Bay, Alexandria Bay and Pamayya Bay are given in the following table and figures.

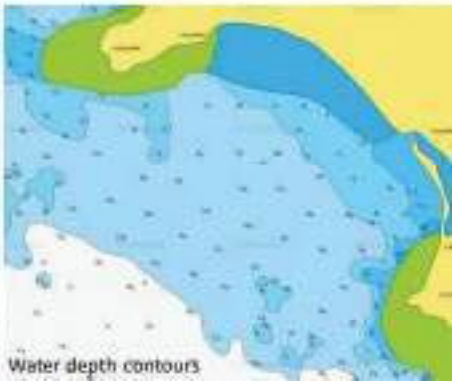
Potential other major nesting areas

ID	Area	LAYER	Beach send area in ha (as per Google tracing)	Approximate beach Length in KM	Average beach Width of Beach in M	Average beach Width of Wet Beach in M	Average beach Wet Area in HA	Carrying Capacity	Slope of the Beach
1	Casurina Bay	Coastal Sand	39.41	5.40	95.00	47.80	25.81	709	Gradual
2	Alexandria Bay	Coastal Sand	49.73	4.00	120.00	62.89	25.15	691	Gradual
3	Pamayya bay	Coastal Sand	15.26	3.21	25.00	11.19	3.59	99	Moderate
TOTAL			104.40	12.61			54.56	1499.00	



Casurina Bay, potential nesting site of Leatherback Turtles

Area	LAYER	Area in ha (as per GIS - LULC map)	Area in ha (as per Google tracing)	Approximate Length in KM	Average beach width in M
Alexandrea Bay	Coastal Sand	36.94	49.73	4.0	120



Alexandrea Bay, potential nesting site of Leatherback Turtles

Area	LAYER	Area in ha (as per GIS - LULC map)	Area in ha (as per Google tracing)	Approximate Length in KM	Average beach width in M
Pamayya Bay	Coastal Sand	8.03	13.20	3.21	22

Pamayya Bay, potential nesting site of Leatherback Turtles

2. Currently, the entry of turtles to Galathea Bay (Western Flank) is about 3.5km. After the construction of breakwater, the entry will reduce to less than 1 km. However, the number of turtles which nests on the western flank of the Galathea Bay is maximum of 2-6 per day (night). Duration of nesting process takes place within 8 to 10 hours. The beach area at western flank of Galathea is about 60ha. It is possible that some turtles may not nest in this area and may opt for nesting in the nearby beaches like Pamayya Bay, Alexendria Bay, Casaurina Bay etc.

3. Lighting can be minimized through reduction, shielding, lowering and/or use of turtle friendly lights without compromising people and operations safety. This control measure is necessary in order to reduce potential disorientation effects on female turtles when approaching beaches for nesting and on sea turtle hatchlings making their way seaward specially during nesting season.

4. Impacts of pollution due to artificial light intensity on turtle nesting beaches is addressed within the scope of environmental education programs carried out at Port. Also important for photomitigation is the care during installation works and port operations in the proposed port areas. In this regard a Technical Guidelines for Photopollution stands out, established procedure of Açu's Port Administration. These guidelines are applied to all contracted and subcontracted companies that perform services at Port areas. They also apply to light control and reduction during dredging projects for dredger and its support vessels

5. Collection of data on coastal environments, nest ecology and physiology, counting of eggs, safeguarding of eggs, incubation period monitoring, hatchling success, collection of biometric data from individuals, and record of non-reproductive events should be made in construction as well as operation phase across the coastal areas of Great Nicobar Island.

6. Establishment of Advisory Committee including experts of turtle biologist, marine ecosystem, benthic ecosystem, and physical oceanography, port engineer to ensure the safety and safeguard of turtles in the proposed project area.

7. The development of single window system software where everyone can see and access the population status data on leatherback turtles will be beneficial for the development awareness campaign.

8. Strictly following Dredging protocol and operational protocol as prepared by IUCN experts and Species Survival Commission's Marine Turtle Specialist Group and revision, scrutiny, and follow-up of the processing time to time as per the expert opinion.

9. Installation of deflectors to clear turtles from the path of the suctioning equipment.

10. Protection of turtles and their eggs against the poaching, predation, inundation, or erosion in their natural environment by protecting those *in situ* or safely relocating into a hatchery until they hatch, and releasing them into the sea.

11. Establishment of a Long-Term Monitoring Programme with satellite telemetry study should be made on the turtles on Galathea Bay as a baseline study (before the project) to understand their migratory route and the selection of site and arrival to the same area or their relocation for nesting.

12. Development of Quick Response Team (QRT) during the nesting period to safeguard the turtles and eggs from natural as well as anthropogenic predators.

13. Outreach programs to create awareness among the local fishing communities, local people, students, and tourists about turtle conservation.

14. Capacity-building programs among the fishermen and to encourage them to use Turtle Excluder Device including practical training for the conservation of turtles.

15. Development of standard photomitigation plan to avoid photopollution.

16. Environmental education addressing the most sensitive issues to sea turtle and its conservation to be made to the stakeholder of the proposed port and general public at large.

Remark

As per IUCN data there was a decline in population of Leatherback turtle across the globe till 2010. However, adopting an effective management practices the population has been steadily increased which made the species from *Critically Endangered* to *Vulnerable* (IUCN 2022). Further, IUCN predicted that by 2040, the leatherback turtle may be listed as *Least Concern* considering the present state of increment in population size. The nesting beaches of Great Nicobar Island receives only less than 1.0% of nesting female leatherback turtle's global population. Though the construction of port and other allied facilities in Galathea Bay may temporarily cause disturbance for nesting during the construction phase, it may not affect the global population of this migratory species. However, strict adherence of the aforesaid mitigation measures in Galathea Bay during construction and operational phases may minimize the impact in considerable extent.

References:

Eckert, K.L., Wallace, B.P., Frazier, J.G., Eckert, S.A. andPritchard, P.C.H. 2012. Synopsis of the biological data on the leatherback sea turtle (*Dermochelys coriacea*). Biological Technical Publication BTP-R4015-2012, US Fish and Wildlife Service, Washington, DC.

Houghton, J.D., Doyle, T.K., Davenport, J., Wilson, R.P. and Hays, G.C., 2008. The role of infrequent and extraordinary deep dives in leatherback turtles (Dermochelys coriacea). *Journal of Experimental Biology*, 211(16):.2566-2575.

Namboothri, N., Swaminathan, A., Choudhury, B.C. and Shanker, K., 2012. Post-nesting migratory routes of leatherback turtles from Little Andaman Island. *Indian Ocean Turtle Newsletter*, 16: 21-23.

Swaminathan, A., Thesorow, S., Watha, S., Manoharakrishnan, M., Namboothri, N. and Chandi, M., 2017. Current status and distribution of threatened leatherback turtles and their nesting beaches in the Nicobar group of islands. *Indian Ocean Turtle Newsletter*, 26: 12-18.

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EAC Comment:

ZSI studies identify environmental impacts that are purely speculative covering 9 bullet points. It seems that there are no impact studies carried out and suggested only generalist measures. Galathea being key Leatherback Turtle nesting and ICTT and the development of support infrastructure on the east and west flank of it will destroy it fully. Thus, the report expected to envisage strong mitigation measures for other nesting sites that are completely lacking currently. WII report also not dwell on mitigation measures and in fact only recommends need for developing and implementing mitigation plans.

ZSI input:

The leatherback turtle is distributed in the tropical, subtropical, and subpolar seas. These animals are known for their extraordinary migration covering long routes for feeding and nesting depending on the season. The jellyfishes, salps, and siphonophores are commonly known prey for leatherback turtles. The females are known to produce several (3-10) clutches of 60-90 eggs during every reproductive season and represent re-migration interval of multiple years (2+) between subsequent reproductive seasons (Eckert *et al.*, 2012).

Distribution in Andaman & Nicobar Islands:

- *Andaman group of Islands*- Little Andaman, Rutland, North Cinque, South Cinque, Karmatang Beach and Cuthbert bay.
- *Nicobar Group of Islands*-Great Nicobar, Little Nicobar, Katchal, Kamorta, Nancowry, Teressa, and Tillanchong.

Conservation Status:

- Indian Wildlife (Protection) Act, 1972- Schedule I (Part II)
- CITES Appendix II
- CMS Appendix I & II (1979) (CMS, IOSEA Marine Turtles, Atlantic Turtles)

IUCN Redlist Category and Criteria

- Presently considered under ***Vulnerable*** category.
- 2013-2022: Vulnerable
- 2000: Critically Endangered
- 1982-1996: Endangered

Global Population Trend:

A total of seven subpopulations of Leatherback turtles are recorded globally with wide ranges of variabilities in their population size, geographic range, and population trends (Wallace *et al.*, 2010, 2011). Generation length was assessed as 30 years. Estimation of global population change based on subpopulation trends was recorded with a decline of -40.1% during the past three generations. As per the assessment, the assessment of past, present, and future was carried out for global Leatherback population trends. An increase in population size is correlated with the success of conservation actions, mitigation plans and future threats (IUCN, 2022).

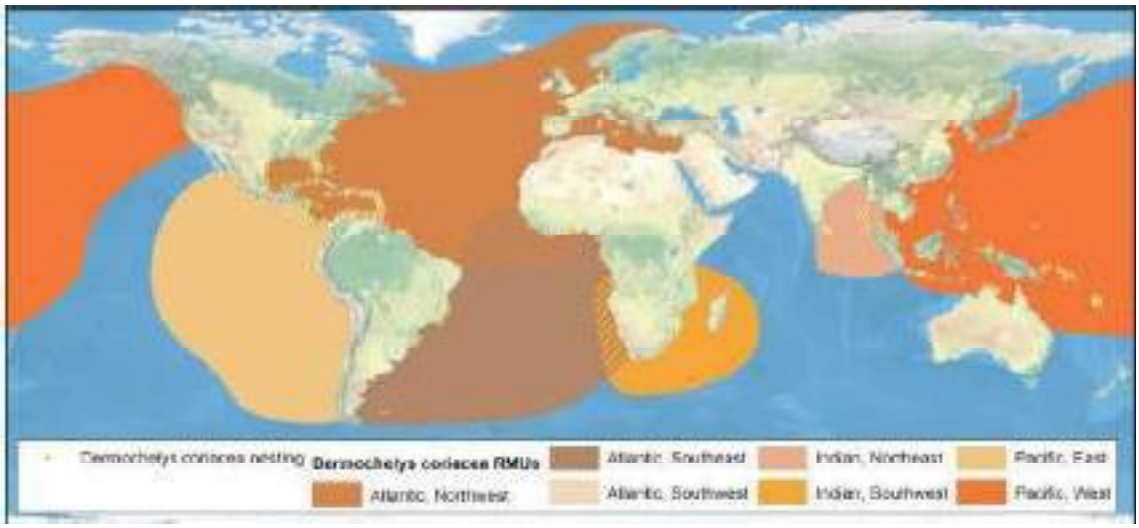
The rapid decline was recorded in the total global abundance of Leatherback subpopulations from 90,599 nests/year to 54,262 nests/year over three generations until 2010. As per estimate, the reduction in the annual nesting abundance values was recorded as the

approximately 12,943-18,120 nesting females/year (= 38,828-54,359 adult females) to 7,752-10,852 nesting females/ year (= 23,255-32,557 adult females) within three decades (TEWG, 2007; Reina *et al.*, 2002, IUCN, 2022).

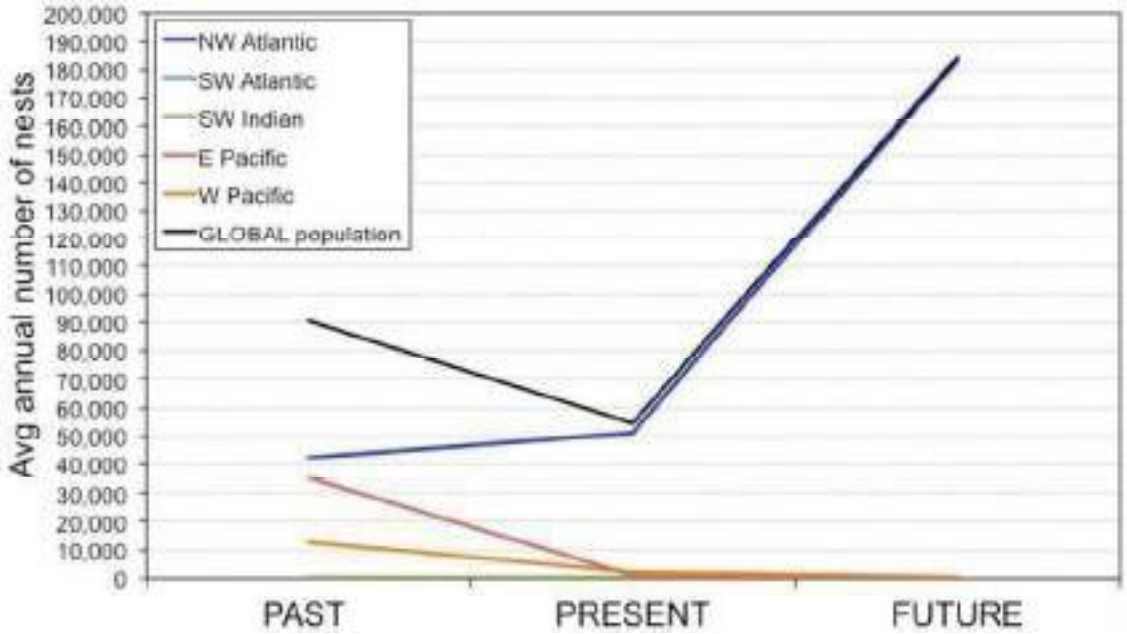
The Northwest Atlantic subpopulation is large and growing (TEWG, 2007) whereas the Southeast Atlantic subpopulation is the largest in the world (Witt *et al.*, 2009). If the present developments in the abovementioned areas, the global population trend might no longer meet thresholds for IUCN Threatened categories within ten years and can be seen as 1,84,662 nests/year (with nearly 26,380-36,932 females/ year to 79,141-1,10,797 adult females total) within 2040 where the Northwest Atlantic subpopulation will be seen with 99% among the total population (IUCN, 2022).

The population of East Pacific subpopulation and the West Pacific subpopulation are declining rapidly and affecting the global population with the declined by > 97% for East Pacific (from >35,000 nests/year to <1,000 nest/year, or >5,000 nesting females/year to < 140 nesting females/year), and by >80% for the West Pacific (from >12,000 nests/year to <2,200 nests/year or 2,600 females/year to <500 females/year) (Eckert, 1993; Chan and Liew, 1996; Dutton *et al.*, 2007; Hitipeuw *et al.*, 2007; Santidrián Tomillo *et al.*, 2007; Sarti Martínez *et al.*, 2007; Tapilatu *et al.*, 2013). Harvest of eggs and mortality due to incidental capture in fishing gear are the prime causes of the destruction of population trends (Eckert, 1993; Wallace and Saba, 2009; Tapilatu *et al.*, 2013; IUCN, 2022).

It is expected that the population of leatherback turtles will no longer be under the "Threatened" according to IUCN Red List Criteria by 2020 (three-generation decline of 29.4%), and would qualify as Least Concern by 2030 (3% increase) under IUCN Guidelines (IUCN 2011) if the conservation measures are working properly to safeguard the population trends of this species (IUCN, 2022).



Global distribution of leatherback turtles based on subpopulation (Source, IUCN, 2022)

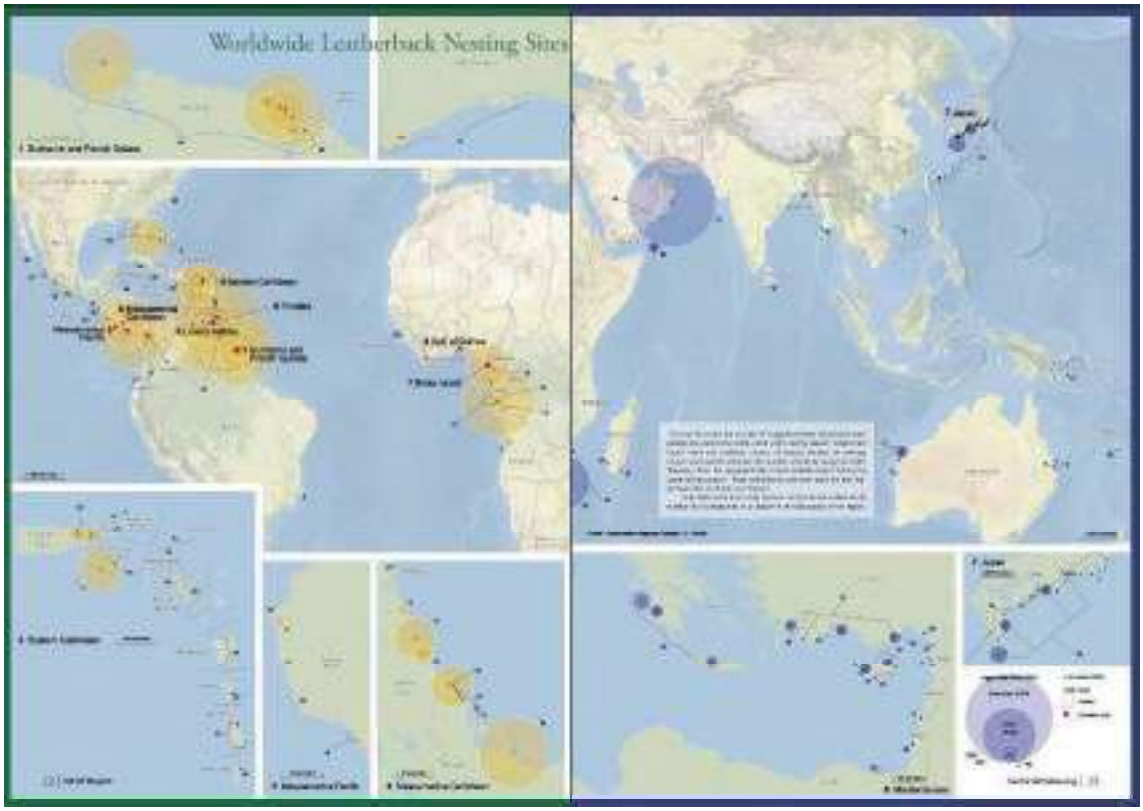


Global population trend of leatherback turtles based on subpopulation (Past-3 generation ago; Present-2010; Future-2040) (Source, IUCN, 2022)

Assessment of Leatherback subpopulation based on IUCN Red List (Source, IUCN, 2022)

Global Nesting:

The giant Leatherbacks are reported in the Atlantic, Pacific, and Indian Oceans whereas the nesting is found maximally on the beaches in tropical latitudes around the world. Globally, the largest remaining nesting aggregations are reported in Trinidad and Tobago, West Indies (Northwest Atlantic), and Gabon, Africa (Southeast Atlantic). The basic requirements of leatherback turtle nesting are soft and sandy beach along with wide entry from the ocean.



Worldwide Leatherback nesting Sites (Source: SWOT, 2007)

Nesting Status in the Indian Ocean Region:

Maximum nesting of around 5000 nests/year is recorded in Bird's Head Peninsula, West Papua, Indonesia (Halim *et al.,* 2001; Putrawidjaja, 2000) followed by Great Nicobar Island with nearly 2000 clutches/ year (Andrews and Shanker, 2002). Other nesting areas include other islands of Andaman and Nicobar Islands (Andrews *et al.,* 2001), Godavaya, Sri Lanka with nearly 300 clutches/year (Ekanayake *et al.,* 2002), and Natal, South Africa with about 100 females/year (Hughes, 1996) (Shanker, 2003).

Nesting Status and Trends in Andaman and Nicobar Islands:

The nesting of Leatherback Turtles was reported for the first time from the West Bay region of Little Andaman by Bhaskar (1979a&b). The nesting pattern of leatherback turtles was analysed based on the available published data and reports from the Department of Environment and Forests. It was observed that the arrival of this species was maximally concentrated in Great Nicobar Island whereas the nesting patterns in other areas were also reported with different frequencies. The nesting pattern of leatherback was also found with great alteration after the 2004-Tsunami. Before the Tsunami, the major nesting was recorded in Great Nicobar and Little Nicobar Islands (Andrews *et al.*, 2006) whereas the Indian Ocean Tsunami exponentially altered the entire coastal ecosystem and presently the nesting is restricted to Great Nicobar Island only.

The nesting of Leatherback Turtle of Andaman group of Islands was summarized based on the available literature (Bhaskar, 1979a, 1981; Bhaskar, 1993; Sivasundar 1996; Andrews, 2000a&b; Namboothri *et al.,* 2010; Swaminathan *et al.,* 2011) . The nesting of Leatherback Turtle of Nicobar group of Islands was noted based on the available documents (Andrews,

2006a&b; Namboothri *et al.,* 2011, 2012; Jadeja *et al.,* 2016; Swaminathan *et al.,* 2017, 2019) and recording of ZSI and Department Environment and Forests .

Nesting records of Leatherback Turtles in Andaman group of Islands

Islands/ Areas	1974	1978-79	1981	1984	1991-92	1997	1999	Pre 2004	2003-04	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2014
Little Andaman		70	90	88			34	40-100		Low	38	59	7	149	4 tagged	10 tagged
Island							1 Juv.									
Cuthbert Bay		Report				1/2			23 ind.; 15 nests							
Rutland Island					5	Report			13 ind., 12 nests							
Karmatam Beach	Report															

Nesting records of Leatherback Turtles in Nicobar group of Islands

Islands/ Areas	Apr. 1979	Feb. 1981	Nov. 1991-Mar.1992	Mar. 1993- Apr.1994	Dec. 1995-Feb. 1996	Dec. 1997-Feb.1998	Nov. 2001-Apr 2001	Oct. 2001- Apr. 2002	Nov. 2003- Apr. 2004	Nov. 2004	Feb. 2011	Feb. 2015-Apr. 2016	2017-18	2018-19	2019-20	2020-21
GREAT NICOBAR ISLAND	**160**	**63**	**672**	**237**	**282**	**124**	**1752**	**425**	**575**	**84**	**146**	**782**	**182**	**203**	**483**	**691**
Galathea	-	-	158	237	282	124	524	425	1030 ind., 575 nests	84	146	417	182	203	483	691
Alexandria	80	55	343	-	-	-	866	-	-		-	66				
Dagmar	80	8	171	-	-	-	362	-	-		-	166				
Other areas												133				
LITTLE ANDAMAN ISLAND				**165**								**229**				
Kiyang	-	-	-	115	-	-	-	-	-		-	99				
Bahua	-	-	-	50	-	-	-	-	-		-	40				
Other areas												90				
KAMORTA ISLAND												**6**				

KATCHAL ISLAND	5											**57**				
NANCOWRY ISLAND												**1**				
TERESSA ISLAND	4															

Co-existence of Port and Turtle Conservation- Case studies:

1. ***Port of Açu, southeast Brazil***
   - This port is located near the major nesting ground of the loggerhead sea turtle (*Caretta caretta*). The co-existence of the Port and Turtle conservation program was adapted in 2008 and has been going on successfully. Three action plans were adapted to conserve turtles. The program is divided into 3 lines of action, integrating sustainability factors 'people', 'planet', 'prosperity', 'peace', and 'partnership' connecting to multiple SDGs. The plans are sustainable port operations, monitoring and protection of coastal environments, and community outreach and scientific research. A new protocol adapted the reconcile operational and sea turtle protection.
   - During the conservational program, SDG-3, 4, 9, 12, 14, and 17 were adopted and managed sustainably.
   - Effects of pollution due to artificial light intensity on turtle nesting beaches are addressed within the scope of environmental education programs carried out at Port of Açu.
   - A standard plan and Technical Guidelines for Photopollution as well as photomitigation were adapted.
   - Lighting can be minimized through reduction, shielding, lowering, and/or use of turtle-friendly lights without compromising people and operations safety.
   - This control measure is necessary to reduce potential disorientation effects on female turtles when approaching beaches for nesting and on sea turtle hatchlings making their way seaward, especially during nesting season.
   - Monitoring and protection of coastal environments include Nests identification and protection, Eggs counting, Incubation period monitoring, Hatchling success, Collection of biometric data from individuals, Record of non-reproductive events, Veterinary center for treating animals, and Contribution to scientific knowledge
   - Community outreach and scientific research includes involvement of fishermen and fishing entities, local communities, tourists, and students to the widest possible range audience for environmental awareness about sea turtles, establishment of these actions meets the goals of inclusive and quality education, in addition to promoting opportunities for lifelong learning for all stakeholders, environmental education in and outside Port area addressing the most sensitive issues to sea turtle mortality identified through research throughout the years: trawling bycatch and incorrect solid waste disposal, studies the biology and ecology of sea turtle species, photopollution as well as efficient use of natural resources, sustainable consumption patterns, reducing waste generation through prevention, reduction, recycling and reuse, etc., and development of visitor Center to host environmental education actions for visitors in order to bring attention about sea turtles conservancy and coastal environment.
   - Success story includes a record of 14,269 reproductive events (nests) in 13 monitored seasons, protection of over 1 million hatchlings, identification of reproductive dynamic and spared on the monitored area recognizing the main areas for nesting, 70 animals

were rescued, treated and released back to the ocean, 110 animals were tagged for long-term monitoring, 25 animals have been monitoring by satellite (telemetry), more than 65 environmental education activities and more than 7,500 people of local communities were made for the conservational management (https://sustainableworldports.org/project/port-of-acu-protecting-sea-turtles/).

2. ***Port of Tema- Container Terminal Operator, Meridian Port Services-Ghana***

- The proposed port area is known as the nesting habitat for Leatherback, Green, and Olive Ridley turtles. As a condition for the grant of EPA Permit, GPHA and MPS carried out to create a compensatory environment for these threatened species. A Sea Turtle Conservation Programme was initiated in 2018 to mitigate the impacts and ensure turtles' protection.
- The baseline study was made for the available turtle species.
- Daily patrols were made during the construction phase including night patrols along with the project site with a 2km stretch to document the impact and to reduce the same. Patrols were also made daily basis in the operational phase to reduce the impact on turtles identified by identifying any turtles nesting in the area and to ensure the safeguard and relocation of eggs for hatching.
- Special protection and care were taken for turtle eggs to provide safeguard those against the threats like poaching, predation, inundation, or erosion in their natural environment by protecting those *in situ* or safely relocated into a hatchery until they hatch, and then hatchlings were safely released into the sea. Community engagement and habitat improvement activities were also implemented at the offset site.
- During the conservational program, SDGs- 4, 6, 8, 14, 15, and 17 were adopted and managed sustainably.
- Success story includes safeguarding to1,17,527 turtle eggs and releasing over 89,871 hatchlings into the sea since 2018, generation the scope of employment for the local community as the part of a youth as patrol team, and increased local community participation and awareness on turtle protection, regular cleaning, and sanitation program adopted to keep the area clean, use of the hatchery as an educational tool for School, Colleges and University to create sea turtle conservation interest in Ghana, improvement of the local economy through the introduction of sea turtle ecotourism.

3. ***Dhamra Port- India***

- The Dharma Port is located 15 km away from the largest nesting site of the Olive Ridley Turtle of India i.e. Gahirmatha of Odisha. The Dhamra Port is one of the best models whereas conservational practices of endangered sea turtles were adopted along with the major corporation of the global environmental organization working together to ensure proper operation of the large industrial port as co-existence (IUCN, 2014).
- A team on Special Environment Management Plan was made to make sure that it would in no way affect the turtles in the area.
- The dredging protocol and the operational protocol were established in consultation with IUCN experts and Species Survival Commission's Marine Turtle Specialist Group.

- The dredging procedure is called "trailing suction hopper dredgers". Prolonged dredging initiatives have been taken by the IUCN team in association with the US Army Corps of Engineers15, and with the DPCL team to come up with a turtle-friendly dredging system and develop regulatory measures to ensure effectiveness.
- The IUCN team had spent a substantial amount of time supervising and inspecting the dredging methods, and the operation cycles, and evaluating existing plans to install deflectors and inflow screens. They reviewed schedules, vessel design and specifications, and locations of dumpsites.
- The IUCN team provided a recommendation for the installation of deflectors to clear turtles from the path of the suctioning equipment. The deflector had a plow-like lead, similar to the "cowcatchers" on old steam locomotives. Sleeping turtles would simply be shifted out of the path of the suctioning dredgers. The designing of a simpler deflector device was made to commence without delay.
- Installations of inflow and outflow screens were made to monitor and detect turtles this created employment for the local population.
- The development of prompt decision-making tools was made to stop work under unavoidable conditions or during the reporting of a dead turtle on the in-flow screen.
- The IUCN observers lived on the dredgers and searched for turtles in the hoppers and the inflow and outflow screens. They also made a common platform to share data on the availability of turtles.
- Natural calamities, physicochemical parameters, and oceanic actions were also considered for the dredging operation.
- Introducing a unique lighting system in the port area was made in consultation with the IUCN specialist group. This is the pioneering step in the Indian context to minimize the mass killing of turtles. The lighting plan includes the types of light and the intensity control of emitted light to decrease the potential downstream impacts on nestling adult turtles and emerging hatchlings at the Gahirmatha mass nestling site.
- The placement of artificial light makes several disturbances in the natural ecosystems. It provides advantages to the predators to act upon the prey animals to a greater extent whereas the light may make severe damage to the biological clock of several nocturnal and make them vulnerable. Lighting guidelines were adopted in Dharma Port with the use of down-facing fixtures and bulbs with wavelengths attuned to avoid the visual spectrum of the turtles.
- IUCN recommended using low-pressure sodium vapor lamps or other light sources that exclude wavelengths less than 520 nm as these wavelengths are not visible to turtles. The recommended IUCN area lighting, for roadway, wharf, mast, or elevated structure lights should use full 90° cutoff light fixtures. To minimize light spill to the sky, fixtures were to be installed at around 15° below the horizontal plane. All lighting should be of minimum lamp wattage, an alert to engineers who tend to stumble on the side of caution, and provide more lighting than necessary. There should be no use of fluorescent, mercury vapor, metal halide, or other broad-spectrum high-intensity discharge lamps. There should be no floodlighting, up-lighting, or other forms of directional lighting aimed above the horizon.

- Outstretch program was initiated to create awareness among the local fishing communities, local people, and students about turtle conservation.
- Promoted the use of Turtle Excluder Device and provided practical training to fishermen.
- IUCN recommended drafting and adopting a gold-standard Environmental Management Plan including Cumulative Effects Management, effective management to address effects of individual hazards, and detailed protocols for the DPCL emergency response to address the whole range of potential accidents and natural disasters.
- Success story includes likely no disturbance in Olive Ridley Turtle nesting as 407,020 Olive Ridley sea turtles come ashore for mass-nesting at the Nasi-1 and Nasi-2 islands of Gahiramatha marine sanctuary for 'arribada' during 14-21 March 2020 and 3,49,694 Olive Ridley sea turtles during 9-23 March 2021. Local community people are actively associated with turtle conservation, and turtle-ecotourism. Fishermen are using Turtle Excluder Device for the conservation measures.

Mitigation measures:

The management practices adopted by Port of Açu, southeast Brazil; Port of Tema- Container Terminal Operator, Meridian Port Services-Ghana and Dhamra Port- India are the success stories to conserve sea turtles and are proposed to be followed in Galathea bay during t construction and operational phases.

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Sl. No. viii

EAC Comment:

ZSI should provide details of coral restoration in GoK which they used as an example to illustrate in EIA-EMP. Total area restored? which areas restored? total cost involved in the same? survival rate of corals? and ecological functions achieved through the restoration? with hard peer reviewed evidence. This will help understand the costs and effectiveness of coral transplantation and draw specific conservation plan for coral translocation and restoration at Galathea Bay and other impact areas. These specific details are completely lacking in the current conservation plan. All corals being in Schedule 1, these details will be essential since the transhipment terminal may have major impact on over 117 species that are present in the Galathea Bay as per ZSI report.

ZSI input:

Coral transplantation/ restoration in Gulf of Kachchh

1. Zoological Survey of India has the distinction of carrying out prestigious and unique first of its kind Ecological Restoration in coral reef areas in the recent past in the present study site (Gulf of Kachchh) itself with the able support of the Marine National Park Authority of Gujarat Forest Department, while a couple of agencies have tried and given up.
2. ZSI restored a total of about 2000 square meter degraded coral reef area along the Gulf of Kachchh region by employing site specific strategies and multidisciplinary approaches and by involving local community (Satyanarayana and Chandran, 2017).
3. A total of 232 cement structures with 2320 native coral and branching coral transplant were restored in Pirotan site. In Narara site, 1170 native coral transplants were restored in 214 cement structures and a total of 110 cement structures, 50 iron frames were used to restore 1050 native coral transplants at Mithapur restoration site. Although high survival rates of transplanted native coral species were recorded in all restoration sites after one year of continuous monitoring, Pirotan site recorded maximum (97.24%), than the Narara (96.50%) and Mithapur (96.57%) restoration sites (Fig. 1). As far as concern with the restored branching coral transplants, survival rate of *Acropora* transplants was recorded 85.25% at Mithapur restoration site and 68.75% at the Pirotan site. But the survival rate of *Montipora* transplants was recorded higher in Pirotan restoration site 78.57% than the Mithapur site (59.40%) (Satyanarayana and Chandran, 2017).
4. Pirotan recorded highest survivorship (97.24%) than the other two sites. Coral fragments attached on the artificial cement/iron/pvc structures were found started encrusting on the cement plates by overgrowing on the tied nylon and copper tags from the 2nd month %) (Satyanarayana and Chandran, 2017).
5. Restoration is being done on in Gulf of Kachchh area (Narare Reef, Kalubar Island). About 9000 corals from 49,000 m^2 area (40 times bigger than the MNP-ZSI ICZM transplantation effort carried out from 2012-2018) will be translocated.
6. The present work budget around Rs. 4,00,00,000.00 (only for salary and some consumable) whereas other all the support will be made by the sponsoring agency.

At great Nicobar Island, there is no impact has been envisaged to the corals due to the proposed projects including ICTT. However, during the construction, if any coral colonies are disturbed, same will be translocated after the detailed assessment and analysis of type of coral and species.

The estimated coast of the transplantation/restoration at Great Nicobar is to be Rs. 5,35,75,000.00/hectare.

Globally-Coral reef restoration costs estimated from $1,717 up to $2,879,773 USD/hectare (Bayraktarov *et al.,* 2015) which is equal to Rs. 1,31,315.13 to 22,02,43,311.18 per hectare.

Methodologies for Coral Translocation/ Restoration
Setup and process of translocation/ restoration

The first step for coral translocation is to minimize stress and prevent damage to corals. For successful transplantation of corals species translocation will be made in suitable selected areas that have very similar environmental conditions as the areas they originally came from, especially water flow depth gradient and turbidity. Data on key physicochemical parameters (including salinity, temperature, water current gradients and limits, and turbidity) at both the donor and recipient areas will be collected and also measured using fixed data loggers. The coral colonies will be tagged using colors and codes depicting the depth, location, growth form, and type of species before translocation from the demarcated sites, carried at the same depth while transporting them, and will be placed at the same depth and similar environment at the recipient site. Coral colonies will be translocated entirely as a whole object, lifted from the sea bottom, and loaded to the carrying trays fixed at the ship/boat bottom at the same depth of excavation carefully with lift bags. The lifted corals will be transferred carefully to hanging and submerged metal cages with soft carpet at the bottom, hanging at required depths at the sides of the carrying vessel, avoiding the exposure and depth difference to the translocated corals. Ambient water quality parameters such as sea surface water temperature and dissolved oxygen will be measured once (with at least three replicates) at the coral donor sites on the day of coral translocation. Corals will be transported to the suitable recipient site as soon as possible on the same day following the removal. The vessel will be progressing at a slow and steady speed when approaching close to the recipient site. After arriving at the coral recipient site, the colonies will be fixed with the boulders gradually to minimize disturbance related to sediment. The coral colonies will be placed at similar depths and orientations similar to the recipient sites as far as possible. Every translocated colony at the recipient site will be tagged with waterproof labels depicting important details pertaining to that particular coral. All the corals will be firmly anchored or attached to the substratum using epoxy without causing lethal damage to the corals. All tags will be nailed in the vicinity of the coral colonies at distances not so close to interfering with the potential growth. This would allow the identification and recording of the rehabilitation progress of corals during post-translocation monitoring (Table 4).

Post translocation/ restoration monitoring

The growth rate of the true corals is very slow and sensitive to several ecological factors. Periodical monitoring will be made to record the successful translocation/ restoration. Corals will be monitored for a minimum period of 5 years constantly, irrespective of fair or rough weather conditions. The translocated coral colonies as well as the tagged natural coral colonies at the recipient site will be monitored mostly daily or at least 15 days per month for a period of 1styear. In the 2nd, 3rd, 4th, and 5th years the intensity of monitoring will be reduced gradually depending on the results (Table 4).

Table 4: Time Schedule of the project for coral transplantation/ restoration

Targets	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th Month	11th Month	12th Month	13th -60th Month
Establishment													
Recruitment of Staff													
Procurement of Material													
Field lab set up													
Preliminary Study													
Sediment traps in selected areas to monitor the sediment movement.													
Recipient site data collection, selection and gridding.													
Excavation area data collection, gridding and coral tagging.													
Translocation													
Sub-tidal													
Photographing and tagging the species to be translocated													
Sub-tidal Coral translocation, (90 days)													
Inter tidal													
Photographing and tagging the species to be translocated													
Inter tidal Coral translocation,													
Post Translocation Monitoring													
Monitoring the Relocated corals (countering the threats until the corals survive well.)													

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Sl. No. xi

EAC Comment:

There is no illumination policy considering that the proposed transhipment terminal is the largest Leatherback Sea Turtle nesting site. There is a passing reference to it in the ZSI report.

ZSI input:

Illumination Plan for proposed Project

Artificial light is considered one of the significant pollutants which create notable disturbance to the variety of faunal communities in different ways along with the developing negative impacts on the ecosystems (Colman *et al.*, 2020). The artificial light makes significant changes in the foraging, reproduction, migration, and communication pattern of the wildlife with negative consequences, and evidence is recorded among a variety of faunal communities including invertebrates, birds, reptiles, and mammals (Longcore and Rich, 2004; Aubrecht *et al.*, 2008; Kamrowski *et al.*, 2012; Mazor *et al.*, 2013; Weishampel *et al.*, 2016; Colman *et al.*, 2020). The impacts of light pollution on the sea turtles are notably high and make serious damage to their biological courses. The natural lights are providing the signal to the hatchlings for their general movement toward the sea whereas the presence of artificial light confuses their inherent behavior in finding the sea and causes tiredness, dehydration and the loss of energy that is vital to their first step of migration towards the open sea and resulted in higher mortality in early age and the presence of artificial light also enhances the scope of predation and make their life vulnerable (Witherington and Bjorndal, 1991; Lorne and Salmon, 2007; Pendoley and Kamrowski, 2015). Artificial light is also reported to disrupt the nesting of adults and female individuals are avoiding artificial light and even the beach for nesting (Salmon, 2003; Pendoley and Kamrowski, 2015; Silva *et al.*, 2017). The selection of any beach by the turtle for nesting is dependent on various ecological parameters and very selective beaches are being considered by the turtles for nesting while the presence of artificial light may change the entire dynamics of beach selection by the turtles. A recent study made by Colman *et al.* (2020) suggested that artificial light has a greater impact on the nesting behavior of leatherback turtles. A study made by Médicci *et al.* (2009) found that the proportion of landings with nest buildings decreased significantly due to the presence of artificial light but nesting success was not influenced by the presence of light.

Mitigation

1. Steps would be taken to reduce the intensity and percentage of artificial light in the vicinity of nesting ground and port to reduce light pollution that affects sea turtles.

2. Turn off lights visible on nesting beaches or use special fixtures to shield the lights from the beach.

3. 1st option- use of low-pressure sodium-vapor lighting (LPS) only.

4. 2nd option-use of a light source lesser than 520 nm wavelength which is not within visible range of turtles.

5. Use of Turtle Safe Lighting – these red lights emit a very narrow portion of the visible light spectrum, which is less intrusive to nesting sea turtles and hatchlings.

6. Introduction of unique sodium-vapor lighting light in consultation with expert/ specialist group.

7. Detailed step-wise lighting plan including types of light, the intensity during construction and operational phase of ICTT, and in accordance with the breeding season of turtles.

8. Preparation of lightning guidelines and making awareness among the employees and workers of the ICTT project.

9. Detailed lighting plan for roadway, wharf, mast, or elevated structure lights with full 90°cutoff light fixtures.

10. Steps should be taken to control the light spill to the sky by installing fixtures installed at around 15° below the horizontal plane.

11. Use of minimum lights and light to minimum lamp wattage.

12. A complete ban on the use of fluorescent, mercury vapor, metal halide, or other broad-spectrum high-intensity discharge lamps.

13. Ban on floodlighting, up-lighting, or other forms of directional lighting aimed above the horizon.

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Sl. No. xviii

EAC Comment:

This is also in seismic zone 5 and high wind and cyclonic effect area and occurrence of tsunami. Being closer to Indonesian islands where high intensity earthquakes come often with related tsunami spreading to Bay of Bengal and Nicobar, the level of development should be low density and to some extent medium density and with all resilient mitigation measures. This needs to be confirmed and accordingly EIA-EMP to be amended.

ZSI input:

Seismic zone study is beyond the scope of ZSI expertise. Hence inputs could not be furnished.

Sl. No. xxxiv

EAC Comment:

ZSI and WII studies only identified flora and fauna and physico-chemical aspects. None of the reports provides any specific mitigation measures for core impact areas such as ecology, biodiversity and endangered and endemic species. The report did not mention on the impact of these development on nocturnal fauna. Revised report addressing above observations may be submitted.

ZSI input:

<u>General impact on ecosystem and biodiversity</u>

- Coastal development at back shore and front shore will be major factor for threatening Critically Endangered leatherbacks include loss or degradation of nesting habitat; disorientation of hatchlings by beachfront lighting; nest predation by native and non-native predators; degradation of breeding habitat; increase in marine pollution and debris; and watercraft strikes. Increase of exploitation by humans for the eggs and meat.
- During the construction in seafront areas, the marine ecosystem will be highly affected especially wherever there are coral reefs. The development of jetties and ports along the coastal areas likely to have impact on the entire benthic cover including coral reefs, sea grass and seaweed habitats along with associated faunal communities.
- During the operation phase, the movement due to sea-ways traffic may create impact on the water quality and benthic ecosystem which is required to be restored sustainably with greater conservation measures.
- Oil pollution at sea can have population level impacts on this MMS, particularly where spills occur in sensitive areas.
- Light pollution will be an issue for turtles at nesting beaches both during egg laying and nestling emergence.
- Plastic materials will become entanglement and ingestion by sea turtles, will be a great threat.

- Climate change and severe weather driven by habitat shifts and alterations, storms and flooding, and temperature extremes also scored highly as a threat to MMS.
- Construction at fore shore can cause chronic sedimentation, sewage effluent, pollutant discharge, and changes in water flow and runoff, loss of land from shoreline change or coastal erosion which can adversely affect coral growth rates and metabolic activities as well as directly destroy corals reef habitat.
- Dredging, land retreat, and sedimentation can smother reefs or increase turbidity in coastal waters, thus reducing light needed for coral growth.
- Coral disease and mortality can be seen due to increased pollution level and cause changes in coral community structure, and impede coral growth, reproduction, and larval settlement (e.g., nutrient runoff can lead to algal blooms that stifle coral growth).
- Coastal populations will increase and natural coastal protection will be degraded or lost, sea-level rise, salinity, pH and changes in storm patterns.
- Generation of waste and pollution; release of greenhouse gas emissions; freshwater depletion; spread of invasive flora and fauna through ballast water that cause destruction of marine ecosystem; as a result, it will affect the biotic and abiotic factor of this ecosystem and reduce the Rare/endangered/threaten marine fauna.
- Coral reefs provide spawning, nursery, refuge and feeding areas for a large variety of organisms, including economically important crustaceans (e.g. shrimps, spiny lobsters and crabs) and cephalopods. About 10% of global fisheries production comes from the coral reef ecosystems. There is a direct correlation between the health of reefs and the population of crustacean species. The decline of reefs because of human actions can cause a decrease in the biodiversity of crustaceans.
- Migratory marine species (MMS) include marine mammals, seabirds, turtles, sharks, and tuna. Many are now among the most threatened due to the diverse range of pressures they encounter during their extensive movements. 21% of MMS are classified as threatened (i.e. categorized as Critically Endangered, Endangered or Vulnerable). Sea turtles are the most threatened group (85%), followed by seabirds (27%), cartilaginous fish (26%), marine mammals (15%) and bony fish (11%).
- The ingestion of toxic substances leached from plastic fragments will cause negative impact on MMS, will be resulting in impaired movement and feeding, reduced reproductive output, lacerations, ulcers, and death along with oil pollution.
- Increased coastal development, increased population and habitat alteration will be greater threat to Nicobar Megapode and Nicobar Long-Tailed Macaques on coastal areas. The Nicobar megapode prefers a sandy loam bed of coastal areas to construct the nests. Any alternations in sea water activities in the vicinity of mounds can cause against the incubation process and thus a decline in mortality of offspring. These developments will have significant threats to the Nicobar Long-Tailed Macaques in the coastal areas.
- Without careful measures, Commercial marine shipping can unintentionally transport foreign species to new environments – where without natural predators, these "invasive" species can threaten local ecosystems and existing species; Degrade and damage the environment; Reduce biodiversity; Reduce productivity in resource sectors such as fisheries and aquaculture; Damage infrastructure such as piers as well as power, water and navigation systems; and Introduce diseases.
- The increasing human activities such as fishing in the mangrove areas, and crossing the creeks without adequate protection will result in crocodile attacks on humans and resulted as human-animal conflicts.

Impact of nocturnal animals:

- Artificial light is considered one of the significant pollutants which create notable disturbance to the variety of faunal communities in different ways along with the developing negative impacts on the ecosystems (Colman *et al.*, 2020). The artificial light makes significant changes in the foraging, reproduction, migration, and communication pattern of the wildlife with negative consequences, and evidence is recorded among a variety of faunal communities including invertebrates, birds, reptiles, and mammals (Longcore and Rich, 2004; Aubrecht *et al.*, 2008; Kamrowski *et al.*, 2012; Mazor *et al.*, 2013; Weishampel *et al.*, 2016; Colman *et al.*, 2020).
- The some nocturnal animal migrate and navigate by moonlight and starlight. The use of artificial light disrupts the biological clock and orientation of those species and as a result millions of birds die colliding with needlessly illuminated buildings and towers. Artificial lights can cause them to migrate too early or too late and miss ideal climate conditions for nesting, foraging and other behaviors.
- The impacts of light pollution on the sea turtles are notably high and make serious damage to their biological courses. The natural lights are providing the signal to the hatchlings for their general movement toward the sea whereas the presence of artificial light confuses their inherent behavior in finding the sea and causes tiredness, dehydration and the loss of energy that is vital to their first step of migration towards the open sea and resulted in higher mortality in early age and the presence of artificial light also enhances the scope of predation and make their life vulnerable (Witherington and Bjorndal, 1991; Lorne and Salmon, 2007; Pendoley and Kamrowski, 2015). Artificial light is also reported to disrupt the nesting of adults and female individuals are avoiding artificial light and even the beach for nesting (Salmon, 2003; Pendoley and Kamrowski, 2015; Silva *et al.*, 2017). The selection of any beach by the turtle for nesting is dependent on various ecological parameters and very selective beaches are being considered by the turtles for nesting while the presence of artificial light may change the entire dynamics of beach selection by the turtles. A recent study made by Colman *et al.* (2020) suggested that artificial light has a greater impact on the nesting behavior of leatherback turtles. A study made by Médicci *et al.* (2009) found that the proportion of landings with nest buildings decreased significantly due to the presence of artificial light but nesting success was not influenced by the presence of light.
- Artificial lights attract plenty of insects which can be seen as a fatal attraction. Declining insect populations negatively impact all species that rely on insects for food or pollination. Artificial lighting is tremendously harmful to many insect populations especially for moths. Once the insects are trapped by the light, they can be killed directly by lamp's heat or can be easy prey for several predators (https://myfwc.com/conservation/you-conserve/lighting/pollution/).
- The impacts of artificial lights on amphibians are also damaging. Majority of the frogs are nocturnal. Alteration in nest hiding behaviour,, reproductive behaviour, and possibly calling, breeding success are recorded due to the presence of artificial lights. Attraction towards artificial light as part of to forage make them more vulnerable to

dehydration and predators (https://myfwc.com/conservation/you-conserve/lighting/pollution/).

- Several mammals are nocturnal. The impact of artificial light can be seen to create major alteration in the circadian rhythm of some mammals. Presence of artificial light can increase rate of tumours among the rats due to suppressed melatonin production (https://myfwc.com/conservation/you-conserve/lighting/pollution/).
- Artificial lights are making serious damages to various reptiles like lizard and gecko (https://myfwc.com/conservation/you-conserve/lighting/pollution/).

Mitigation measures:

- Steps would be taken to reduce the intensity and percentage of artificial light in the vicinity of nesting ground and port to reduce light pollution that affects sea turtles.
- Turn off lights visible on nesting beaches or use special fixtures to shield the lights from the beach;
- 1st option- use of low-pressure sodium-vapor lighting (LPS) only.
- 2nd option-use of a light source lesser than 520 nm wavelength which is not within visible range of turtles.
- Use of Turtle Safe Lighting – these red lights emit a very narrow portion of the visible light spectrum, which is less intrusive to nesting sea turtles and hatchlings
- Introduction of unique sodium-vapor lighting light in consultation with expert/ specialist group.
- Detailed step-wise lighting plan including types of light, the intensity during construction and operational phase of ICTT, and in accordance with the breeding season of turtles.
- Preparation of lightning guidelines and making awareness among the employees and workers of the ICTT project.
- Detailed lighting plan for roadway, wharf, mast, or elevated structure lights with full 90°cutoff light fixtures.
- Steps should be taken to control the light spill to the sky by installing fixtures installed at around 15° below the horizontal plane.
- Use of minimum lights and light to minimum lamp wattage.
- A complete ban on the use of fluorescent, mercury vapor, metal halide, or other broad-spectrum high-intensity discharge lamps.
- Ban on floodlighting, up-lighting, or other forms of directional lighting aimed above the horizon.

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EAC Comment:

Since the impact assessment is grossly inadequate, the EMP budgets are grossly inadequate and not thought through. e.g. the biggest impact is on ecology and yet the annual budget allocation is only about 1.9 crore for monitoring ecology during construction phase while nothing is provided for during operational phase. Cost of Satellite studies and nest monitoring at Galathea on leatherback (10 lakh), coral transplantation (52 Crore), habitat restoration (4 crore), endangered species monitoring (22 lakh) etc. are grossly under-estimated.

ZSI input:

ZSI has given a brief plan on the coral transplantation and restoration with budget quote. Apart from coral reef ecosystem, if any habitat is requited to be restored with the association of ZSI, the institute will be part of the project.

Enclosure XIV

Management plan for terrestrial invasive species

Management plan for terrestrial invasive species at Great Nicobar Island

As part of the Great Nicobar Island development, most of the materials, labours and then the population will come to the land. In this process, there is possible threat to Great Nicobar Island from non-native plants, insects, animals, and diseases that harm the environment, economy and human health. This requires strategy for preventing introductions of invasive species on this Island and reducing impacts.

Main aim to this management plan is:

- Prevention
- Early detection & response
- Control & restoration
- collaboration

Prevention:

Preventing the introduction of terrestrial invasive species before they arrive in Great Nicobar Island (GNI) is the most cost-effective invasive species strategy (Leung et al. 2002; Lodge et al. 2016). The species that pose the greatest risk to environment, economy and human health must be identified through risk assessment and their pathways to introduction monitored and blocked.

Species with the most potential to harm the environment, economy or human health must be listed and regulated that prohibits or restricts their import, sale, and possession. The list of local species is already identified and listed (refer annexure I of this document). Based on the identified list of local species, the UT administration along with the forest department must prepare a regulation to prohibits/restrict the species other than the local species or which are harmful to local environment, economy and human health. Restriction on import of any material to GNI is prevention but is not a solution considering the long-term development of GNI.

Early detection & response

Detection of terrestrial invasive species on the arrival and respond to prevent their establishment and spread in Great Nicobar Island. The UT Administration must continually update the species list and communicate and coordinate the most effective surveillance strategies to battle Terrestrial Invasive Species. While new occurrences to GNI are inevitable, preparation prior to an early detection will increase the probability of eradication. Therefore, it is important to prepare an overarching Terrestrial Invasive Species Response Plan to establish a process of action, communication, evaluation, and funding before a new detection of a high threat species. Response plan (Species-specific) will be developed by UT Administration along with the forest department for invasive species that are most likely to arrive in Great Nicobar Island.

Control & restoration:

If an invasive species becomes widespread or established at a scale in which the potential for eradication is severely weakened, effective control is more difficult and requires more resources (Lodge et al. 2006). Invasions that are spreading or already causing significant impacts require different strategies than those for which early detection and eradication is still possible.

Administration must have the necessary information to forecast long-term impacts and weigh the benefits and costs of various management alternatives. Managing established Terrestrial Invasive

Species requires developing additional technologies (e.g., chemical, biocontrol, mechanical, genetic) or enhancing species-specific comprehensive management strategies, best control practices and restoration techniques to mitigate negative impacts. If treatments are pursued, the progress of treatment generally follows the method of prioritization by density of infestation (i.e., least to most infested, followed by restoration where necessary)

Collaboration:

The Administration must encourage collaboration to optimize solutions and share resources, knowledge and skills. Managing Terrestrial Invasive Species requires the knowledge and expertise of individuals from many disciplines and organizations including universities, government agencies, NGOs and the private sector. The Administration must conduct various programmes / workshops ahead of the start of implementation works at GNI to seeking the input of experts and support research.

Significant work is needed in the development and implementation of risk assessment, risk analysis, blocking pathways across boundaries and borders, species-specific response plans and control and management options. In this regard various expertise required for:

- Resource experts - to conceptualize and test strategies
- Partners - to assist in implementing the management plan throughout the work area
- Local resources - provide local residents with information on invasive species and treatment options and manage on-the-ground control activities.

To meet the above mentioned four goals of the Terrestrial Invasive Species, activities have been categorized into six areas:

- Risk analysis
- Management practices
- Monitoring and research
- Outreach and education
- Regulation and policy
- Leadership and coordination

Risk analysis:

Potential threats must be assessed through risk analysis; first, species must be evaluated by a risk assessment to determine the likelihood of a species introduction, establishment, spread and the severity of the impact. Risk analysis will aid in determining the most cost-effective management interventions, possibly including a deliberate, but justified "do nothing" approach.
Risk assessment requires understanding the biology of the species such as lifecycle, habitat requirements and various aspects of its reproduction. It also requires understanding how receptive Great Nicobar island's various forest, wildlife, urban, suburban and rural environments will be and how severely they could be impacted by the invasive organism. The risk assessment must be in line with the below framework:

1. Identify and prioritize ecosystems vulnerable to Terrestrial Invasive Species
2. Identify and prioritize current and potential high-threat Terrestrial Invasive Species
3. Analyse the impacts of landscape level factors
4. Analyse pathways of Terrestrial Invasive Species introduction and spread

Management Practices:

Develop and disseminate protocols and strategies for effective Terrestrial Invasive Species management and ecosystem restoration. Successful management, including prevention, early detection and control of Terrestrial Invasive Species requires a suite of tools to implement management actions. These include methods to identify the most important pathways to prevent new introductions and the most effective detection technologies. Once invasive species begin spreading, dispersal models are needed to determine how to best limit their spread. For those species that are well-established, managers need information on costs and benefits of various management alternatives, including streamlined processes for obtaining certifications and permits if necessary. Finally, restoration can be considered for some environments where invasive species have been sufficiently reduced and where consistent with land management goals. The management practice must be in line with the below framework:

1. Minimize impacts of Terrestrial Invasive Species through control activities
2. Decrease likelihood of new Terrestrial Invasive Species establishing and spreading in Great Nicobar Island
3. Incorporate Terrestrial Invasive Species prevention, detection and control into land management plans and activities
4. Prevent future Terrestrial Invasive Species invasions and restore ecosystem integrity through enhanced restoration and rehabilitation strategies

Monitoring and Research:

Coordinate monitoring efforts and direct research efforts to improve the effectiveness of Terrestrial Invasive Species management strategies. Knowledge about invasive species prevention, detection and treatment practices is incomplete and frequently outdated. Emphasizing the use of applied science will ensure that managers are implementing the most effective technologies for invasive species management. Communicating this information effectively through best management practices will ensure all partners are using the most effective tools.

A framework is also needed to measure progress in accomplishing the four goals of this plan: prevention, early detection and response, control and restoration and collaboration. For instance, monitoring the number of acres treated for invasive species measures an output but fails to show how well the plan achieves control and restoration. A variety of appropriate metrics tied to precise objectives are needed to help managers evaluate progress and identify ways to continually improve.

The Monitoring and Research must be in line with the below framework:

1. Improve surveillance, reporting and data management with a focus on pathways, risk analysis and early detection
2. Expand research on Terrestrial Invasive Species
3. Track implementation and assess effectiveness of the management plan

Outreach and Education:

Provide right and sufficient information and trainings to the management, associated staffs as well as to the locals, increase local involvement in prevention, detection and control efforts.

The outreach and education must be in line with the below framework:

1. Increase public awareness of Terrestrial Invasive Species impacts and threats using public and private partnerships

2. Prevent the introduction and limit the spread of Terrestrial Invasive Species through public outreach, staff training and information sharing
3. Improve the effectiveness of Terrestrial Invasive Species control through education and training on control measures

Regulation and Policy:

Use established research and data to develop and revise state policies and regulations for management of Terrestrial Invasive Species.
Appropriate regulations are necessary to keep invasive species out of Great Nicobar Island and minimize the spread of existing ones. Regulators need to provide clear and concise information on laws and policies and streamline processes to promote compliance among industries, recreational users and other partners. The regulation and policy must be in line with the below framework:

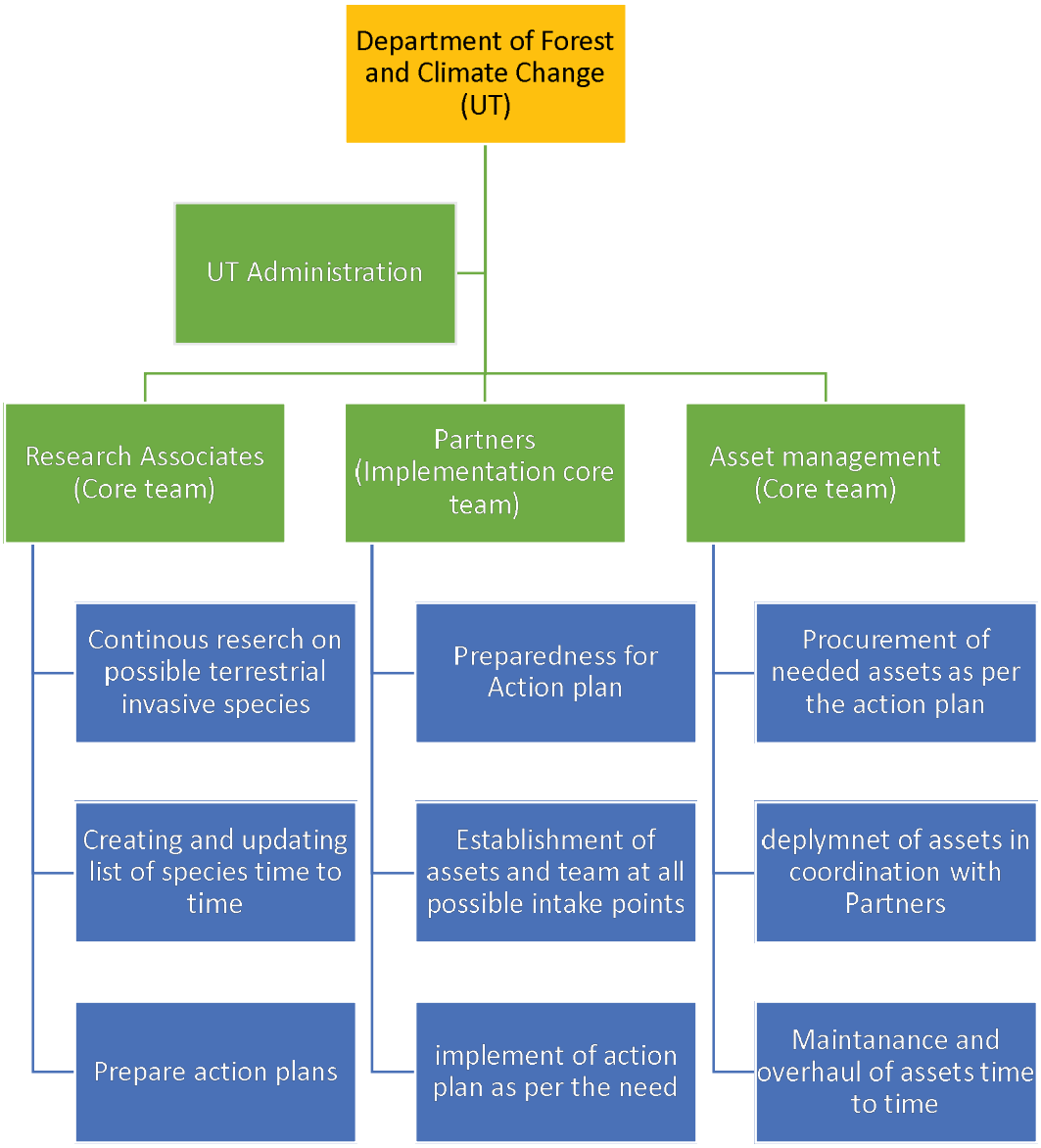
1. Improve regulatory and policy frameworks for invasive species management
2. Secure resources for high-priority invasive species projects

Leadership and Coordination:

Terrestrial Invasive Species prevention, detection and management occur at multiple levels of government among numerous partners and within various frameworks across the Island. To enhance the ability to prevent introductions, limit dispersal and improve effectiveness of long-term management measures, it is essential to put forth a cohesive and comprehensive interagency effort, provide support for external partners and facilitate informed decision-making. These strategic actions aim to enhance coordination among state agencies and build leadership capacity to advance Terrestrial Invasive Species management at all levels across the Island. The leadership and coordination must be in line with the below framework:

1. Improve capacity to detect and respond to high-threat and emerging Terrestrial Invasive Species
2. Increase technical expertise available for Terrestrial Invasive Species information and identification
3. Prevent and manage Terrestrial Invasive Species through coordination and collaboration with partners at multiple levels

The plan must be prepared by the UT Administration in full coordination with the forest department. The broad structure of the team to prepare the management plan and to implement as per the need is given below:



Reference:

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- Michigan's Terrestrial Invasive Species State Management Plan

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Annexure R-4(Continued)

Extract of submission made to EAC in its meeting held on 22-23rd August 2022 with relevant enclosures.

Details sought by EAC regarding Integrated development of International Container Transshipment Terminal (ICTT), Township & Area Development and Power Plant in Great Nicobar Island vide 297th meeting of Expert Appraisal Committee (EAC) held on 24th – 25thMay, 2022 at INDUS Conference hall in the Ministry of Environment, Forests & Climate Change (MoEF&CC), Indira Paryavaran Bhavan, New Delhi.

Sl. No.	Enclosure No.	Title
1.	***Enclosure 1***	Safe wild-life corridors
2.	***Enclosure 2***	Revised Master Plan layout
3.	***Enclosure 3***	Wildlife sanctuaries notification
4.	***Enclosure* 4**	500 m buffer from HTL around Pemayya Bay
5.	***Enclosure 5***	Exclusion of CRZ IA and IB from port land-use
6.	***Enclosure* 6**	Letter regarding existing storage of HSD at Campbell Bay
7.	***Enclosure* 7A**	Allotment of land for proposed shifting of IOCL Petroleum Terminal at Car Nicobar and Campbell Bay – Letter bearing File No. 1-44/TNC/Petrol Outlet/Car Nicobar/2012/1475
	***Enclosure* 7B**	Risk assessment for proposed HSD storage
8.	***Enclosure* 8**	Oil spill contingency plan
9.	***Enclosure* 9**	Conservation and Management Plan for Corals
10.	***Enclosure* 10**	Detailed evacuation plan
11.	***Enclosure* 11**	Disaster Management Plan for Andaman & Nicobar Islands
12.	***Enclosure* 12**	Road on stilts in CRZ areas
13.	***Enclosure* 13**	Revised ICRZ recommendations letter - No.PCCF/EPA/1/Vol-XVI/154
14.	***Enclosure* 14**	Impact of extended breakwater on turtle nesting
15.	***Enclosure* 15**	Conservation and long-term monitoring of Sea Turtles of the Nicobar Islands with special focus on the Leatherback Sea Turtle
16.	***Enclosure* 16A**	Comprehensive Conservation Plan – Long term monitoring and conservation of the endemic Nicobar Megapode (Megapodeius nicobariensis) in the Nicobar Archipelago submitted by WII
	***Enclosure* 16B**	Comprehensive Plan for Nicobar Megapode Conservation in the Nicobar Archipelago
17.	***Enclosure* 17**	Number of mounds of Nicobar Megapode and their location
18.	***Enclosure* 18**	Mangrove Conservation and Management Plan for Great Nicobar Island
19.	***Enclosure* 19**	Location map for mangroves in Great Nicobar Island
20.	***Enclosure* 20**	Crocodile Conservation Plan
21.	***Enclosure 21***	EMP Cost

EAC Observation (iv):

Over 50 Km of low-lying coastal area of the eastern side of the GNI is now being developed in the form of township and port as well as power plants which will obstruct the forest-sea shore- forest movement of several animals like Robber or Coconut Crab and birds, especially coastal birds like megapod. However, no provision for forest- sea shore wildlife corridors have been kept in the Master Plan Therefore, there is a need to revise the master plan layout keeping natural forest corridor between Campbell Bay / Galathea NPs and seashore of at least 300-500-meter width generally at every 3 km interval. Such corridors shall be excluded from project area. Location of such corridors shall be identified in consultation with ANFD. Roads crossing such wildlife/ animal corridors shall have animal underpasses in the form of elevated roads or animal over bridges depending upon the terrain. No provision for canopy bridges for road crossing by Nicobar Long-tailed Macaque, Nicobar tree shrew and other arboreal animal as well as passages for like crocodiles, crabs, frogs, snakes and other amphibians/reptiles are made. Same need to be made in road design. Such provision shall be made in road design and revised layout of the masterplan generally at every 2 Km interval between green belt on both sides of roads as per WII guidelines and in consultation with SFD. Provide chainage wise details of canopy crossings and underpasses as mentioned above.

Response (iv):

Safe wildlife corridors at eight (8) locations along the eastern side of the island connecting forest and seashore through via-ducts (elevated crossings) on the north south arterial road have been proposed and incorporated in the master plan. In addition to wildlife corridors, number of culverts and canopy crossings will be provided at appropriate locations and the same will be incorporated in the detailed engineering design for movement of wildlife. The locations of the proposed wildlife corridors i.e. via ducts have been selected based on the ground situation and input provided by ZSI and Department of Environment & Forest. The width of the corridor ranges from 250 m to 1100 m and the eastern side of the corridors towards the seashore would be maintained as green area.

Best Practices

Case Study 1: Mumbai-Nagpur Expressway, Maharashtra, India – provision of animal crossing corridors.

The Balasaheb Thackeray Samruddhi Mahamarg (expressway) between Nagpur and Mumbai will be the first highway in the country where nine green bridges (overpasses) and 17 underpasses for wild animal movement are being constructed as part of mitigation measures.

Also, all along the highway, leopard-proof fences will also be constructed so that the animal doesn't jump over on to the 701 km expressway which will see vehicles plying at speed upto 150 kmph. **The 120-meter wide road runs through 10 districts of Maharashtra and will cut the travel time from 16 to 8 hours.**

Of this 701 km, 117 km passes through wildlife habitats, tiger corridors, and eco-sensitive zone (ESZ) of three sanctuaries – Tansa, (corridor of Harishchandragadh sanctuary), katepurna, and Karanja Sohol called as wildlife focused area (WFA).

(Source: First in country: A flyover for animals on Mumbai-Nagpur highway | Nagpur News - Times of India (indiatimes.com)).

Case Study 2: Santa Monica mountains, California, USA –Wallis Annenberg wildlife crossing (Under construction as per below information).

The Wallis Annenberg Wildlife Crossing is a project comprising a green bridge built across the 101 highway near Los Angeles, creating a corridor between two parts of the Santa Monica mountains. Stretching 210 ft long and 165 ft wide, the overpass will allow safe passage for lizards, snakes, toads and mountain lions, with an acre of local plants on either side and vegetated sound walls to dampen light and noise for nocturnal animals as they slip across.

The project, nearly a decade in the making, comes at a crucial time. Highways in this car-heavy landscape crisscross critical habitat for the protected mountain lions and other animals, forcing them to make what can be deadly crossings. At least 25 of the big cats have been killed on Los Angeles freeways since 2002. The latest death was just weeks ago, on 23 March, when a young lion was struck and killed on the Pacific Coast highway.

The project is breaking the mold in many ways: not only is it the largest crossing in the world, stretching over 10 lanes of one of the busiest roadways in the country, but it's also an engineering marvel. The crossing is designed to seamlessly integrate into the mountains, offering big cats, coyotes, deer, lizards, snakes and other creatures a safe way to travel to different parts of open territory in the Santa Monica mountains recreation area – a 150,000-acre space.

The scientists say there is a learning curve for animals, and they will slowly begin to explore the bridge. For wary creatures, it may take up to five years to use the crossing successfully. Cats will follow smaller prey species, who generally more quickly adapt to the new territory.

The stretch of Highway 101 where groundbreaking was set to begin in April 2022. Photograph: John Antczak/ AP.

A rendering of the wildlife bridge crossing, which will feature native plants and vegetated walls. Photograph: AP

Some of the species that are expected to use the wildlife bridge. Photograph: Living Habitats and National Wildlife Federation.

(Source: Animal crossing: world's biggest wildlife bridge comes to California highway | Wildlife | The Guardian).

ICTT

EAC Observation (vii):

Considering the fact that due to ICTT construction in Galathea Bay, township development and other development activities as part of integrated development of Great Nicobar Islands the movement of Leatherback turtles as well as Nicobar Megapods and their nesting is likely to be disturbed and therefore the turtles and Nicobar Megapod birds are likely to shift their nesting sites in nearby western coast of the GNI and other areas. Though Andaman and Nicobar administration has declared some of the islands as WLS in Little Andaman and other places for Leatherback turtles and Nicobar Megapods yet considering the Pemayya Bay, Casuarina Bay and Alexandria Bay as established sites for Leatherback and Nicobar Megapod nesting are potential site for developing them as Wildlife Sanctuaries/ Conservation Reserve in to additional legal protection for these species. All the areas except the area proposed for defense purpose in western coast of GNI including Pemayya and Casuarina Bay shall be excluded from the master plan as stated in the previous meeting observations as well.

Response (vii):

1. **Nesting beaches management and protection of nests**

In GNI nesting of leatherback turtles have been reported in East of Indira point, West of Indira Point, Koshindon, Laxmi Nagar, North of Alexandria, South of Alexandria, North of Dogmar, South of Dogmar, Pulo Bed, Pulo Kunji, re Pinsuot, Renhong, Safed Balu, Patatiyo and South of Galathea besides Galathea bay.

All major nesting beaches in Great Nicobar Islands including Alexandria bay, Casuarina bay, Pemaya bay, Dogmar will be protected by establishing protection camp and kept under 24X7 surveillance and monitoring. Sufficient manpower will be deployed during nesting season for round the clock protection of all major nesting beaches. Hatcheries will be established in each of the nesting beaches to improve the survival rates of the hatchlings. Hatcheries will be established to support the main method of conservation and will be used alongside other conservation measures. Beach patrolling, clear demarcation of nests and providing protective fencing around the nests will be done to avoid predation.

Through effective protection and hatchery management, the survival rate of the hatchlings will be improved to 80-90%. The hatchlings so reared in the hatcheries will be released back into the sea as per standard procedures. The Department is having adequate expertise in management of turtle nesting beaches and hatcheries management. Efforts are on to establish the camps during October this year in all the major nesting beaches in GNI. Hatcheries will be managed by a qualified and experienced frontline staff of the department who has an expertise in turtle conservation. Capacity building programmes will be organised on regular basis for the frontline staff and employees involved in turtle conservation.

A detailed monitoring and evaluation system will be put in place by the department as that of Curthbert Bay in Middle Andaman to ensure that the hatchery is effective. Data on the number of nests and eggs, and the percentage of eggs that hatch successfully will be maintained as part of the hatchery management.

In addition to the nesting beaches in Great Nicobar Island, protection camps will also be established in nesting beaches of Little Nicobar, Kamorta, Katchal and Nancowry and necessary

care will be taken to protect the nests from the predators and hatcheries will also be established to improve the survival of hatchlings.

Sufficient fund provision has been kept under EMP for conservation of leatherback turtles and other sea turtles and management of nesting beaches. Further, the Administration, through the UT plan scheme will also take up turtle conservation programmes in other parts of the islands including the Andaman group of islands.

2. Effective measures proposed under the Leather Back Conservation plan are::

i. Systematically monitor the nesting population of Leatherback and other sea turtles in the Nicobar group of Islands.
ii. Track fine-scale movements and migration of Leatherback turtles and other sea turtle species to identify critical nearshore areas, inter-rookery movement or use of nesting beaches in the Nicobar group of islands.
iii. Conduct stable isotope studies of leatherback sea turtles to understand the factors affecting reproductive output and remigration intervals.
iv. Identify the genetic population structure of leatherback sea turtles from the Andaman & Nicobar Islands and assess their relatedness to populations of other RMUs.
v. Characterize all nesting beaches along with threat assessments and guide management to strategies protection measures (eg. establishing PA network, development of hatchery management guidelines, etc.) for critical nesting beaches considering futuristic scenarios.
vi. Conduct training workshops and awareness programs for forest personnel and local communities to develop their capacity in turtle population monitoring, habitat management, nest protection and hatchery management practices.
vii. Collection of extensive information on population and nesting ecology of leatherback turtles and other turtles of the Nicobar Islands
viii. Insights on the fine-scale movements, site-fidelity to nesting beaches, high use areas, inter-nesting intervals, and migration corridors of turtles of the Nicobar Islands will be generated.
ix. Information on the non-breeding regions and foraging areas of sea turtles, specifically of the threatened leatherback turtle will be established.
x. Information on the genetic identity of the leatherback turtle populations of the Nicobar Islands that represent the Northeast Indian Ocean RMU will be generated.
xi. List of priority nesting sites of each of the sea turtle species of the Nicobar Islands will be generated. Further, information on the vulnerability of these priority turtle nesting sites due to various influencing factors will be generated.
xii. Site-specific management interventions for the long-term conservation of sea turtles is developed and will include guidelines for legal protection measures (eg. Establishment of Protected Area Network) to offset population declines in sites with high development pressure.
xiii. Local communities, forest personnel and other stake holders will be made aware about sea turtles and their significance in marine ecosystems.
xiv. Capacity development programmes for the forest personnel and local communities to systematically monitor nesting turtle populations, manage nesting habitats and training to develop turtle hatcheries.

3. Declaration of new wildlife sanctuary;

Already 3 new wildlife sanctuaries have been identified at Little Nicobar, Menchal and Meroe Islands for conservation and protection of Leatherback turtles, Megapode and Corals respectively and intention notifications for declaration of wildlife sanctuaries have already been issued for the same. **Refer Enclosure 3.**

Status of the notification for new Wildlife Sanctuaries

- 21.03.2022 – Ministry of Home Affairs (MHA) accorded approval for new wildlife sanctuaries to be created. These include the following –

  a. Leatherback turtle sanctuary of 13.75 sq.km at Little Nicobar Island
  b. The entire Menchal Island of 1.29 sq.km as a Megapode Sanctuary.
  c. The entire Meroe Island of 2.73 sq.km as a Coral Sanctuary.

- 21.04.2022 – Intention notification issued for leatherback turtles, Megapode & Corals.

- 18.05.2022 – Proclamation has been issued on by Deputy Commissioner (Nicobars) inviting claims and objections to settle their rights.

DC (Nicobar) vide order no. 123 dated 19.07.2022 stated that there no person has any rights within the limits of proposed three wildlife sanctuaries. Based on the said order, the process of issuing final notification has been initiated.

4. Protection of Pemayya Bay

In case of Pemayya Bay, a buffer of 500 mts from the HTL around Pemayya Bay has been demarcated as special use area for Costal Protection and no development activities have been proposed in the buffer area of Pemayya Bay and the area will be kept as green and shall restrict any activity which may impact protection of Leatherback turtles in the area. **Refer Enclosure 4.**

5. Additional beaches identified for leather Back conservation and protection

Further, areas namely Alexandria Bay and Casuarina Bay are located far away and fall outside the project area on the western coast. All these areas including Pemayya Bay have been made part of the leatherback conservation plan. Also, the Pemayya Bay, Alexandria Bay, Casuarina Bay and other potential leatherback turtle nesting sites such as Nanjappa Bay, Dogmar, Pulo Bed, Pulokunji, etc. have been included as part of Leatherback turtle conservation plan. As such, adequate measures have been proposed for protection of nesting beaches and sea turtles including leatherback turtles.

Since effective measures have been proposed for conservation of turtles and their nesting beaches in Great Nicobar Island besides declaration of leatherback turtle sanctuary and protection of nesting beaches in other islands of Nicobar group and Little Andaman, declaration of further WLS in GNI is not proposed.

EAC Observation (x):

Though many parts of the proposed master plan for port falling within CRZ IA and CRZ IB (Viz area B, C, D etc) are proposed to be eliminated from master plan yet the revised layout map of the project after excluding such areas have not been submitted.

Response (x):

The areas highlighted in the observation (x) above have been removed from the proposed port plan. **Refer Enclosure 5.**

EAC Observation (xi):

Wildlife Institute of India (who have done sea turtle monitoring and satellite tracking across parts of India for several decades) should submit detail road map with financial requirement for monitoring Leatherback Turtle movement through satellite tracking in GNI and habitat restoration & nest protection measures at all other nesting sites in A & N for minimum 10 years.

Response (xi):

WII has prepared the plan for Conservation and long-term monitoring of Sea Turtles of the Nicobar Islands with special focus on the Leatherback Sea Turtle for a period of 10 years primarily aimed at conservation of leatherback turtles and other sea turtles in Great Nicobar Islands and other islands in Nicobar group.

The conservation plan will be implemented in two phases and will involve intensive efforts to systematically monitor nesting beaches and at the same time involve extensive use of technology to understand the turtles in the offshore environment.

Phase I will involve the following activities –

a. Population monitoring and nesting ecology
b. Movement Ecology: tracking movements, identification of high use areas in the breeding sites and non-breeding regions
c. Determining foraging areas using stable isotopes
d. Population genetic structure of leatherback turtles
e. Assessing vulnerability of turtle nesting beaches and adoption of appropriate management strategies
f. Multi-stakeholder involvement in the long-term conservation of sea turtles

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 sea turtles.

The activities listed are proposed to be taken up during the Phase II-

a. Annual population assessment surveys as per the standardized protocol developed during Phase 1.
b. Implementation of site-specific nesting habitat management interventions such as removal of dune vegetation and explore possibility of thinning tree or shrub cover in the immediate vicinity of nesting beach.
c. Implement measures to control introduced predators to eliminate or reduce sea turtle nest predation.

d. Development of site-specific nesting beach management plans
e. Strengthening the research wing of the forest department by conducting special training programs on using advanced scientific tools for data collection and analysis.

The budget requirement for the proposed 10-year Sea Turtle Conservation Plan for the Nicobar Islands is INR 29.83 Crores where INR 20.88 Crores for WII and INR 8.95 Crores for A&N Forest Department for its implementation in two phases. Refer Enclosure 15 for details of the 'Conservation and long-term monitoring plan'.

EAC Observation (xii):

SACON is requested to submit Nicobar Megapod monitoring and conservation plan for minimum 10 years.

Response (xii):

As desired by EAC under conclusion and recommendation, the SACON/WII were asked to submit a Monitoring and conservation Plan for a minimum period of ten years and both the institutions have been asked to submit a joint proposal for monitoring and conservation plan for Nicobar megapode for ten years. They have also been requested to take on board any scientists or organisations working on this particular species at present or in the past, in the interest of conservation of the said species and its habitat. However, in spite of our efforts to get a proposal jointly from WII/SACON, both the institutions have submitted a separate proposal.

The Conservation and monitoring plan submitted by WII focuses on the standardisation of population estimation techniques for Nicobar megapode across its distributional range to understand population trend of the species over time (long-term), role of habitat features in structuring megapode populations within and across islands, nesting patterns of the Nicobar Megapodes across ecological gradients and document potential factors that influence their reproductive success, fine-scale movements and ranging patterns of Nicobar Megapodes within and across islands using advance technology, investigate dispersal, colonisation and meta-population dynamics of Nicobar Megapode populations across the islands, threat assessments to the Megapode populations due to natural and anthropogenic drivers through vulnerability and risk mapping and create awareness among local communities on the Nicobar Megapode and assist in the identification and establishment of Conservation Areas and conduct capacity-building programs for local stakeholders for effective conservation of Nicobar Megapodes. The expected outcome of the implementation conservation and monitoring in next 10 years will provide 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, 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 conservation reserves for in-situ conservation, and capacity developed among front-line forest staff on population monitoring techniques, data collection and compilation. The budget requirement of Rs. 22.02 crores is projected for implementation of the plan in next 10 years.

The SACON submitted a comprehensive conservation plan for nicobar megapode and the proposed plan focuses on standardised population monitoring protocol, distribution of the Nicobar megapode, Spatio-temporal monitoring, identification of the critical breeding habitats, study the breeding ecology to strategies for future interventions, monitoring of the movement pattern, landscape level habitat use, dispersal ability, and colonization, genetic diversity, assessment of the threats to

Nicobar megapode to provide site/island-specific interventions, development and implementation of a participatory conservation model through capacity building and awareness, development and implementation of a relocation and captive management plan for the Nicobar megapode population in the proposed project site. The budget requirement for the proposed Comprehensive Plan for Nicobar Megapode Conservation in the Nicobar Archipelago is INR 18.21 Crores for its implementation in two phases.

Since WII has been identified as a scientific agency to prepare and implement conservation plans for leatherback turtles and saltwater crocodiles and to have proper coordination in the field, it is suggested that WII may include SACON and implement the conservation plan. Coordinated and collaborative research will have better outcome and in the larger interest of the endemic species of Nicobar megapode, WII may co opt SACON in implementation of the plan. They can also include institutions like ZSI as ZSI has worked on the species in the recent past and have come out with the mapping of the megapode mounds in Great Nicobar Island.

Refer Enclosure 16 A Comprehensive conservation plan –Long term monitoring and conservation of the endemic Nicobar Megapode in the Nicobar Archipelago submitted by WII, Dehra Dun.

Refet Encloser 16 B 'Comprehensive Plan for Nicobar Megapode Conservation in the Nicobar Archipelago' submitted by SACON, Coimbatore.

Plan/coral conservation plan which normally forms the part of EIA/EMP for CRZ purposes. No justification has been given for not including mangrove conservation plan including the plan for compensatory planting in lieu of loss of mangrove cover.

Response (xxiii):

The Mangrove Conservation and Management Plan for Great Nicobar Island has been prepared by the Department of Environment and Forests, A&N Administration and the same is enclosed as **Enclosure 18**. Refer **Enclosure 19** for Map for location of mangroves. The mangrove conservation plan is aimed at restoration and restocking of the tsunami impacted mangrove areas besides enhancement/enrichment through plantations. The plan also aims at improving the diversity of mangroves, its richness and stand density through proper assessment of distribution and status of mangrove species found in Great Nicobar Island alongwith the locations. The conservation plan addresses the strategies to restore and revive the mangrove areas through ecological restoration and enrichment planting.

As part of the conservation plan, the following strategies namely establishment of mangrove nursery, habitat enhancement/rehabilitation, mangrove plantation, establishment and management, development of mangrove/plantation techniques, management techniques, revival of critical taxa, research and monitoring and education outreach have been included.

An amount of Rs.7.5 crores is kept for mangrove conservation and management as part of EMP.

The updated EMP cost is enclosed as **Enclosure 21.**

EAC Observation (xxiv):

Similarly, coral conservation plan has not been included in the EIA/EMP without giving any justification for non-inclusion in EIA/EMP.

Response (xxiv):

The Coral Conservation Plan prepared by ZSI addresses both, the conservation strategies for coral colonies around GNI as well as translocation strategies for ten (10) hectares of impacted corals. A total of 245 species of scleractinian corals under 53 genera and 15 families (including 2 genera under Scleractinia IncertaeSedis) are recorded from seven sites including the Great Nicobar Island. No major coral reef exists within the work area of the project. However, scattered coral reefs are available at the peninsular part of the Galathea Bay.

As part of the assessment for conservation and management of Coral reefs, the Coral cover required to be translocated from the proposed site is around 10 ha which includes around 20668 Coral colonies out of which approximately 16150 colonies will be translocated. The plan addresses the probable sites for translocation, the methodology, the coral colonies for transplantation, conservation and management of coral reefs both at the translocated sites, donor sites and other sites in Great Nicobar Islands. The conservation and management strategies include physicochemical assessment of water, survey methods for macro benthos both qualitative and quantitative analysis, etc. The approximate cost of coral conservation plan is estimated to INR 53.57 Crores. **Refer Enclosure 9** for detailed Coral Conservation Plan.

The updated EMP cost is enclosed as **Enclosure 21.**

EAC Observation (xxv):

In response to EACs request for Saltwater Crocodile management plan, no plan have been submitted except the assurance of following Action plan for mitigation of Human crocodile conflict in A&N Islands along with the SOP. These areas of GNI being good nesting sites of Saltwater Crocodile are likely to fall in category of Crocodile Conservation Zones (CCZ) and therefore as per prescriptions of Action plan no human activities including tourism is permitted unless it is prescribed in wildlife management plan/working plan. Prescriptions for mitigation of conflict as per Action plan will be applicable only if areas within project site fall in human-crocodile co-existence zone or crocodile free zone. Therefore, there is a need to submit the actual status of the Saltwater Crocodile habitat/nesting sites falling within the project area as per Action plan for mitigation of human crocodile conflict areas along with a Saltwater Crocodile conservation plan in case areas inside project fall in Crocodile conservation Zone category.

Response (xxv):

In Great Nicobar Island the crocodiles have been sighted in Magar nallah, Dillon nallah, Vihjay Nagar, Laxmi nagar, galathea bay and navy dera in the project area in the past and also in Casuarina bay and Alexandria bay in the west coast falling outside the project area. The potential habitats include Gandhi nagar, and Shastri nagar, etc. Accordingly, WII has been asked to prepare a crocodile conservation plan. WII has prepared a 'Conservation & Management Plan of Salt Water Crocodile (Crocodylus porosus) in Great Nicobar Island'.

aimed at long term conservation of Saltwater Crocodile and its habitat in GNI based on robust scientific data, rigorous monitoring and scientific rescue and rehabilitation practices.

The conservation plan proposes to study the population size, occupancy, ecology and genetics on salt water crocodile of GNI, monitor movement and ranging pattern of different age and sex of individual in selected crocodile habitats and identification of nesting sites, their protection, conservation and management including monitoring of the population including mitigation strategies.

The programme will have the following objectives:

- Identification and characterization of crocodile habitats.
- To ensure public safety through prohibition, regulation and crocodile rehabilitation.
- Improve community awareness for crocodile human coexistence.

The conservation and management plan of salt water crocodile in Great Nicobar Island addresses the issue of creating a crocodile rescue and rehabilitation centre. Based on the outcome of the study and looking at the population size at different crocodile habitats and potential habitats. The management strategies including the spatial planning and zonation will be carried out for effective conservation of the species and its habitats based on the outcome of assessment for status and distribution of crocodiles with their abundance.

The Conservation & Management Plan is divided into two components as Monitoring and Management. The budget requirement for the Monitoring is INR 9.7 Crores and for Management is INR 32.2 Crores. The implementation of the plan will be done in two phases of 5 years each post approval of the plan. Refer **Enclosure 20** for the 'Conservation and Management Plan of Salt Water Crocodile' prepared by WII.

EAC Observation (xxvi):

Response to 3.1.27. Conclusions and Recommendations by the EAC.

A. Exclusion of areas from total project area

EAC Comment (i):

Areas proposed for any activity other than defense in the western coast of the GNI especially the areas of Pemayya Bay, Casuarina Bay and Alexandria Bay which can be used by Leatherback and other sea turtles and Nicobar Megapods and even by crocodiles as alternative nesting sites.

Response (i):

No development is proposed on the western side of Galathea Bay in Phase I development apart from Defence area development, power plant and basic infrastructure to sustain defence and power plant site.

It is recommended to have a buffer area of 500 mts from high tide line around Pemayya to be declared as Costal Protection Area with stringent controls on any development within the area. Revised map is enclosed as **Enclosure 4.**

Alexandria Bay and Casuarina Bay are located far away and fall outside the project area on the western coast. All these areas including Pemayya Bay have been made part of the leatherback conservation plan. Adequate measures have been proposed for protection of nesting beaches and turtles.

The proposed highlighted area as per map below and the entire Trunk infrastructure (in addition to area highlighted below) will be developed in Phase I

Proposed Phase I development:

All necessary mitigation measures and conservation strategies have already been included and are part of the EMP. Extending the breakwater further towards Galathea river will have an adverse impact on the shore line of the western flank of Galathea Bay. This may cause erosion to the beach and will severely impact the turtle nesting areas. It is thus not recommended to extend the breakwater towards the mouth of Galathea river.

EAC Comment (viii):

300 to 500 Mtr wide natural forest corridor should be kept as animal corridor at every 3 Km interval all along project area for facilitating movement of wildlife between forest and the sea shore so that development plants at GNI does not stop the access of several endemic and endangered wild animals like Nicobar Long-tailed Macaque, Nicobar tree shrew, Robber or Coconut crabs, Saltwater Crocodiles Nicobar Megapod, Nicobar Crake etc. to the sea which is actually the part of their habitat. This shall be done in consultation of A&NFD and wildlife experts. Chainage wise details to be provided in the road alignment.

Response (viii):

Safe wildlife corridors at 8 locations along the eastern side of the island connecting forest and seashore through via-ducts in the north south arterial road have been proposed and incorporated in the master plan. In addition, several culverts and canopy crossings will be provided at appropriate locations and the same will be incorporated in the detailed engineering design for the safe movements of wildlife. The locations of the proposed wildlife corridors i.e. via ducts have been selected based on the ground situation and inputs provided by ZSI and Department of Environment & Forest. The width of the corridor ranges from 250 meters to 1100 meters and the eastern side of the corridors via ducts towards the seashore would be maintained as green area and no development is proposed in the said areas. Refer **Enclosure 1.**

EAC Comment (ix):

Stretches of road crossing these above-mentioned wildlife corridors shall be elevated to facilitate the movement of wildlife under these elevated road stretches or alternatively wildlife over bridges can be constructed if terrain demands. Chainage wise details to be provided in the road alignment.

Response (ix):

Safe wild-life corridors at multiple locations along the eastern side of the island connecting forest-sea shore through via-ducts in the 55m wide arterial road have been incorporated in the master plan**.** Further, adequate number of culverts and canopy crossings will also be provided at appropriate locations and incorporated in the detail design stage. Refer **Enclosure 1..**

EAC Comment (x):

Provision shall be made in road design for canopy walks/bridges for crossing the arboreal animals as well as for passage of snakes, crabs crocodiles etc and other amphibians/ reptiles. Chainage wise details to be provided in the road alignment.

Response (x):

Safe wildlife corridors at 8 locations along the eastern side of the island connecting forest- sea shore through via-ducts on the 55 m wide arterial road have been incorporated in the master plan. Adequate number of culverts and canopy crossings will also be provided in addition to the 8 via ducts at appropriate locations during the detail design stage. **Refer Enclosure 1.**

EAC Comment (xi):

The stretches of the road falling in CRZ IA and IB area shall be on stilts as per the prescriptions in CRZ notification. Revised layout of plan shall clearly indicate such stretches along with geo coordinates and the mention of road on stilts shall also be made in the master plan as per this revised lay out. Chainage wise details to be provided in the road alignment

Response (xi):

The suggestion has been incorporated in master plan. **Refer Enclosure 2.**

D. Declaration of Protected Areas for conservation of Turtles, Megapode bird and crocodiles: -

EAC Comment (xiii):

A&N FD in consultation with WII shall identify the areas in Pemayya Bay, Casuarina Bay and Alexandria Bay suitable for habitat and nesting ground of Leatherback turtles, Nicobar Megapode and Saltwater Crocodiles. Additional legal protection to these areas by way of declaring these areas as WLS or Conservation Reserves as per provisions of Wildlife Protection Act. This may help in ensuring the continued nesting of these animal/birds in Great Nicobar Islands. These will be in addition to the PAs already in the process of notification.

Response (xiii):

Already 3 new wildlife sanctuaries have been identified at Little Nicobar, Menchal and Meroe Islands for conservation and protection of Leatherback turtles, Megapode and Corals respectively and intention notifications for declaration of wildlife sanctuaries have already been issued for the same. **Refer Enclosure 3.**

Status of the notification for new Wildlife Sanctuaries

- 21.03.2022 – Ministry of Home Affairs (MHA) accorded approval for new wildlife sanctuaries to be created. These include the following –

  a. Leatherback turtle sanctuary of 13.75 sq.km at Little Nicobar Island
  b. The entire Menchal Island of 1.29 sq.km as a Megapode Sanctuary.
  c. The entire Meroe Island of 2.73 sq.km as a Coral Sanctuary.

- 21.04.2022 – Intention notification issued for leatherback turtles, Megapode & Corals.

- 18.05.2022 – Proclamation has been issued on by Deputy Commissioner (Nicobars) inviting claims and objections to settle their rights.

DC (Nicobar) vide order no. 123 dated 19.07.2022 stated that there no person has any rights within the limits of proposed three wildlife sanctuaries. Based on the said order, the process of issuing final notification has been initiated.

In case of Pemayya Bay, a buffer of 500 mts from the HTL around Pemayya Bay has been demarcated as special use area for Costal Protection and no development activities have been proposed in the buffer area of Pemayya Bay and the area will be kept as green and shall restrict any activity which may impact protection of Leatherback turtles in the area. **Refer Enclosure 4.**

Further, areas namely Alexandria Bay and Casuarina Bay are located far away and fall outside the project area on the western coast. All these areas including Pemayya Bay have been made part of the leatherback conservation plan. Also, the Pemayya Bay, Alexandria Bay, Casuarina Bay and other potential leatherback turtle nesting sites such as Nanjappa Bay, Dogmar, Pulo Bed, Pulokunji, etc. have been included as part of Leatherback turtle conservation plan. As such, adequate measures have been proposed for protection of nesting beaches and sea turtles including leatherback turtles.

Since effective measures have been proposed for conservation of turtles and their nesting beaches in Great Nicobar Island besides declaration of leatherback turtle sanctuary and protection of nesting beaches in other islands of Nicobar group and Little Andaman, declaration of further WLS in GNI is not proposed.

EAC Comment (xiv):

Wildlife corridors as proposed in above paras can also be declared as Conservation Reserves/ Community Reserves under WLPA.

Response (xiv):

For facilitating movement of wildlife between forest and the seashore to several endemic and endangered wild animals like Nicobar Long-tailed Macaque, Nicobar tree shrew, Robber or Coconut crabs, Saltwater Crocodiles Nicobar Megapod, Nicobar Crake etc. Eight numbers of strips of varying widths ranging from 220 m to 1100 m have been envisaged as a part of dedicated wildlife corridors in the project for unhindered and safe movement of animals to travel freely between the forest and the seashore without crossing the roads. The wildlife corridors have been designated as open green area where no development activities have been proposed and separate Development Control Regulations (DCRs) will be crafted to ensure protection, operation and maintenance of the designated corridors. These will form a part of the overall DCRs which will be formulated at a later stage.

As adequate safeguards and protection from the wildlife corridors have been provided declaring them as conservation reserves /community reserves does not arise.

EAC Comment (xv):

Mangrove Conservation Plan: Mangrove areas falling inside the project areas should be clearly demarcated and area calculated. Total loss of Mangrove cover shall be intimated which shall form the basis for Mangrove Conservation Plan. Detailed Mangrove Conservation Plan should be prepared by PP in consultation with A&NFD which shall include compensatory planting of Mangrove as well as re-densification of the degraded mangrove areas in Great Nicobar, and other islands of Nicobar group and Andaman group of Islands. This plan shall form the part of EIA/EMP reports. PP shall also indicate the time frame for preparation of the plan and its inclusion in the EIA/EMP report.

Response (xv):

The Mangrove Conservation and Management Plan for Great Nicobar Island has been prepared by the Department of Environment and Forests, A&N Administration and the same is enclosed as **Enclosure 18.** Refer **Enclosure 19** for Map for location of mangroves. The mangrove conservation plan is aimed at restoration and restocking of the tsunami impacted mangrove areas besides enhancement/enrichment through plantations. The plan also aims at improving the diversity of mangroves, its richness and stand density through proper assessment of distribution and status of mangrove species found in Great Nicobar Island alongwith the locations. The conservation plan addresses the strategies to restore and revive the mangrove areas through ecological restoration and enrichment planting.

As part of the conservation plan, the following strategies namely establishment of mangrove nursery, habitat enhancement/rehabilitation, mangrove plantation, establishment and management, development of mangrove/plantation techniques, management techniques, revival of critical taxa, research and monitoring and education outreach have been included..

The updated EMP cost is enclosed as **Enclosure 21**.

EAC Comment (xvi):

Coral Conservation Plan: A detailed Coral Conservation/Translocation Plan shall be prepared by the PP in consultation with A&NFD and ZSI following IUCN sp translocation protocols and the same shall be made the part of EIA/EMP report. PP shall also indicate the time frame for preparation of the plan and its inclusion in the EIA/EMP report.

Response (xvi):

The Coral Conservation Plan prepared by ZSI addresses both, the conservation strategies for coral colonies around GNI as well as translocation strategies for ten (10) hectares of impacted corals. A total of 245 species of scleractinian corals under 53 genera and 15 families (including 2 genera under Scleractinia IncertaeSedis) are recorded from seven sites including the Great Nicobar Island. No major coral reef exists within the work area of the project. However, scattered coral reefs are available at the peninsular part of the Galathea Bay.

As part of the assessment for conservation and management of Coral reefs, the Coral cover required to be translocated from the proposed site is around 10 ha which includes around 20668 Coral colonies out of which approximately 16150 colonies will be translocated. The plan addresses the probable sites for translocation, the methodology, the coral colonies for transplantation, conservation and management of coral reefs both at the translocated sites, donor sites and other sites in Great Nicobar Islands. The conservation and management strategies include physicochemical assessment of water, survey methods for macro benthos both qualitative and quantitative analysis, etc. The approximate cost of coral conservation plan is estimated to INR 53.57 Crores. **Refer Enclosure 9** for detailed Coral Conservation Plan.

The updated EMP cost is enclosed as **Enclosure 21.**

EAC Comment (xvii):

Crocodile Conservation and Management Plan: PP shall indicate the crocodile habitats and nesting grounds inside the project area along with the geo coordinates and intimate the status of such crocodile habitat and nesting grounds as per the Action Plan for Mitigation of Human-Crocodile Conflict in Andaman & Nicobar Islands. In case these identified crocodile habitats/nesting grounds are categorized as Crocodile Conservation Zone attempts shall be made to exclude these crocodile habitats/nesting grounds from the project area and in case it is unavoidable to exclude such areas then a crocodile Conservation Plan shall be made by PP in consultation with A&NFD and WII and same shall be part of EIA/EMP reports. PP shall also indicate the time frame for preparation of the plan and its inclusion in the EIA/EMP report.

Response (xvii):

In Great Nicobar Island the crocodiles have been sighted in Magar nallah, Dillon nallah, Vihjay Nagar, Laxmi nagar, galathea bay and navy dera in the project area in the past and also in Casuarina bay and Alexandria bay in the west coast falling outside the project area. The potential habitats include Gandhi nagar, and Shastri nagar, etc. Accordingly, WII has been asked to prepare a crocodile conservation plan. WII has prepared a 'Conservation & Management Plan of Saltwater Crocodile (Crocodylus porosus) in Great Nicobar Island'. aimed at long term conservation of Saltwater Crocodile and its habitat in GNI based on robust scientific data, rigorous monitoring and scientific rescue and rehabilitation practices.

The conservation plan proposes to study the population size, occupancy, ecology and genetics on salt water crocodile of GNI, monitor movement and ranging pattern of different age and sex of individual in selected crocodile habitats and identification of nesting sites, their protection, conservation and management including monitoring of the population including mitigation strategies.

The programme will have the following objectives:

- Identification and characterization of crocodile habitats.
- To ensure public safety through prohibition, regulation and crocodile rehabilitation.
- Improve community awareness for crocodile human coexistence.

The conservation and management plan of salt water crocodile in Great Nicobar Island addresses the issue of creating a crocodile rescue and rehabilitation centre. Based on the outcome of the study and looking at the population size at different crocodile habitats and potential habitats. The management strategies including the spatial planning and zonation will be carried out for effective conservation of the species and its habitats based on the outcome of assessment for status and distribution of crocodiles with their abundance.

The Conservation & Management Plan is divided into two components as Monitoring and Management. The budget requirement for the Monitoring is INR 9.7 Crores and for Management is INR 32.2 Crores. The implementation of the plan will be done in two phases of 5 years each post approval of the plan. Refer **Enclosure 20** for the 'Conservation and Management Plan of Salt Water Crocodile' prepared by WII.

The updated EMP cost is enclosed as **Enclosure 21**.

EAC Comment (xviii):

Wildlife Institute of India should submit detail road map with financial requirement for monitoring Leatherback Turtle movement in GNI and habitat restoration & nest protection measures at all other nesting sites in A & N for minimum 10 years.

Response (xviii):

WII has prepared the plan for Conservation and long-term monitoring of Sea Turtles of the Nicobar Islands with special focus on the Leatherback Sea Turtle for a period of 10 years primarily aimed at conservation of leatherback turtles and other sea turtles in Great Nicobar Islands and other islands in Nicobar group.

The conservation plan will be implemented in two phases and will involve intensive efforts to systematically monitor nesting beaches and at the same time involve extensive use of technology to understand the turtles in the offshore environment.

Phase I will involve the following activities –

a. Population monitoring and nesting ecology
b. Movement Ecology: tracking movements, identification of high use areas in the breeding sites and non-breeding regions
c. Determining foraging areas using stable isotopes
d. Population genetic structure of leatherback turtles

e. Assessing vulnerability of turtle nesting beaches and adoption of appropriate management strategies
f. Multi-stakeholder involvement in the long-term conservation of sea turtles

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 sea turtles. The activities listed are proposed to be

taken up during the second phase:

1. Annual population assessment surveys as per the standardized protocol developed during Phase 1.
2. Implementation of site-specific nesting habitat management interventions such as removal of dune vegetation and explore possibility of thinning tree or shrub cover in the immediate vicinity of nesting beach.
3. Implement measures to control introduced predators to eliminate or reduce sea turtle nest predation.
4. Development of site-specific nesting beach management plans
5. Strengthening the research wing of the forest department by conducting special training programs on using advanced scientific tools for data collection and analysis.

The budget requirement for the proposed 10-year Sea Turtle Conservation Plan for the Nicobar Islands is INR 29.83 Crores where INR 20.88 Crores for WII and INR 8.95 Crores for A&N Forest Department for its implementation in two phases. Refer **Enclosure 15** for details of the 'Conservation and long-term monitoring plan'.

EAC Comment (xix):

SACON/ Wildlife Institute of India is requested to submit Nicobar Megapod monitoring and conservation plan for minimum 10 years.

Response (xix):

As desired by EAC under conclusion and recommendation, the SACON/WII were asked to submit a Monitoring and conservation Plan for a minimum period of ten years and both the institutions have been asked to submit a joint proposal for monitoring and conservation plan for Nicobar megapode for ten years. They have also been requested to take on board any scientists or organisations working on this particular species at present or in the past, in the interest of conservation of the said species and its habitat. However, in spite of our efforts to get a proposal jointly from WII/SACON, both the institutions have submitted a separate proposal.

The Conservation and monitoring plan submitted by WII focuses on the standardisation of population estimation techniques for Nicobar megapode across its distributional range to understand population trend of the species over time (long-term), role of habitat features in structuring megapode populations within and across islands, nesting patterns of the Nicobar Megapodes across ecological gradients and document potential factors that influence their reproductive success, fine-scale movements and ranging patterns of Nicobar Megapodes within and across islands using advance technology, investigate dispersal, colonisation and meta-population dynamics of Nicobar Megapode populations across the islands, threat assessments to the Megapode populations due to natural and anthropogenic drivers through vulnerability and risk mapping and create awareness among local communities on the Nicobar Megapode and assist in the identification and establishment of Conservation Areas and conduct capacity-building programs for

local stakeholders for effective conservation of Nicobar Megapodes. The expected outcome of the implementation conservation and monitoring in next 10 years will provide 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, 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 conservation reserves for in-situ conservation, and capacity developed among front-line forest staff on population monitoring techniques, data collection and compilation. The budget requirement of Rs. 22.02 crores is projected for implementation of the plan in next 10 years.

The SACON submitted a comprehensive conservation plan for nicobar megapode and the proposed plan focuses on standardised population monitoring protocol, distribution of the Nicobar megapode, Spatio-temporal monitoring, identification of the critical breeding habitats, study the breeding ecology to strategies for future interventions, monitoring of the movement pattern, landscape level habitat use, dispersal ability, and colonization, genetic diversity, assessment of the threats to Nicobar megapode to provide site/island-specific interventions, development and implementation of a participatory conservation model through capacity building and awareness, development and implementation of a relocation and captive management plan for the Nicobar megapode population in the proposed project site. The budget requirement for the proposed Comprehensive Plan for Nicobar Megapode Conservation in the Nicobar Archipelago is INR 18.21 Crores for its implementation in two phases.

Since WII has been identified as a scientific agency to prepare and implement conservation plans for leatherback turtles and saltwater crocodiles and to have proper coordination in the field, it is suggested that WII may include SACON and implement the conservation plan. Coordinated and collaborative research will have better outcome and in the larger interest of the endemic species of Nicobar megapode, WII may co opt SACON in implementation of the plan. They can also include institutions like ZSI as ZSI has worked on the species in the recent past and have come out with the mapping of the megapode mounds in Great Nicobar Island.

Refer Enclosure 16 A Comprehensive conservation plan –Long term monitoring and conservation of the endemic Nicobar Megapode in the Nicobar Archipelago submitted by WII, Dehra Dun.

Refet Encloser 16 B 'Comprehensive Plan for Nicobar Megapode Conservation in the Nicobar Archipelago' submitted by SACON, Coimbatore.

EAC Comment (xx):

The PP has to submit revised ICRZ recommendation letter issued on 22/03/2022 by Andaman & Nicobar Islands Coastal Zone Management Authority (ANCZMA) especially regarding effective ICRZ area involved in various activities has been revised and part of holistic project now declared for Defence, Strategic, National Security, and Public Purpose.

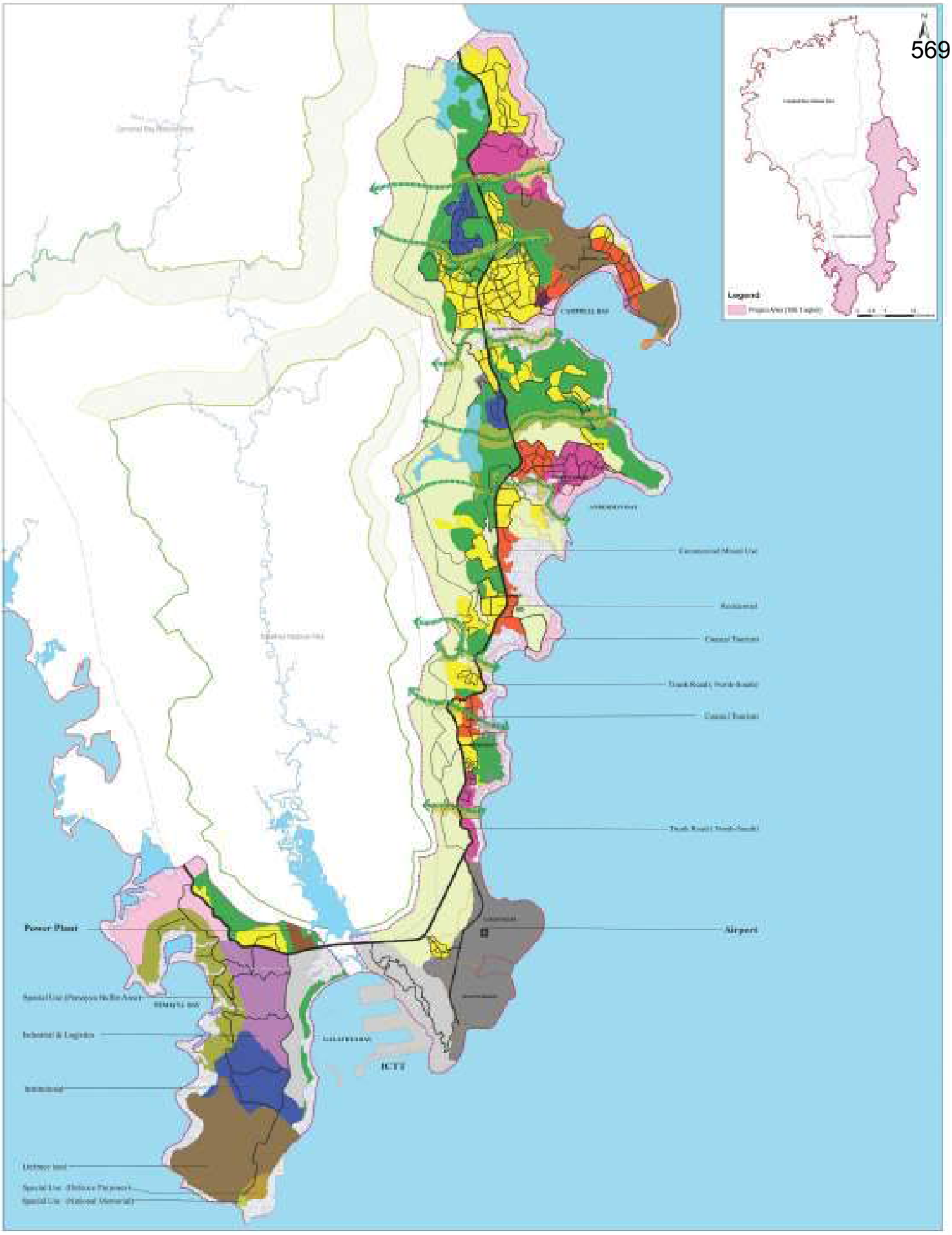
Response (xx):

Revised ICRZ recommendations have been received via letter 'No.PCCF/EPA/1/Vol-XVI/154, ANDAMAN & NICOBAR ADMINISTRATION, DEPARTMENT OF ENVIRONMENT AND FORESTS, PCCF (CRZ & FC) / Nodal Officer, FCA & MS, A&N CZMA/ VAN SADAN, HADDO, PORT BLAIR, Dated 8th July,

List of Enclosures

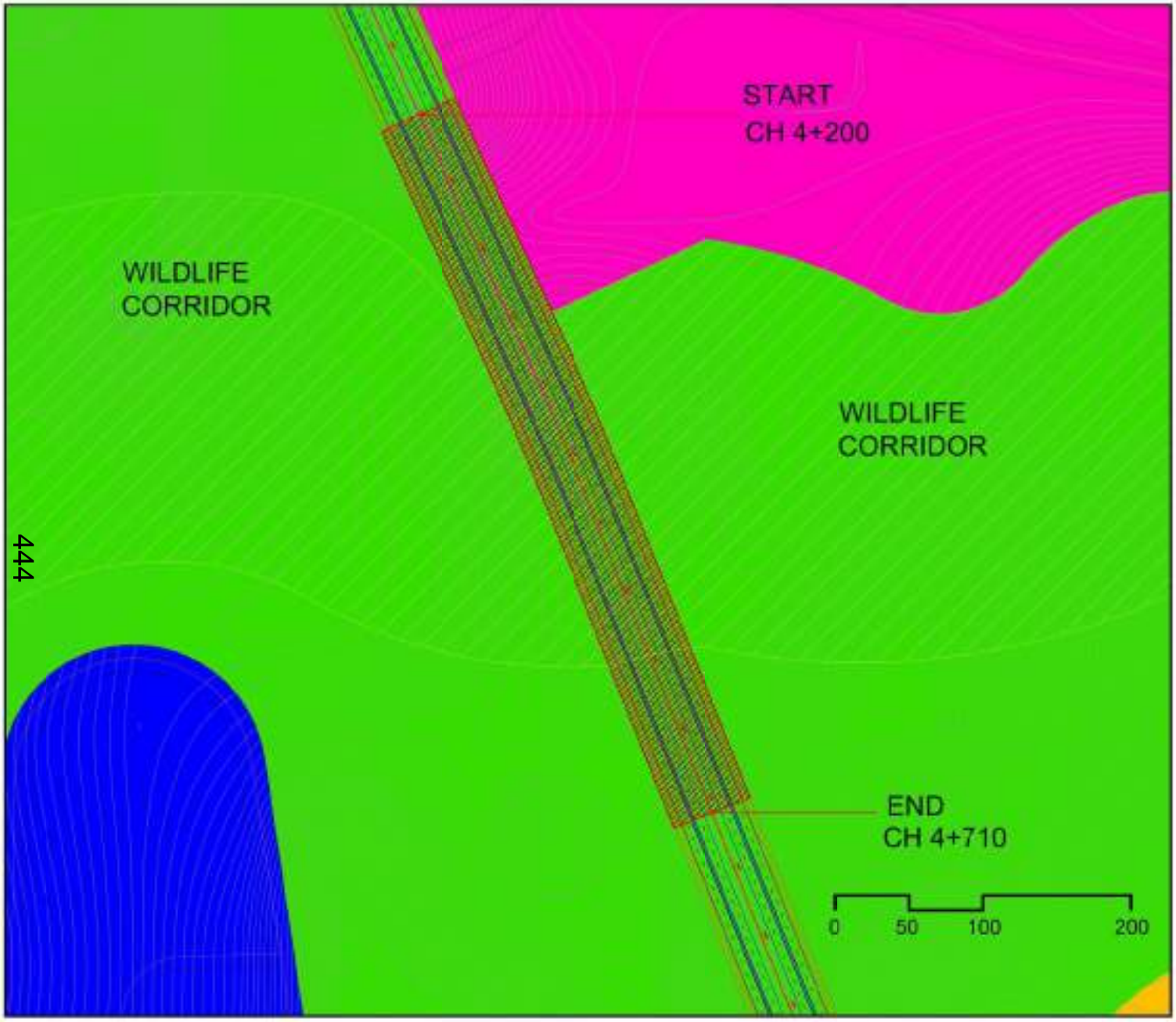
Sl. No.	Enclosure No.	Title
1.	***Enclosure 1***	Safe wild-life corridors
2.	***Enclosure 2***	Revised Master Plan layout
3.	***Enclosure 3***	Wildlife sanctuaries notification
4.	***Enclosure* 4**	500 m buffer from HTL around Pemayya Bay
5.	***Enclosure 5***	Exclusion of CRZ IA and IB from port land-use
6.	***Enclosure* 6**	Letter regarding existing storage of HSD at Campbell Bay
7.	***Enclosure* 7A**	Allotment of land for proposed shifting of IOCL Petroleum Terminal at Car Nicobar and Campbell Bay – Letter bearing File No. 1-44/TNC/Petrol Outlet/Car Nicobar/2012/1475
	***Enclosure* 7B**	Risk assessment for proposed HSD storage
8.	***Enclosure* 8**	Oil spill contingency plan
9.	***Enclosure* 9**	Conservation and Management Plan for Corals
10.	***Enclosure* 10**	Detailed evacuation plan
11.	***Enclosure* 11**	Disaster Management Plan for Andaman & Nicobar Islands
12.	***Enclosure* 12**	Road on stilts in CRZ areas
13.	***Enclosure* 13**	Revised ICRZ recommendations letter - No.PCCF/EPA/1/Vol-XVI/154
14.	***Enclosure* 14**	Impact of extended breakwater on turtle nesting
15.	***Enclosure* 15**	Conservation and long-term monitoring of Sea Turtles of the Nicobar Islands with special focus on the Leatherback Sea Turtle
16.	***Enclosure* 16A**	Comprehensive Conservation Plan – Long term monitoring and conservation of the endemic Nicobar Megapode (Megapodeius nicobariensis) in the Nicobar Archipelago submitted by WII
	***Enclosure* 16B**	Comprehensive Plan for Nicobar Megapode Conservation in the Nicobar Archipelago submitted by SACON
17.	***Enclosure* 17**	Number of mounds of Nicobar Megapode and their location
18.	***Enclosure* 18**	Mangrove Conservation and Management Plan for Great Nicobar Island
19.	***Enclosure* 19**	Location map for mangroves in Great Nicobar Island
20.	***Enclosure* 20**	Crocodile Conservation Plan
21.	***Enclosure 21***	EMP Cost

Enclosure - 1



PROJECT:
HOLISTIC DEVELOPMENT OF GREAT NICOBAR ISLAND IN ANDAMAN & NICOBAR ISLANDS

DRAWING TITLE:
LOCATIONS OF WILDLIFE CORRIDORS



Key Map

Coordinates

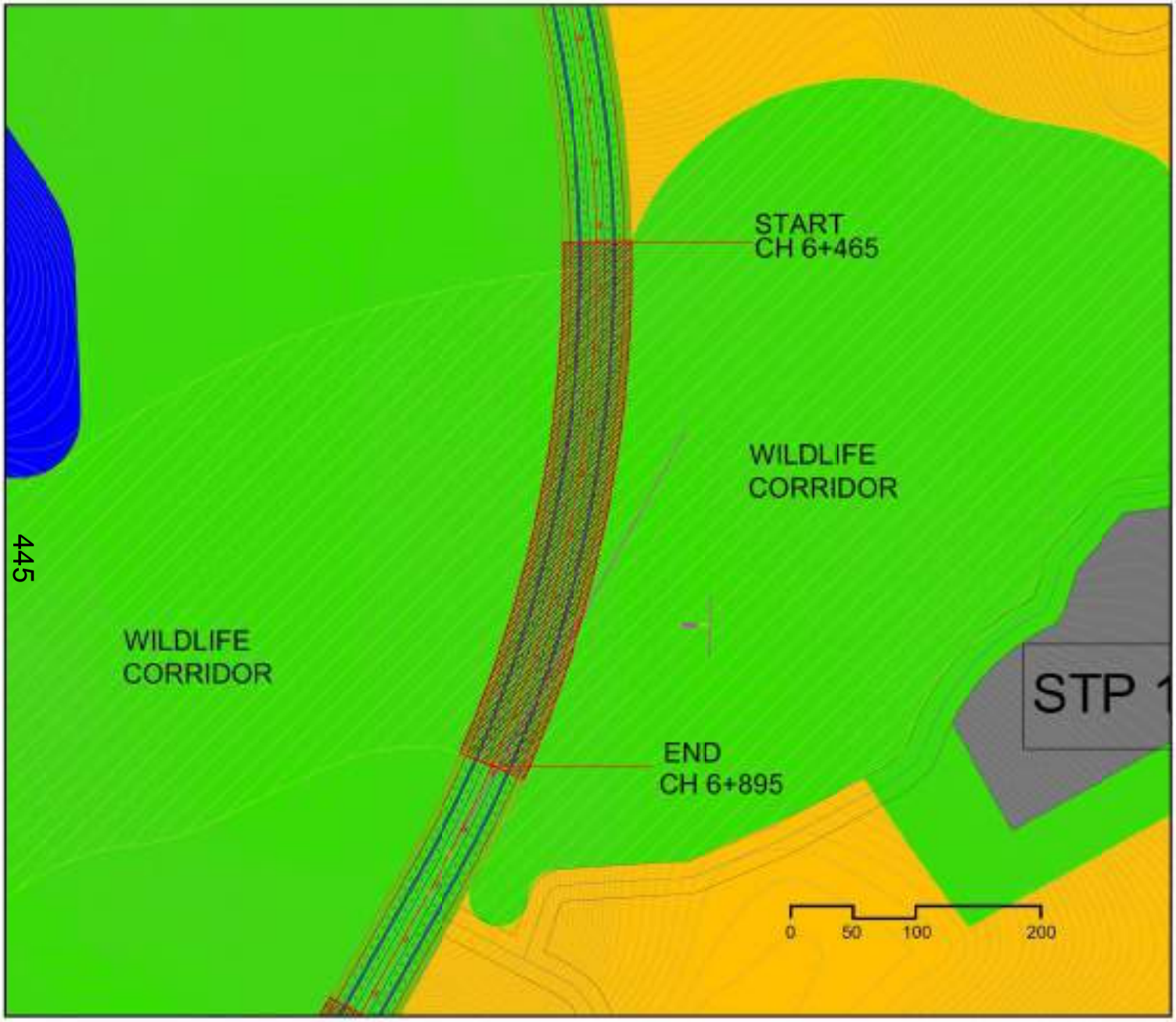
X 598516.432893

Y 777930.207231

Length= 510m

WILDLIFE CORRIDOR 01

570



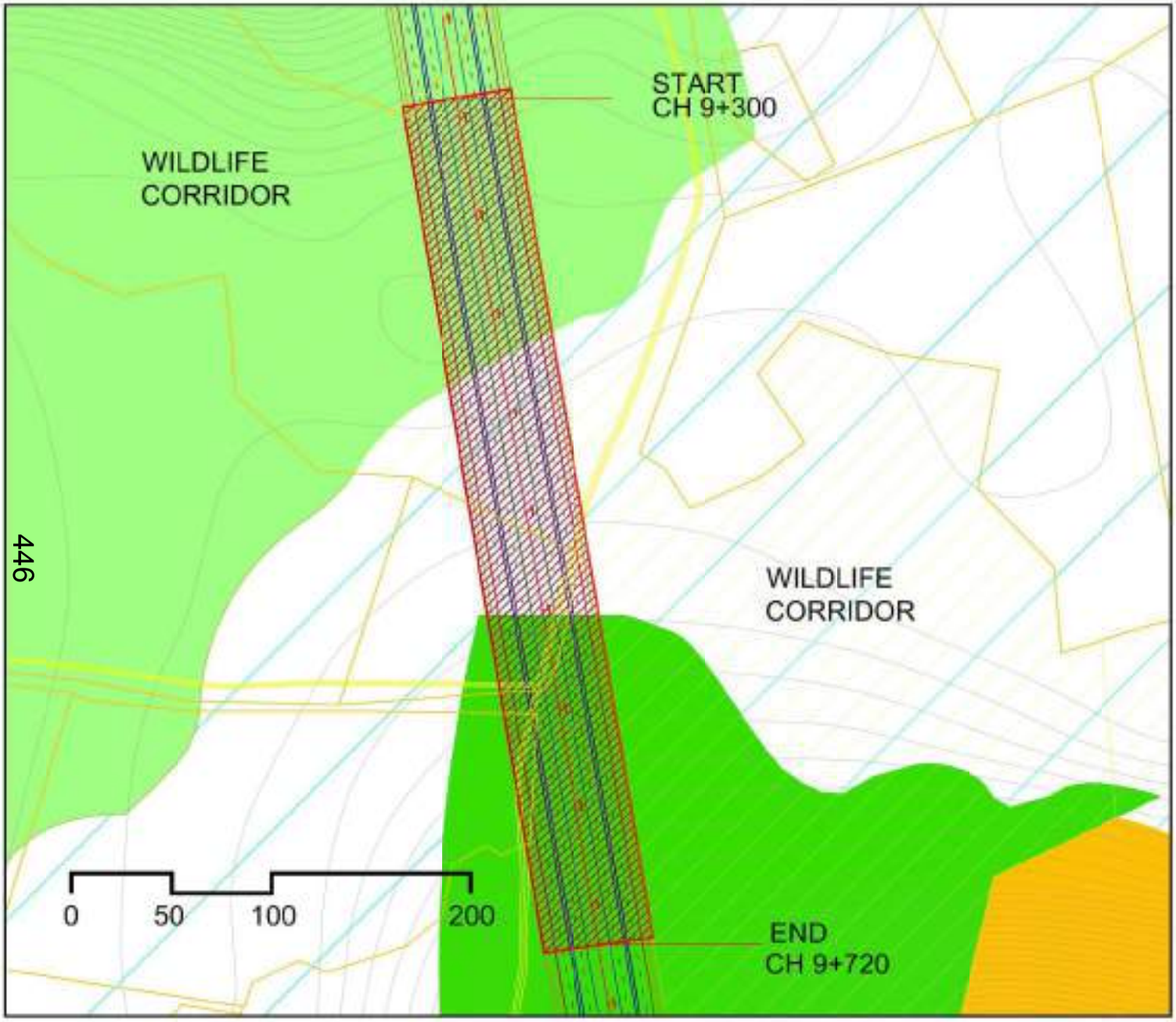
Key Map

Coordinates	
X	599158.3942
Y	775830.5105

Length= 430m

WILDLIFE CORRIDOR 02

571



Coordinates

X 598807.4342

Y 773267.2363

Length= 420m

WILDLIFE CORRIDOR 03

Key Map

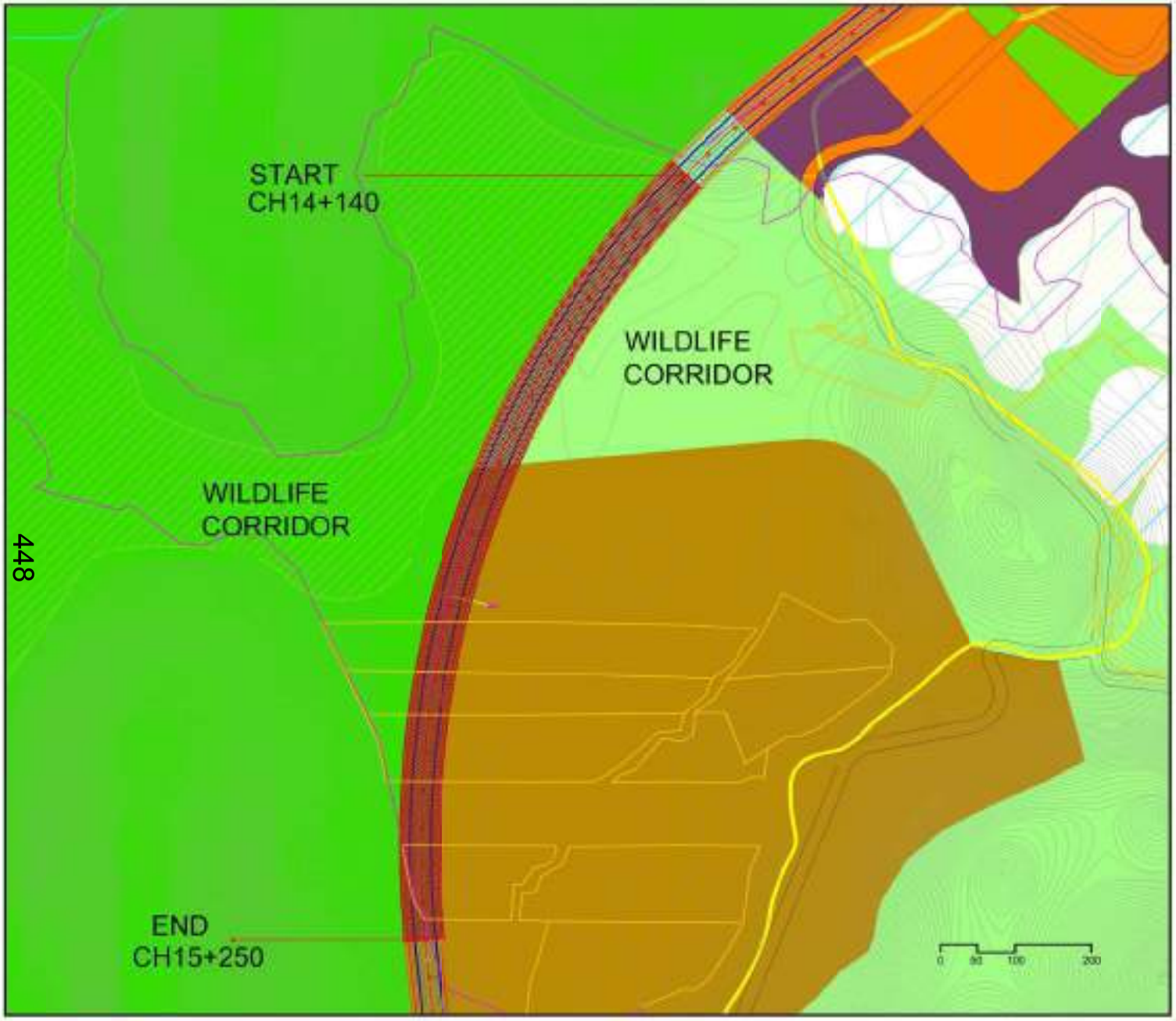
Coordinates

X 599617.2102

Y 770186.1365

Length= 430m

WILDLIFE CORRIDOR 04



448

Key Map

Coordinates

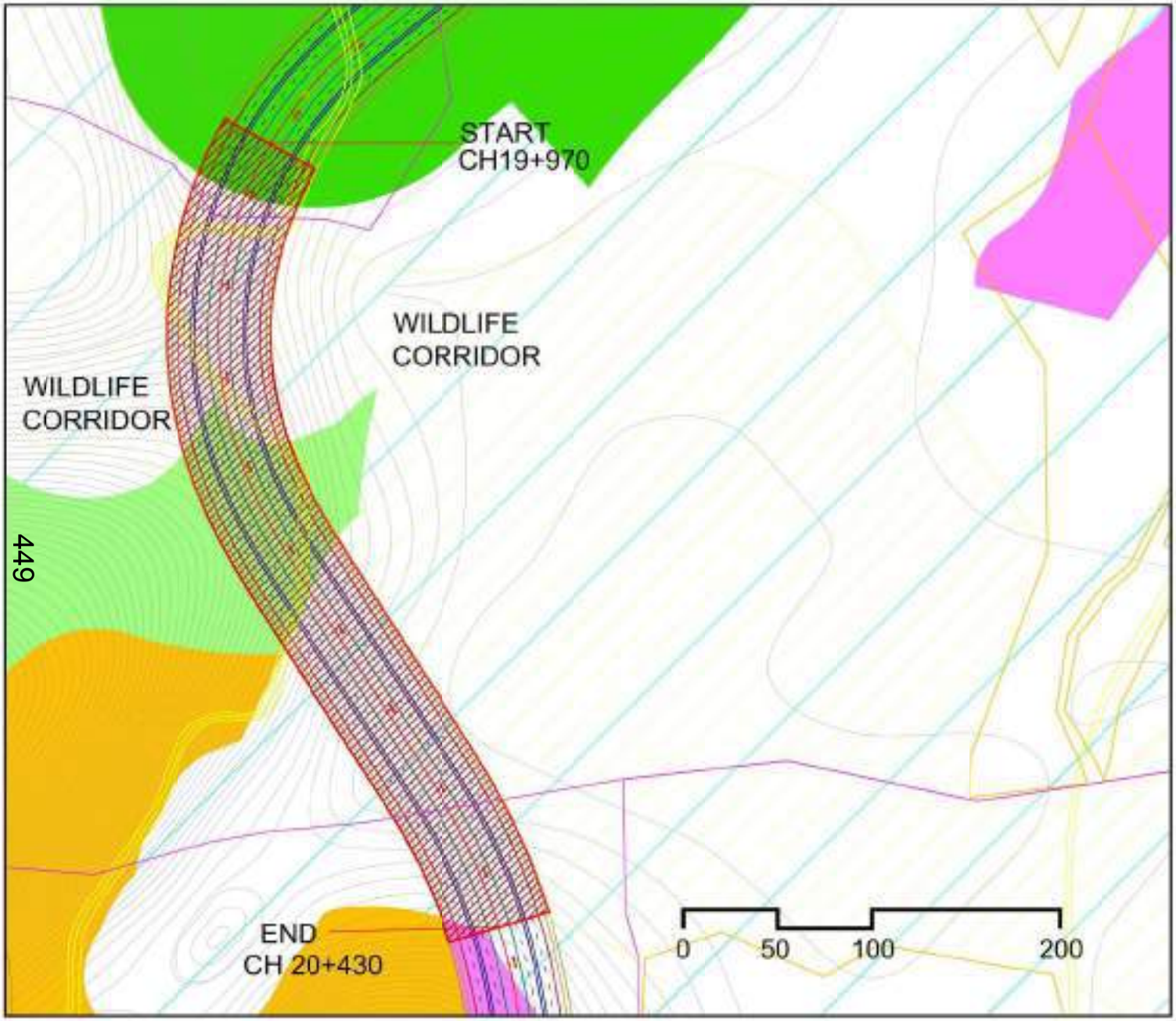
X 599322.1431

Y 768740.3774

Length= 1110

WILDLIFE CORRIDOR 05

574



Key Map

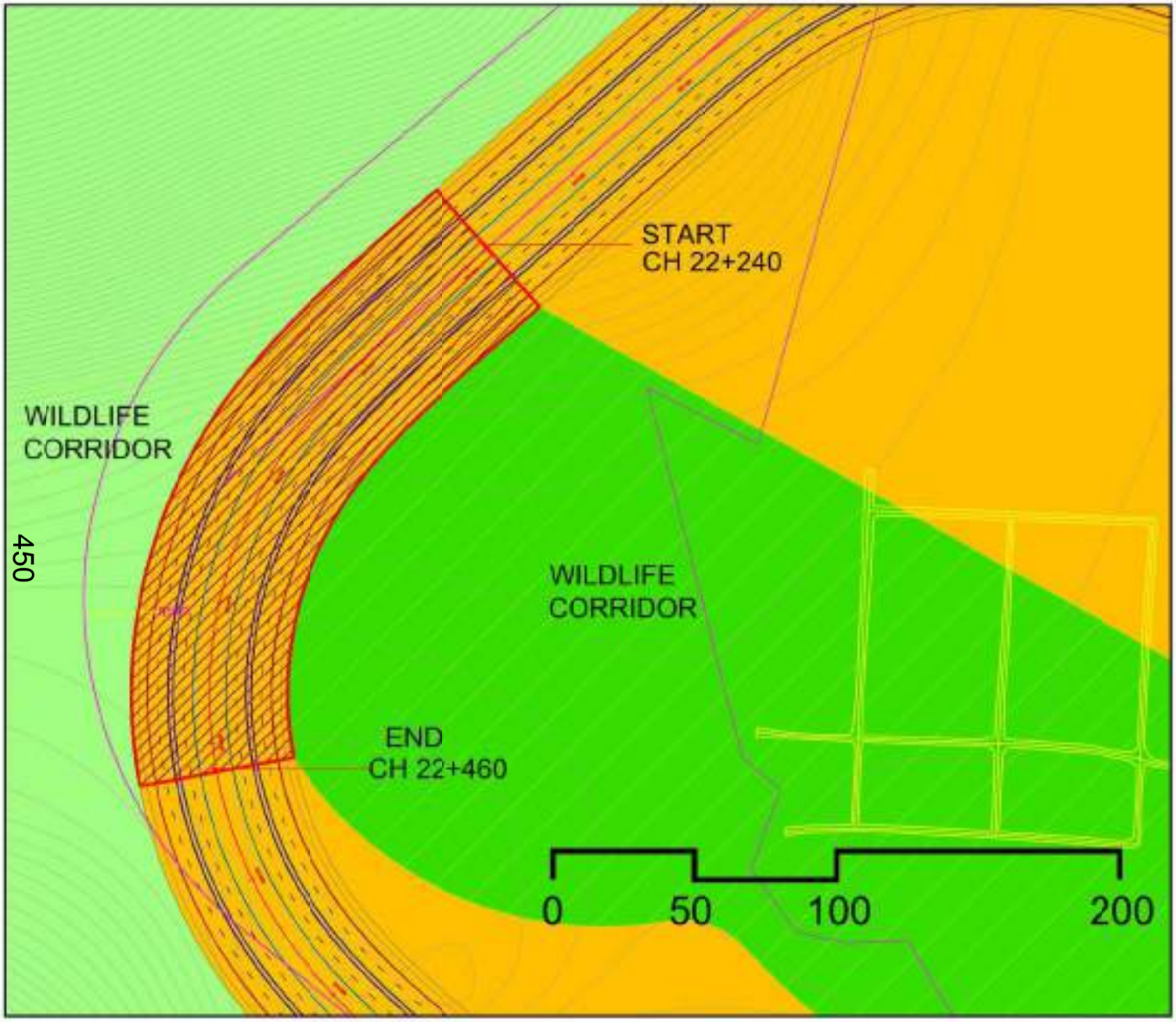
Coordinates

X 598506.6655

Y 763410.3537

Length= 460m

WILDLIFE CORRIDOR 06



Key Map

Coordinates

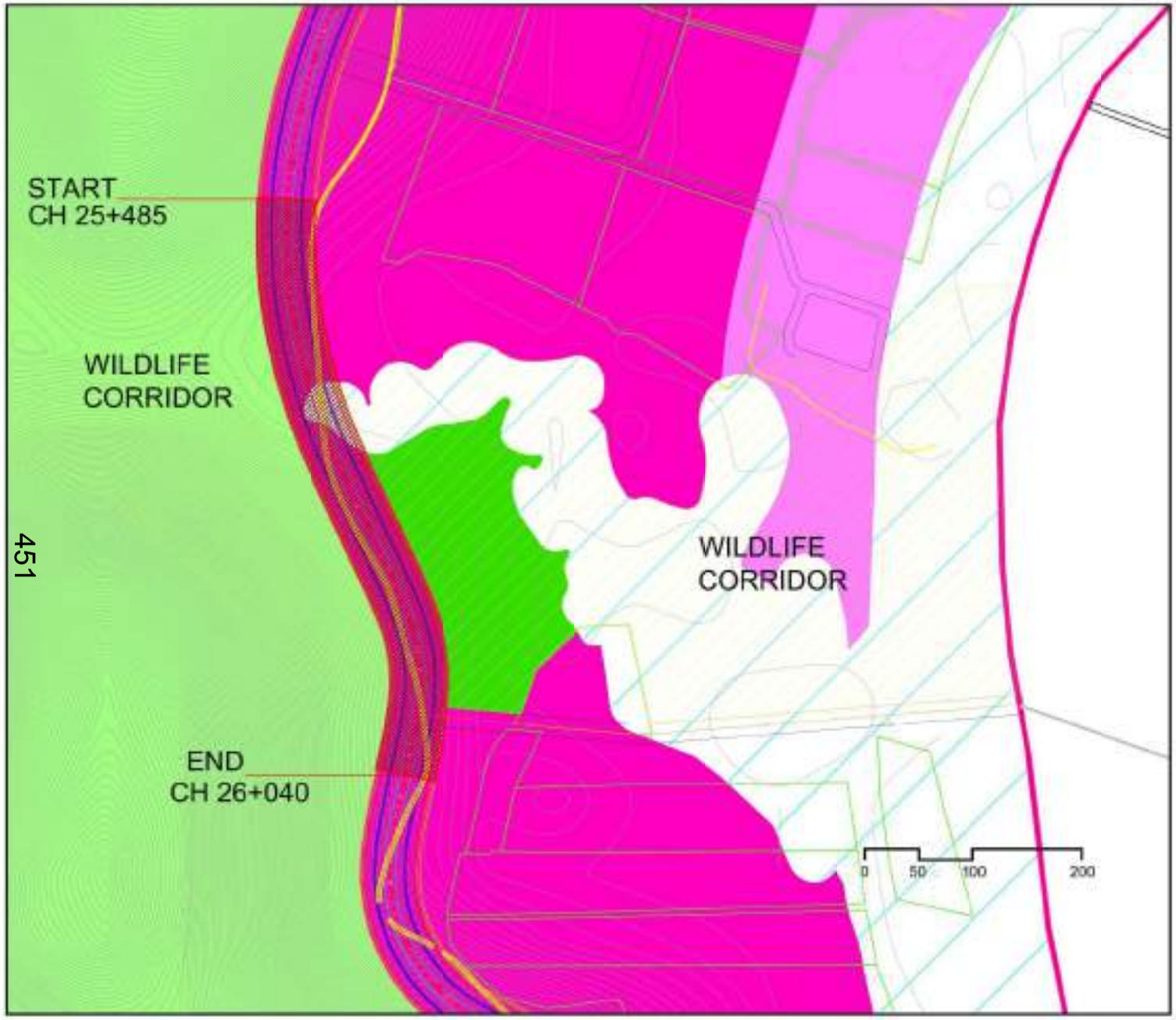
X 597674.9769

Y 762031.9332

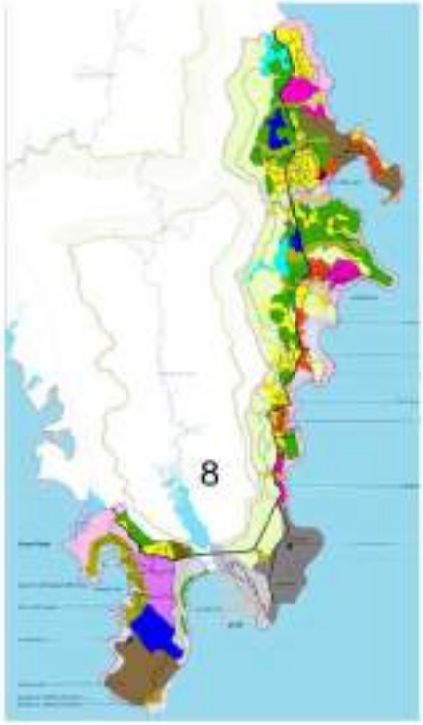
Length= 220m

WILDLIFE CORRIDOR 07

576



451



Key Map

Coordinates

X 598058.6724

Y 758771.0131

Length= 555m

WILDLIFE CORRIDOR 08

577

Sharma, Prem

From: raghuksc@rediffmail.com on behalf of Raghunathan <raghuksc@rediffmail.com>
Sent: 19 July 2022 14:48
To: Sharma, Prem
Cc: Malhotra, Abhishek; Vyas, Divya; somnath.mukherjee1911@outlook.com
Subject: [EXTERNAL] Re: Regarding EAC responses on GNI project

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Mr. Prem,

The presently prepared map for wildlife corridors are taking care of macaque as well as megapode populations and also smaller mammals and reptiles rich zones in the GNI. Hence it may be finalized.

Regards.
C. Raghunathan

From: "Sharma, Prem" <Prem.Sharma@aecom.com>
Sent: Tue, 19 Jul 2022 13:57:29
To: Raghunathan <raghuksc@rediffmail.com>, Raghunathan C <raghunathan.c@zsi.gov.in>, 'kscraghu' <kscraghu@gmail.com>
Cc: "Malhotra, Abhishek" <Abhishek.Malhotra@aecom.com>, "Vyas, Divya" <Divya.Vyas@aecom.com>, "somnath.mukherjee1911@outlook.com" <somnath.mukherjee1911@outlook.com>
Subject: Re: [EXTERNAL] Regarding EAC responses on GNI project

Dear Sir,

Thank you for valuable suggestions. Your points well noted and incorporated. Please find enclosed the map as requested. Please note following:

1. Corridors are proposed near to the location of identified wildlife.
2. The corridors have been proposed in line with the topography of the eastern coast and location i.e. valleys with a clearance ranging from 4m to 30m, which will be more than enough for animals to safely cross along the proposed wildlife corridors.
3. We have conserved all drainage channels and corridors which are having very less terrain challenges with respect to connecting forest with sea. Further, adequate number of culverts of varying sizes (depending on the size of natural drainage) will be provided at appropriate locations during detail design. The culverts will be in addition to the proposed wildlife corridors.
4. These corridors also act as a buffer between the settlement areas identified for development.
5. The total length of the corridor proposed over a span of approx. 22kms is approximately 4.13 kms.
6. These corridors proposed are almost equidistant apart from Campbell bay which is an existing settlement area. Campbell bay being densely populated does not have any option for similar corridors but the road alignments will have sufficient culverts for crossing of reptiles and other animals.

We have reviewed and have now provided the best alignment of these corridors in line with the requirements to have uninterrupted access for wildlife from forest to sea and vice versa. The maps with all these changes is enclosed for your review and approval.

Regards
Prem

From: Sharma, Prem <Prem.Sharma@aecom.com>
Sent: 16 July 2022 19:42

To: Raghunathan <raghuksc@rediffmail.com>; Raghunathan C <raghunathan.c@zsi.gov.in>; 'kscraghu' <kscraghu@gmail.com>
Cc: Malhotra, Abhishek <Abhishek.Malhotra@aecom.com>; Vyas, Divya <Divya.Vyas@aecom.com>; somnath.mukherjee1911@outlook.com
Subject: Re: [EXTERNAL] Re: Regarding EAC responses on GNI project

Dear Sir,

Resending the email as earlier email was not delivered.

Regards
Prem

From: Sharma, Prem <Prem.Sharma@aecom.com>
Date: Saturday, 16 July 2022 at 7:25 PM
To: Raghunathan <raghuksc@rediffmail.com>
Cc: Malhotra, Abhishek <Abhishek.Malhotra@aecom.com>, Vyas, Divya <Divya.Vyas@aecom.com>, somnath.mukherjee1911@outlook.com <somnath.mukherjee1911@outlook.com>
Subject: Re: [EXTERNAL] Re: Regarding EAC responses on GNI project

Dear Sir,

As per the data on Megapodes and Macaques provided by you earlier, we have prepared a map showing these locations over the proposed landuse map along with the proposed wildlife corridors. Kindly review and provide your consent on the same.

Thanks & Regards
Prem

From: Raghunathan <raghuksc@rediffmail.com>
Date: Friday, 15 July 2022 at 10:55 AM
To: Sharma, Prem <Prem.Sharma@aecom.com>
Cc: Malhotra, Abhishek <Abhishek.Malhotra@aecom.com>, Somnath Mukherjee <somnath.mukherjee1911@outlook.com>, Vyas, Divya <Divya.Vyas@aecom.com>, ANIIDCO LTD. PORT BLAIR <aniidco@gmail.com>, gopinath.lagudu <gopinath.lagudu@nic.in>, Dhriti Banerjee <dhritibanerjee@gmail.com>, technical Section <technical@zsi.gov.in>
Subject: [EXTERNAL] Re: Regarding EAC responses on GNI project

Dear Mr. Prem,

As discussed at your office in New Delhi on 14th July 2022, kindly superimpose the maps showing distribution of macaques and megapode mounts in Great Nicobar Island and send the same for suggesting suitable alignment of safe wildlife corridors in the arterial road of Great Nicobar Island.

Regards.
C. Raghunathan

From: "Sharma, Prem" <Prem.Sharma@aecom.com>
Sent: Thu, 14 Jul 2022 18:22:26
To: Raghunathan <kscraghu@gmail.com>, "raghuksc@rediffmail.com" <raghuksc@rediffmail.com>, "Technical Section ZSI HQ, Kolkata" <technical@zsi.gov.in>
Cc: "Malhotra, Abhishek" <Abhishek.Malhotra@aecom.com>, Somnath Mukherjee <somnath.mukherjee1911@outlook.com>, "Vyas, Divya" <Divya.Vyas@aecom.com>, "ANIIDCO LTD. PORT BLAIR" <aniidco@gmail.com>, gopinath.lagudu <gopinath.lagudu@nic.in>

Subject: Regarding EAC responses on GNI project

Dear Sir,

In reference to our discussion regarding provision of wildlife corridor within GNI planning area, we have consulted with Project Proponent (ANIIDCO) and Andaman and Nicobar Forest Department for safe wildlife corridors at multiple locations along the eastern side of the island connecting forest- sea shore through via-ducts under the 55m wide arterial road which have been incorporated in the master plan.

In this regard, please find attached letter along with the details for wildlife corridors as provisioned.

We request to seek concurrence from your esteemed organisation which is well versed with the complete ecology of the island with respect to the provision of wildlife corridors as proposed.

Kindly let us know if any clarification is required.

Regards,
Prem Shankar Sharma AoITPI, MCoA
(B.Arch M.Plan – Infra)
Senior Urban & Regional Planner,
Urbanism + Planning
prem.sharma@aecom.com

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DLF Cybercity, DLF Phase 2, Gurgaon, 122002
T: +91 124 4830 100 F: +91 124 4830 108
aecom.com

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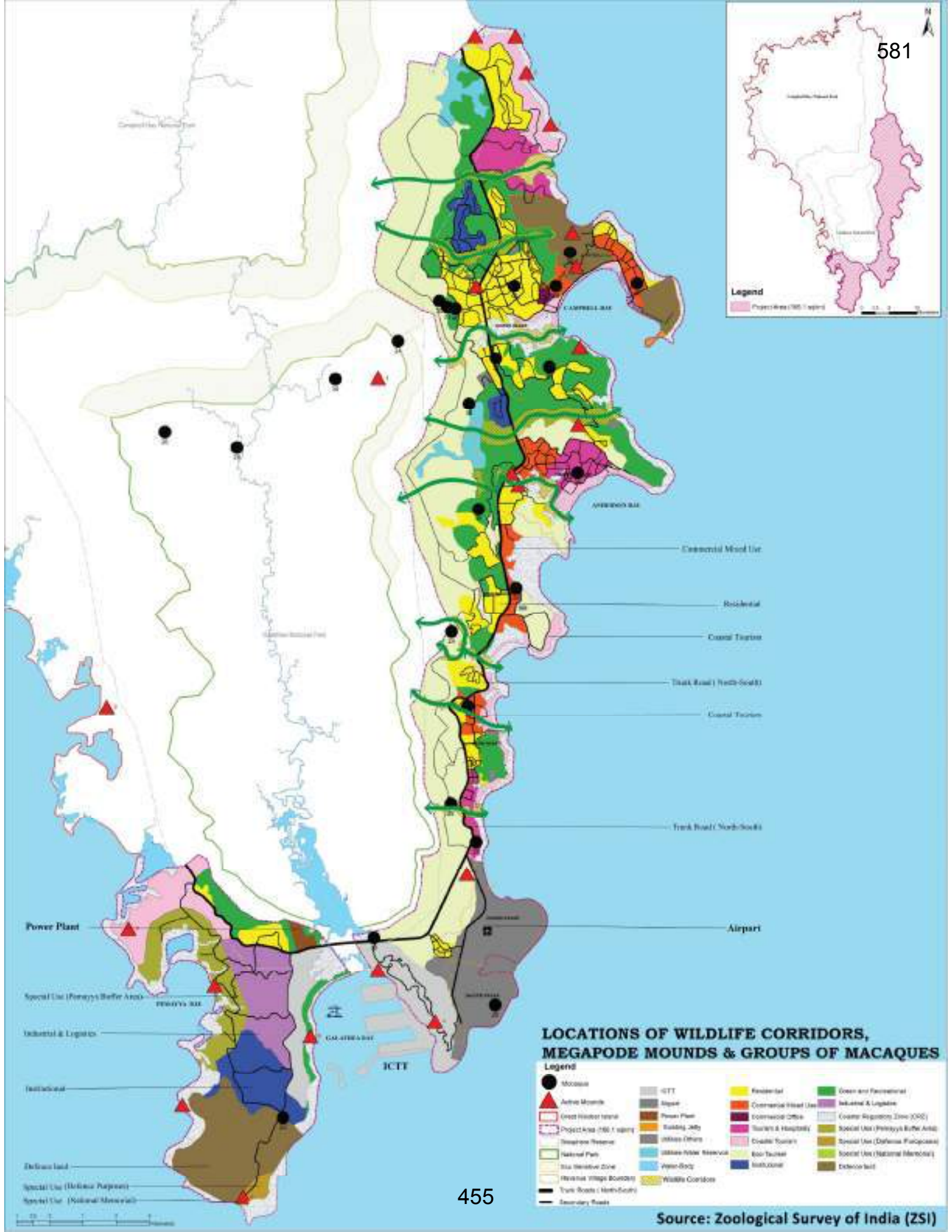
581
Legend
Commercial Mixed Use
Residential
Coastal Tourism
Trunk Road (North-South)
Coastal Tourism
Trunk Road (North-South)
Power Plant
Airport
Special Use (Periyar's Buffer Area)
Industrial & Logistics
Institutional
Defence land
Special Use (Defence Purposes)
Special Use (National Memorials)
ICTT
GALATHEA BAY
LOCATIONS OF WILDLIFE CORRIDORS,
MEGAPODE MOUNDS & GROUPS OF MACAQUES
Legend
Source: Zoological Survey of India (ZSI)
455

Enclosure - 3

अण्डमान तथा निकोबार राजपत्र

Andaman And Nicobar Gazette

असाधारण

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No.....Port Blair, April, 2022

अण्डमान तथा निकोबार प्रशासन

ANDAMAN AND NICOBAR ADMINISTRATION

(पर्यावरण एवं वन विभाग)

(DEPARTMENT OF ENVIRONMENT & FORESTS)

NOTIFICATION

Port Blair, dated the 21st April, 2022

No. F.No CWLW/WL 243/217.-WHEREAS, the Andaman & Nicobar Administration considers that the area, the situation and limits of which are defined in the Schedule below is of great ecological, faunal, floral, geomorphological, natural and zoological significance;

AND WHEREAS, it appears to the Andaman and Nicobar Administration that the said area is needed to be constituted as a Wildlife Sanctuary for the purpose of protecting, propagating and developing wildlife therein especially the Leatherback Turtle, its habitat and environment;

NOW THEREFORE, in exercise of the powers conferred by sub-section (1) of section 18 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 declares his intention to constitute the said area, the situation and limits of which are specified in the schedule below, as Wildlife Sanctuary to be known as "Leatherback Turtle Sanctuary".

SCHEDULE

Leatherback Turtle Sanctuary

Total Area: 13.75 Sq. Km. (Approximately) at Little Nicobar Islands in the A & N Islands including 6.67 Sq.km of water area within the baseline system.

Description of boundary:

The boundary of theLeatherback Turtle Sanctuary will be as follows:

North: Starting from a point **'A'** at 7° 20' 13.05" N, 93° 37' 59.26" E, the boundary runs eastwards along an imaginary line till it meets point **'B'** at 7° 20' 15.08" N, 93° 38' 37.57" E.

East: From the point 'B' the boundary runs Southwards along an imaginary line passing through point **'C'** at 7° 19' 53.12" N, 93° 38' 37.54" E, point **'D'** at 7° 18' 52.98" N, 93° 38' 22.81" E, point **'E'** at 7° 15' 52.74" N, 93° 38' 22.56" E, and meets point **'F'** at 7° 14' 53.22" N, 93° 38' 46.74" E.

South: From the point **'F'**, the boundary moves southwest along an imaginary line till it touches the low tide line at point **'G'** at 7° 14' 48.52" N, 93° 38' 38.60" E.

West: From the point **'G'** the boundary runs northwest along an imaginary line in the Bay of Bengal till it touches the coastline at point **'H'** at 7° 15' 49.61" N, 93° 37' 47.17" E, thence further the boundary runs along the coastline till it meets point **'I'** at 7° 16' 1.41" N, 93° 37' 44.46" E. From the point **'I'** the boundary moves northwards along an imaginary line and touches low tide line at point **'J'** at 7° 18' 31.9" N, 93° 37' 20.70" E, then the boundary follows the low tide line and touches point **'K'** at 7° 18' 34.63" N, 93° 37' 20.89" E. From point **'K'** the boundary further moves northeast and culminates at point **'A'**

Admiral D.K. Joshi, PVSM, AVSM, YSM, NM, VSM (Retd.)
Lieutenant Governor,
Andaman & Nicobar Islands.

By order and in the name of the Lieutenant Governor,
Andaman & Nicobar Islands.

(Dr. V. Candavelou)
Principal Secretary (Environment & Forests)

अण्डमान तथा निकोबार राजपत्र

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ANDAMAN AND NICOBAR ADMINISTRATION

(पर्यावरण एवं वन विभाग)

(DEPARTMENT OF ENVIRONMENT & FORESTS)

NOTIFICATION

Port Blair, dated the 21st April, 2022

No. F.No ©WLW/WL/243/218 - WHEREAS, the Andaman & Nicobar Administration considers that the uninhabited Island, the situation and limits of which are defined in the Schedule below is of great ecological, faunal, floral, geomorphological, natural and zoological significance;

AND WHEREAS, it appears to the Andaman and Nicobar Administration that the said uninhabited Island is needed to be constituted as a Wildlife Sanctuary for the purpose of protecting, propagating and developing wildlife therein especially the Megapode, its habitat and environment;

NOW THEREFORE, in exercise of the powers conferred by sub-section (1) of section 18 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 declares his intention to constitute the said uninhabited Island, the situation and limits of which are specified in the schedule below, as Wildlife Sanctuary to be known as "Megapode Sanctuary".

SCHEDULE

Megapode Sanctuary:

The entire Island of Menchal Island covering an area of 1.29 Sq. Km. situated in between 93°45'44.5" and 93°46'19" East Longitude and 7°24'11"N and 7°23'38" North Latitude in the Bay of Bengal.

Admiral D.K. Joshi, PVSM, AVSM, YSM, NM, VSM (Retd.)
Lieutenant Governor,
Andaman & Nicobar Islands.

By order and in the name of the Lieutenant Governor,
Andaman & Nicobar Islands.

(Dr. V. Candavelou)
Principal Secretary (Environment & Forests)

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ANDAMAN AND NICOBAR ADMINISTRATION

(पर्यावरण एवं वन विभाग)

(DEPARTMENT OF ENVIRONMENT & FORESTS)

NOTIFICATION

Port Blair, dated the 21st April, 2022

No. F.No CWLW/WL243/219 - WHEREAS, the Andaman & Nicobar Administration considers that the uninhabited Island, the situation and limits of which are defined in the Schedule below is of great ecological, faunal, floral, geomorphological, natural and zoological significance;

AND WHEREAS, it appears to the Andaman and Nicobar Administration that the said uninhabited Island is needed to be constituted as a Wildlife Sanctuary for the purpose of protecting, propagating and developing wildlife (terrestrial and marine) therein especially the Corals, its habitat and environment;

NOW THEREFORE, in exercise of the powers conferred by sub-section (1) of section 18 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 declares his intention to constitute the said uninhabited Island, the situation and limits of which are specified in the schedule below, as Wildlife Sanctuary to be known as "Coral Sanctuary".

SCHEDULE

Coral Sanctuary

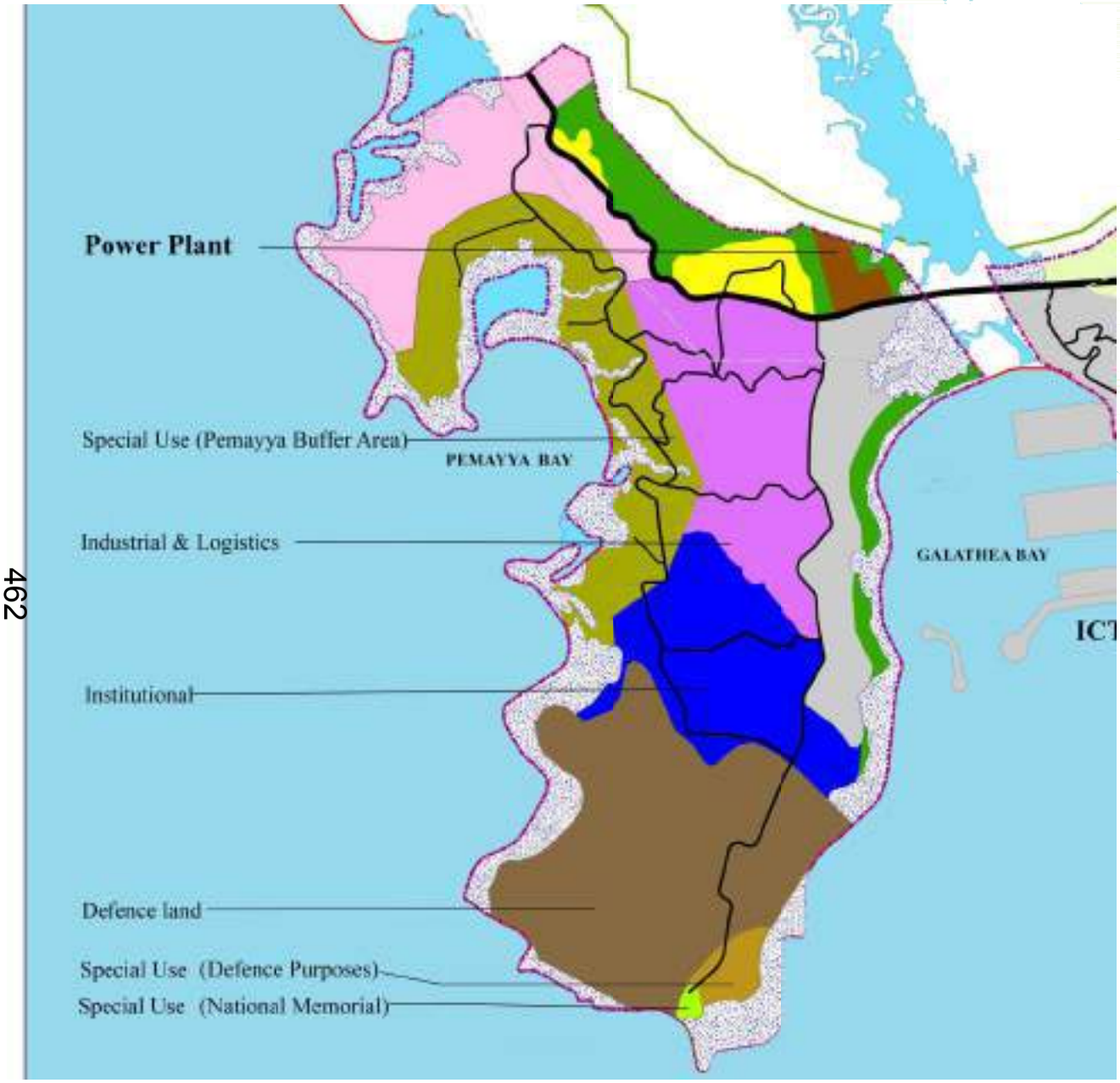
The entire Island of Merse Island including the surrounding marine area, covering an extent of 2.73 Sq. Km situated in between Latitudes 7° 30' 32.20" N to 7° 31' 36.0" N and Longitudes 93° 32' 18.50" E and 93° 33' 4.00" E.

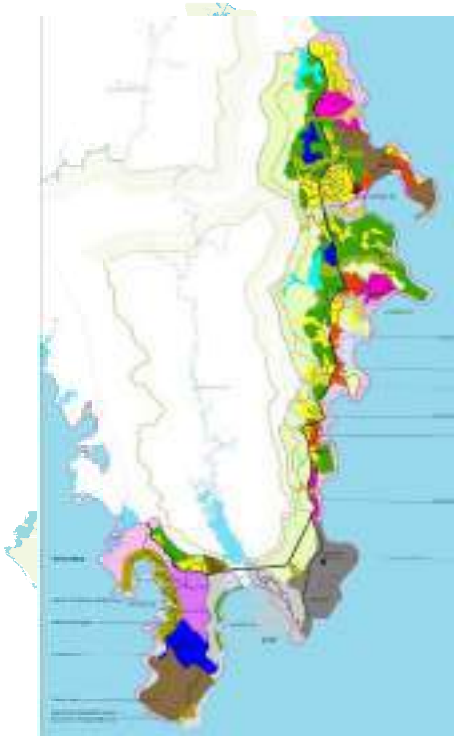
Admiral D.K. Joshi, PVSM, AVSM, YSM, NM, VSM (Retd.)
Lieutenant Governor,
Andaman & Nicobar Islands.

By order and in the name of the Lieutenant Governor,
Andaman & Nicobar Islands,

(Dr. V. Candavelou)
Principal Secretary (Environment & Forests)

Enclosure - 4





Key Map

500m Buffer from HTL at Pemayya Bay

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Enclosure - 9

Conservation and Management Plan for Coral Reefs
of
Great Nicobar Island

Submitted by

ZOOLOGICAL SURVEY OF INDIA
Ministry of Environment, Forest and Climate Change

1. INTRODUCTION

Coral reefs are the most primitive living ecosystem of the marine biota, a structure built by colonies of tiny coral animals over millions of years. Due to its enormous productively in oceans environment, corals reefs are often called as 'Rain Forest of the Sea'. The extraordinary beauty, bright palette of colors, and oddly patterned inhabitants, are really a means of delighted arena of this Earth's most important ecosystems. The biodiversity of the reef system supports a vast interdependent food web, from microscopic plants and animals to humans. Corals are the important structural feature of reefs in shallow tropical seas since the 100 million years ago to till date. The highly productivity and biological diversity made the corals most sustainable in this changing environment.

The coral reefs are the natural heritage and stock of biological diversity of the world which supports a great deal of faunal communities. It has been estimated that between1-9 million species live on coral reefs (Ramakrishna et al., 2010). It is a hunting ground, a safe place to hide, a place to breed, to raise young, and to grow old. The productivity of healthy coral reefs not only gives supports for the corals but also to sustain a rich interlinked system of species which has been the main source of food and resources. The reef dwelling species are yielding influential chemicals effective in treatment of disease.

Coral reefs take a great role to form natural breakwaters protecting the fertile coastal lands and human settlements of many islands and continental nations from erosion by storm waves and other climatic or natural problems. But the degradation of coral reef environment has been spreading all over the world ocean gradually due to natural calamities as well as anthropogenic stresses. The possible warming of our climate with associated warming of ocean temperatures, increased sedimentation from development along coastal areas, pollution, and unsustainable fishing methods are only some of the threats to reefs worldwide. As humans change the environment on the surface of the Earth, the conditions underneath the surface of our oceans change accordingly. From the microscopic plants that live within the tissues of the corals to the diversity of invertebrates and fishes that find food and shelter within the colourful caves and crevices, the reef system's millions of species also provide important food resources for sharks, sea turtles and dolphins.

Millions of people throughout the world depend directly on the reefs for their livelihood. Coral reefs cover less than 0.2% of the total area of oceans but act as house of 25% of all marine creatures (Ramakrishna *et al.,* 2010). Coral reefs are dynamic systems, producing lime stones at the rate of 400-2000 tones per hectare per year (Chave *et al.,* 1972). Coral reefs influence the chemical balance of world's oceans (Smith, 1978). Scleractinian corals are strong calcareous aragonite structure formed by gradual deposition of calcium carbonate by the living tissues of corals as the secreted materials with the presence of supportable marine environment. The reef environment supports a pristine environment of marine faunal communities to manage balanced ecosystems. The benthic biotic environment supports a great composition of floral and faunal components. It defined as "all of the bottom terrain from the wave-washed shoreline at flood-tide level to the greatest deeps" (Sverdrup *et*

al., 1942). The high water mark on the shoreward side to the boundary marked by the continental self is defined as the littoral zone. The standard distance covered by the littoral zone from the shoreline into the seaward side is 200 m. The littoral zone is further marked from the shoreline up to 50 m as eulittoral and from 50 m to 200 m as sublittoral zone. The eulittoral zone further may divide into intertidal zone and submerged eulittoral benthic zone. Thus the eulittoral benthic zone which lies beyond the low water mark comprises of biota that always remain below water level and are not affected by tidal changes. The cosmopolitan eulittoral fauna, which extends from the higher mark into the sea comprises of interstitial fauna, intertidal fauna (macrofauna), meiobentos, microbenthos and macrobenthos communities. This present proposal deals with the survey, monitoring and conservational aspects of the coral reef ecosystems.

2. GENERAL PRACTICE FOR CORAL CONSERVATION

Coral reefs are natural breakwaters substitute as a first line of defense for coastal communities, protecting the coastline from wave energy and preventing coastal erosion and flooding (Zepeda-Centeno *et al.,* 2019). The high complexity and rugosity in the reef crest may considerably dissolve wave energy that crosses the reef towards the coast (Harmelin-Vivien, 1994; Alcolado *et al.,* 2009; Busutil *et al.,* 2011; Gardner *et al.,* 2005; Zepeda-Centeno *et al.,* 2019). So, a strong, healthy and physically complex coral community can deliver the characteristics needed to increase and maintain coastal protection (Zepeda-Centeno *et al.,* 2019). Coral reefs deliver extensive ecosystem goods and services worth hundreds of billions of dollars globally every year. But this is unfortunate that the coral reef ecosystems of the world are rapidly declining due to climatic and anthropogenic disturbances. As per recent reports of IPCC, up to 90% of coral reefs could be lost by 2050, even if warming is limited to an increase of 1.5°C. Urgent climate action is required along with bold local management to halt declines and support coral reef resilience now and into the future. Coral reef restoration can be used as part of a broader management strategy to combat declines in coral health globally. The restoration methodology is not designed to reduce climate impacts, but rather, it is intended as a complementary tool to support natural recovery following disturbance in high-value areas (ICRI, 2021).

In 2004, the Society for Ecological Restoration International Science & Policy Working Group describes restoration as "the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed". Further, "restoration attempts to return an ecosystem to its historic trajectory". Restoration projects ideally require no attendance once they are mature. Currently for coral reefs, the term restoration is used to encompass both 'restoration' and 'rehabilitation'; with the latter emphasising "the reparation of ecosystem processes, productivity and services. . ." without meaning a return to pre-existing biotic conditions, and often requiring some attendance. A restored ecosystem "contains sufficient biotic and abiotic resources to continue its development without further assistance or subsidy" (Bostro¨m-Einarsson *et al.,* 2020). The overall concept of the coral restoration may include the direct transplantation of coral fragments on the reef, coral gardening where corals are fragmented, grown in nurseries, and planted back on the reef larval propagation where coral larvae are reared until ready to attach to the reef and released,

and the use of artificial structures with planted coral with the goal of protecting coastal areas (ICRI, 2021).

The techniques for coral restoration are depending on the basic principle that secures broken corals so they will survive. Asexual reproduction in corals is the prime contributor for this process. In restoring coral reef through asexual propagation and the securement of coral fragments are used to increase solid structures available for coral growth, to increase coral coverage and to alter growing conditions. These objectives can also be referred to structural, biological, and physical conditions. Structural restoration normally includes the building of artificial reefs, sinking of wrecks, or relocation of rocks/dead coral heads. The goal is to surge the quantity of reef construction and environment accessible for the corals and other reef organisms to propagate. Physical restoration is required in areas were the reef has been vanished or exponentially reduced due to disturbances. In areas which have been reduced to rubble or sand, corals will not have solid structure to attach to and will end up being abraded or buried during high waves. Biological restoration generally includes increasing the amount of living corals on the reef in areas were structure is already available. This is normally attained by collecting and rehabilitating naturally broken coral fragments, propagating coral colonies, culturing coral larvae, or transplanting living coral colonies. The overall aim of biological restoration is to regrow corals in areas where populations have been diminished or lost. Physical restoration comprises addressing the conditions in which the corals are developing to improve their health, growth rates, or fecundity. These methods have generally been developed more recently, and some are still in the experimental stages. Methods include mid-water coral nurseries or mineral accretion devices such as Biorock technology. The detailed methodologies for the coral transplantation in global level are cited below.

2.1. Direct transplantation

The earliest and most common method of coral restoration involves the direct transplantation of coral fragments, from a donor to a recipient reef. Overall, direct transplantation studies reported an average survival of 64%, with 20% reporting >90% survival of transplanted corals. Direct transplantation has primarily involved fast-growing corals, with more than three-quarters of case studies using branching coral morphologies (Bostro¨m-Einarsson *et al.*, 2020).

2.2. Coral gardening

Continuous harvesting of coral fragments may have detrimental effects on donor corals and populations. In response to this, a more sustainable model has been developed where coral recruits or small fragments are raised in intermediate nurseries, prior to outplanting on restoration sites. The nursery phase protects corals from damaging conditions during their most vulnerable stages, with the intention of planting them onto damaged reefs once they have reached a size threshold at which their post-transplantation survival is higher. In addition, once fragments have reached a suitable size they can be broken into smaller pieces, and these can be grown in the nursey, multiplying the number of fragments available to outplant. In this review, 48% of case studies involved coral gardening, with a majority of records focusing on the transplantation phase of the concept (transplantation phase 24%,

nursery phase 16%, both phases 8%). Corals were raised in either field-based (*in situ*), or land-based (ex situ) nurseries, depending on local conditions. Practitioners advocating the use of a coral nursery phase for reef restoration highlight improved growth and survivorship rates of fragments, compared to direct transplantation. Coral gardening studies exhibited an average 66% survival in the outplanting phase, compared to 64% survival in direct transplantation studies (Bostro¨m-Einarsson *et al.,* 2020).

2.3. Micro-fragmentation

Less than 5% of transplantation studies have been conducted with corals characterised by slow growing life histories. Massive corals have largely been overlooked, mainly due to their slow growth and thicker skeletons, which are less amenable to fragmenting. The micro-fragmentation' technique (developed by Mote Marine Laboratory) that enables massive and encrusting corals to be produced and outplanted using concepts developed for coral gardening (Forsman *et al.,* 2015). A diamond blade saw is used to cut small fragments ($1cm^2$) of massive corals, which are then mounted on tiles. After approximately 12 months, the fragments can either be further sub-divided to generate new micro-fragments or outplanted. Micro-fragments that are secured to reef substrates or dead coral skeletons in an array will readily fuse together to form a larger colony (termed 're-skinning'). The research outcomes show high survival and rapid growth of fragments (Forsman *et al.,* 2015; Bostro¨m-Einarsson *et al.,* 2020).

2.4. Larval enhancement

Larval enhancement methods aim to increase rates of coral fertilisation, larval survival and recruitment. Larval enhancement can be seen grouped into two main types: one where larvae are settled on artificial structures, and one where larvae are settled directly onto the reef. Concrete tetrapods are used for 'seeding'. Approximately 10% of settled larvae survived, and 56% of seeding units harboured. The second larval enhancement technique included collection of coral gametes during spawning and rearing in holding tanks or on the reef, after which larvae are released directly onto the reef in enclosures that retain them over the target substrate during the settlement period (Bostro¨m-Einarsson *et al.,* 2020).

2.5. Artificial reefs

The creation of substratum involves structures that are placed on the seabed deliberately, sometimes to mimic characteristics of a natural reef, or for the purpose of increasing potential habitat for reef fauna, fisheries production, recreational diving opportunities, or the prevention of trawling. The developments of artificial reefs are presently widely used for coral transplantation (Bostro¨m-Einarsson *et al.,* 2020).

2.6. Substratum stabilisation

The direct physical restoration of damaged substratum mostly involves stabilising rubble in an area that has been affected by storms or ship groundings. The rationale for stabilisation is that survival rates for coral recruits are low on loose substratum. The most common method

is to install mesh or netting over the rubble to prevent further movement. This is generally a precursor to the transplantation of corals onto the damaged area and/or additional deployment of artificial structures. The survival rate of the coral can be 80% (Bostro¨m-Einarsson *et al.*, 2020).

2.7. Substratum enhancement with electricity

The aim of the technique is to mimic the chemical and physical properties of reef limestone, by encouraging the precipitation of calcium and magnesium on artificial substrata (Goreau, 1996). A direct electrical current is established between electrodes, and calcium carbonate and magnesium hydroxide precipitates at the cathode, while oxygen and chlorine are produced at the anode (Hilbertz, 1976). The purpose of this mineral accretion is to potentially increase the calcification of coral polyps, thereby boosting colony growth and resilience to stressors (Bostro¨m-Einarsson *et al.*, 2020).

3. ZSI's EXPERIENCE IN CORAL CONSERVATION

Zoological Survey of India has the distinction of carrying out prestigious and unique first of its kind Ecological Restoration in coral reef areas in the recent past in the present study site (Gulf of Kachchh) itself with the able support of the Marine National Park Authority of Gujarat Forest Department, while a couple of agencies have tried and given up. ZSI restored a total of about 2000 square meter degraded coral reef area along the Gulf of Kachchh region by employing site specific strategies and multidisciplinary approaches and by involving local community (Satyanarayana and Chandran, 2017).

A total of 232 cement structures with 2320 native coral and branching coral transplant were restored in Pirotan site. In Narara site, 1170 native coral transplants were restored in 214 cement structures and a total of 110 cement structures, 50 iron frames were used to restore 1050 native coral transplants at Mithapur restoration site. Although high survival rates of transplanted native coral species were recorded in all restoration sites after one year of continuous monitoring, Pirotan site recorded maximum (97.24%), than the Narara (96.50%) and Mithapur (96.57%) restoration sites (Fig. 1). As far as concern with the restored branching coral transplants, survival rate of *Acropora* transplants was recorded 85.25% at Mithapur restoration site and 68.75% at the Pirotan site. But the survival rate of *Montipora* transplants was recorded higher in Pirotan restoration site 78.57% than the Mithapur site (59.40%) (Satyanarayana and Chandran, 2017). Pirotan recorded highest survivorship (97.24%) than the other two sites. Coral fragments attached on the artificial cement/iron/pvc structures were found started encrusting on the cement plates by overgrowing on the tied nylon and copper tags from the 2^{nd} month %) (Satyanarayana and Chandran, 2017). Restoration is being done on in Gulf of Kachchh area (Narare Reef, Kalubar Island). About 9000 corals from 49,000 m² area (40 times bigger than the MNP-ZSI ICZM transplantation effort carried out from 2012-2018) will be translocated. The aforementioned project work cost around Rs. 4,00,00,000.00 (only for salary and some consumable) whereas other all the support will be made by the sponsoring agency.

4. STATUS OF CORAL REEFS IN GREAT NICOBAR ISLAND

Great Nicobar Island is the largest and southernmost island of the Nicobar group of islands of Andaman and Nicobar Islands. The narrow and shallow coastal water of Great Nicobar Island harbors fringing-type coral reefs. The detailed status of the reef areas of Great Nicobar Island is represented below.

4.1. Distribution of Scleratinian Corals at proposed sites

A total of 245 species of scleractinian corals under 53 genera and 15 families (including 2 genera under *Scleractinia Incertae Sedis*) are recorded from seven sites including the proposed project site of Great Nicobar Island during the present study. No major coral reef exists within the work area of the project. However, scattered coral reefs are available at the peninsular part of the Galathea Bay. A maximum of 117 species is documented from the Galathea Bay followed by 111 species in Sastri Nagar, 107 species from Campbell Bay, 102 species from Laxman Beach, 76 species from Gandhi Nagar, and 25 species from Anderson Bay, and only 15 species from Laxmi Nagar. The occurrence sharing of three groups of corals (Abundantly seen, commonly seen, and rarely seen) are plotted below (Fig. 1). The scleractinian corals of Galathea Bay are scattered with about 117 species of corals ad are reported on the eastern and western peninsular flanks of the bay.

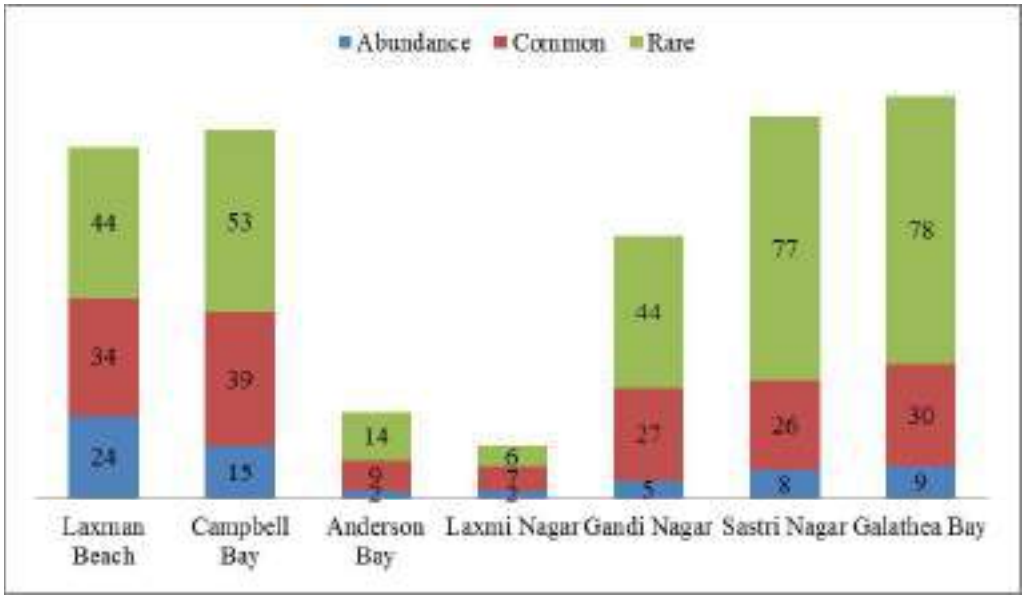


Fig. 1: Species richness of Scleractinian corals from seven selected areas of Great Nicobar Island

4.2. Diversity

The statistical analysis was made to evaluate the ecological status of scleractinian corals from the seven sites of the Great Nicobar Island. The dominance index (D) of the species ranges from 0.01 to 0.07. Five study areas out of the seven represented the dominance of 0.01 while

Anderson Bay represented 0.04 while Laxmi Nagar showcased the lowest numerical value of 0.07 for the dominance index. The Simpson density index suggested the ranges between 0.93 to 0.99. Five study areas such as Laxman Beach, Campbell Bay, Gandhi Nagar, Sastri Nagar, and Galathea Bay harbor a maximum value of 0.99 as Simpson diversity index for each area while a minimum of 0.93 is recorded from Laxmi Nagar. The species diversity index was measured by means of the Shannon index (H) which is ranged from 2.45 at Laxmi Nagar to 4.42 at Galathea Bay. Other ecological indices like Brillouin's, Menhinick's, and Margalef's indices also comprehensively suggested the maximum species diversity from the Galathea Bay region and the minimum from the Laxmi Nagar area (Table 1).

Table 1: Ecological indices of seven study areas of Great Nicobar Island

Indices	Laxman Beach	Campbell Bay	Anderson Bay	Laxmi Nagar	Gandhi Nagar	Sastri Nagar	Galathea Bay
Dominance_D	0.01	0.01	0.04	0.07	0.01	0.01	0.01
Simpson_1-D	0.99	0.99	0.96	0.93	0.99	0.99	0.99
Shannon_H	4.34	4.36	2.91	2.45	4.02	4.40	4.42
Evenness_e^H/S	0.75	0.73	0.73	0.77	0.73	0.74	0.71
Brillouin	4.11	4.11	2.65	2.23	3.76	4.12	4.14
Menhinick	4.65	5.15	2.68	1.89	4.63	5.79	5.91
Margalef	16.35	17.47	5.37	3.38	13.40	18.63	19.43

4.3. Benthic cover

Thorough studies were carried out in the seven study areas of Great Nicobar Island to estimate the benthic cover. A maximum of 39.27% of live coral cover was recorded from the Campbell Bay region followed by 30.81% from Gandhi Nagar, 25.59% from Sastri Nagar, 24.10% from Laxman Beach, 19.92% from Anderson Bar, 17.46 from Galathea Bay, and the minimum of 13.45% from Laxmi Nager. Among the other algae, a maximum of 51.75% was recorded from Galathea Bay while a minimum of 5.52% from Anderson Bay (Table 2).

Table 2: Summary details of Benthic cover of reef ecosystem of Great Nicobar Island

Parameters	Laxman Beach	Campbell Bay	Anderson Bay	Laxmi Nagar	Gandhi Nagar	Sastry Nagar	Galathea Bay	MEAN VALUE
Dead Coral	4.25	9.02	3.40	5.54	3.80	0.40	1.72	4.02
Live coral	24.10	39.27	19.92	13.45	30.81	25.59	17.46	24.37
Other animal	6.45	4.56	7.59	9.48	8.00	3.89	2.48	6.06
Other algae	24.15	6.95	5.52	13.78	19.77	33.87	51.75	22.26
Abiotic	41.05	40.20	63.57	57.75	37.62	36.25	26.59	43.29

The present study indicates a total of 491.7975 ha. reef areas across the seven study areas (Fig. 2) including 116.4173 ha. of reef areas at Galathea Bay which is distributed up to the maximum extent of 1200m (perpendicular) from the coastline on the eastern and western peninsular flanks of the bay while most of the reefs are scattered in distribution within the limit of a mean distance of 500m whereas the reef areas of Sastri Nagar are recorded with the

total distributional cover of around 103.8703 ha. along with the mean distributional range from the coast is 250m (perpendicular) along with the maximum of 500m while Laxman Beach represents the minimum of 34.4921 ha. of reef areas within the mean proximity of 150m from the coast while the maximum distributional ranges are within 350m (Fig. 3). It is significant to mention that about 17.46% are live corals are reported among the 116.4173 ha. of reef areas at Galathea Bay.

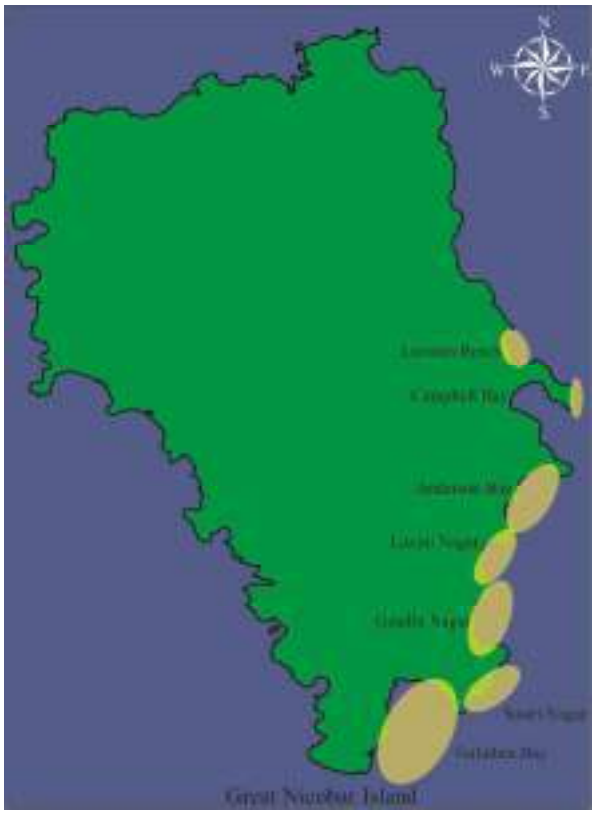


Fig. 2: Study areas of Great Nicobar Island

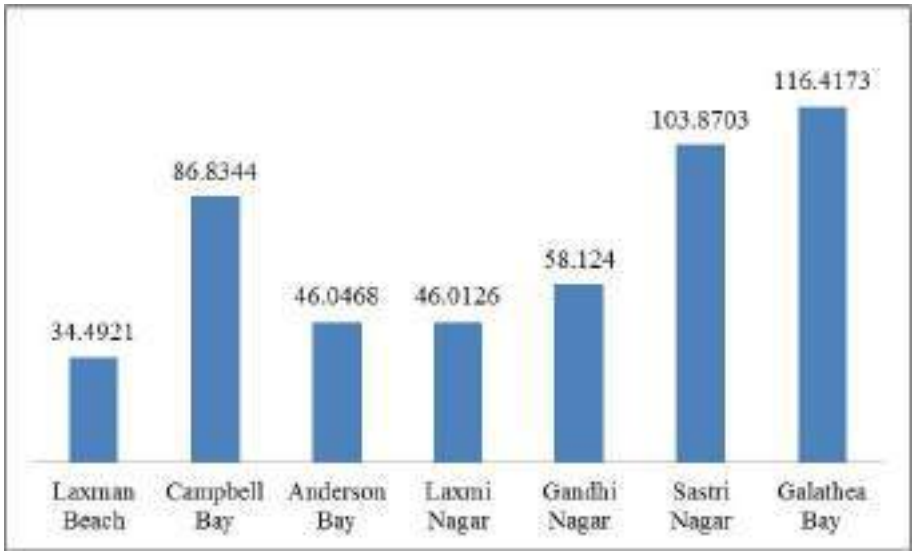


Fig. 3: Reef area cover (in ha.) of seven study areas of Great Nicobar Island

4.4. Similarity index of benthic communities

The grouping among the study sites was carried out based on the benthic covers and life forms of the study areas. The parameters such as percentage cover of dead coral, live coral, other animals, other algae, and abiotic were considered during the preparation of this dendrogram. The maximum similarity was found in the benthic components of Gandhi Nagar and Laxman Beach, followed by Anderson Bay and Laxmi Nagar. The characteristic features of the benthic communities of Galathea Bay are maximally different from all the study areas (Fig. 4).

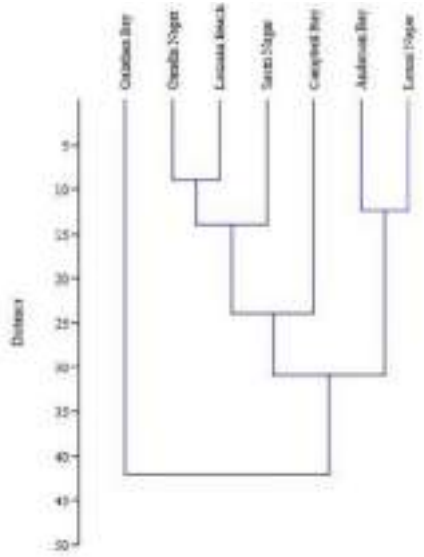


Fig 4: Dendrogram on Euclidean distance to make grouping based on benthic cover at the study sites of Great Nicobar Island

4.5. Similarities and dissimilates based on life forms

The similarities and dissimilates among the study areas were also calculated based on the availability of live coral life forms such as *Acropora* - Branching, Encrusting, Submassive, Digitate, and Tubular; and non-*Acropora* - Branching, Encrusting, Foliose, Massive, Submassive, Mushroom, Heliopora, Millepora, and Tubipora. The maximum similarity was recorded between Anderson Bay and Laxmi Nagar; followed by Sastri Nagar and Galathea Bay. The physical attributes of live coral life forms of Laxman Beach were with the proximity to the cluster of Anderson Bay and Laxmi Nagar whereas Gandhi Nagar and Campbell Bay were seen as the representation of a different subset of the cluster (Fig. 5).

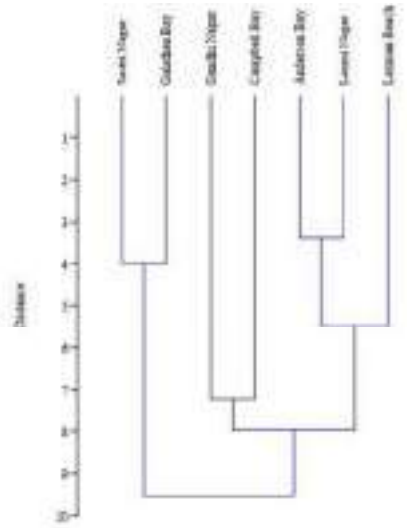


Fig 5: Dendrogram on Euclidean distance to make grouping based on live coral life forms at the study sites of Great Nicobar Island

4.6. Correlation of scleractinian species

Studies on cluster analysis were attributed based on the Raup-Crick index availing absence-presence data of scleractinian species and found that the occurrence in a variety of species availability contributed a major role to denote area-wise cluster formation. The data suggested that the species of communities are narrated a close relationship between Laxmi Nagar and Campbell Bay while the maximum of dissimilarity was found between Laxman Beach and Sastri Nagar (Fig. 6).

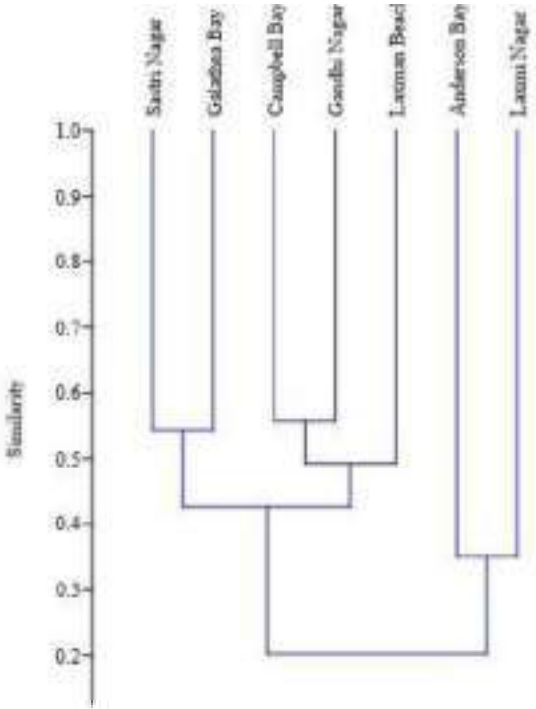


Fig. 6: Bray-Curtis similarity-dissimilarity cluster of scleractinian corals along seven study areas of Great Nicobar Island

5. TRANSLOCATION/RESTORATION SITES OF GREAT NICOBAR ISLAND

As a part of the project on Holistic Development of Great Nicobar Island, it is proposed to translocate and restore the corals falling on the proposed project site.

5.1. Overall observation

As per the above-mentioned analysis, the overall benthic community of Galathea Bay is mostly different from other study areas. All the study areas are situated in close proximity to Great Nicobar Island within a range of nearly 30 km. (aerial distance). The thorough scrutiny of the benthic communities resulted in this differentiation. Another study signified Galathea Bay and Sastri Nagar are sharing maximum similarity in live coral life forms and species occurrence followed by Campbell Bay, Gandhi Nagar, Laxman Beach, and Anderson Bay. The environmental status and physicochemical status of the study areas are conducive with the oligotrophic environment.

5.2. Probable sites and justifications

The details of the probable sites for coral translocation/ restoration are given below (Table 3).

Table 3: Probable sites for coral translocation/ restoration

Site No.	Areas	Present Reef Cover (ha.)	Scleractinian species richness (number of species)	Outcome
Site 1	Laxman Beach	34.4921	102	Increase of reef cover and habitat along with species diversity.
Site 2	Anderson Bay (North-East Bay region)	46.0468	25	Increase of reef cover and habitat along with species diversity.
Site 3	Gandhi Nagar	58.124	76	Increase of reef cover and habitat along with species diversity.
Site 4	Campbell Bay (South-East Bay region)	86.8344	107	Increase of reef cover and habitat along with species diversity.

The species diversity, density, and composition of Galathea Bay are maximally correlated with Sastri Nagar. As Sastri Nagar is situated near the Gakathea Bay (the proposed project site), the developmental works may have some temporary negative impact on the coastal waters which may affect the immediate translocation/ restoration of scleractinian corals. So Sastri Nagar is not selected as the probable site for translocation/ restoration.

6. METHODOLOGIES FOR CORAL TRANSLOCATION/ RESTORATION

6.1. Site Selection

The site selection is completely dependent on the objectives of the work. Here the major objectives of the proposed work depend on the transplantation studies. Hence, site selection will be made as Donor Site and Recipient Site.

Donor Site- The proposed project deals with the transplantation and restoration of corals. Corals will be extracted from Galathea Bay of Great Nicobar Island with the help of coral cutting saw, hammer & chisel, and hydraulic underwater hammer drill etc. Though no dredging will be undertaken near to the eastern and western flanks of the peninsular area of the bay, some corals may get affected due to the dredging in the nearby areas due to the deposition of the dispersed sediments. It has been presumed that that about 4 ha of corals may get affected.

Recipient Site- The coral transplantation will be made at other sites of Great Nicobar Island to restore the coral reefs. Corals will be initially transplanted at Laxman Beach and Joginder Nagar Beach area (Anderson Bay). Transplantation can be made at Gandhi Nagar or Campbell area also if required. These areas will be the recipient sites.

6.2. Benthic cover details of Galathea Bay

- Total benthic cover of Galathea Bay: 116.4173 ha.
- Benthic cover of live coral in Galathea Bay: 20.32 ha.
- Density of coral colonies 51.67 individuals/ 10 m × 10m area
- Density of coral colonies 5167/ ha.
- Depth range 5-25 m.

6.3. Coral colonies for Transplantation

- Coral cover required to be translocated from the proposed site: 4 ha.(Table 4)
- Coral colonies required to be translocated from the proposed site: 20668 (Total Value)
- Colonies will be translocated: 16150 (Approximate)
- Total area required for the coral transplantation: 4 ha. (The coral colonies or fragmented segments will be attached/ fixed with some solid substratum and will be places gradually one by one)

Table 4: Benthic cover and Colonies to be translocated (maximum)

Group	*Translocation required (individual colony/ coralla)*	*Gross major colonies to be transplantation*
Acropora-Branching	310.69	300
Acropora-Digitate	1346.30	1300
Acropora-Tabular	5814.26	5000

Non-Acropora- Branching	621.37	600
Non-Acropora- Encrusting	1242.74	500
Non-Acropora- Foliose	414.25	200
Non-Acropora- Massive	9290.98	7000
Non-Acropora- Submassive	1301.92	1000
Mushroom	118.36	100
Tubipora	207.12	150
TOTAL COVER	20668.00	16150

6.4. Setup and process of translocation/ restoration

The first step for coral translocation is to minimize stress and prevent damage to corals. For successful transplantation of corals species translocation will be made in suitable selected areas that have very similar environmental conditions as the areas they originally came from, especially water flow depth gradient and turbidity. Data on key physicochemical parameters (including salinity, temperature, water current gradients and limits, and turbidity) at both the donor and recipient areas will be collected and also measured using fixed data loggers. The coral colonies will be tagged using colors and codes depicting the depth, location, growth form, and type of species before translocation from the demarcated sites, carried at the same depth while transporting them, and will be placed at the same depth and similar environment at the recipient site. Extraction of the coral colonies will be made from the substratum with help of coral cutting saw, hammer & chisel, and hydraulic underwater hammer drill etc. Coral colonies will be translocated entirely as a whole object, lifted from the sea bottom, and loaded to the carrying trays fixed at the ship/boat bottom at the same depth of excavation carefully with lift bags. The lifted corals will be transferred carefully to hanging and submerged metal cages with soft carpet at the bottom, hanging at required depths at the sides of the carrying vessel, avoiding the exposure and depth difference to the translocated corals. Ambient water quality parameters such as sea surface water temperature and dissolved oxygen will be measured once (with at least three replicates) at the coral donor sites on the day of coral translocation. Corals will be transported to the suitable recipient site as soon as possible on the same day following the removal. The vessel will be progressing at a slow and steady speed when approaching close to the recipient site. After arriving at the coral recipient site, the colonies will be fixed with the boulders gradually to minimize disturbance related to sediment. The coral colonies will be placed at similar depths and orientations similar to the recipient sites as far as possible. Every translocated colony at the recipient site will be tagged with waterproof labels depicting important details pertaining to that particular coral. All the corals will be firmly anchored or attached to the substratum using epoxy without causing lethal damage to the corals. All tags will be nailed in the vicinity of the coral colonies at distances not so close to interfering with the potential growth. This would allow the identification and recording of the rehabilitation progress of corals during post-translocation monitoring (Table 4).

7. CONSERVATION AND MANAGEMENT

The following parameters will be monitored on monthly basis for the period of five years initially to conserve the corals at the translocated site as well as donor site.

7.1. Physicochemical Data Collection

Physicochemical parameters of the water sample indicate the environmental status of the said ecosystem. Data on various parameters will be collected systematically and seasonally to understand ecological cohesion of the coral reef ecosystem of the said project sites (Table 5, Plate 1).

7.1.1. *pH*

The pH indicates the concentration of H^+. In water samples it ranges from 1 to 14. The sample with pH 7.0 indicates the neutral state while pH 1.0 is most acidic and pH14.0 is considered as most alkaline. The pH of reef water can be seen within a stipulated range from (7.5 to 8.4). As salinity is one of the most important physicochemical states for the corals, variation in pH level can be useful for the documentation of threats on corals which may be the effect of pollution and so on. The pH can be measured with a simple pH meter. The data will be collected continuously over three-month intervals.

7.1.2. *Temperature*

Temperature is most important parameter for the coral reefs. The temperature of the air and water can be measured by holding a simple mercury thermometer 0.5 m below the surface or at the depth of study site. It is recommended to record the data while the bulb end is still in the water. A better measurement is to use a maximum/minimum thermometer which measures both the warmest and the coldest that the water has been since the thermometer was last set. Data can be obtained in regular interval to record the temperature gradient of the study site. The data will be collected continuously over three-month intervals.

7.1.3. *Turbidity or Transparency of water*

Light is most required physical agent for the corals reef for the continuation of zooxanthallate life through photosynthesis. Turbidity indicated the cloudy state of water, and is a measure of how far an observer can see under water and how far down the light can go. It is measured with a secchi disc. It is a disc 20 cm in diameter painted black and white and attached to a weighted rope which is marked each metre to show its length. Vertical and horizontal transparency can be measured with the secchi disc. The disc can be attached by a non stretchable rope. Lower the disc into the water until observer can no longer sees. Slowly pull up the disc until you can just see it again from the surface, and write down the distance to the disc as measured by the marks on the rope. If you do not know which mark it is, count them

as you pull the disc back up. The data record should me made several times about the same time of a day at different location to get comparative data.

Turbidity meter or nephelometer is a useful tool for the measurement of turbidity. The working principle depends on the passing a beam of light through a water sample and measuring the light scattered by the particulates at the 90° angle to the light beam and directly proportional to the turbidity. Nephelometer Turbidity Units (NTU's) is the reading measures. Turbidity meter – EUTWCH is used for the analysis of turbidity. The data will be collected continuously over three-month intervals.

7.1.4. *Sediment deposition*

The rate of sediment deposition is one of the most important parameter which makes the entire reef vulnerable due to dredging operation and erosion. It can be measured on the basis of collected suspended materials. Sediment traps can be fixed in a stand and should be kept for particular days (not more than 14 days), the jar should be capped and brought to the laboratory for analysis. If there is any small animal in the jar, that should be removed. The sampled sediments will be poured on whatman filter paper and will be filter by Buchner funnel. The filtration process will be made several times to remove salts. Then the sediment sampled will be dried in drying oven at 70°C. Calculation will be made to acquire sedimentation rate as mg of sediment per cm^2 per day. The sediment weight is the total weight minus the filter weight, and the area of the jar opening is πr^2. The data will be collected continuously over three-month intervals.

Sedimentation rate= (Sediment weight/ No. of days at site $\times \pi r^2$)

7.1.5. *Salinity*

Salinity is a measure of salt is in the water. There are three simple ways to measure salinity. To measure salinity, you will need to collect a sample of water from the surface at the same place where measured the turbidity was made. Put the sample in a clean bottle of a size appropriate to the technique being used, and take it back to the shore for measurement. Hydrometer is a weighted glass tube that floats at a different depth in the water depending on the salinity (or specific gravity). Put the hydrometer in a transparent cylinder or deep jar and fill with sample water until the hydrometer floats. Then put your eye at the level of the water and read the number on the hydrometer scale. Data will be recorded along with temperature. Refractometer is a little like a telescope with a measuring scale in it. Take a small sample of the water and put it under the little cover. Hold the cover down without blocking the light, and read the salinity (or refractive index) by looking through the eye piece. Hand Refractometer-RHS-10 is used for the process. Data will be recorded. Conductivity meter is working by passing electricity through the water. The data will be collected continuously over three-month intervals.

7.1.6. *Nutrient*

For nutrient analysis, water samples will be collected in polypropylene bottles, stored in icebox and transported to the laboratory for immediate analyses. Samples will be filtered using Millipore APFC filter papers (1.2 μm pore size and 47 mm diameter) for analysis of total suspended solids and nutrients. Nitrite, nitrate, inorganic phosphate and silicate were analyzed following the standard methods (Grasshoff *et al*., 1999). Data quality will be checked by careful standardization, procedural blank measurement and by triplicate samples, finally average readings were taken into account. The precision of nitrate + nitrite (NO_3+NO_2), ammonium, phosphate, and silicate will be ±0.02, 0.02, 0.01, and 0.02 µM, respectively. The data will be collected continuously over three-month intervals.

7.1.7. *Chlorophyll-a and dissolved oxygen*

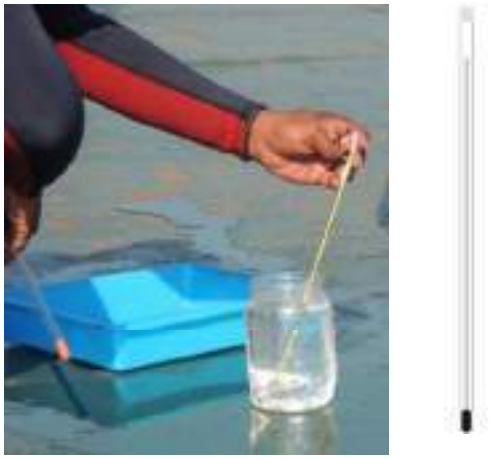
Chlorophyll-*a* pigments will be estimated following Spectrophotometric method (Parsons *et al*., 1992). For estimation, one litter of seawater will be collected in polypropylene bottles and filtered through Millipore Glass Fibre prefilters (0.7µm pore size, 47 mm diameter) under a pressure less than 100 mm Hg. The pigment will be extracted in 90% acetone and filtrates were kept in refrigerator for 24 hrs. under dark condition. The extract will be centrifuged and the supernatant will be used to determine chlorophyll '*a*' following the spectrophotometric method and optical density will be measured at the wavelength of 630 to 750 for chlorophyll-*a*. Winkler's titration method will be followed for Dissolved Oxygen (Strickland and Parsons, 1972). Seasonal means for DO will be collected based on day and night measurements. The data will be collected continuously over three-month intervals.

Table 5: Monitoring of the physicochemical parameters of the proposed project sites

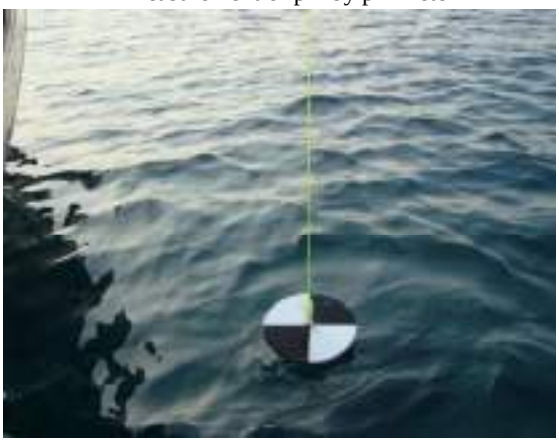
Sl. No.	Data	Seasonal Data	Donor Site	Recipient Site
1.	Current speed [m/ s]	●	●	●
2.	Temperature [°C]	●	●	●
3.	Salinity [PSU]	●	●	●
4.	Dissolved oxygen [mg/L]	●	●	●
5.	Turbidity [NTU]	●	●	●
6.	Chlorophyll-a [µg/L]	●	●	●
7.	Inorganic nutrients [µM]	●	●	●
8.	Sedimentation rate [mg/m^2/day]	●	●	●
9.	Organic content of sediments [mg/m^2/day]	●	●	●
10.	C:N ratio of sediments	●	●	●

Plate 1: Physicochemical Parameters documentation

Measurement of pH by pH meter

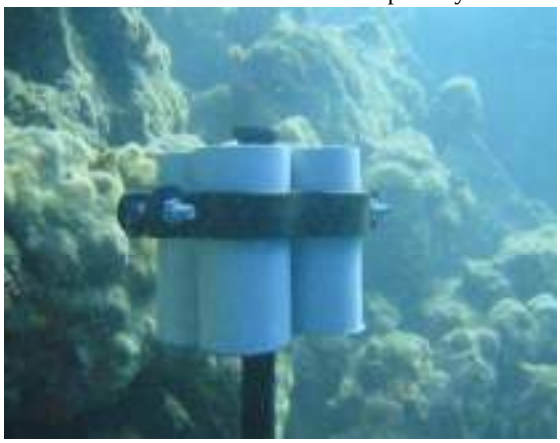


Measurement of temperature by thermometer



Secchi Disk for water transparency

Turbidity meter – EUTWCH



Sediment trapper

Refractometer-RHS-10 for Salinity

Deployment of water sampler

Water sampler with open ends

Aqua trap non metalic water sampler

Water sampler with messenger

Deployment of water sampler

SYSTRONICS water sample analyzer

7.2. Survey methods for Macro-benthos (Intertidal and Subtidal Fauna)

The fauna occurring in the intertidal zone which is the area between the highest high water mark and the lowest low water mark of the seacoast. The present investigation of GIS requires details of quality and quantity of species composition stressing marine biodiversity area. To achieve this target, the following methodology should be adopted. A general survey of the area is to be made to assess the faunal diversity both qualitatively and also quantitatively to note the dominant group. This data should be recorded separately.

7.2.1. *Methodology*

Intertidal fauna are conveniently collected during low tide period from the exposed coast, the substratum of which may be rocky, muddy, sandy, dead coralline beds, sea grass or algal beds etc.

7.2.2. *Qualitative analysis*

The fauna are hand-picked, scooped out of sandy bottom, chisels out of the rocky or dead coral substratum or washed out of the sea grass or algal beds. The collected specimen should first be kept in the *in situ* seawater and brought to the laboratory.

Samples which are contractile in nature and react instantaneously even for mild stimulus, should be narcotised prior to preservation. In order to narcotise, place the specimen in containers of seawater and allow the specimen to expand or attain its natural form. Add in micro-doses, the narcotiser in the medium so as to respond mildly. Gradually increase the dosage until the specimen ceases to respond to stimuli. At this stage, the narcotised specimen may be transferred to 4 to 10% neutralised sea water formalin for preservation and identification.

The type of narcotiser used differs depending on the faunastic group of the specimen and is as follows:

1. Magnesium Chloride – Coelenterates (Anthozoans & Alcyonarians), Ctenophones
2. Magnesium Sulphate – Asteroides, Ophiuroides, Holothuroides & Molluscs
3. Menthol Crystals – Turbellarians, Nudibranchs (Mollusca), Ascidians
4. Alcohol – Polychaetes, Brachiopods & Protochordates
5. Chloral hydrate – Polychaetes & Molluscs

Narcotised samples may be preserved in 4-10% neutralised sea water formalin solution.

5.6.3. *Quantitative analysis*

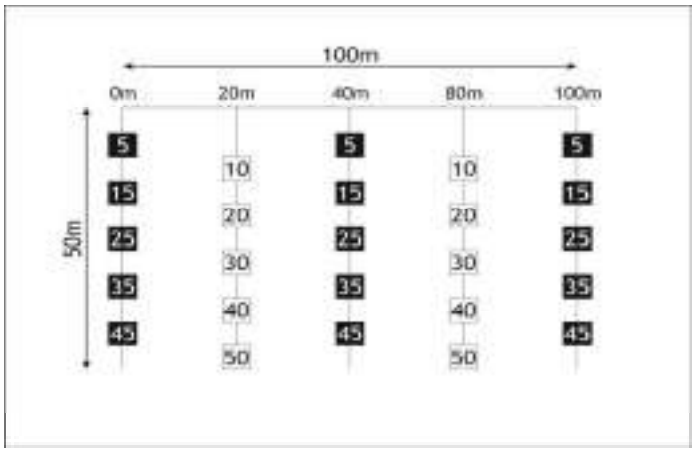
Intense quantitative assessment of dominant elements of both ecologically and economically important species may be made as per the Transect Quadrate Method.

5.6.3.1. Transect Quadrat Method (TQM)

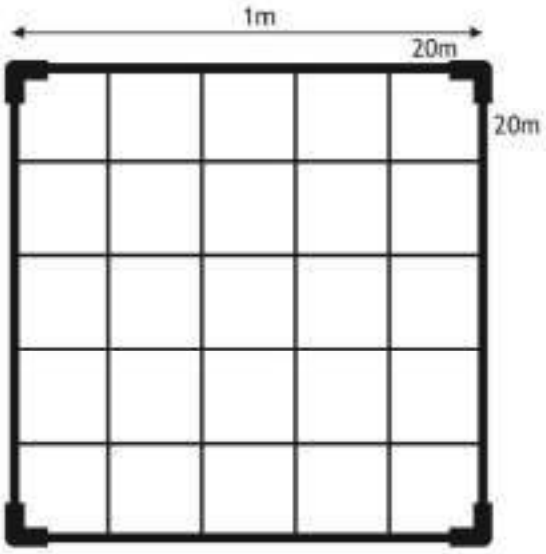
The *in situ* quantitative analysis for intertidal fauna is done by *Transect Quadrat Method,* which is recommended here as an easily adaptable method both with the view of collecting data and for analysis, after perusing through the other methods like Plots and Transact Method of Loya (1978), Random sample method of Bakus (1990) and Line Intercept Transact Method of English *et al.*, (1997). The presently recommended Transect Quadrat Method (TQM) is to cover 100 m along the shore and 50 m into the sea (eulittoral zone) which would cover a sector of eulittoral zone of an area of 5000 sq. m. (Fig. 27). The TQM sector of 100 m wide of a critical habitat may selected either at random, if the ecosystem were to be uniform, or as one sector of 100 m wide of each type of ecosystem, i.e., grass beds, coral reefs, rocky and sandy coast, etc., represented in the critical habitat. This decision of selecting the TQM sector should be based on a preliminary survey of the critical habitat. Mostly the process is preferred during intertidal studies. Where snorkelling and SCUBA diving is possible, this process can be applied. During sub-tidal studies, more man power is required to complete the work.

a. Equipment required
    i. Six pieces of nylon ropes each to cover 50m from the high tide mark into the sea and marked at every 5m distance in order to fix Quadrate stations.
    ii. A gun metal/ brass/ copper Quadrate structure of 1 sq.m. having a mesh of 20X20 cm to conduct quantitative analysis of fixed stations.
    iii. GPS to fix stations.
    iv. Snorkelling equipments (Mask, Snorkel, Reef shoe, Fins)
    v. Self-Contained Breathing Apparatus (SCUBA) diving equipments (Mask, Snorkel, Diving Cylinders, BCD, Regulator, Reef shoe, Fins, Dive computers, Weight belt with weights)
    vi. Plastic slate with pencil

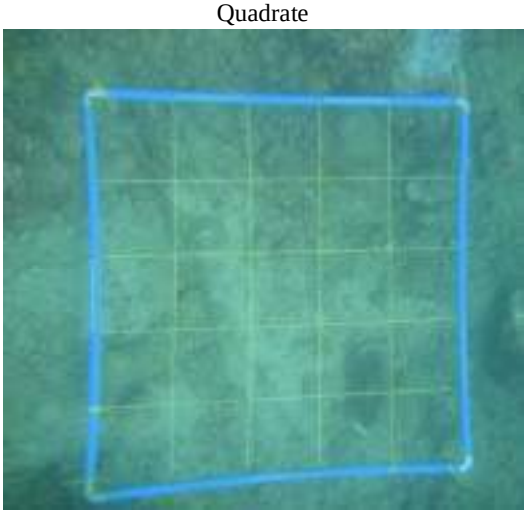
b. Procedure
    i. Fix a point at the highwater mark with a wooden or metal peg.
    ii. Draw the nylon rope, marked at every 5m distance, from this point into the sea for 50m so as to form a transect line perpendicular to the coast
    iii. Draw similar transect lines at a distance of every 20m parallel to the first transect line upto 100m. This will give totally 6 transect lines perpendicular to the shore and parallel to each other.
    iv. Fix five stations at 10m distance on each transect line beginning at 5/10m on alternate transect lines as shown in the Fig. 3 so as to fix a total number of 30 stations out of 5000 sq. m. area.
    v. Each station is to be inventorised for biotic components with a 1 sq.m. Quadrant frame partitioned by 20×20 cm mesh, by placing the Quadrant on the stations. Thus sampling is done in all 30 stations, which covers 6% of the total area of 5000 sq.m.



Diagrammatic representation of survey methodology for Transact Quadrate Method (TQM)
(Area to be surveyed is 100m X 50m = 5000 sq.m.; Total no. of stations to be covered is 6 transacts x 5 stations = 30 3. Sampling area = 6%)



Quadrate



Quadrate at *in situ* condition

5.6.3.2. Quadrat Method

Coral cover is estimated using a 1 m^2 quadrat frame divided into 100 (20×20cm) smaller squares. The observer visually estimates coral cover *in situ* and records the data on an underwater writing slate. The observer uses the grid to estimate total area of each species encountered. A transect line is not required because the frame can be flipped 25 times to measure contiguous non-overlapping areas without reference to the line. In this study, the quadrat was moved successively along the entire 25 m transect line without overlap, encompassing a total area of 25 m^2. The coral coverage by species was estimated in each frame (Jokiel *et al.*, 2005).

5.6.3.3. Photo-Quadrats

Documentation of coral reefs through the process of Photo-quadrat is one of the good monitoring methods of status evaluation. But it is recommended for all kind of data interpretation. It can provide accurate information on reef cover but the analysis of photographs can be time consuming (Rogers *et al.*, 1994).

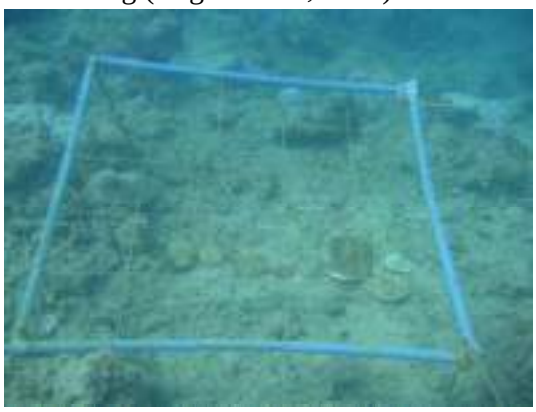


Photo-Quadrate at *in situ* condition

a. Qualitative Representation:

At every 1 sq. m. area of study, count the number of coral types (er. CM= Coral massive, CF= Coral Folios, CE = Coral Encrusting, etc.) and the associated fauna and sum up the total of each species for all the 30 Quadrates. Calculation given below will represent the percentage of quality composition of 30 sq. m. area as a sample of the total 5000 sq. m.

$$\text{Percentage of live form (benthos) in quality} = \frac{\text{Nos. represented of one species}}{\text{Total numbers of all species}} \times 100$$

b. Quantitative Representation:

At each study square area, measure the area of coral and faunal types represented and calculates it for 30 Quadrates with the help of the quadrat frame of 1 sq. m. and compute the results as follows:

$$\text{\% of live form (benthos) In quantity} = \frac{\text{Total area covered by each type for 30 quadrates}}{\text{Area surveyed (30sq.m.)}} \times 100$$

5.6.3.4. Line Intercept Method

Line Intercept Transects (LIT) are used to collect data on the sessile and non – sessile benthic organisms such as Porifera, Cnidaria, Mollusca, Crustacea, Echinodermata and other coral reef associated organisms. This method is used mainly wherever coral reefs are present and are more than 50 m. away from the shore. Coral reefs and the associated fauna are part of the intertidal community, other than the fauna present in the sandy bottom. These communities are characterized by life form categories, which will provide a clear description of the reef community for GIS mapping of the intertidal coral reefs and other associated fauna mentioned above. The LIT is used to estimate the life form cover of the coral reef and also the reef associated organisms within a specified area by calculating the length of the line that is intercepted by the object (different coral species- Mollusca, Echinodermata and others). This measure of cover is expressed as a percentage, which is considered to be an unbiased estimate of the proportion of the total area covered by that coral reef and associated organisms provided the size of the coral reef is relative to the length of the line and the length of the line is small relative to the area of interest. This method of LIT and Quadrate is used mainly where the coral reefs are present.

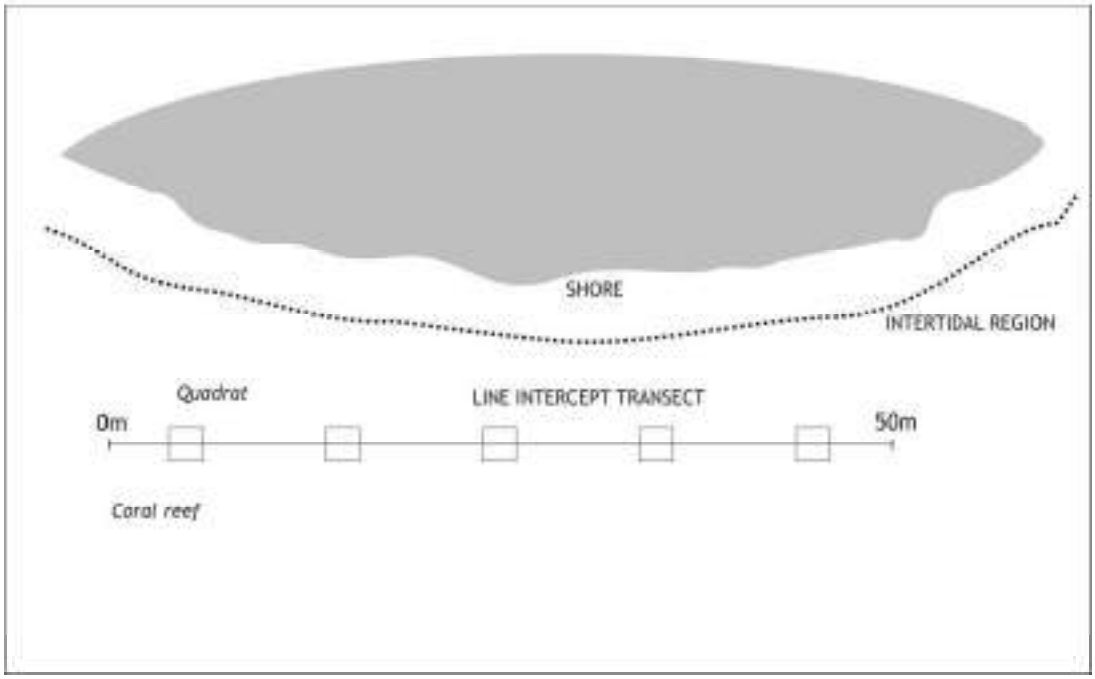


Diagram showing the method of laying LIT and Quadrate on a coral reef at intertidal region

The data collected using LIT is also substantiated by a one square meter quadrate along the line of intercept which will give a clear cut idea of the faunal composition of benthic organisms both qualitatively and quantitatively. Once the transect is laid, the observer moves slowly along the transect recording onto the underwater writing pad about the life forms encountered under the tape. At each point where the benthic lifeform changes, the observer records the transition point in centimeters and the code of the lifeform (Table 6,

Plates 2-7). Hence, along the length of a transect (XY) a percent of intercept points (1) are recorded for each of lifeform. The length of each lifeform encountered under the transect (L) is the difference between the transition points recorded for each lifeform. After completion of LIT a quadrat is placed over the line (tape) at every 5/ 10 or 20 m depending on the lifeform present to collect and substantiate the LIT data.

a. Equipment's required

i. GPS (Portable)

ii. Snorkeling equipment's (Mask, Snorkel, Reef shoe, Fins)

iii. Self-Contained Breathing Apparatus (SCUBA) diving equipment (Mask, Snorkel, Diving Cylinders, BCD, Regulator, Reef shoe, Fins, Dive computers, Weight belt with weights)

iv. Underwater writing pad with pencil

v. Plastic measuring tapes (50 m length),

vi. PVS quadrate

vii. Nail and plastic ropes

viii. Underwater camera with housing for digitization

b. Site Selection

i. A general survey of the area to know where the reefs are present.

ii. At least 2 sites should be selected. If distinct windward and leeward zones exist, sites should be selected in each habitat.

iii. The location of sites should be recorded with a GPS.

c. Analysis

Summary of data showing percent cover and number of occurrences of each lifeform may be calculated using the line intercept and quadrat data. After calculating the intercept (length) from the transitions points recorded along the transect the percent cover of a lifeform category is calculated as follows.

$$\text{Percent cover} = \frac{\text{Length of category} \times 100}{\text{Length of transect}}$$

$$\text{Percent cover Lifeform 1} = \frac{L1+L3+L5\ldots \times 100}{\text{Length of transect}}$$

$$\text{Percent cover Lifeform 2} = \frac{L2+L4+L6\ldots \times 100}{\text{Length of transect}}$$

These analyses will provide quantitative information on the community structure of the sample sites. Successive samples can also be compared from different areas of the coral reef.

Table 6: Lifeform categories and code

CATEGORIES	SUB-CATEGORIES	CODE	NOTES/ REMARKS
Hard Coral			
Dead Coral		DC	Recently dead, white to dirty white.
Dead coral with Algae		DCA	This coral is standing, skeletal structure can still be seen
Acropora	Branching	ACB	At least 2 ^{o} branching, eg. *Acropora palmate, A. formosa*
	Encrusting	ACE	Usually the base plate of immature *Acropora* forms, eg. *A. palifera and A. cuneta*
	Submassive	ACS	Robust with knob or wedge like form eg. *A. palifera*
	Digitate	ACD	No 2 ^{o} branching, typically *includes A. humilis, A. digitifera* and *A. gemmefera*
	Tubular	ACT	Horizontal flattened plates eg. *A. hyacinthus*
Non- Acropora	Branching	CB	At least 2^{o} branching eg. *Seriatopora hystrix*.
	Encrusting	CE	Major portion attached to substratum as a laminar plate eg. *Porites vaughani, Montipora undulata*
	Foliose	CF	Coral attached at one or more points, leaflike, or plate like appearance eg. *Merulina ampliata, Montipora aequituberculata*
	Massive	CM	Solid boulder or mound eg. *Platygyra daedalea*
	Submassive	CS	Tends to form small columns, knobs or wedges eg. *Porites lichen, Psammocora digitata*
	Mushroom	CMR	Solitary, free living corals of *Fungia*
	Heliopora	CHL	Blue coral
	Millepora	CME	Fire Coral
	Tubipora	CTU	Organ-pope coral, *Tubipora musica*
Other Fauna			

Soft Corals		SC	Soft bodied corals
Sponges		SP	
Zooxanthids		ZO	Examples are *Platythoa, Protopalythoa*
Others		OT	Ascidians, anemones, gorgonians, giant clams etc.
Algae	Algal Assemblage	AA	Consists of more than one species
	Coralline Algae	CA	
	Halimeda	HA	
	Macroalgae	MA	Weedy/ fleshy browns, reds etc.
	Turf Algae	TA	Lush filamentous algae, often found inside dameshellfish territories.
Abiotic	Sand	S	
	Rubble	R	Unconsolidated coral fragments
	Silt	SI	
	Water	WA	Fissures deeper than 50 cms
	Rock	RCK	
Other		DDD	Missing Data

Plate 2: Lifeform categories with pictorial representation

DC

DCA

ACB (*Acropora formosa*)

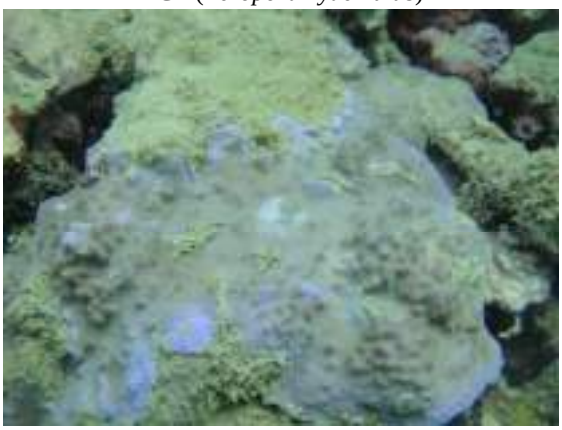
ACE (*Acropora cuneata*)

ACS (*Acropora palifera*)

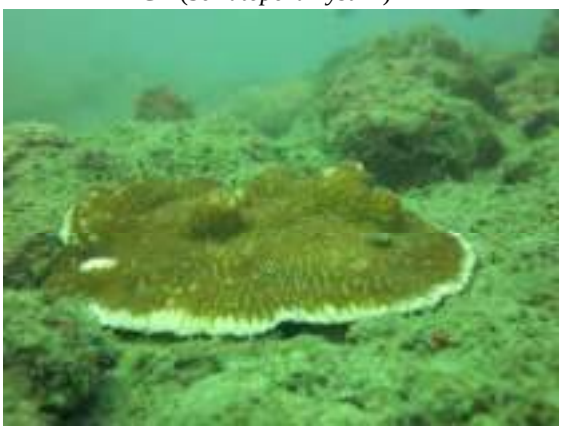
ACD (*Acropora gemmifera*)

ACT (*Acropora hyacinthus*)

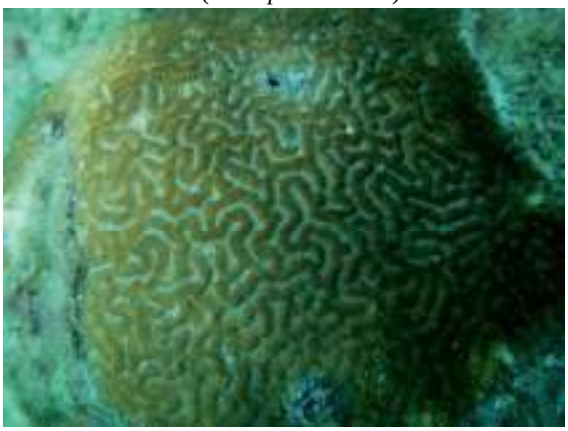
CB (*Seriatopora hystrix*)



CE (*Montipora undata*)



CF (*Merulina ampliata*)



CM (*Platygyra daedalea*)

CS (*Psammocora digitata*)

CMR (*Fungia fungites*)

CHL (*Heliopora coeruliaea*)

CME (*Millepora* sp.)

CTU (*Tubipora musica*)

SC (Soft coral)

SP (Sponge - *Clathria mima*)

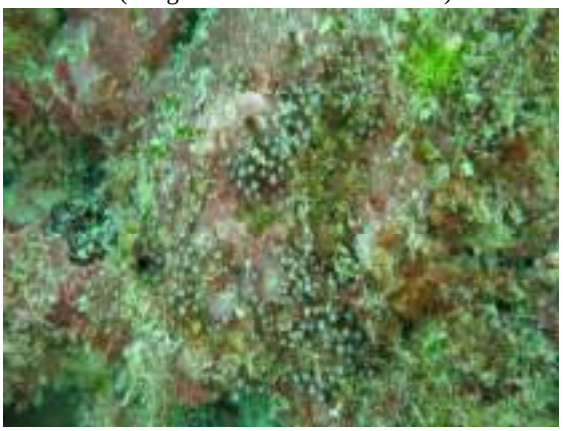
ZO (Zoxanthids)

OT (Ascidia- *Didemnum molle*)

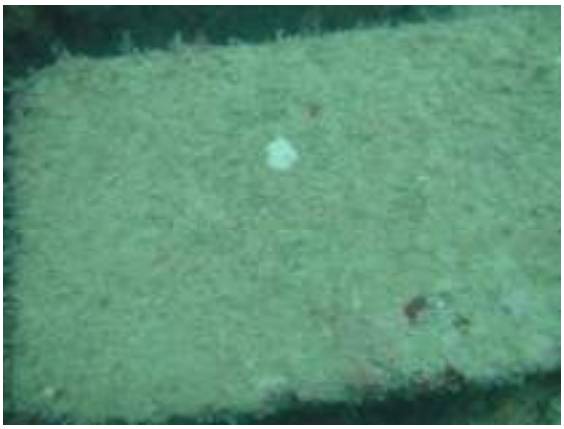
OT (Sea Anemone- *Heteractis magnifica*)

OT (Gorgonians- *Verrucella corona*)

OT (Giant Clam- *Tridacna gigas*)



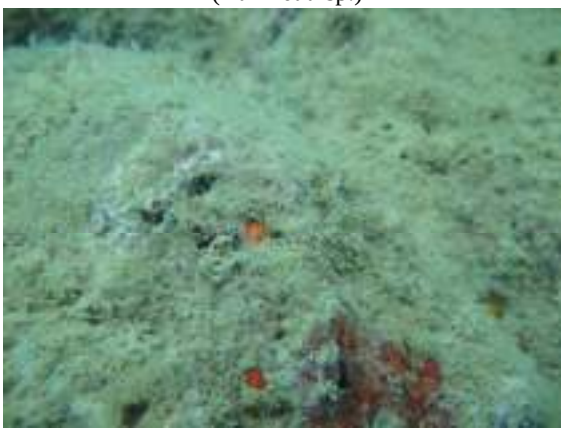
AA (Algal Assemblage)



CA (Cructose coraline algae)

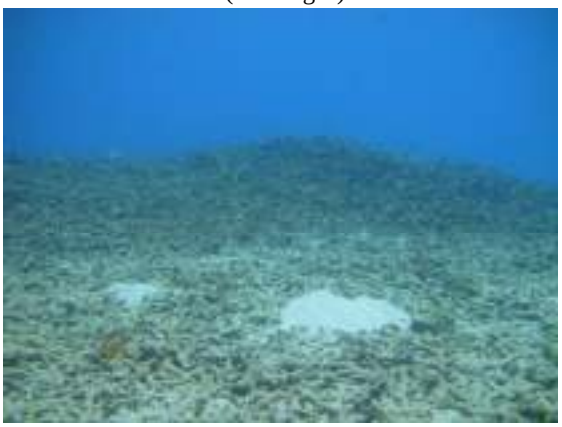
HA (*Halimeda* sp.)

MA (*Acetabularia ceranulata*)

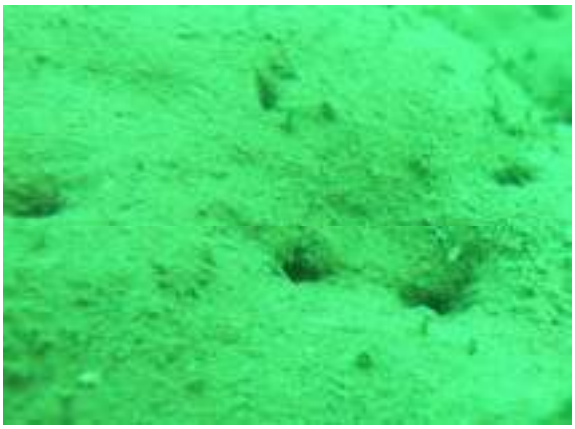


TA (Turf algae)

S (Sand)



R (Rubble)



SI (Silt)

WA (Water)

Plate 3: Benthic cover and LIT studies

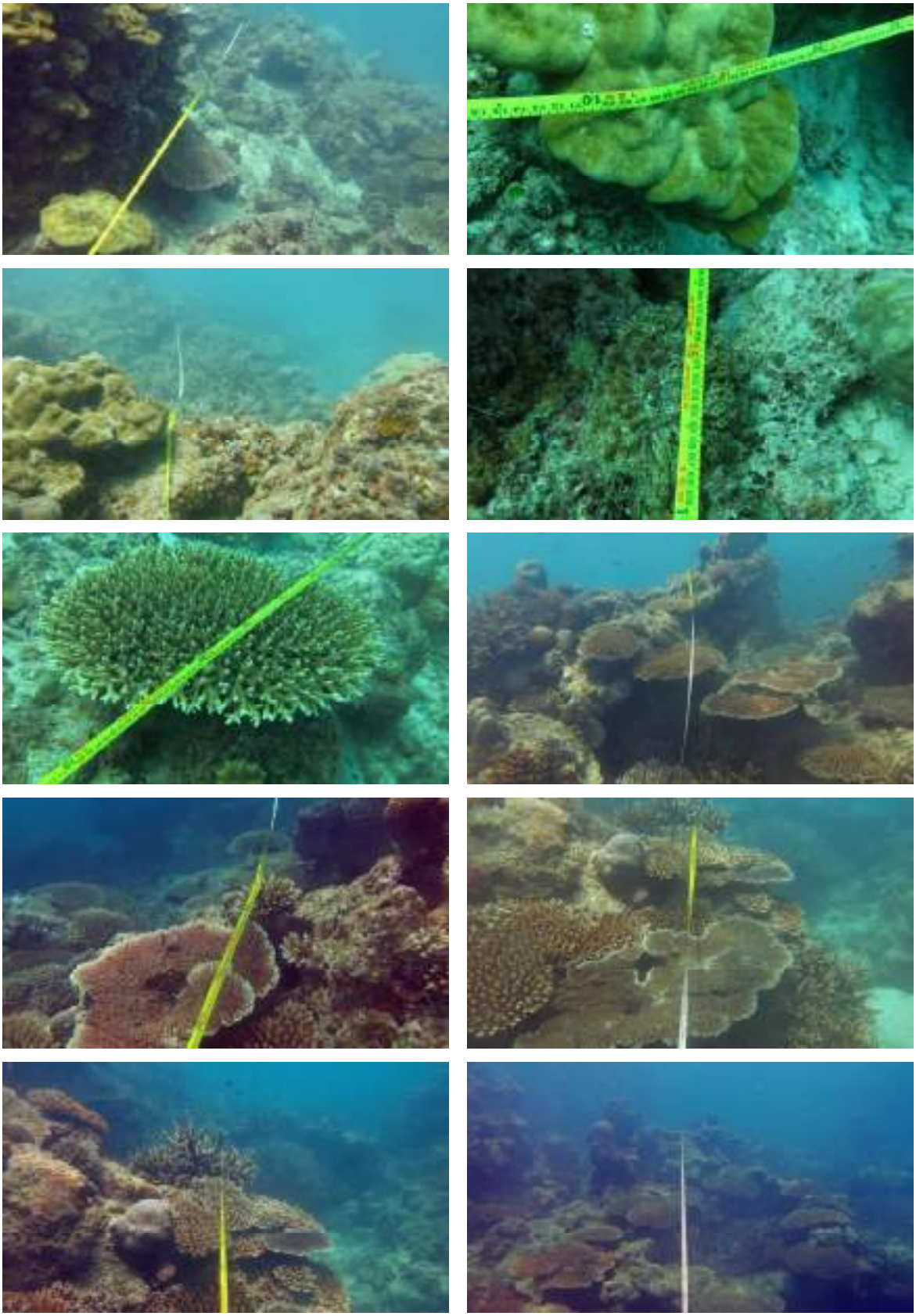


Plate 4: Benthic cover and LIT studies at Laxman Beach, Great Nicobar Island

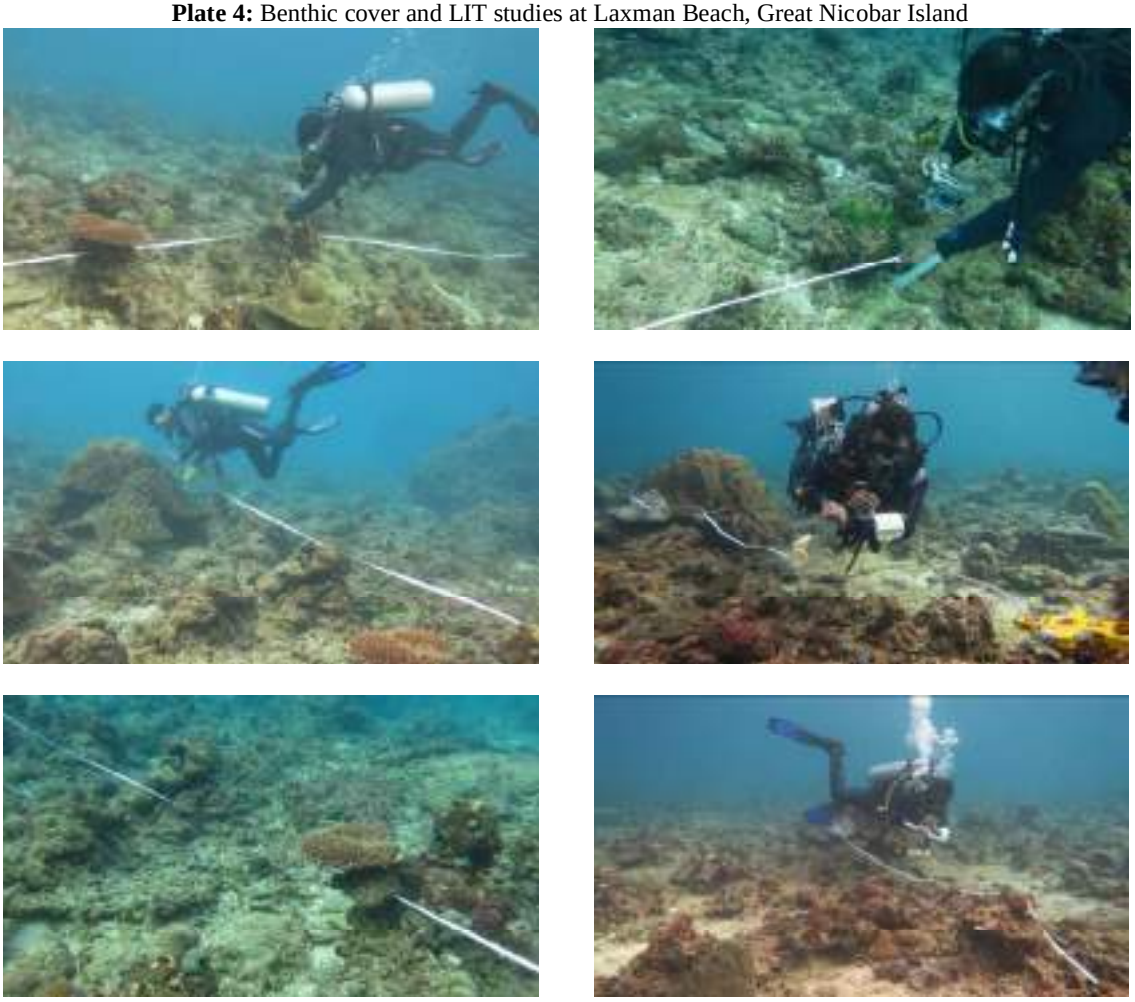


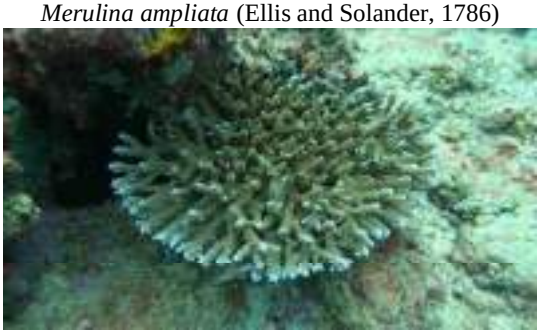
Plate 5: Benthic cover and LIT studies at Sastri Nagar, Great Nicobar Island

Plate 6: Benthic cover and LIT studies at Galathea, Great Nicobar Island

Plate 7: Scleractinian corals, Great Nicobar Island

Merulina ampliata (Ellis and Solander, 1786)

Acropora clathrata (Brook, 1891)



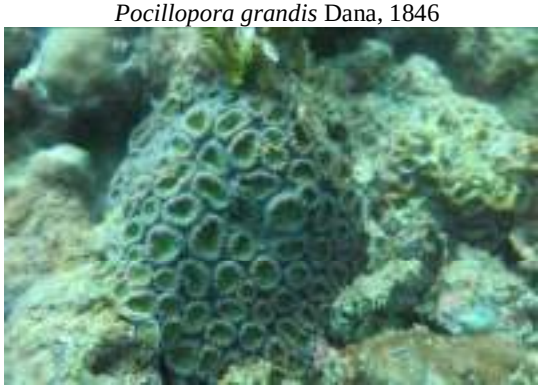
Acropora millepora (Ehrenberg, 1834)

Acropora florida (Dana, 1846)

Echinopora gemmacea Lamarck, 1816

Pocillopora grandis Dana, 1846

Lobactis scutaria (Lamarck, 1801)



Dipsastraea maxima (Veron, Pichon & Wijsman-Best, 1977)

5.6.3.5. Belt Transect

The belt transect method involves surveying a contiguous area along a line transect. It may be considered as a widening of the line transect or a continuous line of quadrats. As with the line transect, information of fauna and flora identified within the belt is recorded. The rapid

ecological assessment belt transect method provides information on coral demographics and condition. The coral divers gather data along five evenly spaced segments (each 2.5 × 1 m; 0-2.5 m; 5.0-7.5 m; 10-12.5 m; 15-17.5 m; 20-22.5 m) along each of the same two 25-m transect lines implemented in the LPI survey. This strategy was designed to maximize time for capturing spatial heterogeneity per transect. Within each 2.5 m^2 transect section, all coral colonies whose center falls within 0.5 m on either side of each transect line are identified and 2 planar measurements recorded. For each coral colony identified the extent of mortality is estimated, dedicating special attention to any evidence of disease. Percentage of colony affected as well as lesion severity and levels of coral predation were also recorded (NOAA, 2014).

5.6.3.6. Point Intercept Transect

Pointy Intercept Transect is another way to gather data documentation for the estimation of percent cover, relative abundance and diversity. The intercept method is simpler and quicker to manage data documentation for a large area. In this process observed records only what is located at each specified point along the line on every 20 cm. The number of point scored by a given species divided by the total number of points yields the percent cover.

c. Requirement
   i. SCUBA diving equipments
   ii. Nylone rope and nail
   iii. Measuring tape
   iv. Underwater writing pad with pencil

5.6.3.7. Underwater Video Transect

Underwater video sampling provides highly precise quantitative estimate of coral cover and abundance of common benthic taxa. The video technique in combination with independent sampling, i.e., no need to establish permanent transects, has proven to be a statistically powerful methodology for comparison of univariate and multivariate parameters in repeat surveys of identified sites of moderate – high coral cover (normally >20 %). This method involves the recording of standardized belt transects using a number of replicate transects of pre-determined length and filmed from a standardized height (approx. 40cm). Video footage is subsequently analyzed to extract quantitative coral data using a point sampling method. A digital video camera in an underwater housing is used to record the substrate along two 25m transects placed end to end with a 3 m separation. A red filter in the housing is used over the lens at depths greater than ~ 4m. The videographer swims approximately 1 m above the transect line with the camera lens pointing directly downward, and additionally records 360° views of the surrounding area at the beginning and end of each transect line. Analysis of the data will be made accordingly Kenyon *et al.* (2005).

Underwater video transect

a. Requirements
   i. SCUBA diving equipments
   ii. Nylone rope and nail
   iii. Measuring tape
   iv. Underwater writing pad with pencil
   v. Underwater video camera with housing

5.6.3.8. Manta Tow Survey

The manta tow technique is used to assess broad changes in the benthic communities of coral reefs where the interest is often an entire reef, or large portion. It enables visual assessment of large areas of reef within a short time and is highly recommended for determining the effects of large scale disturbances such cyclonic storms, coral bleaching and crown-of-thorns starfish. The technique is also useful for selecting sites that are representative of large areas of reef. The manta board is attached to a motor boat with a 17 m length of rope which has buoys placed at distances of 6 m and 12 m from the board. A snorkeller grips the board and is towed for approximately 2 minutes, at the end of which the boat pauses to allow the surveyor to record data. The coverage of bottom features may be recorded on a percentage scale or on a scale of 1–5, where 5 indicates the greatest cover and 0 is used for absence. However, a scale of 1–5 does have the short-coming that observers may be tempted to place a disproportionately large number of values in the middle category, thus creating observer bias. If possible, a scale of 1–6 or 1–4 is more desirable (Done *et al.*, 1982; Kenchington, 1984).

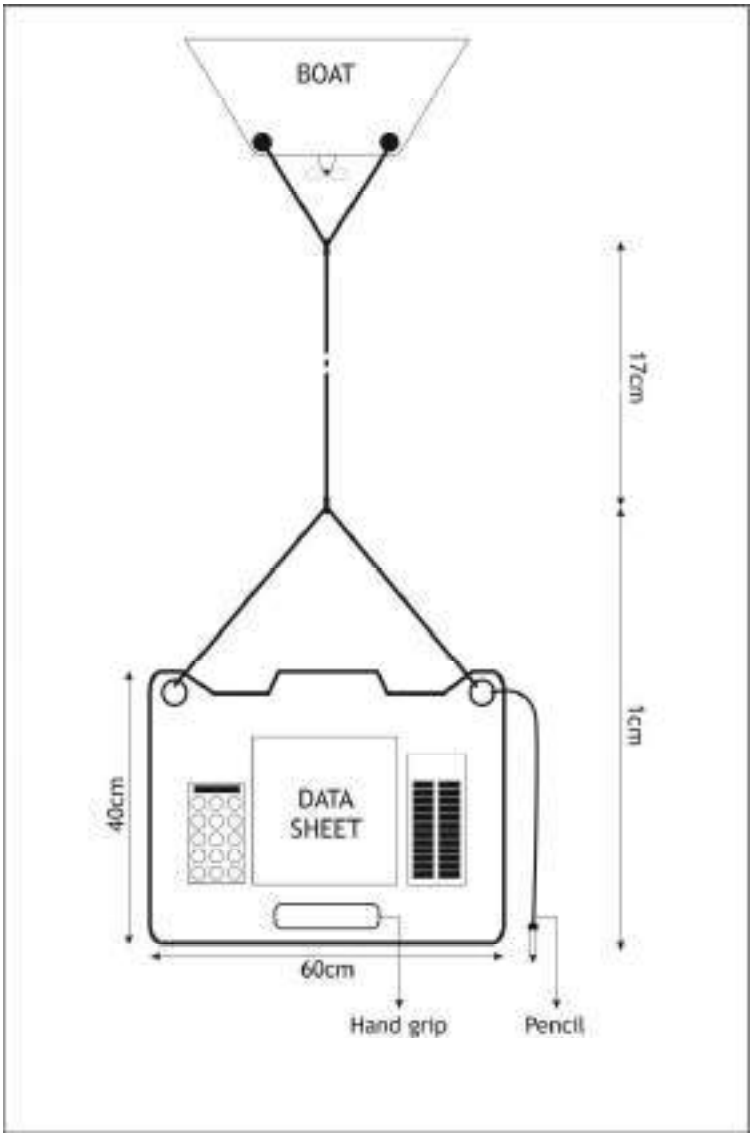
a. Requirements
   i. A small boat with an outboard motor is used for towing observers. The boat should be fitted with a towing bridle.
   ii. A 17 m tow rope connects the manta board to the boat. The rope should be braided and approximately 10mm in diameter. Two buoys are placed on the rope, one at 6 m

from the manta board, and the other at 12 m. These buoys allow the observer to estimate visibility in a standard manner.

iii. The dimensions of the manta board are 600x400x20 mm (length × breadth × thickness). It is recommended that the board be made from marine ply and painted white. Two indented handle grips are positioned towards each corner of the front board. A single handhold is located centrally at the back of the board.

iv. A datasheet is held in position within a recess of the centre of the board. The data sheet should be pre-printed to assist the observer record a set of biological variable and other significant observations.

v. An observer with snorkelling equipment like mask, snorkel, reef shoe and fins.



Manta tow method

5.6.3.9. Video Manta Tow

This method involves towing two SCUBA divers behind a boat at a constant speed (~1.5 knots). One diver manoeuvres the 'benthic towboard' (another name for manta board) equipped with either a downward-facing video camera or a still camera to photograph the benthos at selected intervals. The other diver manoeuvres the 'fish towboard' equipped with a forward-facing video camera to record fish and general reef topography. Towed diver surveys are good to obtain a general description of a large reef area, assess large-scale disturbance. They are best for covering large distances at low levels of taxonomic resolution. Benthic diver attempts to manoeuvre towboard 1 m above bottom. Each minute the benthic diver marks the habitat type on the data sheet. At 5 minute intervals, benthic diver estimates percent cover of major components on data sheet. Macro-invertebrates are recorded when observed in each 5 minute segment on the data sheet. A standard survey lasts 50 minutes (Hill and Wilkinson, 2004).

a. Requirements
   i. 60 m long, 9.5 mm diameter, low-stretch towing rope
   ii. Towing bridle affixed to towboard;
   iii. Towboard with fitted cut-outs or mounts to attach cameras and other instruments
   iv. Housed digital video camera, or housed still camera
   v. 2 strobes and slave sensors (when using housed still camera)
   vi. Depth/temperature recorder
   vii. Waterproof watch with countdown function to signal intervals for visual assessment
   viii. Separate waterproof watch as backup and to monitor dive time
   ix. Depth gauge bottom timer (UWATEC)
   x. GPS unit(s) in towing boat to geo-rectify survey track (Hill and Wilkinson, 2004).

7.3. Pre and Post Translocation Monitoring

The growth rate of the true corals is very slow and sensitive to several ecological factors. Periodical monitoring will be made to record the successful translocation/ restoration. Corals will be monitored for a minimum period of 10 years constantly, irrespective of fair or rough weather conditions. The translocated coral colonies as well as the tagged natural coral colonies at the recipient site will be monitored mostly daily or at least 15 days per month for a period of 1st year. In the 2nd, 3rd, 4th, and 5th years the intensity of monitoring will be reduced gradually depending on the results (Table 7). The data will be collected quarterly during 6th to 10th Year.

Table 7: Time Schedule of the project for coral transplantation/ restoration

Targets	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th Month	11th Month	12th Month	13th -120th Month
ESTABLISHMENT													
Recruitment of Staff													
Procurement of Material													
Field lab set up													
PRELIMINARY STUDY													
Sediment traps in selected areas to monitor the sediment movement.													
Recipient site data collection, selection and gridding.													
Physicochemical Parameters													
Excavation area data collection, gridding and coral tagging.													
Translocation													
SUB-TIDAL													
Photographing and tagging the species to be translocated													
Sub-tidal Coral translocation													
INTER TIDAL													
Photographing and tagging the species to be translocated													
Inter tidal Coral translocation,													
Post Translocation Monitoring													
Monitoring the Relocated corals (countering the threats until the corals survive well.)													

8. LONG TERM MONITORING PROGRAMME

Long-term goals aligned with maintaining and supporting reef ecosystem services. These goals are non-exclusive and can complement one another. In planning for coral restoration efforts, clearly articulating the project goal(s) should be the first point of action. Then, objectives can be defined to track and accomplish the goals over shorter time periods like 1-3 years followed by long-term monitoring and adaptive management like 5-10 years. To manage ecosystems effectively, objectives should be SMART (Specific, Measurable, Achievable, Relevant, and Time-bound), informed by reference ecosystems, and consider anticipated environmental change (ICRI, 2021).

	GOALS	RATIONALES – USE RESTORATION TO
SOCIO-ECONOMIC GOALS		
i)	Sustain or recover coastal protection	Sustain or re-establish the regulating ecosystem services provided by reefs to protect coastal communities and infrastructure by attenuating wave energy and mitigating

		disturbances such as erosion and coastal flooding
ii)	Sustain or recover fisheries production	Sustain or re-establish the provisioning services delivered by reefs in providing habitat and nursery areas for commercially important fisheries
iii)	Sustain or enhance local tourism opportunities	Maintain reef aesthetics to support local reef tourism and/or provide opportunities for eco-tourism experiences
iv)	Promote local coral reef stewardship	Support local communities and/or Indigenous traditional owners to engage and reconnect with the local reef environment, improve reef custodianship and promote intrinsic value of reefs (spiritual, traditional, worship)
ECOLOGICAL GOALS		
i)	Re-establish reef ecosystem function and structure	Rehabilitate the function, structure, diversity and health of degraded coral reef ecosystems
ii)	Mitigate population declines and preserve biodiversity	Assist the recovery of endangered coral populations, and preserve innate reef biodiversity from genes to phenotypes to ecosystems
CLIMATE CHANGE ADAPTATION AND SUPPORT GOALS		
i)	Mitigate impacts and promote reef resilience in the face of climate change	Support resistance and recovery processes to reduce risks of impact and ensure that reefs persist through current and projected changing climate conditions
DISTURBANCE-DRIVEN GOALS		
i)	Respond to acute disturbance to accelerate reef recovery	Assist natural recovery process when reefs are affected by acute disturbances such as storms, predator outbreaks, ship groundings, and other structural damages
ii)	Mitigate anticipated coral loss prior to disturbance	Adopt an effective 'no net loss' mitigation policy whereby if a disturbance (e.g. coastal development) cannot be avoided, it should be minimised and offset for example by relocating anticipated losses prior to disturbance

9. BUDGET

The approximate budget for the coral transplantation/restoration will be Rs. 53,57,50,000.00 for a total of 4 ha. which is cited below (Table 8). The amount was estimated considering the remote locality and connectivity of Great Nicobar Island. The cost of the transplantation/restoration will be Rs. 13,39,37,500.00/ha.

Table 8: Approximate budget coral transplantation/restoration

Sl. No.	Head/Activities	Amount (Rs.)
1.	Salaries for 2 Project Scientist, 5 SRF, 12 JRF, 15 Field Assistants, 3 Motor Car Drivers	10,00,00,000.00
2.	Equipment/Infrastructure/ Vehicles/ Set-up materials	30,00,00,000.00
3.	Travel *TA/DA* for Scientists and Scientific Staff	2,50,00,000.00
4.	Vessel/ Boat hiring charges to conduct marine surveys	3,00,00,000.00
5.	Consumables	1,50,00,000.00

6.	Contingencies	1,50,00,000.00
7.	Preparation of Reports and Publications	50,00,000.00
8.	Capacity building and Awareness	1,50,00,000.00
	Subtotal	50,50,00,000.00
9.	Administrative Charges @15% (Excluding Equipment/Infrastructure/ Vehicles/ Set-up materials)	3,07,50,000.00
	TOTAL	53,57,50,000.00

Globally-Coral reef restoration costs estimated from $1,717 up to $2,879,773 USD/ha. (Bayraktarov *et al.*, 2015) which is equal to Rs. 1,31,315.13 to 22,02,43,311.18/ha.

10. GENERAL PRECAUTIONS TO BE TAKEN DURING THE CONSTRUCTION AND OPERATION OF THE PROJECT LIKE

- Proper routing of barges and ships (bringing construction material) avoiding the coral areas.
- Control of runoff of the construction material to ensure that corals don't get affected due to turbidity.
- Precautions to be taken during capital and maintenance dredging.
- Precautions to be taken during the roads on stilt for the wildlife corrodores.
- No discharge of any effluents into the sea during construction and operation.
- Introduction of permit system for scuba and snorkelling to ensure that unauthorised persons do not disturb and stamp on the live corals.
- Potential impacts to shoreline vegetation, wetlands, coral reefs, fisheries, bird life, and other sensitive terrestrial and aquatic and near-shore habitats during port construction and operation should be fully assessed thoroughly.
- Periodical surveys, assessment and modeling of metocean, hydrological, sedimentological as well as coastal geomorphological situations should be examined together with an identification of potential adverse impacts on coastal processes such as erosion and accretion, from the placement of new physical structures.
- Coastal processes monitoring and management plan should be managed in proper way by means of conducting a risk assessment of littoral sediment transport, shoreline morphology and erosion patterns and trends, and coastal inundation profiles.
- The construction and operation phases of the projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimize impacts by ensuring that the emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines and CPCB Air Quality Guidelines.
- Discharges of process wastewater, sanitary wastewater, wastewater from the construction and operational sites and plants to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality. CPCB guidelines should be strictly followed.

- Water conservation programs should be implemented commensurate with the magnitude and cost of water use. These programs should promote the continuous reduction in water consumption and achieve savings in the water pumping, treatment and disposal costs. Water conservation measures may include water monitoring/management techniques; process and cooling/heating water recycling, reuse, and other techniques; and sanitary water conservation techniques.
- Waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring.
- Noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception.
- Contamination of land should be avoided by preventing or controlling the release of hazardous materials, hazardous wastes, or oil to the environment. When contamination of land is suspected or confirmed during any project phase, the cause of the uncontrolled release should be identified and corrected to avoid further releases and associated adverse impacts.

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Enclosure - 15

Comprehensive Conservation Plan

Conservation and long-term monitoring of Sea Turtles of the Nicobar Islands with special focus on the threatened Leatherback Sea Turtle

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

Proposed 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 Sea Turtle Conservation Plan for the Nicobar Islands is Rs. 29,83,14,187/- (Rupees Twenty-nine crore Eighty-three lakhs Fourteen thousand One hundred and Eighty-seven). The budget requirement for the two implementing agencies and during the two phases of the conservation plan is presented below:

S.No.	Agency	Phase I (Oct 2022-Sep 2027)	Phase II (Oct 2027-Sep 2032)	Total
1	WII	Rs. 11,16,83,971	Rs. 9,71,16,154	Rs. 20,88,00,125
2	A & N Forest Department	Rs. 5,35,00,061	Rs. 3,60,14,001	Rs. 8,95,14,062
Total		**Rs. 16,51,84,032**	**Rs. 13,31,30,155**	**Rs. 29,83,14,187**

Background

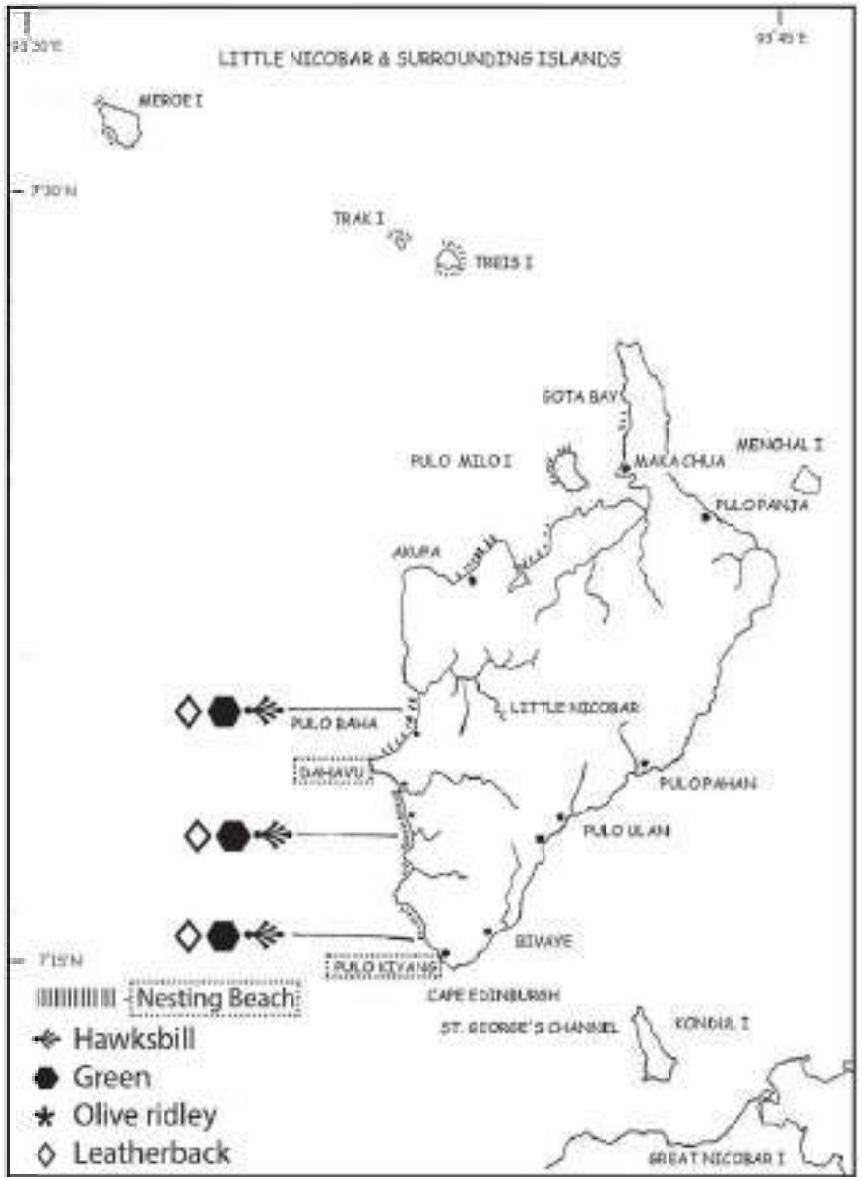
The Andaman & Nicobar Islands and their nearshore areas are recognized for their rich and endemic biological diversity. These islands provide important nesting habitats for four sea turtle species and are the only known nesting sites for the threatened Leatherback sea turtles (*Dermochelys coriacea*) in the Indian region. The highest number of leatherback turtle nesting in the Indian region is observed in the Great Nicobar, Little Nicobar and Little Andaman Islands (Sivakumar, 2021). These islands are also important nesting and foraging grounds for the Critically Endangered Hawksbill Sea turtle *Eretmochelys imbricata*, the Endangered Green sea turtle *Chelonia mydas* and the Vulnerable Olive Ridley turtle *Lepidochelys olivacea*. Like in most other places even here in these remote nesting beaches threats due to nest predators have been reported to be a significant problem. Further, the earthquake and subsequent tsunami of 2004 lead to complete loss of the leatherback nesting beaches, and had led to shifting their nesting to other beaches in the region. However, over the last one decade the nesting by the turtles is said to have normalized in that they have returned to their previous nesting sites. The population of Leatherback turtles nesting in the Indian region is classified as the Northeast Indian Ocean population and is currently assessed as Data Deficient. With virtually very little known about the sea turtles in the Andaman & Nicobar Islands as a whole, and that serious threats facing these species in the Indian region the MoEF & CC as part of an initiative launched the National Marine Turtle Action Plan (2021-2026). The Nicobar Islands are also a strategic location for India, hence mega-developmental projects in the Islands have been gaining momentum in recent times. Especially, an international trans-shipment and the township project in the Great Nicobar Islands envisioned by the NITI Aayog poses 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 invited Wildlife Institute of India to prepare a 10-year conservation plan for sea turtles of the Nicobar group of islands, particularly focusing on Leatherback turtles. This proposed comprehensive conservation plan therefore includes objectives that will help in understanding the broader ecology of the sea turtles especially the leatherback turtle, which will contribute in the development of site specific management interventions that will be critical for their long-term survival.

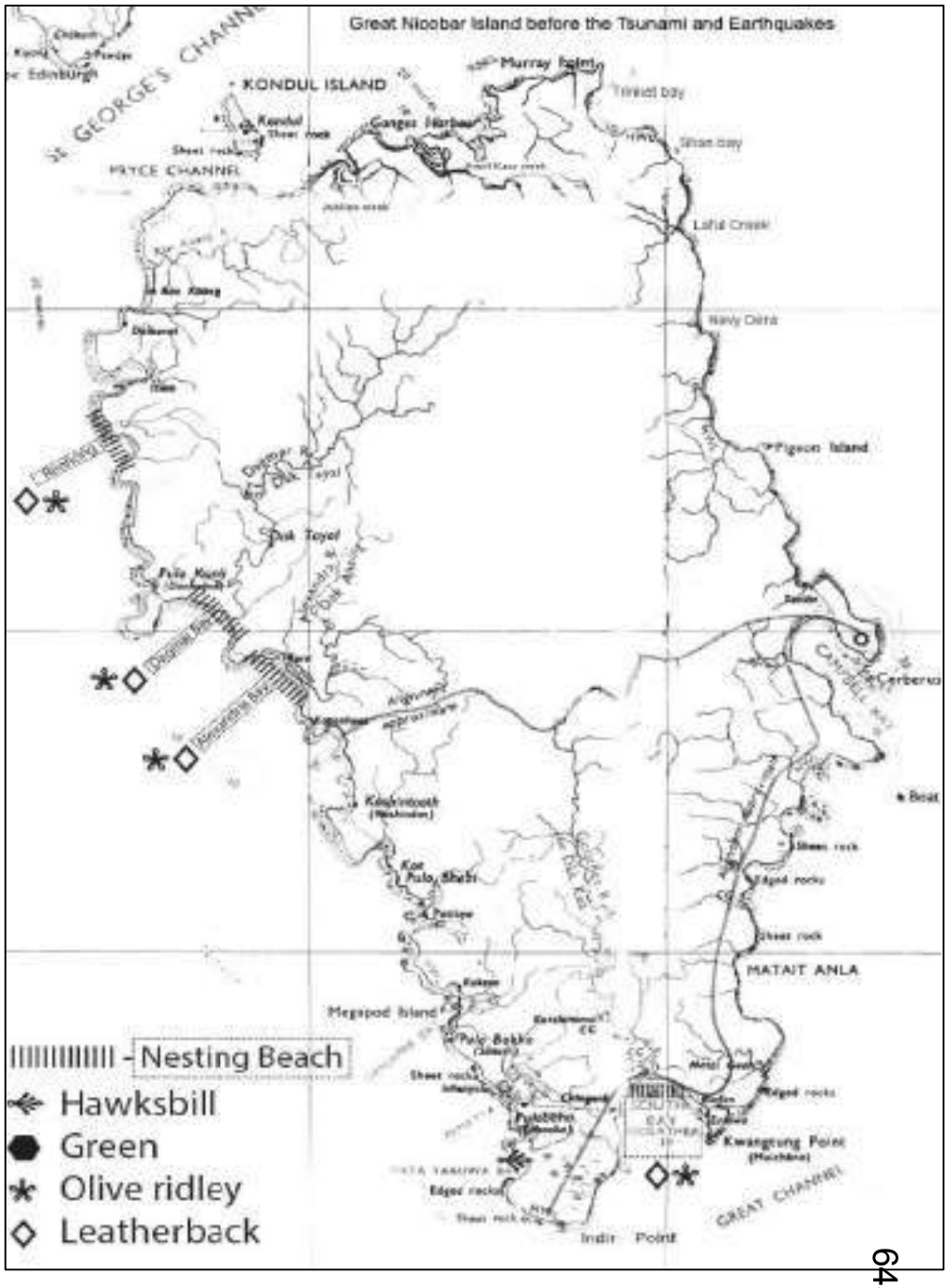
Introduction

Sea turtles belonging to five different species are known to occur in the Indian waters, of which, four species: Leatherback sea turtle (*Dermochelys coriacea*), Green sea turtle (*Chelonia mydas*), Hawksbill sea turtle (*Eretmochelys imbricata*) and Olive ridley sea turtle (*Lepidochelys olivacea*), are known to nest in the islands of Andaman & Nicobar archipelago (Bhaskar, 1993; Andrews et al, 2006; Sivakumar, 2002, 2022). Of these four species, the Endangered Green sea turtle, the Critically Endangered Hawksbill sea turtle, and the Vulnerable Olive Ridley sea turtle *Lepidochelys olivacea* nest throughout the Andaman & Nicobar Islands, while Leatherback turtle nesting is confined primarily to few select beaches of South Andaman and the Nicobar group of Islands. Further, it is reported that Leatherback turtle nesting in the region primarily occurs in the Great Nicobar, Little Nicobar and Little Andaman Islands. And, even within these islands, the Leatherback turtle nesting is reported confined only to a few beaches, which lack coral reefs in the nearshore areas (Bhaskar, 1993). These few beaches are the only place within the Indian territory where Leatherback turtle nesting takes place.

Leatherback sea turtles, listed as Vulnerable according to the IUCN Red List of Threatened Species (Wallace et al., 2013), is composed of seven sub-populations or Regional Management Units (RMUs). The Northwest Atlantic leatherbacks have the largest population and are listed as Least Concern. On the other hand, four RMUs: Southwest Atlantic Ocean, Southwest Indian Ocean, East Pacific, and West Pacific, are Critically Endangered. And the remaining two populations: Southeast Atlantic Ocean and Northeast Indian Ocean, are RedListed as Data Deficient. The nesting populations of leatherback turtles in the Andaman & Nicobar islands belong to the Northeast Indian Ocean RMU, and this is said to be the largest rookery for this population.

Figure 1. Nesting area of different sea turtles in Nicobar Islands (a) Little Nicobar and (b) Great Nicobar. Source: Namboothri et al., 2012





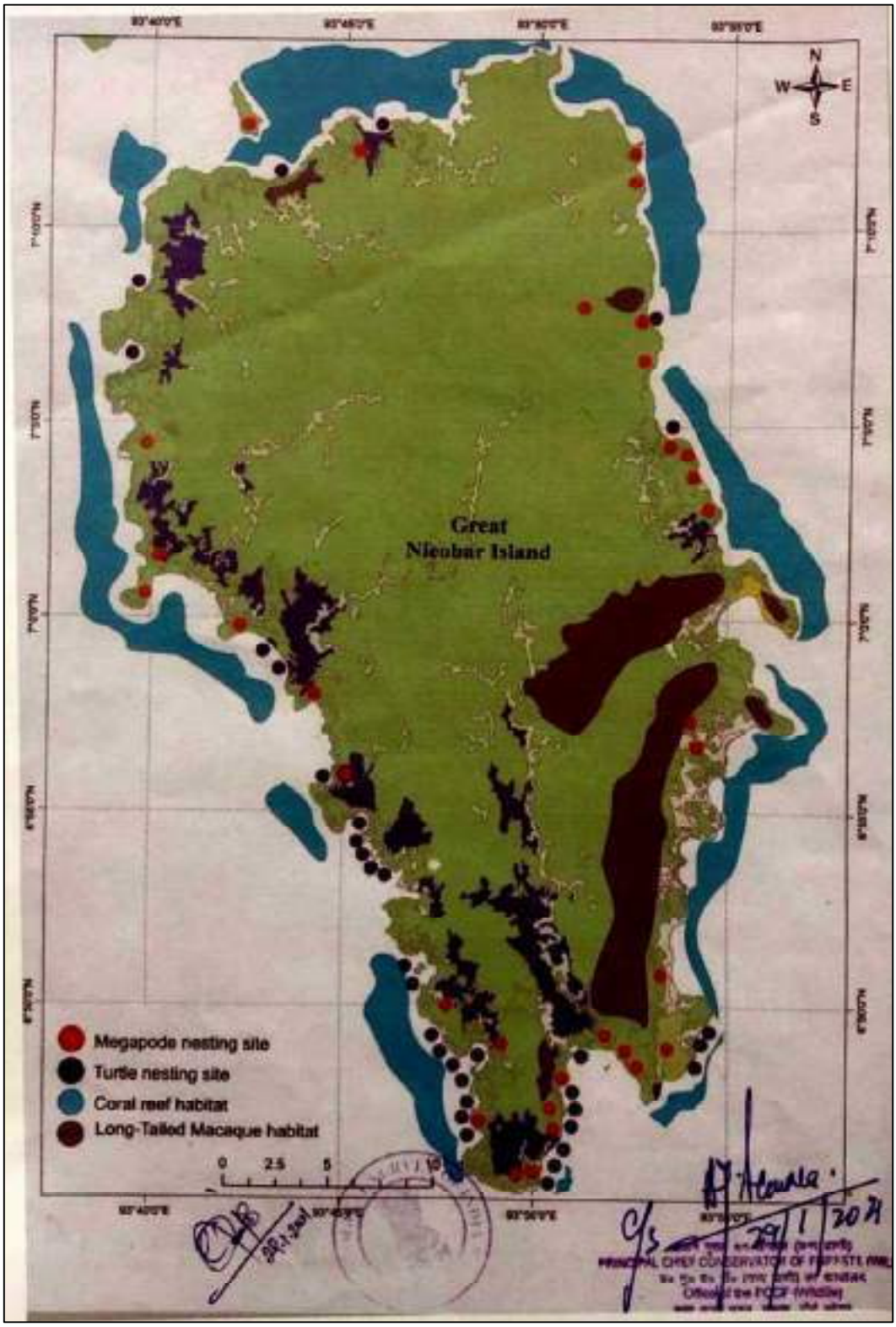


Figure 2. The current information of sea turtle nesting in the Great Nicobar Island as provided by the Andaman & Nicobar Forest Department

Survey of the Nicobar Islands have led to the identification of a number of important nesting beaches for Leatherback sea turtles. The Great Nicobar Island is the largest of these islands and is the most critical nesting area for the Northeast Indian Ocean population of Leatherback Turtles. Bhaskar (1993) and Andrew and Shanker (2002) during a survey of the Great Nicobar Island reported around 1500 leatherback nests. Presently, systematic information on leatherback turtle nesting is collected by the Andaman & Nicobar Forest Department though only from select beaches particularly from the eastern shores of the Great Nicobar Island. Information on nesting of sea turtles on the western coast of Great Nicobar which is predominantly inaccessible is however limited.

Table. The number of turtle nests recorded systematically across two years by forest department personnel from select nesting beaches of the Great Nicobar Island. The information presented here on nesting is only from select eastern beaches of the Island.

S. No.	Species	2020-2021	2021-2022
1.	Leatherback Sea Turtle	594	655
2.	Green Sea Turtle	2	0
3.	Hawksbill Sea Turtle	0	0
4.	Olive Ridley Sea Turtle	49	62

Leatherback sea turtles perform some of the longest migration by any marine vertebrates. Individuals from Papua in Indonesia are known to perform trans-pacific migration of twenty thousand kilometers to the Pacific Ocean along the west coast of North America (Benson et al., 2007). A satellite tracking study of leatherback turtles from the nesting beaches of Little Andaman showed that they migrated to the Eastern and Western parts of the Indian Ocean (Swaminathan et al., 2019). These turtles were observed to move into the range of the West Pacific and Southwest Indian Ocean population of leatherback turtles, which differ in their genetic structure (Dutton et al., 1999). Information on the genetic characteristics of the Northeast Indian Ocean leatherback turtles is absent and their relatedness to other populations is yet to be determined. Further, population structure of turtles from different parts of the Andaman and Nicobar Islands is unknown.

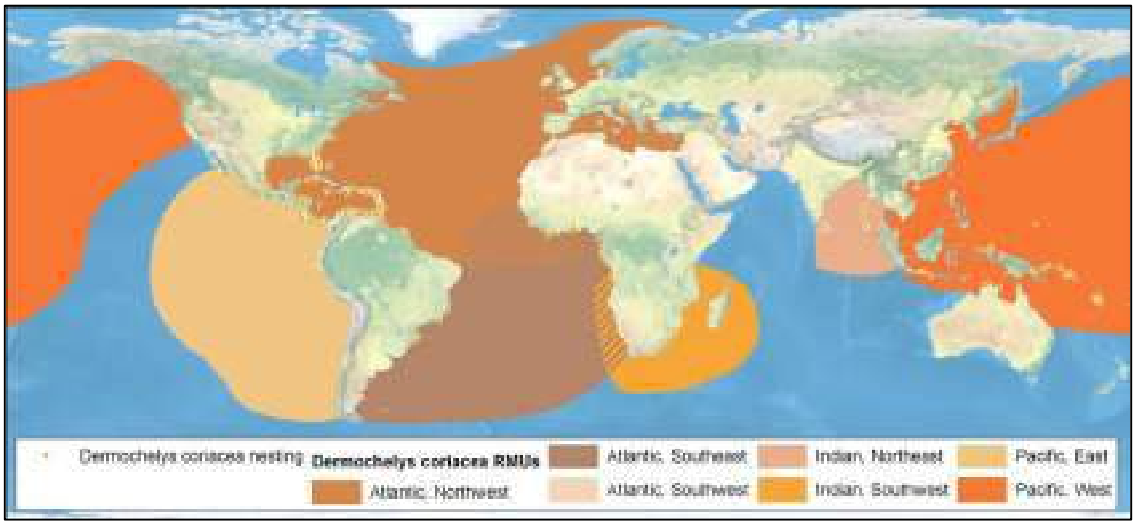


Figure 2. The seven different Regional Management Units (RMUs) of the Leatherback Turtles and their distribution range (Wallace et al., 2013)

Sea turtle ecology particularly the nesting output and inter-migration intervals are largely influenced by the resource availability in their foraging grounds. Therefore, identifying foraging grounds through tracking movements of individual turtles is of prime importance. However, since tracking movements using satellite telemetry is an expensive effort and as a result only limited number of turtles are generally tracked. In recent times, a cost-efficient method through study of stable isotopes has become an important tool to identify foraging areas and also understand foraging ecology. Carbon and Nitrogen isotopes are two important elements present in most food chains and the ratio of the heavy and lighter isotopes of these elements in the organisms of a food chain changes with geographical area and trophic levels, resulting in their availability to be significantly different across ocean basins (Fry, 2006). Therefore, a combination of isotopic ratios along with satellite telemetry of leatherback turtle populations nesting in the Nicobar Islands will help in better understanding their movement ecology and foraging areas.

The Nicobar Islands are also known for nesting of three other sea turtle species. Namboothri et al. (2012) in their review reported Olive ridley turtles to nest on the western coast of Great Nicobar while Hawksbill Sea turtle and Green sea turtle to nest in the Little

Nicobar Islands. It is also reported that the populations of the hard-shelled turtles in the region is likely distinct from those nesting in mainland India and the Lakshadweep Islands (Wallace et al., 2010). Studies on the sea turtles here are limited to few nesting surveys, and for a majority of the Islands information is based on the three decade old surveys carried out by Bhasker (1993). Information on the nesting site selection of these turtles from the Andaman & Nicobar Islands is anecdotal, and information on their near-shore movements, foraging and migration is unknown. Whether, the hard-shelled turtles nesting in the Islands here represent a single population or that they arrive here from different regions is not known. A Green sea turtle tagged in the Persian Gulf reportedly migrated through the Arabian sea and then arrived in the waters of Andaman & Nicobar Is. (Robinson et al., 2017), suggesting connectivity between different populations.

The earthquake and tsunami of 2004 submerged important nesting beaches of turtles in the Nicobar Islands, while on the other hand in the Andaman Islands due to coastal uplift of reefs made nesting beaches inaccessible. Swaminathan et al. (2017) undertook a post-tsunami assessment of turtle nesting beaches in the Nicobar Islands and found turtle nesting to have commenced in select beach stretches after a decade. Like elsewhere, loss of turtle nests in the Islands due to the predation by feral pigs and dogs has been reported. Sivakumar (2021) reported leatherback turtle nests confined to short beach stretches in the Great Nicobar to be entirely predated. Similarly, Swaminathan et al. (2017) during their survey of the 2015-2016 season found that more than 85% of the leatherback nests in Great Nicobar was predated, and much higher when compared to the overall nest loss of 35% reported by Bhaskar (1993). Apart from the above, a small number of turtles and their nests are reported harvested by the local tribes for consumption in the Nicobar region (Tiwari, 2012).

In recent years, climate change is also reported to pose a potential threat to turtles globally. Sea turtle nesting beaches are reportedly lost across many parts of their range due to sea level rise, and elsewhere given that the beach temperature determines sex of the turtle hatchlings it is reported to be increasingly female biased (Hays et al. 2014). Whether, the above such threats are also faced by turtles in the Nicobar Islands is

unknown. For long-term conservation of sea turtles and their habitats in the Nicobar Islands gaps in the current knowledge is to be addressed so as to develop a holistic conservation plan. Therefore, a combination of systematic monitoring of turtle nesting populations, along with intensive studies on nesting ecology, tracking fine-scale movements, and genetic characterization is required. Further, recognizing that the management presently adopts certain interventions, though limited in nature, such as protecting nesting beaches and maintaining hatcheries, the effectiveness of these measures is unknown. Thus, a detailed scientific investigation will be taken up to help improve the effectiveness of existing management practices and evolve new site-specific strategies for the long-term conservation of sea turtles of the Nicobar Islands.

In this context, this comprehensive conservation plan is planned to focus on four major aspects: (i) enhancing the scientific understanding of the population and the general ecology of sea turtles with primary focus on leatherback turtles, (ii) identifying critical sea turtle habitats both in onshore nesting beaches and the near-shore waters for their conservation, (iii) assessing the effectiveness of existing management practices for sea turtles and evolving new site-specific management strategies, and (iv) building capacity among front-line forest staff and local communities for long-term monitoring and management of the sea turtle populations. The first phase of this 10-year conservation plan (2022 – 2027) therefore focuses on creating the scientific base and building the capacity of frontline staff and local communities; while the second phase (2027 – 2032) will focus mostly on implementing necessary site-specific interventions to manage, enhance the habitat quality for sea turtle nesting along with population monitoring. This will help in assessment of potential impacts due to developmental activities in the region. The detailed activities proposed in the first phase of this project is elaborated along with a brief account of the activities in the second phase.

Aim and Objectives

The proposed conservation plan aims to bridge the gaps in the knowledge of sea turtles of the Nicobar group of Islands through a robust scientific approach.

The specific objectives are as follows:

1. To systematically monitor the nesting population of Leatherback and other sea turtles in the Nicobar group of Islands.

2. To collect detailed information on the nesting ecology of Leatherback turtles and other species in the Nicobar group of Islands.

3. To track fine-scale movements and migration of Leatherback turtles and other sea turtle species to identify critical nearshore areas, inter-rookery movement or use of nesting beaches in the Nicobar group of islands.

4. To conduct stable isotope studies of leatherback sea turtles to understand the factors affecting reproductive output and remigration intervals.

5. To identify the genetic population structure of leatherback sea turtles from the Andaman & Nicobar Islands and assess their relatedness to populations of other RMUs.

6. To characterize all nesting beaches along with threat assessments and guide management to strategies protection measures (eg. establishing PA network, development of hatchery management guidelines, etc.) for critical nesting beaches considering futuristic scenarios.

7. To conduct training workshops and awareness programs for forest personnel and local communities to develop their capacity in turtle population monitoring, habitat management, nest protection and hatchery management practices.

Methodology

This 10-year conservation plan in the Nicobar group of islands for sea turtles will be carried out in two phases and will involve intensive efforts by research personnel to systematically monitor nesting beaches and at the same time will involve extensive use of technology to understand the turtles in the offshore environment.

Population monitoring and nesting ecology

Systematic surveys will be conducted at select nesting beaches through the year during the first two years of the proposed conservation plan in order to determine the nesting population of sea turtles. Following this surveys will be taken up at regular intervals during the peak turtle nesting months. Nest counts of leatherback as well as other sea turtle will be made across important nesting beaches in the Nicobar Islands. Nests will be identified based on turtle tracks or excavation by predators and a GPS location will be recorded. Nesting site characteristics that include distance from the high-tide line and vegetation line, beach slope, presence of dune vegetation, sand characteristics, turtle crawl length will be collected. To understand the dynamic nature of turtle nesting beaches, periodic mapping of the beaches using drones will be carried out. Additionally, bathymetric profile of the tidal zone adjacent to the nesting beaches will be mapped to understand use of near-shore areas prior to nesting.

Information on the nesting female turtles such as body size and number of eggs laid will be recorded along with information on oviposition (egg-laying) duration. The nesting leatherback turtles will be PIT tagged (12mm x 2mm), while hard-shelled species will be tagged with metal flipper tags from which remigration interval, inter-nesting period, reproductive output, and nesting beach fidelity will be determined based on the recapture of the tagged individuals.

Movement Ecology: tracking movements, identification of high use areas in the breeding sites and non-breeding regions

To track fine-scale movements of sea turtles a satellite telemetry approach will be adopted wherein Argos-linked FastGPS Platform Terminal Transmitter (PTT) with DIVE sensors will be used. The transmitters weighing less than 1% of the turtle's body weight will be used and will be programmed to transmit locations at regular pre-determined time intervals. As part of this conservation plan 10 % of the nesting leatherback turtles (approx. 80) will be deployed with satellite transmitters. Additionally, a total of 60 hard-shelled turtles of thr three species reported in the region will be deployed with transmitters. Given the leathery nature of the carapace of the Leatherback sea turtles they will be tagged by drilling two holes on their dorsal ridge and securing the transmitters with either nylon-coated braided stainless steel wire or a monofilament line. Antifouling paint will be applied on the tag to prevent biofouling of the tags. In the case of hard-shelled turtles the transmitters will be attached directly on the posterior part of the carapce using a two-part epoxy resin adhesive and then coated with antifouling paint.

Determining foraging areas using stable isotopes

To understand the effects of the foraging area on nesting and remigration interval of sea turtles, skin samples of all PIT tagged and flipper-tagged turtles will be collected for stable isotope analysis. The composition of Nitrogen and Carbon Isotopes will be assessed using Isotope Ratio Mass Spectrometry of the dried skin samples. Further, when the turtles are monitored to nest on different occasions, the reproductive output in the form of clutch size, clutch numbers and remigration intervals can be assessed, and the effect of the foraging areas can be determined.

Population genetic structure of leatherback turtles

In order to characterise the population genetic structure of leatherback turtles nesting in the Nicobar Islands, biological samples will be collected following standard protocols for a select number of turtles at the time of nesting. Opportunistically, samples from dead

hatchlings and predated eggs will also be collected. Genetic analysis and population structure assessment will be made by examining the Mitochondrial DNA sequences following the methodology described by Dutton et al. (1999 and 2013). The population structure of leatherback sea turtles from different nesting beaches of Andaman & Nicobar Island will be assessed to check if the turtles belong to the same population.

Assessing vulnerability of turtle nesting beaches and adoption of appropriate management strategies

Vulnerbaility of the turtle nesting beaches for various factors (eg. Beach dynamics, habitat quality, nest predation, harvest of eggs and turtles by local communities, sea level rise, fishing practices, future developmental activities, etc.) will be assessed. This will help develop a vulnerability mapping of each of the turtle nesting habitats and based on this appropriate management interventions and site-specific strategies will be developed. This will provide directions for prioritising sites for establisment of Protected Area network and also direct investments to manage turtle nesting beaches. The management interventions where possible will involve habitat improvement measures, reduce nest predation pressure, establishment of hatcheries, etc. Standard operating procedures (SoP's) for management of turtle nesting beaches and hatcheries do exist though not specifically for the Andaman & Nicobar Islands. Therefore, from information gathered for the turtle nesting sites of Nicobar Islands specific SoP's will be developed. Local communities (Nicobarese and Shompens) harvest wildlife for their sustenance and are therefore exempted from the Indian Wildlife Protection Act (1972). Given this, the site-specific management interventions to be developed and adopted will be inclusive of the local communities.

Multi-stakeholder involvement in the long-term conservation of sea turtles

For effective conservation it is of prime importance to make aware the importance of sea turtles to all relevant stake-holders in the Nicobar Islands. A series of awareness programs at regular intervals will be carried out for different stake holders (Local communities, fisher folk, forest personnel, other in-line agencies such as Coast Guard, Navy, and local

administration). Further, the frontline forest staff and local communities will be provided training through in door presentations and on site visits on population assessment, nest monitoring, deployment and monitoring of PIT tags and flipper tagging, satellite tagging, tracking movement, data processing and other relevant aspects related to the conservation and management of turtles that will include nest relocation and hatchery management practices.

Expected outcome (Phase I)

1. Extensive information on population and nesting ecology of leatherback turtles and other turtles of the Nicobar Islands

2. For the first time, insights on the fine-scale movements, site-fidelity to nesting beaches, high use areas, inter-nesting intervals, and migration corridors of turtles of the Nicobar Islands will be generated.

3. Information on the non-breeding regions and foraging areas of sea turtles, specifically of the threatened leatherback turtle will be established.

4. For the first time, information on the genetic identity of the leatherback turtle populations of the Nicobar Islands that represent the Northeast Indian Ocean RMU will be generated.

5. List of priority nesting sites of each of the sea turtle species of the Nicobar Islands will be generated. Further, information on the vulnerability of these priority turtle nesting sites due to various influencing factors will be generated.

6. Site-specific management interventions for the long-term conservation of sea turtles is developed and will include guidelines for legal protection measures (eg. Establishment of Protected Area Network) to offset population declines in sites with high development pressure.

7. Local communities, forest personnel and other stake holders will be made aware about sea turtles and their significance in marine ecosystems.

8. Capacity of forest personnel and local communities to systematically monitor nesting turtle populations, manage nesting habitats and turtle hatcheries is developed.

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 sea turtles. The activities listed are proposed to be taken up during the second phase:

1. Annual population assessment surveys as per the standardized protocol developed during Phase 1.
2. Implementation of site-specific nesting habitat management interventions such as removal of dune vegetation and explore possibility of thinning tree or shrub cover in the immediate vicinity of nesting beach.
3. Implement measures to control introduced predators to eliminate or reduce sea turtle nest predation.
4. Development of site-specific nesting beach management plans
5. Strengthening the research wing of the forest department by conducting special training programs on using advanced scientific tools for data collection and analysis.

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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 and acquire permits from MoEFCC																				
2	Procurement of equipment's																				
3	Refining the research methodologies and training of project personnel																				
4	Population estimation – Field data collection, PIT tagging																				
5	Beach mapping and characterization																				
6	Nesting ecology data collection																				
7	Satellite Tagging and monitoring movement																				
8	Near-shore bathymetric mapping and habitat surveys																				
9	Sample collection and genetic analysis																				
10	Stable isotope analysis																				
12	Awareness and capacity building activities																				
14	Report writing and submission																				

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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	Procurement of equipment's																				
3	Population estimation – Field data collection, PIT tagging																				
4	Beach mapping and characterization																				
5	Nesting ecology data collection																				
6	Satellite Tagging and monitoring movements																				
7	Implementation of management activities (Habitat restoration, predator control, hatchery management)																				
8	Awareness and capacity building activities																				
9	Report writing and submission																				

Budget (A): Phase I (October 2022 – September 2027): 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 Associate-I	Habitat and nesting Ecology (@ 31,000+HRA for first 2 years; 35,000+HRA afterwards)	1	4,32,000	4,32,000	4,92,000	4,92,000	4,92,000	23,40,000
2	Project Associate-I	Movement Ecology (@ 31,000+HRA for first 2 years; 35,000+HRA afterwards)	1	4,32,000	4,32,001	4,92,000	4,92,000	4,92,000	23,40,001
3	Project Associate-I	A salary of Rs. 31000 + HRA for one Project Associate for first three years and Rs. 35000 + HRA for the next one year	1	-	4,32,000	4,32,000	4,32,000	4,92,000	17,88,000
4	Project Assistant	Habitat, nesting and movement Ecology (@20,000+HRA)	2	5,56,800	5,56,800	5,56,800	6,40,320	6,40,320	29,51,040
5	Fieldworker	Assisting in field work and base camp maintenance @ Rs 500/day/person for 9 months	2	2,70,000	2,70,000	2,70,000	2,70,000	2,70,000	13,50,000
6	Office Assistant	A salary of Rs. 20,000 + HRA with increment of 15% after 3 years	1	2,78,400	2,78,400	2,78,400	3,20,160	3,20,160	14,75,520
7	Accountant	A salary of Rs. 20,000 + HRA with increment of 15% after 3 years	1	2,78,400	2,78,400	2,78,400	3,20,160	3,20,160	14,75,520
B.	**Travel**								
8	Air and ship travel &transit accommodation	WII HQ to Field sites by PI's and project personnel @ Rs. 50000/person/trip	10	5,00,000	5,00,000	5,00,000	5,00,000	5,00,000	25,00,000

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S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
9	Vehicle hiring	Local movement of project staff during field data collection		5,00,000	5,00,000	5,00,000	5,00,000	5,00,000	25,00,000
10	Fuel and maintenance of boat	For the frequent inter-Island movement for field surveys		10,00,000	10,00,000	10,00,000	10,00,000	10,00,000	50,00,000
C.	**Equipment**								
11	Computers and peripherals	Work station	1	5,00,000	-	-	-	-	5,00,000
12		Desktop for Base camp	1	2,00,000	-	-	-	-	2,00,000
13		Laptop	3	4,50,000	-	-	-	-	4,50,000
14		Printer & computer accessories	1	1,00,000	-	-	-	-	1,00,000
15	Tracking equipment	Satellite transmitter for Leatherback sea turtle @ Rs. 500000/tag	50	2,50,00,000	-	-	-	-	2,50,00,000
16		Satellite transmitter for hard-shell sea turtle @ Rs. 500000/tag	30	1,50,00,000	-	-	-	-	1,50,00,000
17		Satellite transmission charges	80	36,00,000	54,00,000	42,00,000	12,00,000	-	1,44,00,000
18		Satellite tagging accessories		2,00,000	2,00,000	2,00,000	-	-	6,00,000
19		Inconel Metal Tags @ Rs. 100/tag	10000	10,00,000	-	-	-	-	10,00,000
20		Tag applicator @ Rs. 10000/applicator	12	1,20,000	-	-	-	-	1,20,000
21		PIT tags @ Rs. 400/tag	5000	20,00,000	-	-	-	-	20,00,000
22		Pit tag scanner @ Rs. 50000	15	7,50,000	-	-	-	-	7,50,000
23	Other equipment	GPS @ Rs. 20000/unit	5	1,00,000	-	-	-	-	1,00,000
24		Data loggers @ Rs. 10000/unit	100	10,00,000	-	-	-	-	10,00,000
25		Point and Shoot camera	2	2,00,000	-	-	-	-	2,00,000

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S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
26		Drone @ Rs. 300000/unit	2	6,00,000	-	-	-	-	6,00,000
27		Tent @ Rs. 20000/unit	5	1,00,000	-	-	-	-	1,00,000
28		Binoculars @ Rs. 50000	2	1,00,000	-	-	-	-	1,00,000
29		Minor equipment and field gears	-	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	10,00,000
D.	**Genetic sampling and stable isotope analysis**								
30	Molecular analysis	Charges for conducting molecular genetic work	-	-	30,00,000	10,00,000	10,00,000	-	50,00,000
31	Stable Isotope	Stable isotope analysis	-	2,50,000	2,50,000	2,50,000	2,50,000	-	10,00,000
E.	**Training**								
32	Training and Awareness	Capacity building workshops and awareness activities	-	10,00,000	10,00,000	10,00,000	10,00,000	10,00,000	50,00,000
F.	**Accommodation**								
33	Base camp running cost & maintenance	Maintenance of one base camp at Campbell Bay, Great Nicobar Island	-	5,00,000	2,00,000	2,00,000	2,00,000	2,00,000	13,00,000
G.	**Publication**								
34		Publication cost	-	-	-	-	-	3,00,000	3,00,000
H.	**Contingency (2% of the budget)**		-	11,44,352	2,98,592	2,36,992	1,76,333	1,34,533	19,90,802
			Total	5,83,61,952	1,52,28,193	1,20,86,592	89,92,973	68,61,173	10,15,30,883
			Institutional charge of 10%	58,36,195	15,22,819	12,08,659	8,99,297	6,86,117	1,01,53,088
			Grand Total	**6,41,98,147**	**1,67,51,012**	**1,32,95,251**	**98,92,270**	**75,47,290**	**11,16,83,971**

538

664

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	Field worker (Daily rated Mazdoor)	Manpower to monitoring the leatherback nesting (Preferably Nicobarese) @ Rs. 500/day/person for 7 months	20	21,00,000	21,00,000	21,00,000	21,00,000	21,00,000	1,05,00,000
2	Office Assistant	A salary of Rs. 20,000 + HRA with increment of 15% after 3 years	1	2,78,400	2,78,400	2,78,400	3,20,160	3,20,160	14,75,520
3	Accountant	A salary of Rs. 20,000 + HRA with increment of 15% after 3 years	1	2,78,400	2,78,400	2,78,400	3,20,160	3,20,160	14,75,520
B.	**Accommodation**								
4	Turtle monitoring camp establishment	Establishment and maintenance of Leatherback sea turtle monitoring camps and hatcheries in Nicobar Islands	10	2,00,00,000					2,00,00,000
		Maintenance of camps @ Rs. 100000/camp			10,00,000	10,00,000	10,00,000	10,00,000	40,00,000
C.	**Equipment**								
5		Solar Units @ Rs. 15000/unit	10	15,00,000					15,00,000
6		GPS @ Rs. 20000/unit	20	4,00,000					4,00,000
7		Point and Shoot camera @ Rs. 50000/unit	10	5,00,000					5,00,000
D.	**Travel**								
8	Procuring boat	Mechanised engine Dingi for the inter-island movement	2	50,00,000	-	-	-	-	50,00,000
9	Boat Maintenance			5,00,000	5,00,000	5,00,000	5,00,000	5,00,000	25,00,000
10	Fuel charges	For movement between nesting beaches for habitat and nesting surveys		10,00,000	10,00,000	10,00,000	10,00,000	10,00,000	50,00,000
11		Life jackets and buoy @ Rs. 5000	20	1,00,000					1,00,000
E.		**Contingency (2% of the budget)**		6,31,136	1,03,136	1,03,136	1,04,806	1,04,806	10,49,021
		Grand Total		**3,22,87,936**	**52,59,936**	**52,59,936**	**53,45,126**	**53,45,126**	**5,35,00,061**

539

665

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 - 1	Senior researcher for over-all coordination of project (@ Rs 56,000 + HRA for one Project Scientist with 5% increment every 2 year)	1	7,79,520	7,79,520	8,18,496	8,18,496	8,59,421	40,55,453
2	Project Associate-I	Habitat and nesting Ecology (@ 31,000+HRA for first 2 years; 35,000+HRA afterwards)	1	4,32,000	4,32,000	4,92,000	4,92,000	4,92,000	23,40,000
3	Project Associate-I	Movement Ecology (@ 31,000+HRA for first 2 years; 35,000+HRA afterwards)	1	4,32,000	4,32,001	4,92,000	4,92,000	4,92,000	23,40,001
4	Project Assistant	Habitat, nesting and movement Ecology (@20,000+HRA)	2	5,56,800	5,56,800	5,56,800	6,40,320	6,40,320	29,51,040
5	Office Assistant	A salary of Rs. 20,000 + HRA with increment of 15% after 3 years	1	2,78,400	2,78,400	2,78,400	3,20,160	3,20,160	14,75,520
6	Accountant	A salary of Rs. 20,000 + HRA with increment of 15% after 3 years	1	2,78,400	2,78,400	2,78,400	3,20,160	3,20,160	14,75,520
7	Fieldworker	Assisting in field work and base camp maintenance	2	2,70,000	2,70,000	2,70,000	2,70,000	2,70,000	13,50,000
B.	**Travel**								
8	Air and ship travel	WII HQ to Field sites by PI's and project personnel @ Rs. 50000/person/visit	10	5,00,000	5,00,000	5,00,000	5,00,000	5,00,000	25,00,000
9	Vehicle hiring	Local movement of project staff during field data collection		5,00,000	5,00,000	5,00,000	5,00,000	5,00,000	25,00,000

540

666

S. No.	Particulars	Description	Units	Year 1	Year 2	Year 3	Year 4	Year 5	Total
10	Fuel and maintenance of boat	For the frequent inter-Island movement for field surveys		10,00,000	10,00,000	10,00,000	10,00,000	10,00,000	50,00,000
C.	**Equipment**								
11		Satellite transmitter for Leatherback sea turtle @ Rs.500000/transmitter	30	1,50,00,000					1,50,00,000
12		Satellite transmitter for hard-shell sea turtle @ Rs.500000/transmitter	30	1,50,00,000					1,50,00,000
13		Satellite transmission charges	60	24,00,000	36,00,000	36,00,000	12,00,000		1,08,00,000
14		Satellite tagging accessories		2,00,000	2,00,000	2,00,000			6,00,000
15		Other major equipment		20,00,000	20,00,000				40,00,000
16		Minor equipment and field gears		2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	10,00,000
E.	**Training and Awareness**	Capacity building workshops and awareness activities		10,00,000	10,00,000	10,00,000	10,00,000	10,00,000	50,00,000
F.	**Accommodation**								
17	Base camp running cost & maintenance	Maintenance of basecamps	1	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	10,00,000
G.	**Publication**	Publication cost						3,00,000	3,00,000
H.	**Contingency (2% of the budget)**			8,20,542	2,44,542	2,07,722	1,59,063	1,41,881	15,73,751
			Total	4,18,47,662	1,24,71,663	1,05,93,818	81,12,199	72,35,942	8,02,61,285
			Institutional Charge of 10%	41,84,766	12,47,166	10,59,382	8,11,220	7,23,594	80,26,128
			Anticipated increase of price by 10% in 2028	46,03,243	13,71,883	11,65,320	8,92,342	7,95,954	88,28,741
			Grand Total	**5,06,35,672**	**1,50,90,713**	**1,28,18,520**	**98,15,760**	**87,55,490**	**9,71,16,154**

541

667

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	Field worker (Daily rated Mazdoor)	Manpower to monitoring the Leatherback sea turtle nesting beaches and implementing site-specific intervention (Preferably Nicobarese)	20	21,29,400	21,29,400	21,29,400	21,29,400	21,29,400	1,06,47,000
2	Office Assistant	A salary of Rs. 20,000 + HRA for one office assistance with increment of 15% after 3 years	1	2,78,400	2,78,400	2,78,400	3,20,160	3,20,160	14,75,520
3	Accountant	A salary of Rs. 20,000 + HRA for one office assistance with increment of 15% after 3 years	1	2,78,400	2,78,400	2,78,400	3,20,160	3,20,160	14,75,520
B.	**Accommodation**								
4		Maintenance of research station and nest monitoring camps and hatcheries	10	20,00,000	20,00,000	20,00,000	20,00,000	20,00,000	1,00,00,000
C.	**Travel**								
5		Boat Maintenance		5,00,000	5,00,000	5,00,000	5,00,000	5,00,000	25,00,000
6	Fuel charges	Fuel charges for the boat for patrolling duties and field work		10,00,000	10,00,000	10,00,000	10,00,000	10,00,000	50,00,000
D.	**Equipment**								
7	Field data collection & processing	Minor equipment and field gears		2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	10,00,000
E.	**Contingency (2% of the budget)**			1,27,724	1,27,724	1,27,724	1,29,394.40	1,29,394.40	6,41,960.80
		Total		65,13,924	65,13,924	65,13,924	65,99,114	65,99,114	3,27,40,001
		Anticipated increase of price by 10% in 2028		6,51,392	6,51,392	6,51,392	6,59,911	6,59,911	32,74,000
		Grand Total		**71,65,316**	**71,65,316**	**71,65,316**	**72,59,026**	**72,59,026**	**3,60,14,001**

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Enclosure - 16 A

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

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**

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.

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).

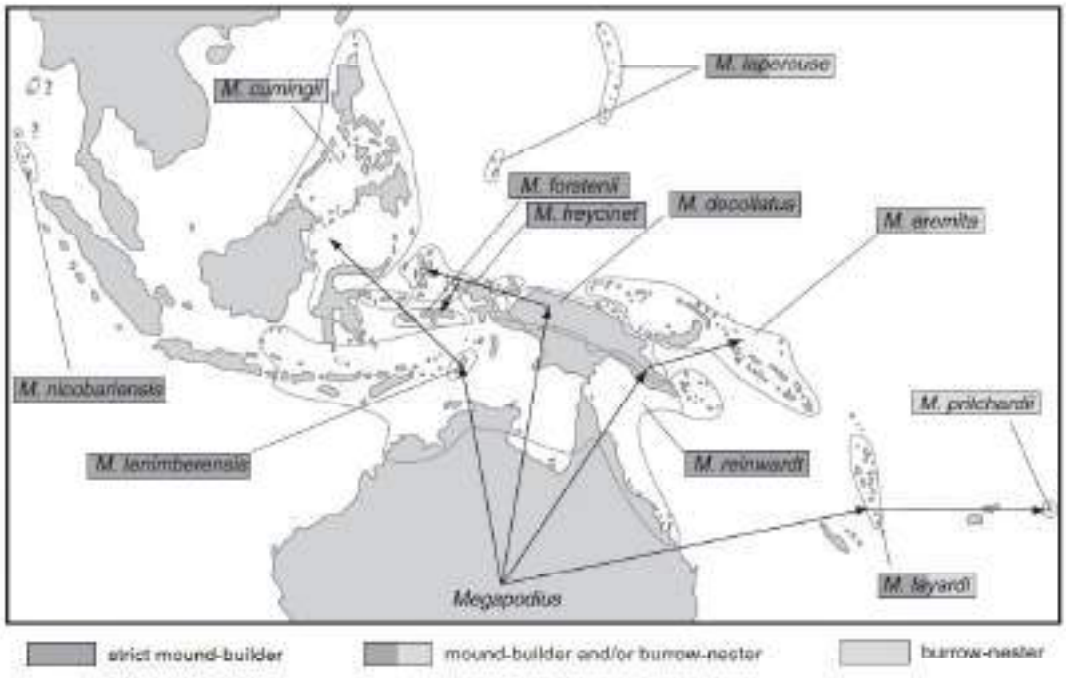

Fig. 1: Global distribution and radiation of the Genus *Megapodius* (Source: Dekker, 2007).

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				■				■				■				■			■	■

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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																				

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Budget (A): Phase I (October 2022 – September 2027): 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 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

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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

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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

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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.

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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 PI's 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

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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**

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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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Enclosure - 16 B

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).

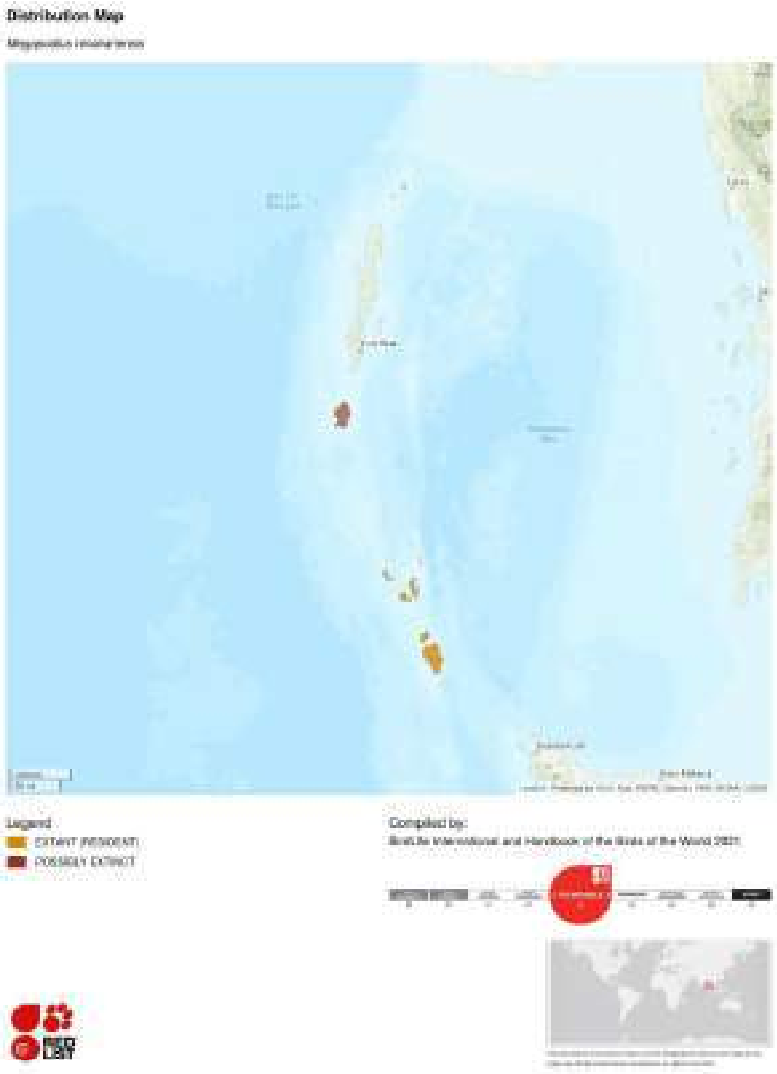

Figure 3. Distributaion map of Nicobar megapode in IUCN RedList

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**	**23818662**	**18288312**	**3296716**	**3296716**	**3296716**	**3296716**	**3320866**	**115714625**

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 No.	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 equipment, 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 dissemination 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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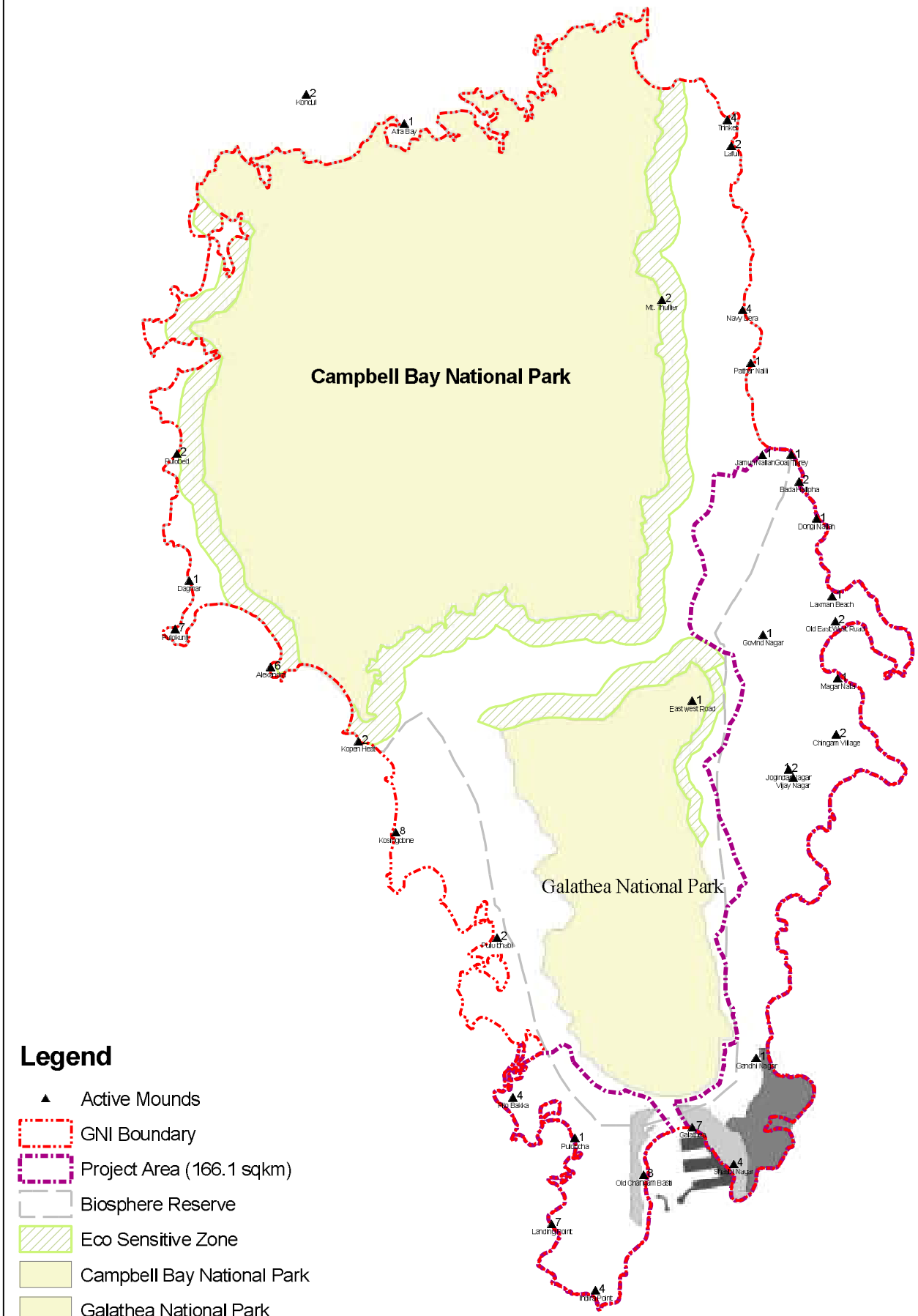
Enclosure - 17

Active Mounds of GNI



Enclosure - 18

CONSERVATION/MANAGEMENT PLAN FOR MANGROVES OF GREAT NICOBAR ISLAND

ANDAMAN AND NICOBAR ADMINISTRATION

DEPARTMENT OF ENVIRONMENT & FORESTS

1. Introduction

Mangroves are trees or shrubs that have the common trait of growing in shallow and muddy salt water or brackish waters, especially along shorelines and in estuaries. In away, mangroves are the tidal forests of coastal wetlands, existing in the inter-tidal zones of sheltered shores, estuaries, tidal creeks, backwaters, lagoons, marshes and mud-flats of the tropical and sub-tropical regions of the world. The word '*Mangroves*' is used to refer to the plants and the associated community.

Mangroves are characterized by one or more species of salt-tolerant trees, or halophytes that form distinct monospecific zones along tropical protected coastlines (Ellison and Farnsworth,1993). They occur in a wide range of geo-morphological settings ranging from the vast riverine and estuarine mangrove forests of Southeast Asia to isolated cays that have developed atop carbonate sands and coral rubble along the coasts of the Caribbean, Micronesia, and the Andamans (Ellison, 2000).

2. Mangroves Ecological and Economic benefits

Mangrove ecosystems are also otherwise called *tidal forests* or *coastal woodlands*. They are ecological wonders by their ability to grow in the interface between land and sea and possess remarkable adaptations like salt exclusion, salt secretion, aerial roots and vivipary. They are the natural soldiers of the coast in that they offer coastal stabilization by preventing erosion caused by cyclones and storms, and they enhance the sedimentation and extension of islands. They are a natural nursery providing shelter and breeding ground to variety of marine organisms like fish, prawns and crabs. They act as both a source and a sink for nutrients, sequester up to 25.5 million tonnes of carbon per year and provide more than 10% of essential organic carbon to the global oceans. Covering only 0.1% of the earth's continental surface, mangrove forests account for 11% of the total input of terrestrial carbon into the ocean and 10% of the terrestrial dissolved organic carbon (DOC) exported to the ocean. They act as biological waste-water treatment plants, lowering the biological oxygen demand (BOD) and performing bioremediation by removing toxic elements. They blend with the human lives of coastal areas by offering day-to-day requirements of fuel wood,

fodder, timber, poles and tannin. Mangrove forests are the economic foundations of many tropical coastal regions providing at least US$1.6 billion per year in "ecosystem services" worldwide&80% of global fish catches are directly or indirectly dependant on mangroves. However, these unique coastal tropical forests are among the most threatened habitats in the world. Mangrove forests once covered three-fourths of the coastlines of tropical and subtropical countries, but less than 50% remains today. Half of the remaining mangroves are degraded because of the unsustainable utilization. The rapid disappearance and degradation of mangroves could have negative consequences for the transfer of materials into the marine systems and influence the atmospheric composition and climate.

Mangroves harbour a large number of animal species, which are partially or totally dependent on mangrove ecosystems. More than 500 species of insects, 229 species of crustaceans, 212 species of Molluscs, 50 species of nematodes, 33 species of polycheates, 150 species of planktonic and benthic organisms are known from Indian mangroves. About 300 species of fishes, 177 species of birds and 36 species of mammals are also reported from Indian mangroves.

Mangroves are an important part of our global ecosystem and have a present coverage of about 15.2 million hectares. It is estimated that 26% of mangrove forests worldwide are degraded due to over-exploitation for fuel wood and timber production. Similarly, clearing of mangroves for shrimp culture contributes to roughly 38% of global mangrove loss, with other aquaculture accounting for a further 14%. Globally, between 20% and 35% of mangrove area has been lost since 1980, and mangrove areas are disappearing at the rate of approximately 1% per year. In India alone, over 40% of mangrove area on the western coast has been converted to agriculture and urban development.

Among the mangroves in 12 coastal states of India, mangroves of the Andaman and Nicobar Islands are unique by its gregarious dense growth, high species diversity, good form, height and size.

Mangrove ecosystems are a potential source of numerous non-wood forest products. If the resource is managed sustainably, it can bring economic development to local communities. Luxuriant mangrove areas support a catch of 11 kg shellfish/ha/day and 4.5 kg finfish/ha/day, an economic gain of US$ 14for shellfish and US$ 3 for finfish. In the Sundarban mangrove forests of West Bengal, wax and honey are collected on commercial basis, yielding a revenue of over Rs. 60 lakhs/per year. In Andaman and Nicobar Islands, the local people are engaged in fishing but the potential of wax and honey collection from mangroves is not yet explored here. This could be a good livelihood option for villagers residing near mangrove areas. In addition, mangroves of these islands attract the tourists from various parts of our country as well as from abroad and help in substantial increase in local economy. Realizing the vital role of mangroves in tourism, the Department of Environment and Forests has taken up various mangrove-related eco tourism activities including the establishment of facilities in North and Middle Andaman.

3. Mangroves of Andaman & Nicobar Island

Total area under mangrove vegetation in India is 4992 sq.km, as per the latest estimate of the Forest Survey of India (2021). Out of this, 616 sq.km, area is mangrove vegetation occur in Andaman & Nicobar Islands. In Andaman group of islands alone, area under mangroves is 614 sq.km, while in Nicobar group of island mangroves occupy only 2 sq. km. Area wise Andaman & Nicobar Islands are third in the country after West Bengal and Gujarat, but as far as density and growth are concerned, mangroves of these islands are probably the best in the country. The mangrove vegetation of these islands constitutes 7.5% of the land area of 8.6% of the total forest area. Mangroves occurring in these islands are mostly fringing the creeks, backwater and muddy shores. Along the creeks, the width range from 0.5km to 1km. At places, this salt tolerant community is found on rock shores subjected to tidal action and regular deposits of mud. Luxuriant mangrove can be seen in Shoal Bay (South Andaman), Yerrata (Middle Andaman) and in Austin Creek (Mayabunder).

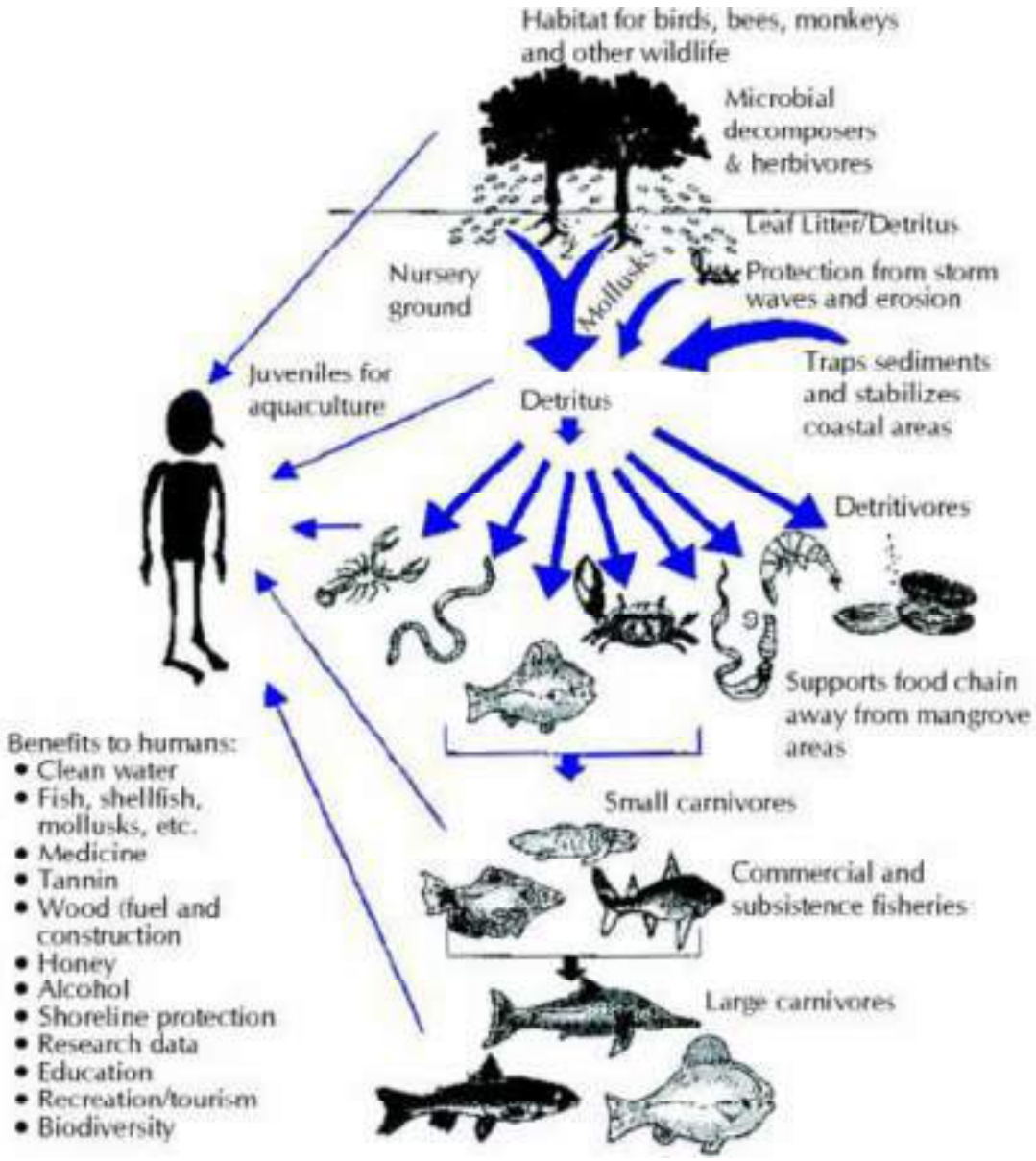


Fig 1: Mangroves and their Ecological and economic benefits (Berjak et al. 1977)

The mangroves in Andaman and Nicobar Islands are less disturbed as compared to other mangroves along the peninsular India. Illegal cutting, encroachment, sewage dumping and browsing by livestock is some of the threats in mangroves of Andaman and Nicobar islands. However, the mangroves of these islands got affected drastically by the massive earthquake and subsequent tsunami that occurred on 26th December 2004. In Andaman and Nicobar Islands, degradation occurred in pockets up to 2,379 m^2. The impact was not just immediate but still under progress. As the land uplifted in northern part of these islands, the mangroves degraded due to the lack of tidal waters whereas in the southern part of the islands due to submergence of land mangrove are degraded by continuous stagnation.

The mangroves of Andaman and Nicobar Islands (ANI) are recognized as the best in the country in terms of density and growth. However, considerable disparities still exist in species composition and classification of mangrove species in the ANI. Further, taxonomical identity and occurrence of certain mangrove species in the ANI remains imprecise. Considering these facts a detailed survey was carried out to provide an updated checklist of true mangrove species of the ANI based on the extensive field surveys and perusal of existing literature in 8 regions of the Andaman & Nicobar Islands and in each region specific sites were selected based on representativeness, importance, and accessibility. Based on the survey, it is found that there are 38 true mangrove species belonging to 13 families and 19 genera present in the Andaman and Nicobar Islands. The discernible changes in the number of true mangrove species and absence of a few species reported in earlier studies could be attributed to the lack of extensive field surveys.

Andaman group of islands have 35 and Nicobar group of island have 23 true mangrove species. Among the eight regions mangrove diversity is high in South Andaman followed by Middle Andaman, Mayabunder, Diglipur, Nicobar, Little Andaman, Havelock and Baratang. Given their limited geographical area, the high similarity index values between the regions (> 0.6) indicate the homogenous nature of mangrove diversity in the ANI and absence of impassable dispersal barriers. Nicobar region exhibited low similarity with other

regions (0.61-0.69)(Ragavan, et al 2015). Periodical information on the extent and status of mangroves in the Islands is imperative not only to improve our understanding of phyto-geography but also for better management and conservation.

Mangroves are typically a closed evergreen forest of moderate height composed of trees specifically adapted to survive on tidal mud that is permanently wet with salt water and submerged every tide.

The massive earthquake that got triggered in the South East Asia on the 26th December 2004 and the *Tsunami* that followed caused considerable geo-morphological changes in the Islands. In the Andamans the land mass tilted upward in the northern latitudes and got sunk in the southern latitudes. The mangroves were the worst affected vegetation due to the impact of Tsunami as they buffer the coastline. Further, the subsequent geological changes due to constant disturbance of major and minor tremors in increments brought in various geo-morphological changes. Mangroves being a dynamic ecosystem got implicated further.

Land inundation impacted the mangrove vegetation in totality in the Andaman group of Islands. The geological changes have caused a permanent effect on the hydrological patterns in terms of tidal water inflow and outflow. In the South Andamans the land mass sunk 1.25 m downwards where in roots and stems (partially) of most shoreline mangroves got permanently submerged. On the contrary, in the North Andamans owing to the upward tilt the high tide water fails to reach the wetlands. The worst affected ones are Rhizophora, Bruguieras, Sonneratia etc., that are inland mangroves. This hydrological change has led to exposure of roots of the mangroves. Being a dynamic forest ecosystem tidal inflow and outflow is very critical in Mangroves. The physiological and nutritional requirements are obligatorily dependant on tidal patterns. Thus in the south vegetation was lost to submergence and in the north physiological drought has set in.

In a seismically active zone like Andamans that is prone to geological changes quantifying the adaptive responses of dynamic forest ecosystems like Mangroves is very crucial. The recent changes allow us to visualize that the mangrove vegetations would move landwards in the southern latitudes and towards the shoreline in the northern latitudes. As a resultant there would be a

climax established. Though considerable reports describe post-tsunami effects on mangroves, attempts have not been made to assess the long-term implications and efforts to restore them. Though the mangroves must have suffered similar damages in the past, presently they are vulnerable to geological and anthropological damages. Therefore there is a need for human assisted and active restoration supporting the process of natural recovery. There is an imperative need for the protection and restoration mangrove areas and the present study is an attempt to develop site specific models for restoration of the critical mangrove habitat which are damaged due to tsunami and under threat of permanent degradation.

All taxa within the family Rhizhophoraceae (true mangroves) are placed under RET category by the IUCN (www.redlist.org). Often it is the life history traits and reproductive success of a species determines its dominance within a vegetation. Though mangroves in Andamans are largely undisturbed taxa such as *Bruguiera parviflora* and *B.sexangula* are increasingly becoming very rare. The individuals recorded in field also exhibit very poor reproductive success. It is important to know why these taxa have gone rare and eventually got diminished. It would be highly desirable at this stage to enrich the said species within the region in consultation with the local forest management plan. Thus with active participation of the Andaman Forest Department, it is possible to restore the species. Further, accessions will also be added to the mangrove interpretation centres existing in the region (Eg. Kalatang, South Andamans, Bakultala, Middle Andamans). Thus the conservation plan needs to simultaneously focus on Mangrove Restoration and Species Recovery of threatened taxa.

4. Mangrove Management in A&N islands

Mangroves of these islands were over-exploited and destroyed on large scale prior to 1987. Because of its high calorific value local people used mangroves as primary fuel wood. In addition, a large portion of mangrove wood was utilised for commercial purposes prior to 1987. During the period between 1981 and 1985 about 14,000 to 26,000 $m^3$of mangrove wood was extracted per year. Local people depended on mangroves as fodder for livestock, production of charcoal and poles. Local fishermen used to cure and dye the nets with mangrove tannin to make it resistant against biological decay. Nowadays the above mentioned benefits are reduced due to the complete

ban on felling of mangrove trees. However the local people of these islands are still reliant on mangroves for the following purposes. Local villagers, particularly women, use mangroves as a fishing ground for sustenance and income generation. Leaves of *Nypa fruticans* and stems of *Phoenix paludosa* are used by villagers of these islands for making huts and fences. Decoction of the shoots of *Ceriops tagal* is used in treatment of malaria. Decoction of seeds of *Heritiera littoralis* is used to treat diarrhoea and dysentery. Barks of *Xylocarpus granatum* and *Xylocarpus moluccensis* are used in the treatment of dysentery. Kernel of *Nypa fruticans* and *Heritiera littoralis* used as food by local peoples and aborigines. Fruits of *Phoenix paludosa* are relished by children. Young shoots of *Acrostichum aureum* are used as vegetables. Propagules of *Bruguiera parviflora* and *Bruguiera cylindrica* are eaten by the tribes.

The Department is implementing various activities related to the protection, conservation, expansion of mangrove cover and area in Andaman and Nicobar Islands through a UT Plan Scheme Conservation and Development of Mangroves and Littoral Forests. Large areas have been brought under mangrove cover through restoration of mangroves and creation of mangrove plantations.

5. Need for Conservation and Management

Mangrove ecosystems are threatened globally due to various anthropogenic activities and global climate change. Adverse effects on mangroves could lead to serious consequences for the adjoining fragile and important ecosystems such as coral reefs and sea grass beds. Mangrove is the only marginal ecosystem which shares the resources with adjoining ecosystem (Vannucci 2001). Moreover, the ecological and socioeconomic values offered by the mangroves are innumerable, immeasurable and incomparable. So conserving mangroves should be a priority in any nation's conservation programmes. The knowledge of exact species composition is imperative not only for understanding the structure and function of mangroves and their bio-geographical affinities but also to plan strategies for their conservation and management (Jayatissa et al. 2002; Wang et al. 2003).

Coastal wetlands the interface between land and sea is unique geologically, ecologically and biologically, it is of vital importance to an array of terrestrial and aquatic life forms. Their spatial distribution is strategic and hence contributes to shoreline protection, upland runoff regulation, and provides breeding, feeding, and nursery grounds for a wide range of fauna (Imbert, *et al.*)

Individual mangrove ecosystems tend to have low species diversity and relatively simple structure (Rey, 1999). The species distribution in coastal wetlands is non random and striated. While species such as *Rhizhophora* and *Ceriops* occupy the shore line with higher salinity the various *Bruguiera* taxa occur in the inland. Thus there are more or less well striated distinct zones, each dominated by a different mangrove species (Rey, 1999). Although tides and successful seedling establishment play an important part in creating these zones, predation of certain propagules by crustaceans such as crabs, can also influence which species creates a certain zone. Grapsid crabs play considerable role in the predation of mangrove propagules that may be a threat to natural or artificial mangrove restorations (Dahdouh-Guebas, *et al.*, 1998).

The taxa Rhizophoraceae is truly viviparous, where the growing embryo remains attached to the parent and germinates into a seedling before falling from the tree (Rey, 1999). Habitat loss and fragmentation are seen as two of the major extinction vortices to terrestrial productivity and biodiversity (Soule, 1991). Mangroves are under threat throughout the tropical distribution, primarily through deforestation and clearing to accommodate aquaculture or establish harbour facilities, or infilling for land-based developments (Hatcher *et al.,* 1989). Mangroves have been reduced between 20 - 75% in many tropical countries in Asia and the Caribbean. A figure of 1% decline per year has been given as a conservative estimate for the Asia-Pacific region (Ong, 1995).

In the marine environment, problems of habitat degradation have so far primarily affected vegetated estuarine and coastal habitats, including wetlands, salt marshes, seagrass beds, kelp forests and mangroves. (Hatcher *et al.,* 1989; Thorne-Miller & Catena, 1991; Suchanek, 1994; Norse, 1993; Zann, 1995). Studies on *Post-Tsunami* Changes in the distribution of mangroves and other land cover categories in South Andaman have indicated that there is a reduction in area of Mangrove swamps, Agriculture and settlement. However, there is an increase in area under tidal creek/water mass in south Andaman.

Whereas, 22% of the mangroves are heavily damaged, 23% least damaged and 15 % moderately damaged. Only 40 % of the mangroves remain intact in the South Andamans (Chatterjee, *et al.,* 2008). The giant fern *Acrostichum aureum, Rhizophora spp, Bruguiera spp, Avicennia spp, Sonneratia spp,* etc. have got affected in various degrees based on their physiological responses to the continuous inundation/exposure under the changed scenario. In the South Andamans, in few localities 30–80% of mangrove stands have got affected. In the Middle Andaman the impact is negligible, whereas in the North Andaman due to the elevation of land, the sea water is not reaching some of the mangrove stands (Dam Roy and Krishnan, 2005).

6. Mangrove Restoration

Restoration is defined as the return from a disturbed or totally altered condition to a previously existing natural, or altered condition by some human action (Lewis,1990). Restoring an ecosystem to exactly the same condition that it was in itself is unrealistic (Simberloff, 1990). However, an approximation of the original system may be possible and sufficient (Lewis, 1990; Henry & Amoros, 1995), given that ecosystems may be essentially non-equilibrium in nature (Wyant *et al.,* 1995). Restoration attempts have been made in major habitat types of marine ecosystems, but mostly in saltmarshes, sea grasses and coral reefs (Race, 1985; Moy & Levin, 1991; Clark & Edwards, 1995). Among different forest ecosystems in the tropics mangroves have received relatively little attention. It has been reported that growing mangroves to a young tree stage leads to greater success by allowing plants to bypass a disease vulnerable stage (Hannan, 1975; Thorhaug, 1990).

Mangrove ecosystems are often cited as being responsive to differences in soil salinity, frequency of tidal inundation, sedimentation, soil chemistry, freshwater influx and groundwater availability. This is said to have led to significant variations noted in mangrove community structure and function even within small geographic ranges. Mangroves may be one of the easiest marine systems to restore because of the apparent plasticity of assemblages, viviparous reproduction and the observation that these seedlings often have the best survival and growth rates where adult conspecifics are absent (Rabinowitz, 1978).

The natural recovery of mangroves is very slow, due to altered soil conditions, permanent changes to the tidal height and drainage patterns, and disruption in supplying mangrove propagules and the larvae of marine

invertebrates and fishes. Restoration of mangroves require active reconstruction of the area in terms of its tidal height and drainage patterns as the first step towards successful restoration of these systems. Tidal exchange and residence time, mud elevation and drainage, and freshwater inputs are likely to be of major importance to mangrove restoration.

Factors important for mangrove restoration such as slope and height of the mud substratum, the distribution of freshwater inputs, the species composition, abundance and size structure of mangrove stands, the densities of detritivorous invertebrates and, importantly, energy flows and other linkages within and outside the ecosystem will have to be considered and looked into for effective restoration. The vertical zonation patterns of species will also be recorded. Past records of what a mangrove system was like prior to damage available will be relied on and also in most cases, the nearby undamaged stands provide the goals for restoration.

Mangrove areas have to be restored with the natural assemblage, structure and ecosystem function (within the bounds of natural variation) that is self-sustaining. The biodiversity of the dense mangrove root systems multiplies the available space for other organisms and offering them a large number of microhabitats in a confined space. Mangroves absorb excess nitrates and phosphates thereby preventing contamination of near shore waters. Mangroves provide breeding and feeding habitats for many marine fishes and crustaceans. Mangroves provide nutrients to the coastal water bodies and maintain ecological balance of the coastal ecosystems. They are vital to coral reefs and sea grass beds as they avert siltation. Mangroves protect the shoreline from wave action, currents, winds and prevent erosion by acting as buffers and catch alluvial materials, thus stabilizing land elevation by sediment accretion that balances sediment loss. The project will help in recovery of mangrove species that are rare, endangered and threatened. Mangrove restoration will improve sustainable fisheries in the area.

Restoration of mangroves will be done by following the ecological Restoration Methods (Lewis, R. 2005) which involves studying the individual species ecology of the mangrove species at the site particularly the patterns of reproduction, propagule distribution, and successful seedling establishment. The normal hydrologic patterns that control the distribution and successful establishment and growth of targeted mangrove species will be ascertained. . The modifications of the original mangrove environment that currently prevent

natural secondary succession (recovery after damage) will be assessed. Then the restoration program to restore appropriate hydrology and, if possible, utilize natural volunteer mangrove propagule recruitment for plant establishment will be designed and implemented. The rate of stabilization and the rate of growth of seedlings will be assessed and if found the natural recruitment is inadequate, planting of propagules, collected seedlings, or nursery raised seedlings will be done (Lewis and Marshall 1997). *Restoring* mangroves is only a part of the solution and efforts to improve the protection mechanism will be undertaken to protect the mangrove ecosystems to ensure the restoration efforts should not go in vain.

Mangrove regeneration and restoration techniques include reintroductions of seeds or propagules and nursery raised seedlings. Seeds or propagules will be directly placed in the area to be restored in addition to the seedlings grown to a height of 0.3-1.2m. It has often been reported that growing mangroves using nursery raised seedlings leads to a better success. In restoration efforts on mangroves care should be taken to propagule from predation by using certain methods viz., saturation of crabs with a large number of propagules, vertical planting of propagules, planting a mixture of species, and planting mature propagules. In addition, crab exclusion is another method that may be helpful.

7. Mangroves in Nicobar group of Islands

Based on the earlier studies, there are 23 true mangrove species reported in Nicobar Group of Islands which include *Avicennia marina, Aegiceras corniculatum, Acanthus ilicifolius, Acrostichum aureum, Bruguiera gymnorhiza, Ceriops tagal, Rhizophora apiculata, Rhizophora mucronata, Rhizophora stylosa, Rhizophora x annamalayana, Dolichondrone spathaceae, Excocaria agallocha, Excocaria indica, Lumnitzera littorea, Lumintzera racemosa, Nypa fruticans, Sonneratia alba, Sonneratia caseolaris, Sonneratia x gulngai, Sonneratia lanceolata, Sonneratia ovata, Sonneratia x urama and Heritiera littoralis*.

The Great Nicobar island post tsunami mangroves are found along the creeks and river mouths in east and west coasts. Notable mangrove areas include Dongi nallah, Magar nallah, Siby nallah, Prembahadur nallah, Dillon nallah, Swarup nallah, Galathea river mouth, Galathea estuary, Vijay nagar, Johinder nagar, Laxmi nagar, adjoining areas of Laxman beach, Jhav nallah

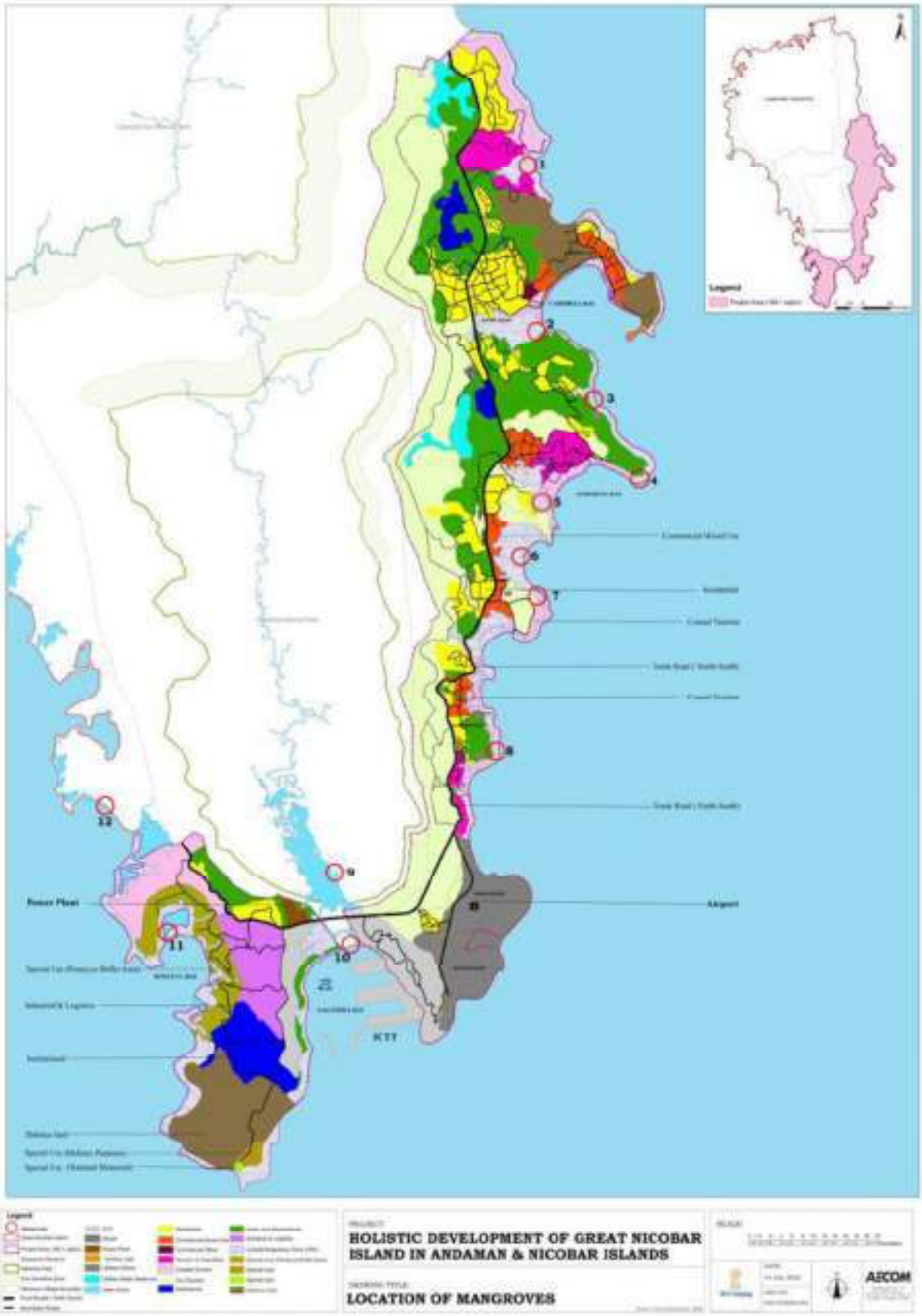
and Gol tikrey in East Coast and Pemaya bay, Nanjappa bay, Alexandria bay and Casuarina bay in West Coast.

8. Conservation strategies

Mangrove ecosystems are threatened globally due to various anthropogenic activities and global climate change. Adverse effects on mangroves could lead to serious consequences for the adjoining fragile and important ecosystems such as coral reefs and sea grass beds. Mangrove is the only marginal ecosystem which shares the resources with adjoining ecosystem (Vannucci 2001). Moreover, the ecological and socioeconomic values offered by the mangroves are innumerable, immeasurable and incomparable. So conserving mangroves should be a priority in any nation's conservation programmes. The knowledge of exact species composition is imperative not only for understanding the structure and function of mangroves and their bio-geographical affinities but also to plan strategies for their conservation and management (Jayatissa et al. 2002; Wang et al. 2003).

The knowledge on species composition, understanding the reproductive and regeneration constraints in rare, endangered and threatened mangroves, and developing species recovery strategies are imperative for understanding the structure, function and services of mangroves and their bio-geographical affinities which are essential for their conservation and management.

Collection of quantitative data on the physical and biological features of the mangrove systems, the slope and height of the mud substratum, the distribution of freshwater inputs, the species composition, abundance and size structure of mangrove stands, the densities of detritivorous invertebrates and, importantly, energy flows and other linkages within and outside the ecosystem will be done. The vertical zonation patterns of organisms will also be recorded. The soil PH will also be tested.


Legend
Power Plant
Airport
ICTT
HOLISTIC DEVELOPMENT OF GREAT NICOBAR ISLAND IN ANDAMAN & NICOBAR ISLANDS
LOCATION OF MANGROVES
AECOM

The damaged mangrove stands will be surveyed for natural regeneration and for restoration of the damaged areas in each sample site, species found in the area will be raised in the nursery and used for restoration. Mangrove nurseries will be established in all four islands for supplementing the natural regeneration and use in artificial regeneration. Two types of treatment will be adopted in restoration of mangrove damaged areas viz. 1) supplementing the natural regeneration and 2) Artificial Regeneration. The techniques include reintroductions of seeds or propagules and transplanting of nursery raised seedlings.

Though the mangroves are one of the easiest marine systems to restore and regenerate because of the apparent plasticity of mangrove assemblages, the presence of viviparous seedlings and the seedlings often have the best survival and growth rates, difficulties have been encountered In revival of tsunami impacted mangroves. The Conservation and management of mangroves in Great Nicobar island and other islands of Nicobar group is aimed at restoration, enrichment, and rehabilitation through ecological restoration methods as well as mangrove plantation and management to actively promote a return to the natural assemblage structure and ecosystem function (within the bounds of natural variation) that is self-sustaining. This will be achieved through identifying the natural state, including key species in maintaining the physical substratum, community structure and food webs maintaining fish stocks, developing methods for restoring key species and assessing the long-term success. Mangrove ecosystems are responsive to differences in soil salinity, frequency of tidal inundation, sedimentation, soil chemistry, freshwater inputs and groundwater availability as the factors are responsible for great variation in mangrove community structure and function even within small geographic ranges. The broad themes include establishment of mangrove nursery, habitat enhancement/restoration, plantation establishment and management, research and monitoring, education and outreach. The strategies/activities proposed under each theme are as follows.

a. Establishment of Mangrove nursery

- Establishment and management
- Collection of propagules and seeds of preferred species

b. Habitat enhancement/rehabilitation

- Investigation on the factors
    - Slope and height of the mud substratum
    - Distribution of freshwater inputs,
    - Species composition, abundance and size structure of mangrove stands
    - Densities of detritivorous invertebrates
    - energy flows and other linkages within and outside the ecosystem
    - Vertical zonation patterns of species
- Mangrove restoration/reforestation
- Assisted Natural Regeneration
- Enrichment planting
- Restocking of diminishing species

c. Mangrove Plantation Establishment and management

- Site Identification and Selection
- Choice of Species
- Plantation Establishment Techniques
- Planting
- Care and Maintenance of Plantations
- Establishment of mangrovetum
- Enrichment Planting

d. Research and monitoring

- Mangrove resource assessment
- Inward and outward migration of mangrove communities
- Regeneration pattern of mangroves with associated changes in hydrology and salinity
- Reproductive and regeneration constraints in rare, endangered and threatened true mangroves and
- Develop species recovery strategies
- Nursery techniques for critical taxa
- Fishery resource assessment
- Growth and yield studies
- Socioeconomic profiling
- Monitoring of livelihood
- Impact monitoring

e. Education and Outreach

- Establishment of a mangrove conservation cell
- Seminars/workshops
- Capacity building for field staff and villagers
- Meetings
- Documentary on mangroves
- video and slide shows
- Pamphlets/Brochures
- Publications on the importance of mangroves, alternative livelihood, sustainable development
- Mangrove board walk
- Mangrove interpretation Centre

9. Outcome:

It is expected that conservation and management of mangrove areas will help in restoration of mangrove areas thereby result in increase in mangrove cover, species richness and diversity. Conservation and management of mangroves actively promote a return to the natural assemblage structure and ecosystem function (within the bounds of natural variation) that is self-sustaining. Restoration techniques and methods, regeneration techniques developed will help in in maintaining the physical substratum, community structure and food webs maintaining fish stocks and will be an important tool for ecosystem management of mangroves having a positive effects on fisheries. Further, the restoration methods developed will be used for restoring mangroves in Andaman that will increase mangrove areas, recovery of RET mangrove species, improve and protect biodiversity. It will provide technical knowledge and skill upgradation in mangrove nursery management, artificial and aided natural regeneration for frontline and executive forest department personnel.

The data generated and the restoration methods used will be demonstrated through education and outreach to the Forest Department Personnel and Coastal communities for adoption and will be used in revival of mangroves in other parts of the A&N islands. Sensitization programme will be organised in the form training to all user groups.

True Mangrove Species Reported in Nicobar Group of Islands

Fig 1: Avicenia marina

Fig 2: Aegiceras corniculatum

Fig 3: Acanthes ilicifolius

Fig 4: Acrostichum aureum

Fig 5: Bruguiera gymnorhiza

Fig 6: Ceriops tagal

Fig 7: Rhizophora apiculata

Fig 8: Rhizophora mucronata

Fig 9: Rhizophora stylosa

Fig 10: Rhizophora annamalayana

Fig 11: Dolichondrone spathaceae

Fig12: Excocaria agallocha

Fig 13: Excocaria indica

Fig 14: Lumnitzera littorea

Fig 15: Lumintzera racemosa

Fig 16: Nypa fruticans

Fig 17: Sonneratia alba

Fig 18:Sonneratia caseolaris

Fig 19: Sonneratia x gulngai

Fig 20: Sonneratia lanceolata

Fig 21: Sonneratia ovata

Fig 22: Sonneratia x urama

Fig 23: Heritiera littoralis

Department of Environment and Forests, A&N Administration through the Divisional Forest Officer, Nicobar Division will implement the various activities of the plan. The research and monitoring activities will be implemented by the department in collaboration with scientific institutions having expertise in the field. Mangrove interpretation centre along with a mangrove board walk will be created for the benefit of all stakeholders and create awareness among the students, fishermen and coastal communities.

10. Budget :

S.No	Activities	Amount (Rs)
1	Establishment of Mangrove nursery	50,00,000.00
2	Habitat enhancement/rehabilitation	1,00,00,000.00
3	Mangrove Plantation Establishment and management	1,00,00,000.00
4	Research and monitoring	1,00,00,000.00
5	Education and Outreach	75,00,000.00
6	Establishment of Mangorve interpretation Centre	1,50,00,000.00
7	Procurement of 2 Engine Dingies, 2 speed boat and 1 mini truck	75,00,000.00
8	Mangrove Conservation Cell	1,00,00,000.00
	Grand total	**7,50,00,000.00**

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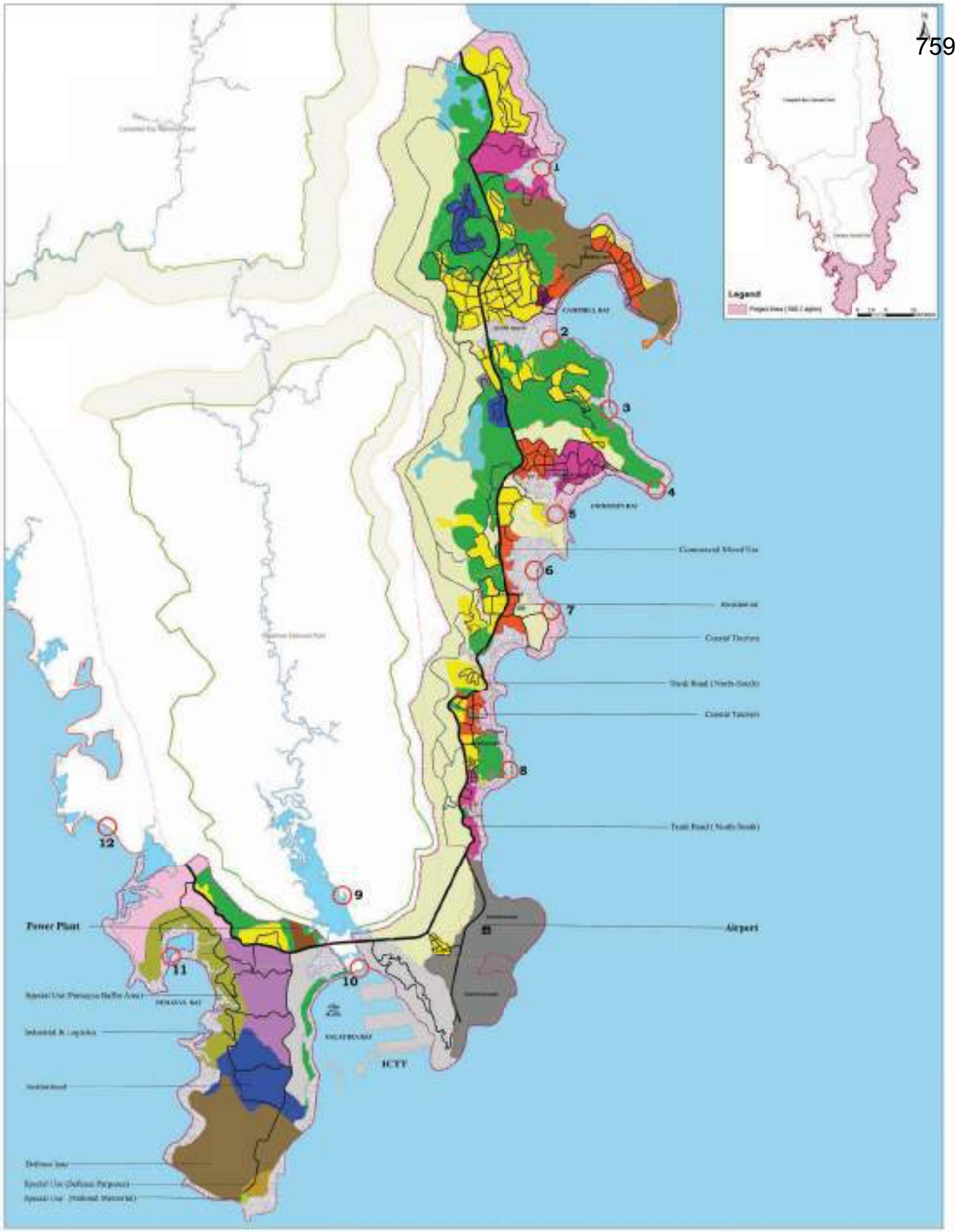
Enclosure - 19



PROJECT:
HOLISTIC DEVELOPMENT OF GREAT NICOBAR ISLAND IN ANDAMAN & NICOBAR ISLANDS

DRAWING TITLE:
LOCATION OF MANGROVES

Enclosure - 20

Conservation & Management Plan of Salt Water Crocodile (*Crocodylus porosus*) in Great Nicobar Island

Submitted to

Andaman and Nicobar Islands Integrated Development Corporation

25 July 2022

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

Photo Credit
Dhritiman Mukherjee
Abhijit Das

Citation: Wildlife Institute of India (2022): Conservation and management plan for the Salt Water Crocodile in Great Nicobar Island. Report, Wildlife Institute of India, Dehradun. Pp 31.

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BACKGROUND

NITI Aayog is engaged in "*Holistic Development of Great Nicobar Island* (GNI)". This includes, 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.". GNI, with an area of 910 sq.km is one of the largest islands of the Andaman & Nicobar archipelago. In this endeavour, the Andaman and Nicobar Islands Integrated Development Corporation (ANIIDCO) has been appointed as the project proponent for the project by A & N Administration. Out of the 910.4 sq km of Great Nicobar Island, the project area covers 166.10 sq km on the South-east side of the Island starting from Campbell Bay in the north to Indira point and adjoining area in the South. Some of the proposed project area is part of Salt Water Crocodile Habitats.

As per the minutes of the 297th meeting of the Expert Appraisal Committee (Infra-I, IA-III) held on 24-25 May, 2022, it has been observed that Great Nicobar Island has a wider habitat for Saltwater Crocodiles. During construction phase the same shall be handled as per provision of Wildlife Act through Department of Forest and as per the action plan prepared by Wildlife Institute of India (WII). Further, an action plan is also prepared as "action plan of mitigation of human-crocodile conflicts in the Andaman and Nicobar Islands".

In the conclusion and recommendation of the EAC vide point E-xvii indicated that "*PP shall indicate the crocodile habitats and nesting grounds inside the project area along with the geo coordinates and intimate the status of such crocodile habitat and nesting grounds as per the Action Plan for Mitigation of Human-Crocodile Conflict in Andaman & Nicobar Islands. In case these identified crocodile habitats/nesting grounds are categorized as Crocodile Conservation Zone attempts shall be made to exclude these crocodile habitats/nesting grounds from the project area and in case it is unavoidable to exclude such areas then a crocodile Conservation Plan shall be made by PP in consultation with A&NFD and WII and same shall be part of EIA/EMP reports. PP shall also indicate the time frame for preparation of the plan and its inclusion in the EIA/EMP report".*

Based on the EAC recommendation of (297th meeting of the Expert Appraisal Committee (Infra-I, IA-III) held on 24-25 May, 2022), the project proponent, ANIIDCO approached Wildlife Institute of India for preparing a Conservation and Management plan for Salt Water Crocodile (Vide letter No 1-1601/ANIIDCO/Projects/2020-21/Vol.XI/998 dated 22 July 2022).

1. INTRODUCTION

Crocodylus porosus Schneider 1801 or Saltwater Crocodile is distributed widely from the eastern coast of India (Sundarban, Bhitarkanika, Andaman and Nicobar Island), Sri Lanka, Seychelles to Australia and South Pacific. It inhabits a wide variety of saline and freshwater habitats, including rivers and creeks, coastlines, coastal flood plains, swamps, rivers and canal outfalls (Webb & Manolis, 1989). Although popularly referred to as 'Salties' these crocodiles are one of the largest living reptile on earth growing up to 6–7 m (Webb et al., 1978; Whitaker & Whitaker, 2008; Erickson et al., 2012). Similar to other crocodilians, it is an opportunistic feeder, using active hunting or 'sit-and-wait' strategy (Cooper & Jenkins, 1993). Females attain sexual maturity at lengths 2.2-2.5 m (10-12 years), males at 3.2 m at around 16 years. The clutch size is 40-60 eggs laid in a mound nest made out of vegetation & mud. Incubation period is 80-90 days. Juveniles, including hatchlings and yearlings, have been reported to consume smaller animals, such as insects, fishes, amphibians and small reptiles (Kumar et al., 2012), although quantitative studies of food preference of the species remain largely unknown. Saltwater crocodiles are widely distributed in the Andaman Islands, especially in the sea front sides. However, their preferred mangrove and marsh habitats have considerably reclaimed due to anthropogenic activities (Whitaker and Andrews, 2003). Overlapping existence in Andaman group of Islands also lead to Human Crocodile conflicts and between 2005-2017, with total of 26 crocodile attacks of which 16 have resulted in deaths. The Environment and Forest Department of Andaman and Nicobar Islands has been taking a number of measures to address this issue but is finding it extremely difficult to prevent the attacks by the crocodiles leading to law-and-order problems. Further, this problem is also affecting various production sectors of the island especially tourism and fisheries. One of the step towards this direction is developing an "*Action plan for mitigating Human-Crocodile Conflict in Andaman and Nicobar Island*" (Henceforth Action Plan 2018) which mainly deals with the conflict mapping and mitigation strategies in Andaman group of Island and the report maintains that "*human crocodile conflicts are rare in Nicobar Islands*". However, the measures proposed in the action plan 2018 can also be extended to Nicobar Islands, if the conflict situations extend to these southern islands in future.

Scanty information on distribution and abundance of Salt Water Crocodile from Nicobar Islands may be considered as a serious management constrain at this point.

2. APPROACH & PLAN

Few published information (such as, Whitaker and Andrews, 2003; Kumar et al., 2012) on the crocodiles of Nicobar Island were collected. Apart from that, crocodile census data of the year 2017 and 2022 from Andaman & Nicobar Forest Department have been obtained for understanding Crocodile distribution in the Great Nicobar Islands. Further, WII team (J.A. Johnson, R. Suresh Kumar, C. Ramesh, P. Nehru and Abhijit Das) has made site visit at the proposed holistic developmental area between 17th and 20 July 2022 and explored the crocodile habitats from Campbell Bay to Indira Point of Great Nicobar Island (GNI). Field observation were made along the creeks, rivers and swamps during day time as well as night hours. In addition, further information on crocodiles of GNI and the development project were gathered while discussion with Forest Department officials and Project Proponent (PP) respectively. All this information helped us in understanding crocodile distribution, finding research gaps, potential impacts and conflicts due to the proposed developmental plan. Visualizing the above facts, the detailed "*Conservation and Management Plan for salt water Crocodile with reference to the proposed Holistic development project*" is prepared. This plan consisting of two components viz., i) **Monitoring**, which deal with status and distribution & ecology of Crocodile and ii) **Management** that deals with reducing any future Human-crocodile negative interaction in the project site of GNI.

3. HOLISTIC DEVELOPMENT PLAN VS CROCODILE HABITAT IN GNI

Based on the desktop review, information available with forest department, holistic development plan and field observation, it is found that crocodiles are distributed widely along the coastal areas of GNI (*figure 1*). Out of almost 195 km of coast line of GNI, ~77 km potential Crocodile Habitat is coming with the impact zone (*figure 1*). Portions of key crocodile habitats coming within the project site include Galathia River, Magar Nala, Indira Point, Surup Nala. Out of these habitats, Surup Nullah (an area between Gandhinagar and Shastrinagar) is planned to be reclaimed for development of greenfield Airport and associated activities.

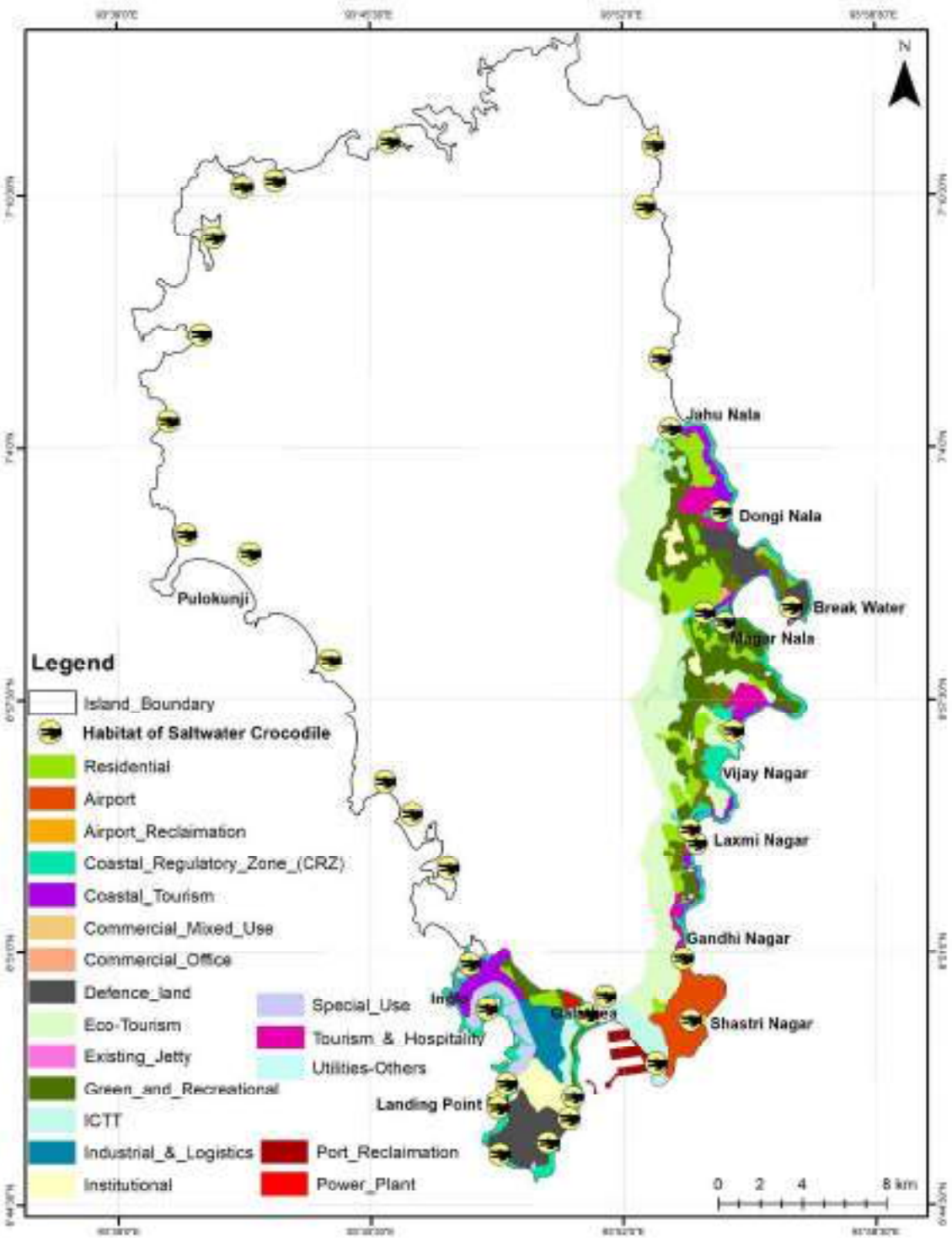

Figure 1: Crocodile Habitats in GNI with special reference to the Proposed Holistic Development Project (Source: Andaman and Nicobar Forest Department 2021 & ANIIDCO)

4. STATUS OF THE CROCODILES IN GREAT NICOBAR ISLAND

Detail assessment of the population status of salt water crocodile from GNI is not available especially after 2004 Tsunami. Survey conducted during 2000-2001 in the Nicobar Island reported a stable population at Galathia Creek and also reported the population was dominated by smaller sized individuals from west coast of GNI. (Whitaker and Andrews, 2003). In 2012, Kumar et al. reported six adults and three sub adults from Indira Point, Sastri Nagar and Magar Nala of the GNI. **However, there is no detailed information on population size, occupancy and nesting and dispersal mechanism of salt water Crocodile in the GNI**.

As per the Andaman and Nicobar Forest Department record, Dongi Nala, Magar Nala, Jogindar Nagar, Vijay Nagar, Laxmi Nagar, Gandhi Nagar, Sashtri Nagar, Galathia, Indira Point, Landing Point, Alexandria Bay, Casuarina Bay and other creeks along the Western side of the Island are regarded as Habitat of Salt Water Crocodile. (*Figure 1*). As per latest Forest Department censes report (17 July 2022), 24 crocodiles were counted from Galathia, Surup and Prem Bahadhur and Magar Nala.

However, this information does not indicate the actual population and distribution status of crocodile in the GNI.

Photo: Galathia River: A Typical Salt Water Crocodile Habitat of GNI

5. CONSERVATION PLAN

5.1. Monitoring Population

5.1.1. Rationale

Monitoring populations plays a critical role in wildlife ecology and conservation (Gibbs 2000). Determining trends in abundance is also important to understand dynamics in animal populations and understanding the effectiveness of management strategies for slow growing and long lived species such as Salt Water Crocodile.

5.1.2. Need statement

Despite having a wide distribution in the Great Nicobar Island, demographic parameters for the Crocodile remain unquantified. Demographics provide baseline for monitoring population health and offer insight into the mechanisms driving population declines. Population studies are also crucial for management of man-animal conflict situations.

5.1.3. Direct and Indirect Counts of Crocodiles

Amphibious nature of Crocodilians allows us to count them directly on land and water. Crocodiles basking on the land during daytime are easier to count and size can be estimated. Night surveys coinciding with the peak activity of crocodilians are productive in terms of finding, counting and catching them. Counts are usually restricted to the period of tide when 50 cm or more of exposed banks are visible from the base of vegetation lining the water (Rodger, 1991). At night, handheld "not so bright light" are the best to capture the "eyeshine" (Magnusson 1982). Very bright lights should be avoided as it washes out the eye shine from smaller crocodilians and those that are nearby. To keep hands free, headlamps are as important as spotlights.

Presence, absence and relative abundance of crocodiles in a given area can also be assessed from indirect evidences such as drag mark, faecal matter on the shorelines or nesting evidences.

Each unique location of detected crocodiles need to be recorded in decimal degrees using a global positioning system (GPS). The sizes of the crocodiles need to be classified as a Hatchling (<50 cm), Yearling, juvenile (>50<120 cm) Sub Adult (>120<180 cm), Adult (>180 cm) or eyeshine only (EO) for submerged individuals (Rodger, 1991; Bayliss, 1987; Thorbjarnarson et al., 2000). Other parameters such as time and location of sightings, activity of sighted crocodile, weather condition, moon stage, vegetation, Human disturbance, wave condition etc. should be recorded.

This method can yield an index of crocodilian population present at any given time. Regular surveys and census can provide information on status and population trend.

A suggested Performa sheet for recording census data is provided in ***appendix 1***.

5.1.4. Camera trapping

Although crocodiles are predominantly aquatic, they require access to terrestrial habitats such as mudflats and water edges for nesting, foraging and basking. Camera traps may be placed in a systematic manner and the spacing was approximately equal to the daily movement distance of male crocodiles as reported by Kay (2005). Cameras can be attached to trees lining the creeks at an uninnundable height. The cameras were oriented toward mudflats (potential basking sites) and waterways, with an average distance of 4.5 metres between the camera and the target mudflat. Heat and motion in front of the camera sensors triggered the cameras, and there was no delay between detection events.

5.1.5. UAV Survey

Use of UAV is particularly useful in difficult to sample areas such as creeks. Aerial surveys may be conducted using Drones equipped with a 4K camera. Crocodile surveys in such way may be conducted during peak basking season. DroneDeploy will be used to create a predefined flight plan over the target area, after which flights in autopilot mode will be deployed to capture aerial imagery of a selected 2km transect based on phase 1 survey. Photographic Mark recapture technique may be tested to see the validity of the technique to estimate population in salt water crocodile. UAV mediated distance sampling may be used to estimate the population of the crocodile in GNI.

5.1.6. Environmental DNA Sampling

eDNA sampling technique is a reliable way to detect the presence and abundance of aquatic species. For eDNA sampling, water samples will be collected from various location of the creeks in plastic Nalgene/glass bottles using a syringe to reduce the sediment load in the water sample. Water samples will be filtered and DNA extractions will be conducted using a DNeasy Blood and Tissue Kit following the standard protocols required for the isolation. Using GenBank BLAST, target species. May be identified Available gene bank sequences will be aligned and look for 12-20 bp conserved regions. DNA amplification will be done using traditional PCR (Polymerase chain reaction) maintaining the annealing temperature. The PCR samples will be purified using QIAquick® PCR Purification Kit. The verified amplified products will be sequenced at the in-house sequencing facility in Wildlife Institute of India. The aligned sequences will be used to generate pairwise genetic distances in MEGA (Kumar

et al, 2016; Kumar et al, 1994) and haplotype network will be built to check genetic variation in the haplotypes collected from different river systems.

5.1.7. Occupancy

To quantify saltwater crocodiles' site occupancy, environmental and anthropogenic factors affecting occupancy with single-season models in both maximum-likelihood and Bayesian frameworks, which accounts for imperfect detection of crocodiles during the surveys. Data from repeated spotlight surveys may meet the assumptions of single-season occupancy analyses in a grid based framework. The main assumptions in single-season occupancy analysis include (1) closure i.e. the population is assumed to be demographically closed during the course of surveys, (2) site independence, (3) no-false positives and (4) constant probability of occupancy and detection assumption Site covariates shall be collected at the 500 m intervals along the waterways which might affect saltwater crocodile occupancy.

For occupancy models, R package may be used to compare Akaike Information Criterion (AICc) of all possible models with covariates and the goodness-of-fit tests were performed using various recommended statistical tests with 200 bootstraps using the R package "unmarked" (Fiske and Chandler, 2011). For Bayesian occupancy models, Markov chains Monte-Carlo (MCMC) with 30,000 iterations will be used of which 1000 were discarded as burn-in and checked the values of Rhat (bR) validate whether or not the models reached convergence.

5.2. Monitoring Crocodile Movement

Understanding the ranging pattern and dispersal mechanism of crocodile are crucial for managing conflict situation. As there is no information on spatial ecology of salt water crocodile of GNI, it is proposed to monitor movement and ranging pattern of different age and sex of individual in selected crocodile habitats, which fall within the Holistic Developmental Project areas.

5.2.1. Rationale: Movement is a fundamental aspect of species ecology and distribution. A lack of understanding about how different organisms move in relation to habitat and resource availability may lead to management constrain. Thus, it is crucial to know seasonal, temporal, age and sex specific movement for informed management decision.

Saltwater crocodiles are the only crocodilian species known for its wide range of distribution (Ross, 1998) and also have been reported for long oceanic movements (Bustard & Choudhury, 1980).

Although they often venture far and wide including in sea, the frequency and seasonality of such forays are poorly known.

5.2.2. Capturing and marking Crocodiles

Being an Island with limited resources, capturing large crocodiles in GNI may be a logistic issue. Thus proper planning and professional team build-up is needed much before the operation. Animals may be captured from boat that may include hand-catching, tongs, dip nets for small crocodiles. For large crocodiles, traps may be used in animal sighting or basking sites. These cages are generally in the form of metal cages or fortified nets. Traps may be camouflaged and baited. Noosing prove effective if it is possible to approach close enough to place a noose around animal's neck or snout. The pole may be made out of bamboo, fibreglass, plastic and other lightweight and flexible material. Once restrained, animals can be sexed by visually inspecting the genitalia (Webb et al. 1984) and a subset of morphometric measurements may be taken (*Appendix 2*). Crocodiles were mostly processed onboard the boat but larger animals were sometimes towed to the bank and processed on land. Crocodiles may be uniquely marked by clipping the caudal scutes (*Appendix 3*). Colourful plastic Cattle tags may be used on the tail scutes of the crocodiles. Portions of small tissue should be preserved for future genetic study. In addition, passive integrated transponders (PIT tags should be subcutaneously implanted in juvenile and subadult animals (*Appendix 4*). Restrained animal may be fitted with radio-transmitter in their nuchal scutes for post release monitoring.

5.2.3. Handling Crocodiles

Once an animal is captured by any of the above mentioned method, it needs to be blindfolded with a heavy sack thrown over its head ensuring that the nostril are open. Specifically identified team member can approach the crocodile from behind and jump on the neck of the crocodile. The first team member must pin the neck and head down to stop it from being able to spin around. Other team member should put the weight on the pelvic and tail area of the crocodile almost synchronously. The person sitting on the neck region should secure the mouth of crocodile and use plastic cable, rubber band to tie it. The eyes and ears should have remained covered till this stage. While releasing the whole procedure may be reversed with mouth tie may be release at the last. Never to let lose any crocodile with tied mouth. Animals that have struggled while rescue operation may need time to recover due to build-up of lactic acid in the muscle. During handling and recovery time, optimum body temperature should be maintained. For more detailed method and veterinary interventions while handling Crocodiles Mallapur et al (2019) may be consulted.

5.2.4. Telemetry Studies

VHF transmitters may be attached either on the nuchal scutes or on the tail. These techniques would provide analysis of home range, temporal selection of habitat, differences in male, female and juvenile movement pattern, directionality of movements, site fidelity and behavioural interactions.

Analysis of such dataset in a GIS platform will provide spatial usage of habitat by crocodiles in GNI. These would help in framing of better conservation management plan for the species. Habitat suitability model will be one of the crucial outputs from the study of home range of the species.

5.2.5. Monitoring ranging pattern in Crocodiles

Salt Water Crocodile are known for their remarkable navigational ability and homing instinct. Translocated individuals are known to travel more than 400 km of coastline in 20 days (Read et al. 2007). A male individual that was even chemically sedated at the site of capture and translocated have travelled 118 km in 12 days (9.8 km/d) to return to the area of capture.

One or two adult individuals in each group can be captured and satellite transmitters may be fitted on them as per protocol. Satellite transmitters will be programmed with appropriate duty cycles to maximise life time of the battery, at least up to two years. The tags will be attached to crocodiles using two-part Epoxy resin adhesive. Additionally, wire will be used to secure transmitters firmly. The signals sent by the PTTs may be downloaded from the ARGOS website and will be used for mapping their movements and locations of crocodiles.

5.3. Monitoring Nesting Habitat

5.3.1. Rationale: Factors determining nest site selection, nesting behaviour, hatching success and juvenile dispersal are central to management of crocodile population within its carrying capacity. However, aspect of nesting ecology in GNI is hitherto not known. Although, crocodiles are widely distributed in the island, but population expansion through intrinsic breeding appears to be constrained by the lack of suitable breeding habitat (freshwater swamps).

The effects of temperature on hatching success and post-hatching fitness-related traits have been documented in crocodiles (Webb and Cooper-Preston, 1989). Incubation temperature also crucial for offspring size, behaviour and determinant of offspring sex in many oviparous reptiles including crocodiles. Such aspects of studies are not known from GNI

5.3.2. Identification of Nesting Sites

Locating Saltwater Crocodile nest is relatively easy as this species build a mound nest utilizing vegetation and soil (Kopstein, 1929; Deraniyagala, 1939, Webb et al. 1977; Whitaker & Whitaker, 1978 Whitaker et al., 1980; Graham, 1981). There is vast nesting seasonality differences of *C. porosus* throughout its distributional range. Nesting in Bhitarkanika occurs during the summer before the arrival of the monsoon (Gopi et al., 2007).

Nests may be located from the reconnaissance boat based diurnal surveys, using UAV, walking along the creeks or via information gathered from local people. Each nest locations will be recorded using a hand held GPS and nest site covariates should be recorded. *Time-lapse camera* may be installed to study behavioural aspects of nesting while dataloggers need to be installed to study the thermal profiling of the nest. Suitable nesting habitats will be identified and mapped during the monitoring period with the application of remote sensing and GIS techniques.

5.3.3 Nest Protection

Identification of nesting sites, their protection, conservation and management must be given priority. Beside collecting scientific data regarding nesting and hatching success, nest need to be protected and monitored. Dedicated volunteers designated by forest department and researchers may monitor the Crocodile nest pre and post hatching period. Looking at the nest guarding behaviour of the crocodiles, the nest area need to be secured from human interference and adequate awareness campaign may be generated in the surrounding areas.

5.4. Population Genetics

5.4.1. Rationale: Maintenance of genetic diversity is a major management objective of a species because genetic diversity represents evolutionary and adaptive potential. Large populations show greater adaptive capabilities than small or fragmented populations. Consequently, genetic potential of species with a small population size is compromised because they have less initial genetic diversity, and loose genetic diversity at a greater rate in each generation, than species with a large population size (Frankham et al. 2002).

5.4.2. Genetic study

There is no genetic study so far conducted on GNI population of Salt Water Crocodile. Thus genetic sampling should be done to determine population structure using microsatellite markers, evidence of bottleneck if any and effective population size. Such study is more relevant post holistic development of GNI.

Photo: Large Marsh near Indira Point is an ideal habitat for Crocodile Nesting proposed as a CCZ in figure 2.

6. MANAGEMENT PLAN

The aim the management plan is to ensure long term conservation of Saltwater Crocodile and its habitat in GNI. The management principles in achieving the objectives should be based on robust scientific data, rigorous monitoring and scientific rescue and rehabilitation practices. Authority to implement the management prescriptions are the Andaman and Nicobar Forest Department.

The programme have following objectives

1. Identification and characterization of crocodile habitats in different management zones as per the Action Plan (Action Plan, 2018).
2. To ensure public safety through prohibition, regulation and crocodile rehabilitation.
3. To improve community awareness for crocodile human coexistence.

6.1.1 Need statement:

Salt Water Crocodile is a natural predator in the ecosystems and may be considered as "keystone" species (Thorbjarnarson, 1992) that maintain ecosystem structure and function. They are also protected under Wildlife (Protection) act 1972 and thus deserve protection. It has been observed that, salt water crocodiles occur in low densities in GNI and there is hardly any human crocodile conflict situation reported from the area. However, learning from the Andaman examples, it is visualized that with the increase in developmental activities and tourism, crocodile conflict may rise in next ten years. Thus, proactive management plan identifying Crocodile Conservation Zone, Human Crocodile Co-existence zone, Crocodile Free zone need to be identified to deal with the future crisis situation to ensure coexistence. Andaman and Nicobar Forest Department already endorsed the Action Plan 2018 prepared by Wildlife Institute of India, Dehradun. In order to address the crocodile conservation issues arising from the proposed holistic development project, following management prescriptions are being made-

6.2. Crocodile Conservation Zone (CCZ)

These zone will include areas falling under Coastal Regulatory Zone that are proposed to be part of Coastal Tourism as per holistic development plan. Crocodile Conservation Zone need to be designated for the conservation of salt water crocodiles in the Proposed holistic Project site. Human activities such as fishing, swimming, aqua-culture, cultivation, washing, wading and bathing should not be allowed while guided eco-tourism in the form of crocodile watching and research activities may be permitted. ***Coastal regulatory zone designated as per the plan is about 1,943 ha, of which approx. 571 ha (in four unit) of coastal regulatory zone shall be designated as Crocodile Conservation Zone*** (Figure.2).

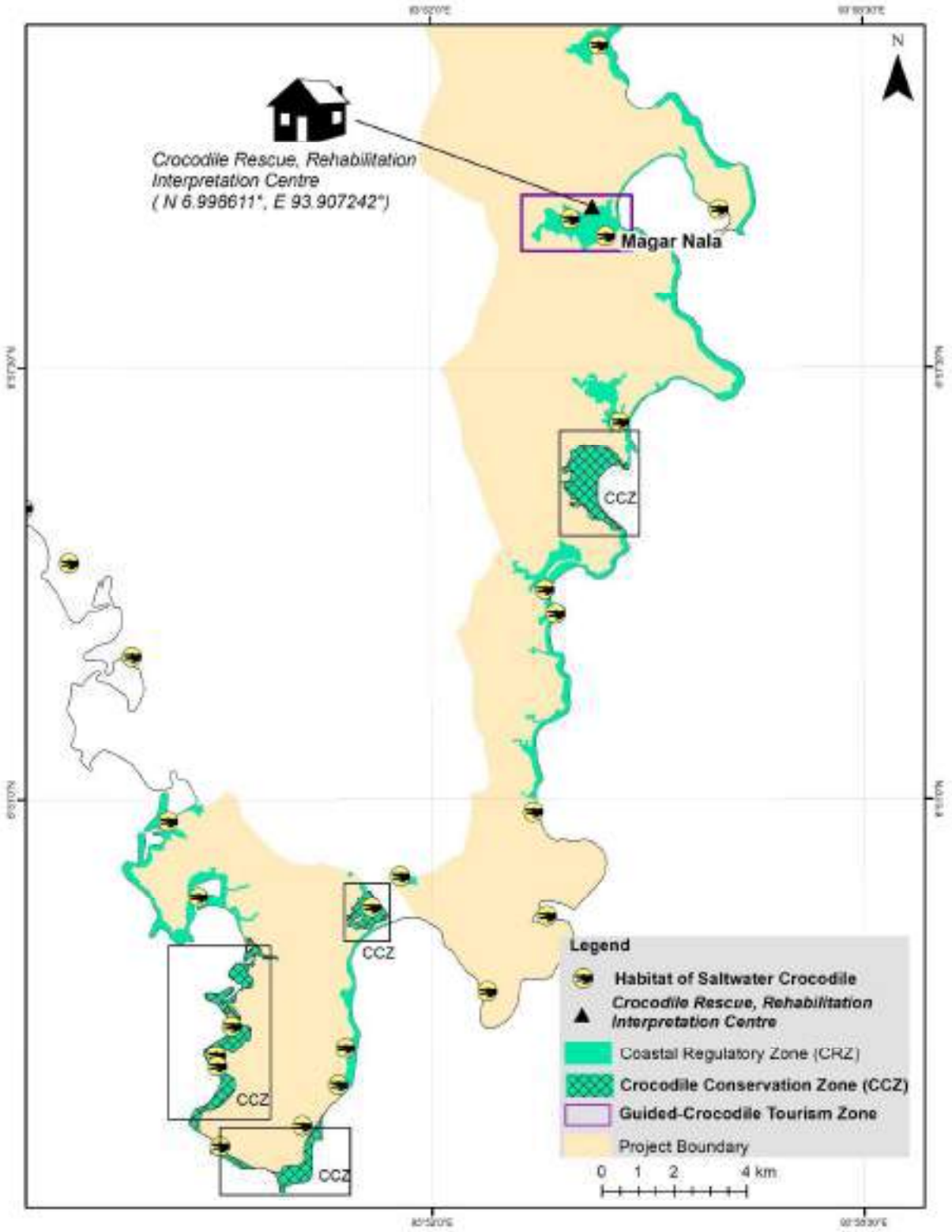

Figure 2: Four Units of Coastal Regulatory Zone Should be recognised as Crocodile Conservation Zone

6.2.1. Establishment of Anti-Poaching Camps:

The species has the most commercially valuable *hide* of any crocodilian, and was intensively hunted for skins historically throughout their range. Whitaker and Andrews (2003) pointed out "poaching" as one of the threat to the adult and Subadult Crocodile population in Nicobar Island. Thus, is recommended that **antipoaching camps may be installed at all the four designated CCZ unit (**Near Vijaynagar, Galathia, Near Indira Point and Landing Point). Possibility of more such camps may be explored in the western side of the Island.

6.2.2. Crocodile Rescue and Rehabilitation Centre

It is proposed to develop one Crocodile Rescue and Rehabilitation Centre (CRRC) close to Magar Nala (**Figure 2**) to deal Crocodile management issues. The centre should have good rescue equipment, rehabilitation tanks etc. Clinical facilities should also be established, and veterinary staff deployed to monitor regular health status and basic treatment. As per the action plan (WII, 2018) the capacity of CRRC should be enough to house around 50 crocodiles initially. The location of the CRRC should be strategic to avoid any natural disaster. Design of CRRC can be developed by experts and in consultation with Central Zoo Authority. The centre should have a trained manpower to deal with captive crocodile management issues including artificial incubation. It is proposed to develop a state of art interpretation facility to disseminate knowledge about crocodile biology. The same interpretation facility will act as knowledge centre to dismay negative attitude towards these giant prehistoric reptiles.

6.3. Human Crocodile Co-Existence Zone (HCCZ)

These zone will include areas falling under Coastal Regulatory Zone that are proposed to be part of Coastal Tourism as per holistic development plan. They are bordered mainly by green and recreational areas, creeks and areas where crocodile habitat and human settlements are in close proximity. In these zones, holistic development plan overlaps with the crocodile habitats resulting in possible human crocodile conflicts in future. Management interventions would therefore be oriented towards achieving a peaceful co-existence of both. As per the action plan to mitigate human crocodile conflict in Andaman and Nicobar Island, Management action plan for HCCZ should include-

1. Joint patrolling team
2. Establishment of Crocodile Conflict Hotline
3. Quick Response Team
4. Safeguarding Tourism areas
5. Capacity Building of forest officials and members of JPTs

Approx. 819 ha (in five unit) of the Coastal tourism zone should be designated as Human crocodile coexistence zone (HCCZ) as shown in Figure 3. Magar nala which is coming within HCCZ may be designated as a special unit where only guided crocodile tourism is permitted instead of Coastal tourism **(**Figure.3).

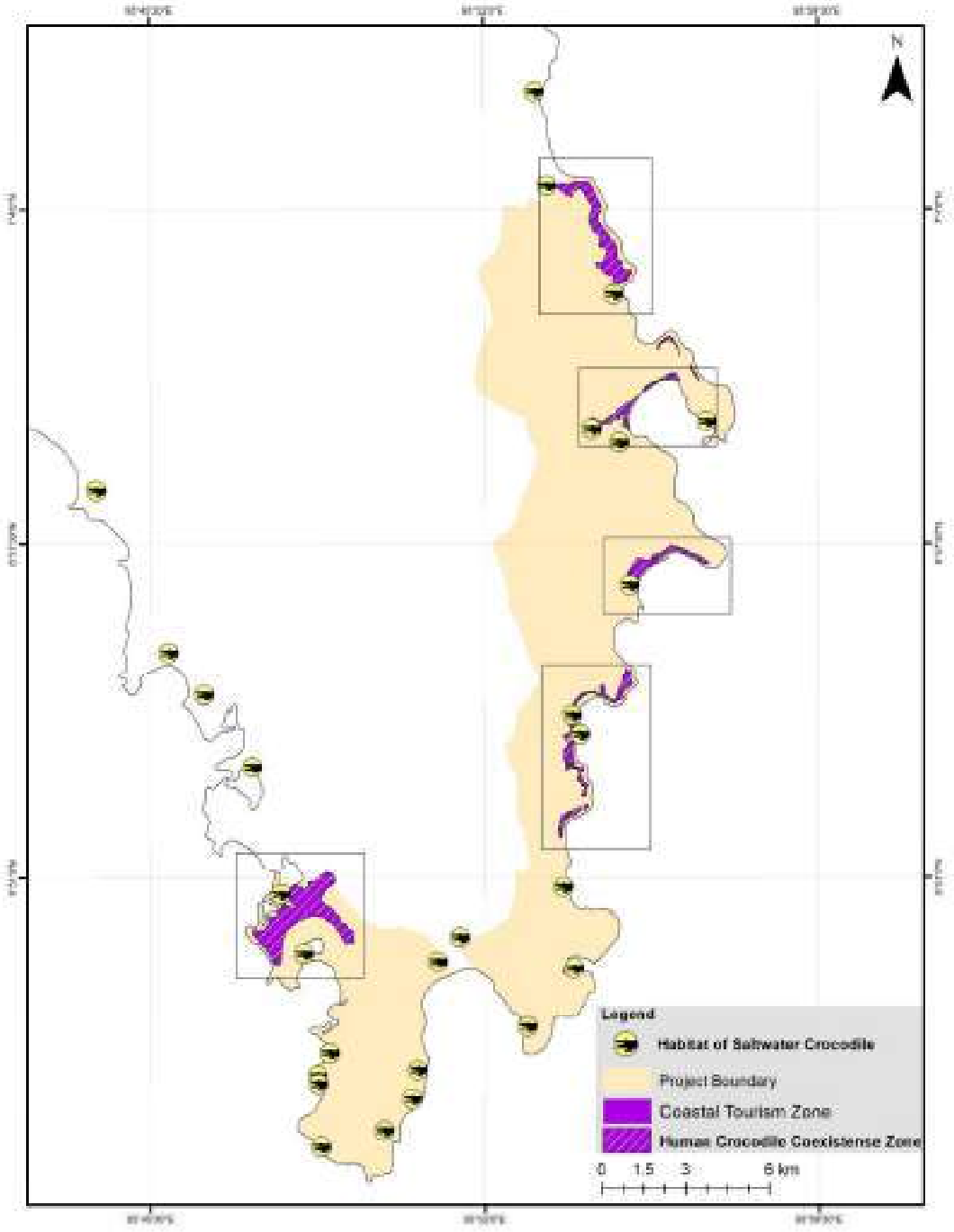

Figure 3: Coastal Tourism Zone should be recognised as Human Crocodile Co-Existence Zone

6.3.1. Joint Patrolling Team

For effective surveillance, regular patrolling involving members from forest department, Police department, gram Panchayat members, and local villagers may be ensured. Local village youths should be paid wages as per local administration's norms. These teams will be trained for crocodile monitoring and communication link via '*Crocodile Hotline*' with the QRTs (Quick Response Teams), Forest Range office and Divisional headquarters. Each JPT will be equipped with a boat and a crocodile Rescue Kit (RK).

6.3.2. Establishment of Crocodile Conflict Hotline

Crocodile conflict hotline should be established for better surveillance and monitoring at Head Quarter and connecting it with 'Crocodile Monitoring Huts' and Quick Response Team. This Hotline is needed for rapid reporting of any sightings of crocodiles near tourist or human inhabited area. This hotline should be made popular using radio programs and local newspapers.

6.3.3. Quick Response Team

'Quick Response Teams' (QRT) shall be constituted by the Forest Department in order to take immediate action in case of conflict situations. Two QRT team comprising of trained experts with support staff would be stationed at the Campbell bay and Galathia Bay. Each QRT should have at least one speed boat, one customized four wheelers for animal transport, crocodile handling kits. QRT members should be trained adequately within India or even in other countries to deal with crisis situation effectively.

6.3.4. Crocodile Monitoring Huts (CMHs)

The action plan 2018 also recommend establishment of Crocodile Monitoring Huts (CMH) in HCCZ and CFZ. In view of the holistic development of the GNI, such huts should be established in strategic locations to safeguard tourists from any untoward incidents. These monitoring huts will be manned by a trained forest staff or a local villager. UAV technologies should be used to monitor crocodile movements in these areas. Establishment of Four CMH is proposed in four HCCZ as marked in the **Figure 3**.

6.3.5. Safeguarding Tourism areas

Department with the help of local administration should ensure appropriate behaviour from tourist to avoid any dangerous incidence. A dedicated team should be involved in speed boat patrolling around

the HCCZ. This team should also be equipped with an appropriate communication system and first aid kits. Further, drones' CCTV and acoustic sensors can also be used to monitor both tourist as well as crocodiles at these important beaches/snorkelling sites/diving sites. Strict restriction should be imposed for any organic garbage disposal in these designated HCCZ areas.

Feasibility of securing tourist beaches from creeks and mangroves by erecting iron mesh, grill gates may be explored based on research findings (Annexure 2 of the Action Plan 2018). Catchy signages like the famous Australian "*Be Crockwise"* with helpline number may be installed along the tourist zones. Watch towers should be erected at selective beaches where the tourist presence is high.

6.3.6. Capacity Building of forest officials and members of JPTs

Handling crocodile is a specialized job and needs proper training. Within India, ANFD may approach Madras Crocodile Trust for organizing at least two training camps a year for the purpose. International exposure may also be planned for the capacity development (Such as Sawarak Forestry Corporation in Malaysia). In these trainings, priority should be given to the members of JPTs and QRTs. The trained manpower can act be helpful in in house training programmes. The duration, timings, contents and location of trainings should be chalked out by the ANFD with the training agencies.

6.4. CROCODILE FREE ZONE (CFZ)

As per the holistic development plan of GNI, an Airport is proposed to be constructed in two phases in Gandhinagar and Shastrinagar area. As per the plan, it is the only site within the project area that is flat enough to facilitate bi – directional take-off and landing. The runway would be 3 km long and 45-meter-wide which include reclamation of a wetland where crocodile presence is known (As per Forest Department Data).

Crocodile Free Zone may be designated in area where wetland reclamation is planned for developmental activities (**Figure 4**). Any crocodile from the proposed reclamation zone as per the current holistic development plan should be translocated following Action Plan 2018. As these animals are currently not involved in Conflict, they shall be radiotagged/satellite tagged to monitor their movement if they are released in the wild.

To avoid any future conflict, efforts should be made to isolate this particular area from the main creek/nallah. Isolation of these stretches should be carried out by way of Setting up of grill gates, check dams, bamboo fences or Installation of Crocodile Exclusion Enclosure (CEE) as delineated in the Action Plan 2018 (**Figure 4**). However, experts are of the opinion that such efforts will not guarantee crocodile proof landscapes, and need to be taken with care.

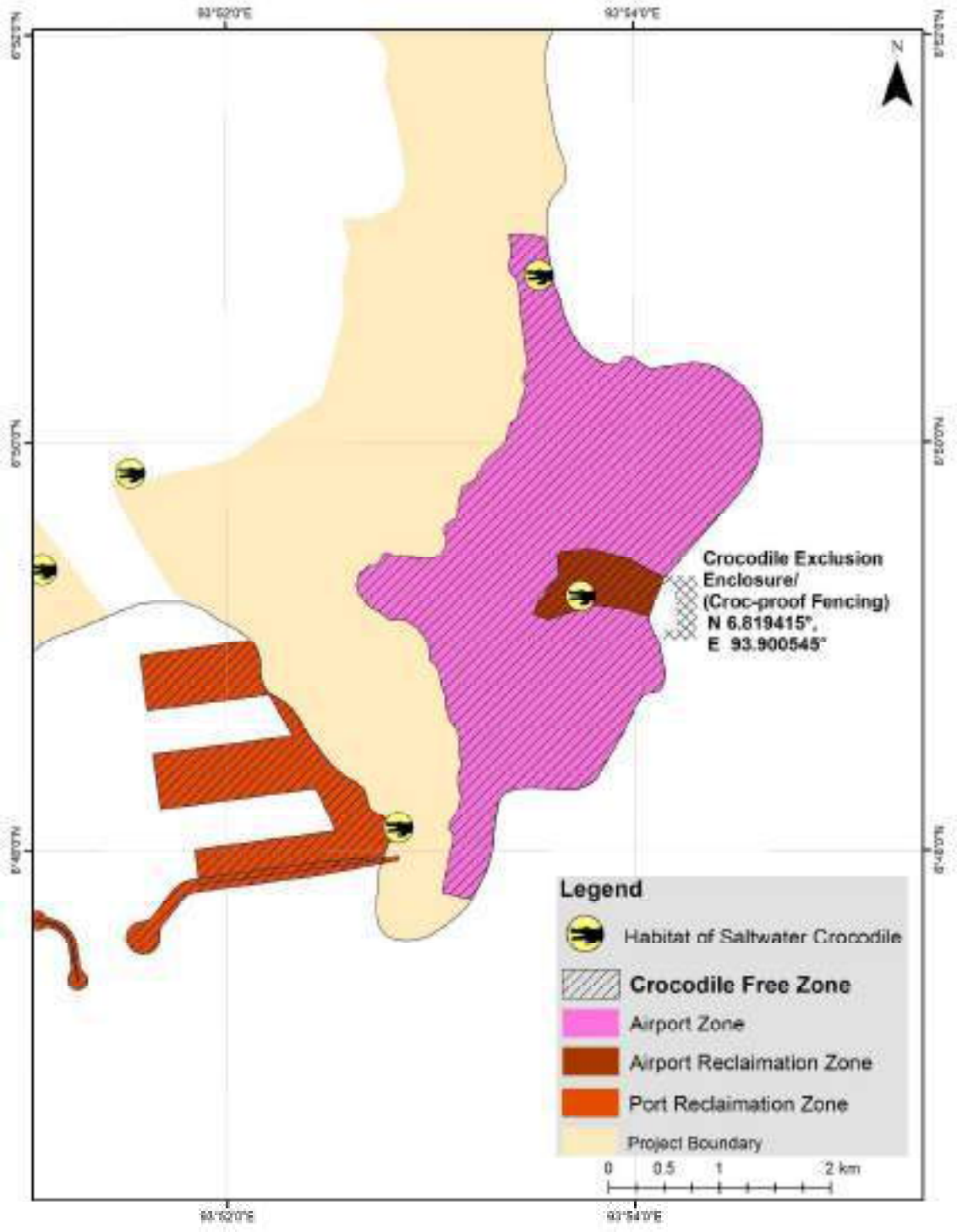

Figure 4: Crocodile free Zone should be designated at the land area reclaimed for Airport and other associate development.

6.5. Awareness & Community Connect for Conservation

The Department of Environment and Forests in the Andaman and Nicobar Islands promotes crocodile awareness among residents and visitors by disseminating educational information via brochures, pamphlets and warning boards (Kumar et al 2012). With the new development plan in GNI, the crocodile awareness programmes may be scaled up in schools. Awareness programmes may be conducted via the proposed Interpretation facilities or organised in school and colleges in Wildlife Week, World Environment Day etc. Appropriate signages with crocodile safety instructions may be installed in designated tourist places. Local media may be engaged for awareness generation.

6.5.1. Garner Public Support in Crocodile Conservation

In the view of future escalation of Human-Crocodile conflict situation in GNI, funds may be allocated to pay quick compensation to crocodile attack victims. As per the action plan, include provision of compensation for loss of cattle life as many locals lose their cattle by crocodile attack. It is proposed to revise the amount of compensation every third year.

6.5.2. Setting up of a Human Crocodile Conflict Task Force

Crocodile Action plan also suggest to establish an institutional mechanism to monitor and implement the Management Plan of HCC in ANI incorporating members from local administration, Forest department, tourism, fishery, agriculture, shipping, defence, Wildlife Institute of India, Zoological Survey of India and Madras Crocodile Bank Trust.

Table 1: Management Plan Implementation, Monitoring and Evaluation Matrix for ten years.

	Activities	1	2	3	4	5	6	7	8	9	10
MONITORING	Population assessment										
	Camera Trapping										
	eDNA										
	UAV Survey										
	Occupancy Estimation										
	Capture and Marking										
	Telemetry										
	Nest Monitoring										
	Genetic Monitoring										
MANAGEMENT	Identification of CCZ										
	Identification of HCCZ										
	Identification of CFZ										
	Establishing Hotlines										
	Establishing QRT and training										
	Establishment of Crocodile Monitoring Huts										
	Establishment of Rescue & interpretation Centre										
	Croc-Awareness										

Table 2: *Indicative budget for the Conservation and Management Plan (Amount in Lakhs in INR)

	Activities	First Five Years	Next Five Year	Remarks
MONITORING	Population assessment	75	75	This include Salary of the Researchers involved in the research
	Camera Trapping and other research equipment's	50	50	50 Units of Camera Traps, Camera, Computer Dataloggers etc,
	eDNA sampling	30	--	Include field and Lab sampling
	UAV monitoring	20	-	Four Units
	Occupancy Estimation	10	10	Include manual survey
	Capture and Marking	100	100	Cage, restraining equipment's etc
	Telemetry	100	-	VHF and Satellite Tags
	Travel	75	75	This include travel of Scientists and Researchers as well as vehicle hiring
	Boat Maintenance and Fuel	75	75	For Research and Patrolling activities
	Nest Monitoring	25	25	Include field work and setting up team for survey and monitoring preferably by locals
	Total	**560 Lakhs**	**410 Lakhs**	
MANAGEMENT	Management of CCZ	200	200	For establishing four ant poaching camp
	Management of HCCZ	500	500	For achieving all the objectives under this head
	Management of CFZ	100	100	This include two customized Rescue Vehicle, Rescue Kits, Cages
	Establishing Hotlines	20	20	Mobile communication, Wireless station
	Boat	30	--	For Surveillance and research
	QRT training	100	100	Two QRT teams with all necessary equipment's and vehicle
	Crocodile Monitoring Huts	100	100	Four Huts in designated HCCZ Zones with CCTV cameras
	Establishment and maintenance of Rescue & interpretation Centre	500	250	Rescue, Rehabilitation, Captive facility and Crocodile Interpretation centre
	Croc-Awareness	100	100	For Awareness materials, sinages, workshops, seminar
	Compensation Schemes	100	100	For any possible future conflict involving Human and cattle.
	Total	**1750 Lakhs**	**1470 Lakhs**	

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Appendix 1

CROCODILE CENSUS DATA SHEET

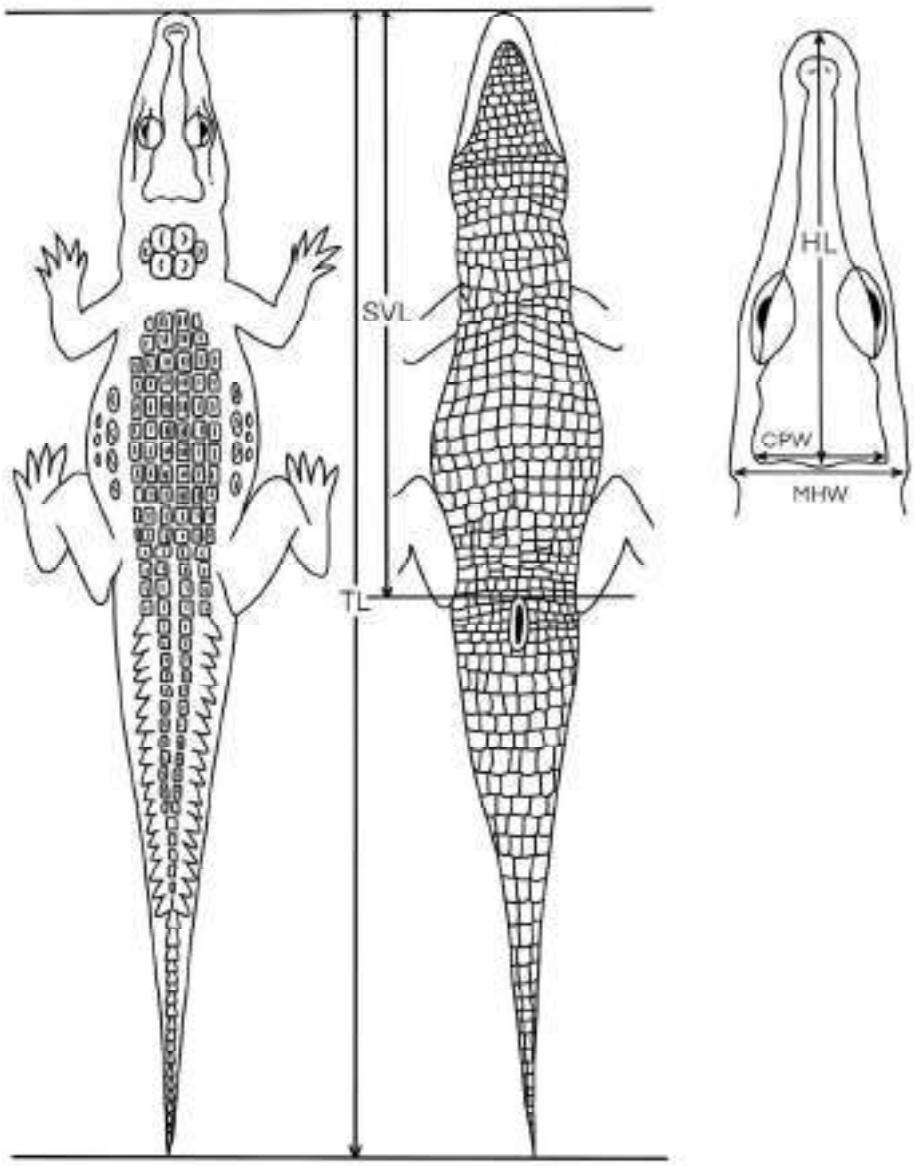
Creek/River ----------Day/Night count …….Date……

Creek/River Length covered……

Size Class	Number Seen	Location OL/IVIM/SWOE/MS	GPS location
Hatchling <60cm Yearlings >60<120cm S. Adults >120<180 Adults >180 EO			
Total			

OL=On Land, IVIM-In Vegetation in Water, SWOE=Shallow Water on Edge, MS= Mid Stream

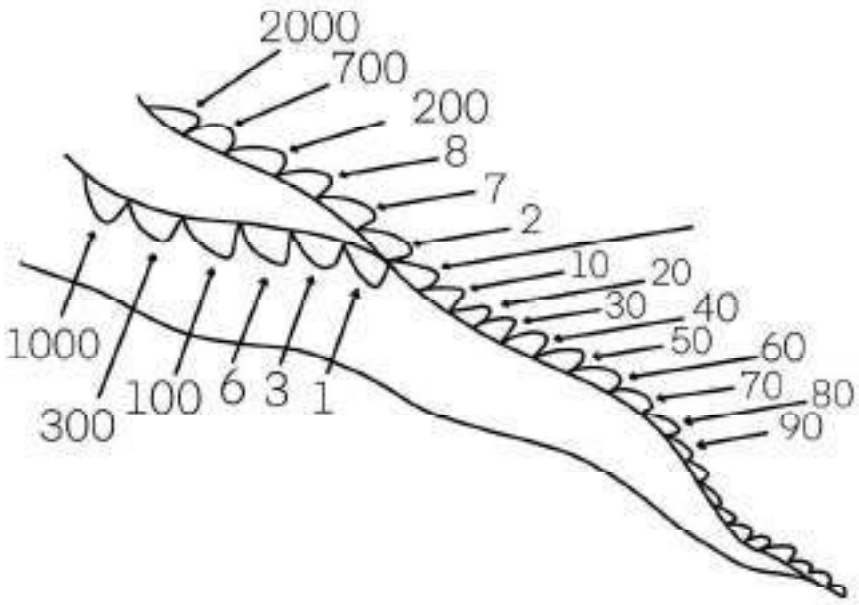
Appendix 2: Morphometric measurements of Salt Water Crocodile (Modified after Kay 2004-5)



Terminologies After Kay 2004-5

SVL= Snout to Vent Length; TL=Total Length; HL=Head Length, CPW=Cranial Platform Width; MHW=Maximum Head Width

Appendix-3: Diagramatic Illustration of the Scute Marking Technique.
(Modified after Bourquin, 2007)



Enclosure - 21

EMP COST

CONSTRUCTION PHASE

EMP cost during Construction Phase

ICTT		Cost (in INR Crores)	
SN	Attribute	Capital cost	Recurring cost
1	Land Environment/Soil Erosion	2,754.00	-
2	Reclamation (Including Airport Reclamation)	10.00	-
3	Ecology - Leatherback Turtles	141.83	-
	Ecology - Megapodes	18.21	0.50
	Ecology - Mangroves	11.50	-
	Ecology - Salt Water Crocodiles	32.20	-
	Ecology - Coastal Vegitation	3.00	-
	Ecology - Coral Reefs	53.57	-
4	Road construction	0.10	-
5	Air Emission	0.90	-
7	Waste Water	-	0.04
8	Solid Waste	0.10	-
9	Social	-	0.50
Total Capital Expenditure on EMP for ICTT (Construction Period 8 Years)		**3,025.41**	**1.04**

AIRPORT		Cost (in INR Crores)	
SN	Attribute	Capital cost	Recurring cost
1	Land Environment	-	-
2	Air Environment	-	1.40
3	Water quality /Wastewater Generation	0.04	-
4	Noise Environment	-	0.10
5	Ecology	-	0.20
6	Solid Waste	0.10	-
Total Capital Expenditure on EMP for Airport (Construction Period 4 Years)		**0.14**	**1.70**

POWER PLANT		Cost (in INR Crores)	
SN	Attribute	Capital cost	Recurring cost
1	Land Environment	-	-
2	Soil Environment	-	0.30
3	Air Quality	-	0.45
4	Water Quality	0.10	-
5	Noise Levels	-	0.02
6	Solid Waste	0.10	-
7	Terrestrial Ecology	-	-
8	Aquatic Ecology	1.00	-
9	Socio-Economics	-	1.00
Total Capital Expenditure on EMP for Power Plant (Construction Period 7 years)		**1.20**	**1.77**

TOWNSHIP		Cost (in INR Crores)	
SN	Attribute	Capital cost	Recurring cost
1	Land Environment	-	2.00
2	Air Emissions	-	0.90
3	Water & Wastewater generation	0.28	-
4	Noise Levels	-	1.00
5	Solid waste generation	7.00	-
6	Natural Hazard vulnerability and Disaster Management system	10.70	-
7	Command & Control centre	100.00	-
Total Capital Expenditure on EMP for Township (Construction Period 12 Years)		**117.98**	**3.90**

Total EMP Cost during Construction Phase	**3,144.73**	**8.41**

EMP COST

OPERATION PHASE

EMP cost during Operations Phase

ICTT		Cost (in INR Crores)	
SN	Attribute	Capital cost	Recurring cost
1	Land Environment	20.00	-
2	Changes in Coastline/Shore line	50.00	-
3	Ecology	-	150.00
4	Fire and explosion hazards	0.30	-
Total EMP Cost for ICTT during Operations Phase		**70.30**	**150.00**

AIRPORT		Cost (in INR Crores)	
SN	Attribute	Capital cost	Recurring cost
1	Land Environment	-	0.03
2	Air Emission	-	-
3	Water & Wastewater	-	-
4	Noise Pollution	-	0.10
5	Solid Waste	-	-
6	Fire and explosion hazards	0.30	-
Total EMP Cost for Airport during Operations Phase		**0.30**	**0.13**

POWER PLANT		Cost (in INR Crores)	
SN	Attribute	Capital cost	Recurring cost
1	Land Environment	0.15	-
2	Ecology	0.25	-
3	Noise	-	0.10
4	Fire and explosion hazards	-	0.30
Total EMP Cost for Powerplant during Operations Phase		**0.40**	**0.40**

TOWNSHIP		Cost (in INR Crores)	
SN	Attribute	Capital cost	Recurring cost
1	Water & Wastewater generation	350.00	-
2	Solid waste generation	150.00	-
3	Solid waste generation	50.00	-
4	Socio - Economics	2.50	-
5	Fire and Explosion hazards	4.80	-
6	Ecology	-	0.02
Total EMP Cost for Township during Operations Phase		**557.30**	**0.02**

Total EMP Cost during Operations Phase	**628.30**	**150.55**

EMP COST
MONITORING PHASE

EMP cost during Monitoring Phase

MONITORING COST / YEAR		Cost (in INR Crores)
SN	**Attribute**	**Broad cost**
1	Land Environment/Soil Erosion	0.02
2	Changes in Coastline/Shore line	1.00
3	Meterology	5.00
4	Ecology	11.60
5	Air Emission	8.00
6	Noise Pollution	3.00
7	Waste Water	7.50
8	Solid Waste	0.10
9	Social	0.20
10	Drainage and Effluent Management	0.01
11	Non Routine Events/Mock up Drill / Contingency	0.10
12	Health checkups	0.20
13	Public Information System/Display	0.70
Total Monitoring Cost		**37.43**

EMP COST SUMMARY

EMP Cost - Construction			
S.no	Project	Cost (in INR crores)	
		Capital Cost	Recurring cost
1	ICTT	3025.41	1.04
2	Airport	0.14	1.70
3	Power Plant	1.20	1.77
4	Township	117.98	3.90
TOTAL		**3144.73**	**8.41**

EMP Cost - Operation			
S.no	Project	Cost (in INR crores)	
		Capital Cost	Recurring cost
1	ICTT	70.3	150
2	Airport	0.3	0.13
3	Power Plant	0.4	0.4
4	Township	557.3	0.02
TOTAL		**628.30**	**150.55**

Monitoring		
S.no	Project	Cost (in INR crores)
		Annual Cost
1	All	37.43
TOTAL		**37.43**

The above cost of EMP has been reviewed and approved by the Project Proponent

Volume-4

Sl. No.	Particulars
1.	**Annexure R-5** Public Hearing Notice, Minutes of Public Hearing, Comment compliance on Public Hearing and Comment compliance on Draft EIA Report.
2.	**Annexure R-6** Extract of EIA Chapter- 5 regarding Analysis of Alternatives (Sites)
3.	**Annexure R-7** A&N (Protection of Aboriginal Tribes) Regulation, 1956
4.	**Annexure R-8** No objection letter dated 18.11.2020 for de-notification of Tribal Reserve Area issued by Ministry of Tribal Affairs
5.	**Annexure R-9** Delegated Powers of the State Govt. to the Administrator/ Hon'ble Lt. Governor – Gazette Published dated 07.06.2022
6.	**Annexure R-10** Committee formation vide order No. 148 dated 26.07.2022
7.	**Annexure R-11** RoFR Certificate under FRA Act, 2006 dated 18.08.2022
8.	**Annexure R-12** Guidelines of Forest (Conservation) Act, 1980 formulated by the MoEF&CC dated 22.05.2019

Annexure R-5

Public Hearing Notice, Minutes of Public Hearing, Comment compliance on Public Hearing and Comment compliance on Draft EIA Report.

ANDAMAN & NICOBAR ADMINISTRATION
POLLUTION CONTROL COMMITTEE
DEPARTMENT OF SCIENCE AND TECHNOLOGY
Dollygunj, Port Blair-744 103, Tel/Fax: 250370
E-mail: dstpcc-andamans@nic.in

PUBLIC NOTICE

Public Hearing for Environmental Clearance for "Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands"

Whereas, M/s Andaman and Nicobar Islands Integrated Development Corporation Limited (ANIIDCO),has applied for obtaining Environmental Clearance under Environment Impact Assessment Notification 2006 for **"Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands"** which includes -

i. Integrated Development of International Container Transshipment Terminal (ICTT)-14.2 Million TEU
ii. Greenfield International Airport (4000 Peak Hour Passengers-PHP)
iii. Township & Area Development
iv. 450 MVA Gas and Solar based power plant in 16610 ha Great Nicobar Islands, Nicobar District at Great Nicobar Island, District Nicobar Taluka Campbell Bay

And whereas, the notification no. S.O. 1533(E) dated 14-09-2006 provides that projects, specified in schedule appended to the notification, shall not be undertaken unless it has been accorded Environmental Clearance by the Ministry of Environment & Forests, Climate Change Govt. of India.

And whereas, the above projects come in the category of projects requiring the Environmental Clearance from Ministry of Environment & Forest and Climate Change under EIA 2006, , Scheduled 7(e) Ports, Harbours, breakwaters, dredging; 7(a) Airports; 1(d) Thermal Power Plants; and 8(b) Townships and Area Development Projects.

And whereas, the Appendix-IV appended for the notification aforesaid provides for **Public Hearing** by the State Pollution Control Board (SPCB) or the **Union Territory Pollution Control Committee (UTPCC)** inviting suggestions/ views/ comments/ objections from the affected persons before Ministry of Environment & Forest and Climate change, Govt. of India takes up the case for the Environmental Clearance. Now, therefore, Andaman Nicobar Administration Pollution Control Committee (ANPCC) invites suggestions/ views/ comments/ objections from the persons likely to be affected by the grant of Environmental Clearance which shall include local authorities, association of person likely to be affected by the project and environmental groups within 26.01.2022.**The EIA report / summary of proposed projects can be seen / studied** by interested persons in the office of the District Magistrate (Nicobar), The Rural Development and Panchayat, The District Industries Office, Port Blair, The Special Officer/Administrator , Gram Panchayat Campbell Bay, Great Nicobar Tehsil, Nicobar District, The Divisional Forest Officer (Campbell Bay, Nicobar Division, The Department of Education, A&N Administration, The Tribal Council Office(Campbell Bay), The ANPCC office (Department of Science and Technology, Dollygunj, Port Blair)the Additional Principal Chief Conservator of Forests (C), MoEF & CC, Regional Office (SEZ), Ist & IInd Floor, Handloom Expert Promotion council-34, Cathedral Garden Road Nungambakkam, Chennai-34 on all working days during office hours for submitting written suggestions to the ANPCC and the Executive summary of the project can also be seen at website of A & N Administration (www.andaman.gov.in) and Department of Science &Technology (https://dstpcc.andaman.gov.in/).

A Public hearing for the said projects is scheduled to be held as per details given below:

S.No	Name of the project	Date & Time	Venue
1.	**Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands" including 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 Great Nicobar Islands, Nicobar District at Great Nicobar Island, District Nicobar Taluka Campbell Bay, Andaman and Nicobar Islands**	27-01-2022 at 11.00 AM	Community Hall, Gram Panchayat Campbell Bay, Great Nicobar Tehsil, Nicobar District, Andaman and Nicobar Islands.

Sd/-
(V. V. Dinesh Kumar)
Member Secretary, ANPCC
File No. 4-11/PCC/PH/2021/1035
Dated: 26 /12/2021

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ANPCC

No.4-11/PCC/PH/2020/ 1235

अंडमान तथा निकोबार प्रशासन
ANDAMAN & NICOBAR ADMINISTRATION
प्रदूषण नियंत्रण समिति
POLLUTION CONTROL COMMITTEE
DEPARTMENT OF SCIENCE AND TECHNOLOGY
Dolly Gunj, Port Blair-744 103 Tel/Fax 250370
e-mail: dstandamans@gmail.com

ED(GM1)
R.D. No: A6
Dt. of Receiving: 07/02/2022
Dt.of Dispatch:

Dated: 03-02-2022

To

The Executive Director,
Andaman and Nicobar Islands Integrated Development Corporation Ltd (ANIIDCO)
Vikas Bhawan, P.B.No.180,
Port Blair-744101, Andaman & Nicobar Islands

Sub : **Public Hearing for Environment Clearance to Proposed Project "Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands" at Community Hall, Gram Panchayat Campbell Bay, Great Nicobar Tehsil, Nicobar District, Andaman and Nicobar Islands -reg;**

Sir,

With reference to Ministry of Environment and Forest, GoI, letter No. IA/AN/NCP/201159/2021 dated 25.05.2021 the Executive Director Andaman and Nicobar Islands Integrated Development Corporation Ltd (ANIIDCO) has submitted request letter vide letter No. F.No 1-1601/ANIIDCO/Projects/2021-22/Vol.V/3958 dated 24-12-2021 for conducting public hearing for Environmental Clearance to the project titled "Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands".

In this connection, Andaman & Nicobar Administration Pollution Control Committee has conducted public hearing on 27.01.2021 at 11.00 am in the Community Hall, Gram Panchayat Campbell Bay, Great Nicobar Tehsil, Nicobar District, Andaman and Nicobar Islands in systematic and transparent manner ensuring widest possible public participation.

A copy of public hearing proceeding along with all the correspondence made is enclosed for your kind reference and further process at your end.

Yours faithfully,

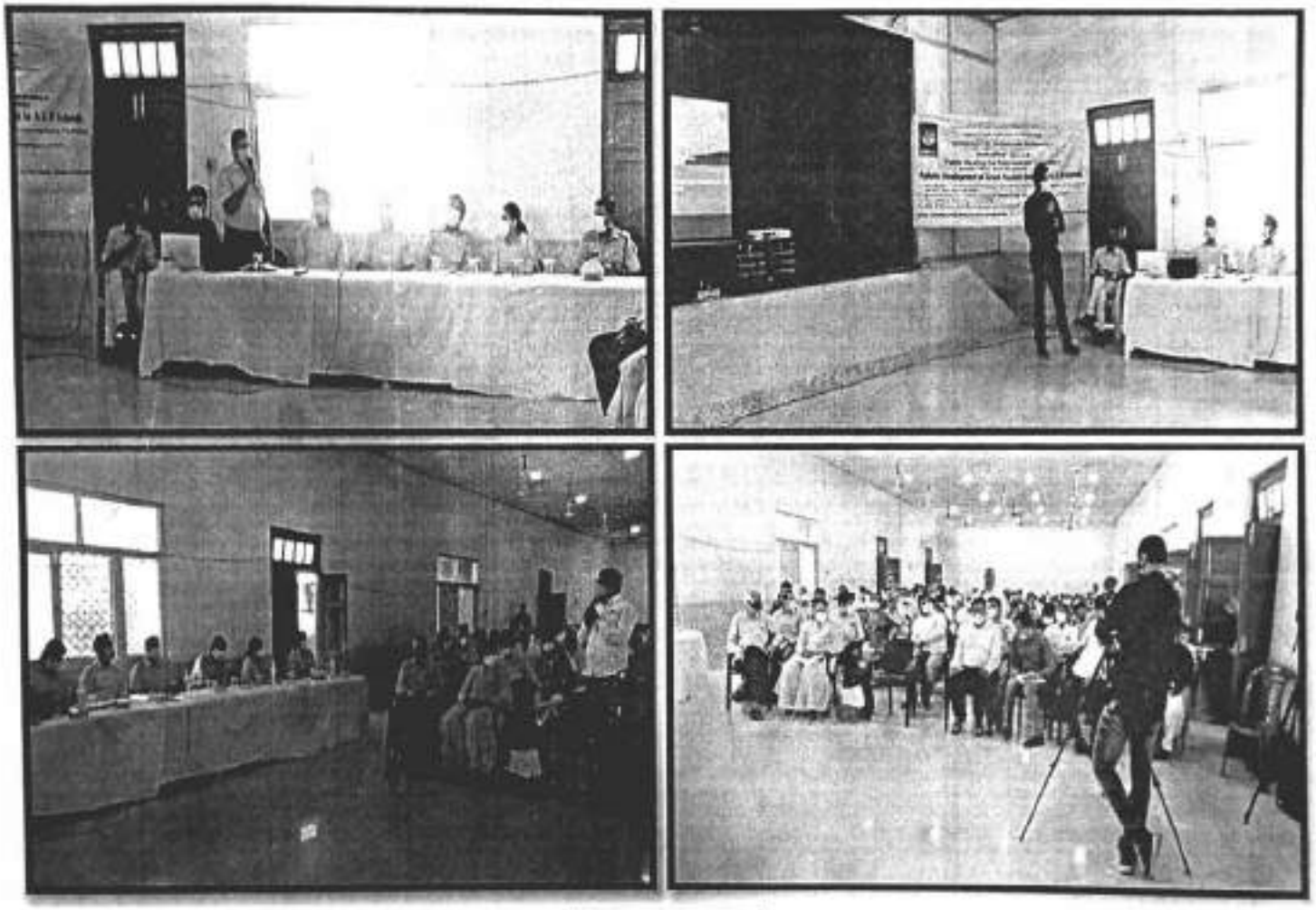
Encl: A/a.

Member Secretary, ANPCC

COMPILATION OF THE PROCEEDING OF PUBLIC HEARING

FOR

ENVIRONMENTAL CLEARANCE TO PROPOSED PROJECT "HOLISTIC DEVELOPMENT OF GREAT NICOBAR ISLAND IN ANDAMAN & NICOBAR ISLANDS" AT COMMUNITY HALL, GRAM PANCHAYAT CAMPBELL BAY, GREAT NICOBAR TEHSIL, NICOBAR DISTRICT, ANDAMAN AND NICOBAR ISLANDS.



ANPCC

Andaman and Nicobar Administration Pollution Control Committee
Science and Technology Bhawan, Dollygunj, Port Blair
Phone/Fax: 03192-250370
Email: dstandamans@gmail.com

Proceedings of the Public hearing held on 27.01.2022 at 11.00 AM under the Chairmanship of Deputy Commissioner (Nicobar)at Community Hall, Gram Panchayat, Campbell Bay, Great Nicobar Tehsil, Nicobar District forEnvironmental Clearance to proposed project "Holistic Development of Great Nicobar Island in Andaman and Nicobar Islands".

The Government/Administration has decided for holistic development of Great Nicobar Island (GNI) for Andaman and Nicobar Islands and Andaman Nicobar Islands Integrated Development Corporation LTD (ANIIDCO), A&N Administration has been appointed as project proponent for implementation of the project.

Public hearing was conducted as per MoEF&CC Notification No. S.O. 1533 (E) dated 14.06.2006 and its subsequent amendment S.O. 3067 (E) dated 1.12.2009, for holistic Development of Great Nicobar Islands which includes Integrated Development of International Container Transhipment Terminal (ICTT)-14.2 Million TEU, Greenfield International Airport (4000 Peak Hour Passengers-PHP), Township & Area Development and 450 MVA Gas and Solar Based Power Plant, which is covered under category A project of the schedule 7 (e), 7 (a), 8 (b) and 1 (d).

The project proponent has submitted the draft Environmental Impact Assessment Report and the Executive Summary of the Environment Impact Assessment Report to ANPCC. The said EIA report and the summary report were sent to the following authorities to make available the draft EIA report for inspection of the public during office hours, till the public hearing is over.

1. The Deputy Commissioner (Nicobar), Car Nicobar, Andaman and Nicobar Islands.
2. The Director, Rural Development and Panchayat, Andaman and Nicobar Administration.
3. The Director, District Industries Centre,Andaman and Nicobar Administration.
4. The Divisional Forest Officer (Campbell Bay), Nicobar division.
5. The Special Officer/Administrator (Assistant Commissioner, Campbell Bay), Gram Panchayat Campbell Bay, Great Nicobar Tehsil, Nicobar District.
6. The Director, Department of Education, A & N Administration, for placing in public libraries.
7. The President, The Tribal Council Office (Campbell Bay),Great Nicobar Tehsil, Nicobar District, Andaman and Nicobar Islands.
8. The Additional Principal Chief Conservator of Forests (C), MoEF&CC, Regional Office, (SEZ), Ist & IInd Floor, Handloom Expert Promotion council-34, Cathedral Garden Road Nungambakkam, Chennai-34.

The Public Hearing was scheduled on 27.01.2022 at 11.00 am at Community hall, Gram Panchayat, Campbell bay, Great Nicobar Islands under the Chairmanship of the Deputy Commissioner, Nicobar District. Public Hearing notice was published in English and Hindi in local newspapers of Andaman and Nicobar islands including The Daily Telegrams, The Dweep Samachar, The Saheel ki Aur, The Arthik Lipi and also in National Newspaper - The Financial Express-Chennai Edition.

Accordingly, the Public Hearing was held on 27.01.2022 at 11.00 am and the Deputy Commissioner, Nicobar District presided over the entire public hearing proceedings. 138 participants

MS, ANPCC

attended the public hearing. The following officials of the A&N Administration were also present during the public hearing.

1. The Additional Principal Chief Conservator of Forests (FC&CRZ), DoE&F
2. The Executive Director, ANIIDCO (Projects)
3. The Assistant Commissioner (Campbell Bay)
4. The Member Secretary, Andaman and Nicobar Pollution Control Committee
5. The General Manager, ANIIDCO

At the outset, the Member Secretary, ANPCCwelcomedthe Chairperson, all dignitaries, general public of the Great Nicobar Island and the participants to the public hearing and gave a brief on the objective, background and procedure of the Public hearing. He mentioned that, according to EIA Notification 2006, the public hearing is to be organized to inform about the proposed project, the outcome of EIA and give opportunity to seek information or clarifications on the project from the project proponent. The public hearing is organized to inform about the outcome of EIA and for ascertaining concerns of local affected persons, their suggestions, apprehensions, comments and views of the general public on the proposed project.

The Executive Director and Project Manager, AECOM has given an overview of the comprehensive Environmental Impact Assessment study conducted for the Holistic Development of Great Nicobar Island including the Integrated Development of International Container Transshipment Terminal alongwith Green Field International Airport, township and Area Development and gas and solar based power plant in 16610 ha in Great Nicobar Islands and elucidated the need for such development and the benefits of the project. Shri Ram Sushil Mishra, EIA Coordinator, Vimta Labs presented the key findings of the Environment Impact Assessment study and the mitigation measures proposed to minimize the impacts and protect the interests of Nicobarese, Shompens, other inhabitants and the ecology and environment of Great Nicobar island. The holistic development is intended while preserving and maintaining the natural ecosystem and rich bio-diversityof GNI.

Thereafter, suggestions, comments, opinions, apprehensions, and responses, if any were invited from the participants of the public hearing in order to clarify the doubts/apprehensions and forward the same to the project proponent to address all the environmental, social and economic concerns expressed and make appropriate changes in the draft EIA report and EMP, and to send the report of the public hearing to MoEF&CC for further action.

1. Shri Barnabas Manju, Chairman, Tribal Council (Great Nicobar and Little Nicobar Islands) on behalf of the tribal community has whole heartedly welcomed the proposed developmental project. The Chairman, Tribal Council has praised the A & N Administration for bringing the holistic development in GNI, which once implemented would generate ample employment and also increase the tourism activities in GNI. He reiterated that due to the implementation of the project in GNI, there will be no loss to tribal communities in the

MS, ONPA

present location as they were relocated and settled in Tsunami Shelter at 7 KM. Further he informed that the Nicobar tribal intends to go back to erstwhile village, Chingen from the tsunami shelter. He requested GoI to take necessary measuresfor relief and rehabilitation of the tribal community of GNI while implementing the holistic developmental project.

2. Shri E.S Rajesh, Ex-Pradhan, Campbell Bay has complimented the A & N Administration for taking forward the holistic development of GNI and shared that the project which he had been hearing since 1980's has now come to a stage for its implementation. On behalf of the settlers' he wanted to know that how much land of the settlers will be acquired while implementing the project. He further informed on behalf of farmers that GoI has settled the farmers in 1969. The first and second generations have faced lot of problems due to poor road connectivity and other social and economic issues. He wanted to know the details of land that will be acquired from the farmers and also requested to provideappropriate alternate land for their survival and compensation at par with the rates of Port Blair Tehsil, South Andaman and in addition he demanded that Govt. job should be provided to one member of each family of the farmers.

   The Executive Director and Project Manager, AECOM responded that the area covered for the project area starts from North of Campbell Bay to Galathea and barest minimum private land will be acquired for the project. The details of the land acquisition will be shared at later stage once the project is approved and the compensation will be given as per the applicable Acts and Rules.

3. Shri Anil Kumar Singh R/o Campbell Bay has welcomed the proposed developmental project and requested to improve and develop the defence sector in GNI. He further requested toprovide the compensation at par with Delhi rates and also demanded for govt. jobs to family members whom will be displaced while acquisition of the land. He further wanted to know when the project will be started.

   The Executive Director and Project Manager, AECOM informed that GoI, A & N Administration and the project proponent ANIIDCO is making efforts to obtain the required permissions and approvals. He further informed that the project proponent is approaching MoEF&CC to get the Environmental Clearance and once it is obtained, the project work will be implemented at the earliest.

4. Shri. Azad Singh, R/o Shastrinagarhas expressed his happiness regarding the implementation of the Project in GNI anddemanded that they need proper compensation and suitable alternate land while acquiring the land. He emphatically mentioned that the children have faced lots of problem in the past for their survivals and requested the administration for better livelihood with proper relief and rehabilitation.

5. Shri. Amrit Singh Rawat R/o Shastri Nagardemanded good alternate land as well as proper relief, rehabilitation and compensation for the settlers. He informed that due to tsunami, the settlers had undergone a very bad time and had lost everything. After the tsunami, the settlers had toiled hard for reviving their agricultural land and restarted cultivation as well as rebuilt the houses. Compensation was not provided adequately after the tsunami. Therefore, he requested to provide alternate land as well as handsome compensation to avoid any future hardship.

MS, ANPCC

6. Smti. Sathyavathi Devi R/o Shastrinagar wanted to know where and when they will be shifted. She also complained regarding non-receipt of compensation for the loss incurred during tsunami.

7. Shri. Parash Kumar R/o Gandhinagar wanted to know when the land will be acquired, demanded suitable compensation of the land and also demanded govt. job for depended members of the ex-serviceman family of Campbell Bay. He has whole heartedly welcomed the proposed holistic development project in GNI.

8. Smti. Rupa Tirkey R/o Campbell Bay expressed her happiness for the proposed project. Sherequested the administration to create and develop higher educational facilities/institutions for economically backward people and demanded for secured employment for the locals and settlers of Campbell Bay on priority. She has also demanded for proper compensation to the farmers for land acquisition.

9. Ms. Jantha, Gujarat inquired about the resettlement of tribal population in light of de-notification of tribal and forest area in GNI.

   The Executive Director and Project Manager, AECOM has informed that since settlement of the settlers in GNI, tribal area as well as the forest area were well demarcated. No tribals are presently staying in the proposed project area after the tsunami of 2004. Further the inhabitant area of tribals are kept away from development. A total of 84.10 Sq. Km tribal reserve area is proposed to be included in the phase –I of the proposed development project in GNI. Whereas 45.23 Sq.km of new area are to be notified as tribal reserve within the National Park and further 31.73 Sq.km of new area are also proposed to be notified as tribal reserve outside the National Park. Hence a total of 7.11 Sq.km of net area of tribal reserve is proposed to be de-notified as tribal reserve.

10. Shri. Kulachand R/o Gandhinagar informed that as per the Land Reform Act, 2013, the land value is very less hence he demanded the acquisition rates may be fixed at par with Delhi rates and also demanded for ownership of the land to the settlers. He further requested not to include the town area of Campbell bay for the project.

11. Shri.Machael R/o Gandhinagar has welcomed the project in GNI and requested for separate quota in Govt. jobs for children of ex-servicemen.

12. Smti. Jaishree R/o Campbell Bay has whole heartedly welcomed the Project in GNI and extended her support for the proposed developmental project. She informed that no shelters were provided during the tsunami and requested not to repeat it again. She requested for proper implementation of relief and rehabilitation package.

13. Smti. Saiamma R/o Gandhinagar belongs to fisherman settler community and demanded for better livelihood and govt. jobs and she wanted fair employment opportunity for them on implementation of the proposed project.

14. Shri. Rafique Mohd. R/o Gandhinagar who belongs from farming community wanted to know the exact area of the land identified for acquisition, so that he can plan the future development of his land and farming activity accordingly.

MS, ANPCL

In response to above queries, the Executive Director and Project Manager, AECOM has clarified that it is difficult to give exact details of the extent of land of each individualsto be acquired at this stage, as the project is still in the process of obtaining necessary approval from different authorities. He further explained that, barest minimum land from the private land holders will be acquired to avoid any inconvenience to the local inhabitants.He emphasised that the holistic development will be for betterment of the locals, settlers, farmers and tribal community of the GNI. He further added that compensations for private land shall be given as per the prevailing Acts and Rules. Other concerned persons having plausible stake in the project were requested to send their responses in writing to the concerned regulatory authorities.

Overall, the public had shown an overwhelming support for the project and requested the Administration that their concerns and interests must be addressed as they have faced untold hardship and difficulties in the island.

At the end, the Member Secretary, ANPCC thanked the chair, all the dignitaries and participants present during the public hearing. He reiterated that most of the querieswere on for providing adequate compensation of the land that may be acquired while implementation of the proposed project andbetter livelihood of the people. The Member Secretary, ANPCC hoped that the participants got the satisfactory replies about the overall proceedings of the public hearing. He further informed that GNI project will bring better livelihood to all the inhabitants of the GNI. He informed that the report of the public hearing will be send to MoEF&CC for taking necessary action.

The following written suggestion/comments received by ANPCC through email and are enclosed with this proceeding as **Annexure A1 to A13**.

S.No	Name of the individuals/agencies/organizations	Date of receipt
1	Ms. JankiAndharia, Professor and Dean, Jamsetji Tata School of Disaster Studies, Mumbai.	18-01-2022
2.	Executive Committee and Member of Madras Naturalists Society, Chennai.	24-01-2022
3	Shri. Vinoy Tandon, IFS, Retd PCCF, Himachal Pradesh, Veteran Member of ANI Group.	24-01-2022
4	Ms. Debi Goenka, Executive Trustee, Conservation Action Trust, Mumbai.	25-01-2022
5	Shri. Uma Shanker Singh, Director, Vanashakti, Lucknow.	25-01-2022
6	Shri. Pankaj Sekhsaria, Member of Kalpavriksh, Pune.	25-01-2022
7	Association of Indian Primatologists.	25-01-2022
8	Indian Anthropological Association	25-01-2022
9	Shri. Rajeev Suri, Environment Action Group, New Delhi	26-01-2022
10	Ms. MadhuriMondal	26-01-2022
11	Authors from group of primatologists, wildlife biologists and Environmental conservationists	26-01-2022
12	Ms. NehaSinha, Head, Conservation and Policy, Bombay Natural	26-01-2022

MS, ANPCC

	History Society	
13	Group of 143 signatories from all over the India	26-01-2022

Shri. Prasad Khale, Senior Conservation Officer, Conservation Action Trust, Mumbai through email on 20.1.2022 informed that the uploaded maps and layout in the draft EIA report were not legible. The ANPCC has uploaded the uncompressed EIA Report consisting of 150 MB in the website of Department of Science and Technology on 22-01-2022 and informed himof the same and provided the link of the website. Shri. Prasad Khale, Senior Conservation Officer, Conservation Action Trust, Mumbai on 25.01.2022 requested for providing VC link for online participation of the public hearing on 27.1.2022. All efforts were made but due to poor internet connectivity in Campbell Bay, the same could not be created/provided.

The List of participants present during the public hearing is enclosed as **Annexure B.**

Video of the proceeding of the public hearing in DVD is enclosed.

27/1/22

Member Secretary
ANPCC

27/1/22

Assistant Commissioner(Campbell Bay)
Nicobar District

Deputy Commissioner(Nicobar)
Nicobar District

The following were present in the public hearing held on 27-01-2022 at 11.00 AM in the Community Hall, Gram Panchayat Campbell bay, Great Nicobar Tehsil, Nicobar district for Environmental Clearance to Proposed Project "Holistic Development of Great Nicobar Island in Andaman & Nicobar islands" :

Sl. No.	Name of the Participants & Address
1.	Prof. K. B. Reddy, FAE in E&ES, Vimta Labs, Hyderabad
2.	TSL DargoTsharani , Vimta Labs, Hyderabad
3.	Ram Sushil Mishra, Vimta Labs Ltd., Hyderabad
4.	Ayyub Hassan, IFS, DFO, N/D
5.	Bhavmabas Manju, CTC
6.	S. Murugan, EE, APWD, Campbell Bay
7.	P. K. Singh, BDO, Campbell Bay
8.	D. Koch
9.	N. Madan Praveen, Settler, Campbell Bay
10.	Prahlad Singh, Gandi Nagar, Campbell Bay
11.	E. S. Rajesh, Ex. Pradhan LN/GP
12.	Dinesh Arora, AECOM
13.	Mohd. Parvez, ANIIDCO, Port Blair
14.	Anil Kumar Singh, G/N, Campbell Bay
15.	Gregory Tirkey, Gandhi Nagar, Campbell Bay
16.	Rajender Kaur Gill
17.	Paramjit Singh, Govind Nagar 8KM, Campbell Bay
18.	Kusum Mishra
19.	Markal Lagra, Gandhi Nagar, Campbell Bay
20.	Murat Singh, Shastri Nagar
21.	Sarjit Kumar, Gandhi Nagar
22.	Nilmall Kumar, Campbell Bay
23.	Sam Suman, Campbell Bay
24.	Charanjit Kaur, Campbell Bay
25.	Gurunath Kaur, Campbell Bay
26.	Ranjit Kaur, Campbell Bay
27.	Ajaib Sir, S/Nagar, Campbell Bay
28.	R. C. Kurup, Gandhi Nagar 30 KM
29.	M. Srinivasan, Gandhi Nagar 30 KM
30.	Sharad Bhide, L/Nagar 24 KM
31.	Rajan Singh, Gandhi Nagar
32.	Titus Peter, Captain Pillobhabi
33.	Paras Kumar, Gandhi Nagar
34.	Kisana Mandal, Campbell Bay
35.	Ashok Biswas, Gandhi Nagar
36.	Swapan Mandal
37.	Vichavati Devi
38.	Ganathari
39.	Mary Gace
40.	Nyanapu
41.	Ashok Kumar
42.	Priyanka Dhotre, Shastri Nagar

43.	Anomma John, Rajiv Nagar
44.	Prabhavali, Campbell Bay
45.	Rajni Tirkey, G/Nagar
46.	Jageet Singh
47.	J. Nagalingan, G/Nagar
48.	Bigam Ram, S/Nagar
49.	Mohan Sarkar
50.	Rafique Mohammed
51.	P. Kumar
52.	P. K.
53.	Satyavathi
54.	Mukesh Devi
55.	K. Kannan (Krishnan Textile)
56.	Jay Shree
57.	Prof. Balu Prakash, FR&DA
58.	N. Tushar
59.	Nirmal Kaur
60.	Sahib Kaur Gill
61.	Kartar Singh
62.	Hanuanth Wagh
63.	Satish Jadhav
64.	Narender Ram
65.	Ravindran Nair, Shastri Nagar
66.	Sreetam Engale, L/Nagar
67.	P. Vinent, S/Nagar
68.	Malan Wagh, L/Nagar
69.	Mukhi Palvey, Laxmi Nagar
70.	Lata Pawar, Govind Nagar
71.	Gloria Ekka, Gandhi Nagar
72.	Chaya Kedkar, L/Nagar
73.	R. Jayashree
74.	Balram Singh
75.	Jayram Pradhan
76.	Anup Lakra, G/Nagar
77.	Ranjit Tirkey, G/Nagar
78.	Raj Kumar, G/Nagar
79.	K. Raja Rao, AAJVS
80.	Geeta, G/Nagar
81.	Lorantus Minj
82.	N. M. Sarassav, G/Nagar
83.	R. Muthulaxmi, L/Nagar
84.	Pradeep Kumar, J/Nagar
85.	Sanjay Ekka, G/Nagar
86.	Krishna Kumar, Solarwork (G/Nagar)
87.	Sudhir Xalxo, G/Nagar
88.	Tanagi jatar
89.	Prem Prakash Ram, Govind Nagar
90.	P.Silva, Campbell Bay
91.	Malta Lakra, R.P.R.S, Campbell Bay
92.	Victoria Lakra, Gandhi Nagar
93.	Domnica Tirkey, Gandhi Nagar

94.	Lelin Kumar Sikdar, Gandhi Nagar, Campbell Bay
95.	V. Ramu Rani, Gandhi Nagar
96.	M. Jeeva Mani, Kamal Basti
97.	B. Rathi Paveli, Kamal Basti
98.	S. Vijayal, Kamal Basti
99.	M. Sutha Devi, Kamal Basti
100.	K. Thavshika, Kamal Basti
101.	Param Jeet Kaur, G.Nagar
102.	V. Pushpa, Kamal Basti
103.	Roppa Tirkey, C R P
104.	Sunil Kumar, Gandhi Nagar
105.	Harjinder Singh Gill, Govind Nagar
106.	Pawan Deep Singh, Govind Nagar
107.	Jagneet Singh, Joginder Nagar
108.	R. Saju, G/Nagar
109.	K. Sekhar, G/Nagar
110.	J. Ugir Velle, G/N
111.	Ajeet Kumar Xalxo, G/N
112.	Clara Dung Dung, G/N
113.	Sisiliga Ekka, G/N
114.	N. Murugam, 30 KM G/Nagar
115.	Sushma
116.	D. Bachme 30KM
117.	A.S Ravat, 30 KM
118.	Shamsher Singh, J/Nagar
119.	Stephen Raj (G/Nagar 30 KM)
120.	Vandna Lakra, Agri. Dept.
121.	Shri. P.S Prasad, Asst. Director, Agriculture Department
122.	Smti. Pitchamal Beevi, Agril Officer, Agriculture Department
123.	Prasanjit Lugun
124.	Hari Prakash
125.	Rakesh Tirkey
126.	Hosie, 2nd Captain Pillobhabi Vill
127.	Mary, Chingan Village
128.	Ratan, Chingan Village
129.	John, Chingan Village
130.	Mathias (Rajiv Nagar)
131.	Zankhna
132.	V. V. Mohd. Aslam, Forest Guard
133.	Mustaque, S/Nagar
134.	N. Sulaiman, Revenue Department
135.	Kiran Kumar, Revenue Department
136.	Jayaprakash, AC Office
137.	Kapoli Mondal, S/Nagar
138.	Malika Kerketta

HOLISTIC DEVELOPMENT OF GREAT NICOBAR ISLAND

COMMENT COMPLIANCE ON THE COMMENTS RECEIVED DURING THE PUBLIC HEARING

S.no	Comments received from
1	Shri Barnabas Manju, Chairman, Tribal Council (Great Nicobar and Linle Nicobar Islands)
2	Shri E.S Rajesh, Ex-Pradhan, Campbell Bay
3	Shri Anil Kumar Singh R/o Campbell Bay
4	Shri. Azad Singh, R/o Shastri nagar
5	Shri. Amrit Singh Rawat R/o Shastri nagar
6	Smti. Sathyavathi Devi R/o Shastri nagar
7	Shri. Parash Kumar R/o Gandhi nagar
8	Smti. Rupa Tirkey R/o Campbell Bay
9	Ms. Jantha
10	Shri. Kulachand R/o Gandhi nagar
11	Shri. Machael R/o Gandhi nagar
12	Smti. Jaishree R/o Campbell Bay
13	Smti. Saiamma R/o Gandhi nagar
14	Shri. Rafique Mohd. R/o Gandhi nagar

S.no	Comments received	Responses
1	Shri Barnabas Manju has praised the A&N Administration for bringing the holistic development in GNI, which once implemented would generate ample employment and also increase the tourism activities in GNI. He reiterated that due to the implementation of the project in GNI, there will be no loss to tribal communities in the present location as they were relocated and settled in Tsunami Shelter at 7 KM. Further he informed that the Nicobar tribal intends to go back to erstwhile village, Chingen from the tsunami shelter. He requested GoI to take necessary measures for relief and rehabilitation of the tribal community of GNI while implementing the holistic developmental project.	The Andaman and Nicobar administration is fully committed to the protection well being and welfare of the PVTGs including Shompens. Several welfare measures are being taken for the protection and well-being of the Shompen tribe. They are provided with ration items, raising plantation and medical care among others. It is stated that the project is aimed at Holistic development of Great Nicobar Island, which assure participatory development and social inclusion. The government is committed to ensure the provisions of Andaman and Nicobar (Protection of aboriginal tribes) regulation, 1956 to protect interest of the tribe is implemented strictly. While considering the proposal of sustainable development of Great Nicobar Island, the administration has consented in principal that (a) The project will not disturb or displace any Shompen/ Nicobari tribal or their habitation. (b) There will be a clear demarcation of land so that there is no scope of conflict that would arise in future. (c) Habitat rights of the tribal will be taken care of as per the Forest rights Act. These has also been considered while making Environmental Impact Assessment (EIA). The shompens will be eligible under the FRA, 2006 and the RFCTLARR, 2013 for compensation for the loss of their habitat (if any). A fair compensation will be devised and compensatory package would be developed exclusively and in addition to the resources already available, for the welfare and development of Shompen, while ensuring that their survival as a community, unique identity, culture and heritage are protected and preserved.
2	Shri E.S Rajesh on behalf of the settlers' he wanted to know that how much land of the settlers will be acquired while implementing the project. He further informed on behalf of farmers that GoI has settled the farmers in 1969. The first and second generations have faced lot of problems due to poor road connectivity and other social and economic issues. He wanted to know the details of land that will be acquired from the farmers and also requested to provide appropriate alternate land for their survival and compensation at par with the rates of Port Blair Tehsil, South Andaman and in addition he demanded that Govt. job should be provided to one member of each family of the farmers.	
3	Mr. Anil Kumar Singh requested to improve and develop the defence sector in GNI. He further requested to provide the compensation at par with Delhi rates and also demanded for govt. jobs to family members whom will be displaced while acquisition of the land. He further wanted to know when the project will be started	
4	Shri. Azad Singh, expressed his happiness regarding the implementation of the Project in GNI and demanded that they need proper compensation and suitable alternate land while acquiring the land. He emphatically mentioned that the children have faced lots of problem in the past for their survivals and requested the administration for better livelihood with proper relief and rehabilitation	

5	Shri. Amrit Singh Rawat demanded good alternate land as well as proper relief, rehabilitation and compensation for the settlers. He informed that due to tsunami, the settlers had undergone a very bad time and had lost everything. After the tsunami, the settlers had toiled hard for reviving their agricultural land and restarted cultivation as well as rebuilt the houses. Compensation was not provided adequately after the tsunami. Therefore, he requested to provide alternate land as well as handsome compensation to avoid any future hardship.	The administration shall ensure that the rights of tribal are fully preserved and no undue steps will be taken. As regards the land acquisition and compensation, it is reiterated that the project aims at holistic development of Great Nicobar Island, which assures participatory development and social inclusion. For this, the project design will strive to minimise the dislocation of families from their land and the requirement of acquisition of land for the project. The details of the land acquisition will be shared once the project design is finalised and the necessary approvals are taken. The compensation for the same will be given as per the relevant provisions under Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. The issues of allotment of alternate land (land against land), compensation for house and farm land will be decided in light of provision of the above-mentioned legislation and with approval of competent authority.
6	Smti. Sathyavathi Devi wanted to know where and when they will be shifted. She also complained regarding non-receipt of compensation for the loss incurred during tsunami.	
7	Shri. Parash Kumar R/o Gandhinagar wanted to know when the land will be acquired, demanded suitable compensation of the land and also demanded govt. job for depended members of the ex-serviceman family of Campbell Bay. He has whole heartedly welcomed the proposed holistic development project in GNI.	
8	Smti. Rupa Tirkey R/o Campbell Bay expressed her happiness for the proposed project. She requested the administration to create and develop higher educational facilities/institutions for economically backward people and demanded for secured employment for the locals and settlers of Campbell Bay on priority. She has also demanded for proper compensation to the farmers for land acquisition.	
9	Ms. Jantha, inquired about the resettlement of tribal population in light of de notification of tribal and forest area in GNI.	
10	Shri. Kulachand informed that as per the Land Reform Act, 2013, the land value is very less hence he demanded the acquisition rates may be fixed at par with Delhi rates and also demanded for ownership of the land to the settlers. He further requested not to include the town area of Campbell bay for the project.	
11	Shri. Machael has welcomed the project in GNI and requested for separate quota in Govt. jobs for children of ex-servicemen.	

12	Smti. Jaishree has whole heartedly welcomed the Project in GNI and extended her support for the proposed developmental project. She informed that no shelters were provided during the tsunami and requested not to repeat it again. She requested for proper implementation of relief and rehabilitation package.	
13	Smti. Saiamma belongs to fisherman settler community and demanded for better livelihood and govt. jobs and she wanted fair employment opportunity for them on implementation of the proposed project.	
14	Shri. Rafique Mohd. who belongs from farming community wanted to know the exact area of the land identified for acquisition, so that he can plan the future development of his land and farming activity accordingly.	

HOLISTIC DEVELOPMENT OF GREAT NICOBAR ISLAND

COMMENT COMPLIANCE ON THE COMMENTS RECEIVED ON THE DRAFT EIA REPORT

S.no	Comments received from	Number of comments
1	Jamshed Ji Tata School of Disaster Management (Tata School of Social Sciences)	2
2	Mr Prasad Khale, Senior Conservation Officer, Conservation Action Trust, Mumbai	162
3	Anthropological Survey of India (ASI)	8
4	Reena + 142 persons	89
5	The Executive Committee & Members of the Madras Naturalists' Society, Chennai	24
6	Mr Vinay Tondon IFS (retd), Former PCCF and HOFF, Himachal Pradesh, Veteran member of ANI Group	1
7	Mr Uma Shanker Singh IFS, DSc, Director, Vanashakti, Lucknow, UP	12
8	Mr. Pankaj Sekhsaria, on behalf of members of Kalpavriksh	3
9	Association of Indian Primatologists (AIP)	20
10	Rajeev Suri, Environment Action Group	27
11	Madhuri Mondal + 24 Persons	12
12	Bombay Natural History Society (BNHS)	15
TOTAL COMMENTS		**375**

Ms. Janki Andharia, Jamshed Ji Tata School of Disaster Management (Tata School of Social Sciences)

S.no	Comments received	Responses
1	This is to flag a concern that the proposed projects at Great Nicobar seem to miss a significant risk that is posed by the fact that the island lies on a major fault line and is also seismically active. Geological considerations become important in assessing disaster risks. Whilst the draft EIA records the occurrence of earthquakes in this region at several places, a systematic risk assessment is missing in the draft EIA Report on the project, which merely states mechanisms for disaster response. A risk analysis is therefore strongly recommended before proceeding with the proposed projects where the investment is expected to be Rs.75000 crores at current prices. The proximity of Great Nicobar to Banda Ache ensured that the 2004 tsunami caused by the undersea quake, created a major impact all along the fault line and the Nicobar group of islands were among the most severely affected. The existing airstrips, ports and jetties of the armed forces even though they were built to seismic standards, collapsed or cracked and were rendered un-usable. The air control tower at Car Nicobar had also collapsed, creating serious challenges for evacuation. The largest casualties in the country were from the Nicobar group of islands. It is important to recall the disaster event and factor in the possibility of a similar disaster occurring again, even though the draft EIA seems to downplay that possibility (see page C3-7).	The section on earthquake is being augmented in the EIA report based on recent research papers on probability of earthquakes in the Nicobar Region. Please refer Chapter 7, Section 7.3. To avoid substantial damage due to the earthquakes it has been suggested that all the structures for the development will follow the relevant standard codes to make structure earthquake proof.
2	At TISS we have a multidisciplinary team of faculty members in the School of Disaster Studies and my colleagues have done some analysis of the seismic activity in the region. This is attached here for your perusal. The scientific evidence suggests that a proposed container terminal at a site which experiences about 44 earthquakes every year (444 earthquakes in the last 10 years- see data attached- Annexure I), needs to be reconsidered. Should another major quake take place, the entire investment on infrastructure would be at risk and the resultant oil and chemical spill would create a major environmental disaster in an area that is renowned globally for its rich biodiversity, unrivalled on our planet. It is also well known that the lighthouse at Indira Point, the southernmost tip of the Great Nicobar	To avoid substantial damage due to the earthquakes it has been suggested that all the structures for the development will follow the relevant standard codes to make structure earthquake proof. Detailed disaster management plan (DMP) in the event of an earthquake /Tsunami (disaster) has also been suggested. Please refer chapter 4 page 15, 110, 135 and chapter 7 page 89.

	Island, which was on high ground before the undersea earthquake of 2004, is now under water, indicating a land subsidence of about 3-4 m.	
	As we understand, the proposed projects include an international container transhipment terminal, a greenfield international airport, a gas-based power plant and a township complex spread over 166 sq. km. which currently comprises pristine coastal systems and tropical forests. It is also expected that 6.5 lakh people will finally inhabit the island whereas the present population is only 8,500 at Great Nicobar and the total population of the entire island chain across about 1000 kms is less than 4.5 lakh people.	The estimated projected population for GNI after development is approximately 3.32 lacs instead of 6.5 lacs.
	The disaster risks involved in infrastructure development plans proposed by NITI Aayog for the Great Nicobar Island needs to be systematically re-evaluated based on a preliminary evidence attached of the instability of the island and the surrounding region.	Appropriate measures have been listed in the EIA report after detailed assessment. Please refer Chapter 4 &7 of the EIA report.
	We hope due attention will be paid to this aspect of possible damage and destruction of national property that could be caused by future earthquakes, volcanic eruptions and tsunamis, especially when India has taken the lead in establishing a global Coalition of Disaster Resilient Infrastructure (CDRI).	The earthquake section of the EIA report is being updated with additional data. Please refer Chapter 7, Section 7.3.

Mr Prasad Khale, Senior Conservation Officer, Conservation Action Trust, Mumbai

S.no	Comments received	Responses
1	We would like to bring to your notice that, many of the maps and layouts provided in the draft EIA report for "Holistic Development of Great Nicobar Island in Andaman & Nicobar Islands." are illegible.	The draft EIA document with clear maps has been uploaded by Andaman & Nicobar Pollution Control Committee, DST Andaman before the Public Hearing.
2	We would suggest that this Public Hearing be postponed until such time a revised draft EIA Report is prepared and made available in the public domain.	Public Hearing has been conducted on 27th January 2022
3	We would like to begin by pointing out that the NABET validity of the EIA Consultants was upto November 2021. The draft EIA Report submitted for this Public Hearing is dated December 2021 i.e. after the expiry of the accreditation. This draft Report therefore needs to be prepared and submitted by an accredited consultant.	NABET accreditation of EIA consultant has already been extended upto February 2023. Same will be reflected in the final EIA report.
4	It is also surprising that the Consultants have only one empanelled expert on Ecology and Biodiversity on their team for the purposes of preparing this draft EIA. It is also not clear what the domain expertise this individual possesses. Given the extremely important and irreplaceable biodiversity that the Great Nicobar Island possesses, it is surprising that only one expert was part of this team.	According to QCI-NABET scheme which is approved and enforced by the MoEF&CC, one approved Functional Area Expert (FAE) is required. The detailed ecology and biodiversity survey was carried out by Prof. K.Bayapu Reddy, a Retired Professor of Environmental Sciences and QCI-NABET scheme approved FAE in Ecology & Biodiversity. Prof. K.Bayapu Reddy has vast practical experience of over 38 years in conducting Ecology and Biodiversity studies involving many Islands in India and abroad. It is to be noted that Marine Ecological studies were also carried out by Zoological Survey of India (ZSI). team and with respect to marine turtle breeding grounds Wildlife Institute of India (WII) is involved. ZSI have been undertaking the studies in the island over decades and the data generated over the years have been included in the EIA report. WII also provided a report "An assessment of the environmental sensitiveness of sea turtle nesting beaches of the Great Nicobar Island" to ANIIDCO. The content of the report has also been included in the EIA study. Both the ZSI

		and WII reports are attached as attachment to the EIA report.
5	Copies of the reports prepared by the sub consultant, their accreditation details and their expertise have not been included in this draft EIA Report.	Accreditation details have been included in the EIA report. Please refer Chapter 12.
6	It is also not clear who the project proponent is, since AECOM has been appointed by the Niti Aayog and not be ANIIDCO.	ANIIDCO is the project proponent. Details has already been included in the EIA report, please refer Chapter 1 section 1.4
7	It is also surprising that AECOM has in turn appointed Vimta Labs as a consultant, even though the MoEF had clearly stipulated that the EIA consultant should be independent.	Vimta labs Pvt Ltd is an independent NABET accredited consultant.
8	A copy of the DPR prepared by AECOM has also not been included. This is a critical lacuna since the DPR would contain detailed engineering drawings showing the locations and alignments of the proposed projects including the breakwaters, jetties, buildings, airport, thermal power plant, township Development Plan, etc. Any change in these parameters during the construction stage would vitiate the findings of the draft EIA Report.	As per the EIA notification, project feasibility was to be attached in form 1 while applying for the TOR. The same was complied with. Further, the listed details in the comments (including project summary, project details, location, drawings etc) have already been included in the EIA report. please refer chapter 2.
9	It is also not clear whether the proposed power plant will be based on gas or coal.	The title of the EIA report itself explains that the power plant will be based on Gas and solar. Further details are covered in chapter 2D.
10	Noncompliance with ToRs – It is clearly evident that the draft EIA Report has been submitted without complying with several ToR. Please refer to Annexure I of the Report. A closer look will reveal that almost all the ToR have not been fully complied with. Some of the ToR have not been complied with at all.	All the TOR points provided by MoEF&CC have been complied in the EIA report. Please refer Annexure I.
11	Disaster, Risk Assessment – The draft EIA Report does not include the possibility of natural disasters such as earthquakes, undersea volcanic eruptions, tsunamis, etc. and the impact of such disasters. This should form a vital component of the draft EIA given the vulnerability of the proposed project to major tectonic fault lines and volcanoes.	The natural disasters like earthquakes, undersea volcanic eruption and tsunamis cannot be precisely predicted. However, various prediction models for the earthquake have been included in the EIA report and is being augmented. Please refer Chapter 7, Section 7.3. India has Indian Tsunami Early Warning System (ITEWS), and integral part of the global tsunami warning and mitigation system established and coordinated by UNESCO, through which warnings for impending tsunamis is to be received between 10 to 20 mins prior to the occurrence. An

		app will be developed which will be mandatory to install on the mobile phones of every resident / workers / visitors to GNI.
12	Pre-Tsunami data on turtles – The draft EIA report includes several references to studies carried out by various agencies prior to December 2004. Given the fact that the tsunami of December 2004 caused major damage to the GNI and particularly the nesting beaches, the pre 2004 data should not be used for comparison. What is required is a long term monitoring study of turtles migration and turtle nesting in the GNI.	Apart from the pre tsunami data, post tsunami data as collected by forest department has been included in the EIA report. The master plan proposes designated area for setting up of institutes in the field of marine ecology and wildlife to promote conservation and long-term study, please refer Chapter 2C, Section 2.1. EIA also suggest radio telemetry for the turtle to understand their movements and behaviours on long term basis.
13	Latest data on sea level rise – The draft EIA Report relies heavily on old and outdated data regarding sea level rise. The impact of sea level rise has also not been incorporated in this draft EIA. A proper detailed study needs to be carried out.	The ToR provided by MoEF&CC does not include the study of sea water rise. Please refer Chapter 6.
14	Climate change assessment - The impact of climate change and rising temperatures has also not been incorporated in this draft EIA. A proper detailed study needs to be carried out.	The ToR provided by MoEF&CC does not include climate change assessment.
15	Impact on Tribals – As per the draft EIA Report, there are about 237 Shompen and 1,094 Nicobarese individuals on GNI. The draft EIA Report also mentions that a part of the Tribal Reserve admeasuring 84.1 square km is proposed to be denotified. This will severely impact the tribal population on the GNI since this forms part of their traditional tribal area. In addition, there will be serious indirect impacts caused by these projects and the inflow of thousands of labourers, tourists, township residents, etc.	84.10 sq. km of project area falls under tribal reserve and de-notification is under process. Out of this, an area of 11.032 sq. km of tribal reserve also falls within the revenue villages and required to be de-notified otherwise also. A&N administration proposes to re-notify 45.23 sq. km of land within Campbell bay National Park & Galathea National Park and 31.73 sq. km land outside the project area as tribal reserve. Thus, the net effective denotification of tribal reserve area is 7.11 sq.km. Further, two national parks (Galathea national park and Campbell Bay national park) and major portion of the tribal area are proposed to be un touched, which is more than 81% of the total GNI area. This has been included in the chapter 1, section 1.5 of the EIA report.
16	Rapid assessment study of WII – The WII study is a rapid assessment study, and the field visit seems to have taken a few days. This is not acceptable. A full-	WII provided a report "An assessment of the environmental sensitiveness of sea turtle nesting beaches of the Great Nicobar Island" to ANIIDCO. The

	fledged long-term study on the turtles needs to be carried out and included in the draft EIA.	Principal Investigator, K. Sivakumar of WII is an expert on marine fauna and has underaken reserchs in Great Nicobar Island. Knowledge and experience and the data collected by Principal Investigator in his earlier studies were also used in the report.
17	ZSI Report – It seems that though the ZSI Report does include a lot of baseline data, it is not clear how much field work has been carried out by the ZSI after May 2021 for the purposes of preparing their Report, which forms part of the draft EIA Report.	The ZSI team from Kolkata with all field equipment were in GNI for some time and have collected significant amount of field data. ZSI also have been undertaking the studies in the island over decades and the data generated over the years have been included in the EIA report.
18	Commercial viability of the proposed Port/ICTT – a) Whilst there is no doubt that whilst there is great geographical value in locating this project in and around Galathea Bay in the GNI, this has to be tempered with the fact that the proposed location is extremely vulnerable to natural disasters. b) Secondly, a copy of the DPR also needs to be made available and examined – the assumptions made in the DPR are vitally important to determine if these projects are financially viable. c) Thirdly, the financial viability of the Port will depend on several factors such as the tariffs, the turnaround time of the ships, the percentage of cargo destined for ports in the Bay of Bengal, etc. Sadly, this information is completely lacking and needs to be provided. d) Fourthly, if the Port is intended to be privatized, it is necessary that the private sector provide the capital for funding this project. It cannot be built at public cost and then handed over to the private sector at apittance. e) It is not clear what are the additional costs required to build these projects that are designed for Seismic Zone 5. f) Insurance – Would it be possible to insure the Port and other projects planned on the GNI?	All concerned studies have been conducted and accordingly location has been finalised. Due ecological concerns have also been considered while selecting the site for ICTT. The DPR is not part of the EIA as per the EIA notification 2006. However, pre-feasibility report (PFR) was attached while applying for the TOR. The financial viability of the project does not form a part of the EIA report as per the EIA notification 2006. No relevance to EIA. Appropriate cost consideration with respect to seismic zoning have been included in the board cost estimation. No relevance to EIA.
19	Phase I study only – This draft EIA covers only the Phase I of the proposed projects. It should be revised and resubmitted to include the impacts of Phase II as well. Piecemealing of these projects should not be permitted.	The proposed development at GNI is for next 30 years. The entire development has been included in application for seeking EC.
20	Carrying capacity study for ports – The Carrying Capacity Study that is included in the draft EIA Report is inadequate and suffers from serious infirmities. An example of how a proper carrying capacity study should be carried out is available at	The document referred is for Columbia river Washington and not applicable to India.

	https://www.govinfo.gov/app/details/FR-2016-10-07/2016-24312 for the Millennium Bulk Terminals—Longview, LLC (Applicant) is proposing to construct and operate an export terminal in Cowlitz County, Washington, along the Columbia River. The project proponents should be asked to emulate this example and include it in the revised draft EIA Report.	
21	The impact of the denotification of the proposed Galathea sanctuary has also not been dealt with in the draft EIA Report.	The EIA has been conducted referring all the authentic data provided/ available with the GOI. All the processes adopted by GOI has been adopted as is. Further, The ToR provided by MoEF&CC does not include the impact assessment of the de-notifcation of Galathea Bay Sanctuary.
22	Defence / Strategic Aspects – a) Whilst there is no doubt that the Chinese are flexing their muscles and expanding their navy and these threats need to be countered, would it not make more sense to strengthen and expand the existing infrastructure belonging to our Armed Forces that exists on GNI and surrounding islands? b) It is also not clear whether the strategic interests of our country would be strengthened by allowing foreign ships to freely enter this area? Or by allowing millions of tourists to fly into this strategic location? c) What control would the Defence Forces exercise over this port, with or without privatization? d) Problems with civilian use of defence airports – We have already seen in Goa and Pune that our Defence Forces are not comfortable with their assets being used by commercial entities. It is also clear that the new proposed airport would severely impact the existing facilities that exist with our Defence Forces on GNI. This issue has not been dealt with in the draft EIA report.	With respect to military expansion and port creation, foreign powers have increased its activities in the IOR by investing in various countries adjoining to India. From this perspective, India's presence in the Andaman & Nicobar Islands must be strongly demonstrated to counter position to foreign power aggressive consolidation in the IOR. The development of GNI into an economic and defence powerhouse will be the most powerful answer to the challenge of foreign powers. Further, The ToR provided by MoEF&CC does not include the mentioned points.
23	The draft EIA document, which stretches to over 1200 pages, has been put together by a consultant in a very short period of six months, considering the fact that most of the country was under travel restrictions because of Covid. The draft EIA is even more remarkable given the travel constraints to Great Nicobar. Secondly, even though it is one of the greatest biodiversity hotspots in the world, scant regard has been paid to the impact of the proposed projects. The Wildlife Institute of India	Already covered as response to point number 16 and 17 above.

	has carried out a Rapid Assessment study over a few days. The Zoological Survey of India has carried out a baseline study and a site appraisal. Significantly, both these studies were commissioned even before the Terms of Reference were issued by the MoEFCC.	
24	Amazingly, the compensatory afforestation for the loss of 130,000 hectares of prime virgin forest lands of Great Nicobar are, contrary to the recommendations of the ZSI, proposed to be carried out in Madhya Pradesh in central India. It seems evident that an equivalent area of non-forest land will not be made available in MP, and that the so-called compensatory plantation would be carried out on existing forest lands.	A & N Islands is having only ~6% revenue land, hence, Compensatory Afforestation is being done in Madhya Pradesh, as per the guidelines of MoEF&CC. in this regard, Government of Madhya Pradesh has submitted the CA scheme and kml file for double the degraded forest area in the State of Madhya Pradesh in lieu of diversion of 121.87 Sq.km. of forest land and 8.88 Sq.km. of deemed forest land to Forest department of A&N Administration.
25	Cost Benefit Analysis a) The Cost Benefit Analysis carried out in the draft EIA is completely faulty and needs to be redone. b) The new NPV values need to be incorporated in this Study. c) Lands adjacent to a National Park or Sanctuary need to be assessed at 10 time the NPV. d) The cost of habitat fragmentation cannot be zero. e) Since the forest lands proposed to be diverted for these projects will be lost forever, the NPV values will have to be calculated for a period longer than 50 years. f) If the forest land is valued at Rs.6000 per square metre after diversion in the draft EIA Report, this is the value that needs to be assigned to the forests that are proposed to be diverted for these projects.	The cost benefit analysis has been done based on the latest FC regulations, further, none of these conditions given in the comments are applicable to the current project.
26	The EMP is sadly lacking in detail and seems to be very cursory. It is necessary that a detailed EMP be prepared, mentioning all the mitigation measures required to be implemented, along with the time frame, costs for the same, etc. The agencies required to implement each of these mitigation measures also needs to be specifically identified.	The EMP includes the cost as well as the agencies responsible for implementation. Please refer Chapter 10.
27	It is not clear where the material required for reclamation will be sourced from, and the environmental and economic costs associated with the proposed reclamation.	All raw materials for construction will be sourced through feasible mainland from India as well as from the nearby countries. However, exact quantity and details will be worked out at the detail design stage.
28	We would also suggest that a more competent consultant be appointed to prepare the revised EIA Report.	NABET Accredited consultant was appointed to conduct the EIA study.

29	Please explain why the TOR has not been fully complied with. Please give a detailed explanation foreach TOR that has not been complied with.	All the TOR points provided by MoEF&CC have been complied in the EIA report. Please refer Annexure I.
30	Why has the draft EIA not been prepared in line with MoEF&CC guidelines for Thermal Power Plant, Port, and Township projects?	The draft EIA has been prepared in line with the MoEF&CC Guidelines. Further, this is a comprehensive EIA for all four projects.
31	The project proponent in introduction part of draft EIA has mentioned about unexplored exquisite nature, unique combination of mountain and beaches, part of world network of biosphere reserves, diverse wildlife, and world's unique coral reserve, as well as numerous endemic species of flora and fauna. Whilst it is obvious that the proposed projects will lead to severe degradation and destruction of such pristine ecosystem, as well as the loss of some species. Please explain why these issues have not been addressed satisfactorily in the draft EIA Report, which is completely lacking in plans for protection of such species and their habitats.	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.
32	Corals over the entire world are facing destruction and bleaching. The proposed project will aggravate the situation in the proposed project area and result in further damage and destruction that has occurred during the tsunami.	Loss of corals due to rise in temperature is a global phenomenon and shouldn't be confused with the project under consideration. No corals area exists within the project work area. However, adequate mitigation measures have been suggested if any corals area affected by the project activities. Please refer Chapter 6 & 10.
33	The project proponent in its draft EIA has noted that "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."	No corals area exists within the project work area. However, adequate mitigation measures have been suggested if any corals area affected by the project activities. Please refer Chapter 6 & 10.
34	It is not clear why the exact quantity of coral bleaching has not been estimated. Corals form a vital link in the support system for all kinds of marine life. This is a serious shortcoming in the draft EIA. We would urge that a proper scientific study on this very important aspect needs to be carried out and the draft Report be revised and resubmitted for Public Comments.	Same as above
35	As per the information provided in the draft EIA report, the proposal is for Phase I of the project.	The proposed development at GNI is for next 30 years. The entire

	Splitting the project into phases amounts to piecemealing of clearances, and the environmental and ecological impacts of the entire project cannot, therefore, be assessed in its totality, as per this draft EIA Report. We would urge that this draft Report be revised and resubmitted for Public Comments.	development has been included in application for seeking EC.
36	Is the holistic development of Great Nicobar Island a standalone project or is it part of any other project? If yes, please give full details of the status of the other project or projects as well as copies of their draft EIA Reports, ECs, etc. It is clear from the draft EIA report that the aim for the proposed activities is to reap economic benefits based on maritime services and tourism amongst other economic drivers. The report states that this will be possible only by the development of key infrastructure facilities. It is therefore evident that there will be other projects that will come up as a result of the proposed activities, such as tourism resorts, diving centres, golf courses, etc.	This project is a Holistic Development of Great Nicobar Island which includes ICTT, Airport, Township and Power Plant.
37	Kindly furnish the existing and proposed detailed land use plans along the proposed layout.	All details have already been included in the EIA report. please refer Chapter, section 3.3 for existing land use and Chapter 2C, section 2.1 for proposed land use.
38	Acquisition of land will also lead to fragmentation of the land and will lead to change in the land use and land cover of the area. What steps are proposed to minimize this impact?	Same as above
39	What is the status of the forest clearance for the proposed project?	Forest clearance is under process through offline process in view of the communication constraints.
40	Has the proposal submitted for the forest clearance? There are no details available for the same on the FAC website.	Forest clearance is under process through offline process in view of the communication constraints.
41	It is scientifically proven that ports and townships can dramatically alter landscapes, significantly impact wildlife, shift population demographics, and pollute and degrade the environment. Have these factors considered while preparation of the draft EIA report?	Yes
42	Please furnish the exact distance of the proposed layout and the ancillary activities from the protected areas and their ESZs, including the proposed Galathea sanctuary (that has now been de-notified). Also, please explain how these activities will impact these ecologically sensitive areas?	Please refer chapter 1, table 1.2
43	Please furnish details of the existing and proposed	Not relevant to EIA

	deployment of Forest Department personnel in the GNI, including the details of vehicles, boats, equipment, etc. at their disposal.	
44	As per the draft EIA report, the detailed project mapping at a scale of 1:4000 as well as 1:25000/50000 is under preparation by NCSCM, Chennai. It is not clear how the draft EIA has been finalised without completion of these maps and reports.	The draft ICRZ plans under 2019 notification is available and has been referred in the draft EIA. Further, the draft superimposed maps of 1:4000 scale was provided by NCSCM and the final maps has been included in the final EIA report. Refer annexure XVII, XVIII & XIX.
45	There are several endemic species found on the Great Nicobar Island which are not even found on the other islands in the Andaman Nicobar region. These species are at great risk of vulnerability. What are the mitigation measures proposed for the same? Are there and species conservation plans?	The EIA report is prepared for the project having an area of 166.1 sq.km. and not for the entire Nicobar island. The mitigation plans to ensure that the project can be constructed and operated with minimal environmental degradation.
46	Turtle nesting of Leatherback and olive ridley turtles have already been impacted due to Tsunami in 2004, climate change, and sea level rise. The proposed projects will further lead to destruction of turtle nesting at the Great Nicobar Island. What are the proposed mitigation measures for the same?	Adequate monitoring and mitigation measures have been provided in the chapter 6 and chapter 10 of the EIA report. also please refer attachment 1 (ZSI report)
47	Kindly furnish copies of the studies carried out on sea turtles found in the Great Nicobar Coastline along with details of their nesting post tsunami. Please also furnish details of the migratory routes of these turtles.	Please refer attachment 1 & 2 (ZSI & WII report)
48	There are Megapode nesting sites present on the Great Nicobar Island. The draft EIA states that "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. ZSI is studying the megapode nesting sites as a part of the draft EIA. The report is awaited."	In chapter 1, section 1.8 of the EIA report, it has been mentioned that *"ZSI is studying the megapode nesting sites as a part of the EIA. The report is awaited."* This is a typographical error. The study has already been completed and included as a part of the EIA report. See Attachment 1. However, A long-term study has been initiated by ZSI.
49	It is not clear how the mitigation measures and impact of the proposed project has been assessed without the report on Megapode nesting sites. The same should be clarified.	Same as point number 48 above.
50	India's National Marine Turtle Action Plan released on February 1, 2021, lists Galathea Bay as one of the 'Important Coastal and Marine Biodiversity Areas' and 'Important Marine Turtle Habitats' in the country. It is included in Coastal Regulation Zone (CRZ)-I, the zone with maximum protection.	Please refer attachment 1 (ZSI report) and chapter 10 of EIA.

	What are the mitigation measures proposed to ensure that the habitats are not impacted due to proposed activities?	
51	Further, the report states that "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."	No comments
52	It seems many studies are still pending. The public hearing should be conducted only after all the studies are completed and made available in the public domain, and the draft EIA suitably revised.	All the studies have been completed and public hearing was held on 27th January 2022
53	It has been mentioned in the report that "The endemic birds include the Nicobar sparrow hawk, great Nicobar serpent eagle, Nicobar megapode, Nicobar parakeet, Nicobar imperial pigeon, Nicobar scops-owl, Nicobar bulbul, and Nicobar jungle flycatcher, all now threatened by human settlements and resulting habitat modification. The beautiful Nicobar imperial pigeon is a large bird that prefers being on the ground and is the closest living relative to the extinct dodo. " This endemic biodiversity will be impacted due to the proposed project. It is not clear if the long-term impact of the proposed activities on the endemic species has been studied. Kindly provide studies and mitigation measures for the same.	Please refer attachment 1 (ZSI report)
54	As per the available information and information provided in the draft EIA, the effects of tsunami and sea level rise are already visible. The biodiversity and ecosystem are already facing great threats and even extinction due to natural disasters in and around the GNI. The proposed project activities will further aggravate the situation. Unfortunately, the EMP does not adequately address these issues.	EMP includes all the mitigation measures arising due to the impact of the project. Please refer Chapter 10.
55	The draft EIA also states that "This sudden 'land drowning' (due to tectonic subsidence), coupled with the tsunami, altered the structure of mangrove forests. As per the study by WII, the mangrove covers in the Nicobar Islands declined by around 97 percent, which is higher than the earlier estimation. The researchers form Centre for Ornithology and Natural History (SACON) documented 20 mangrove species from 34 sites across the Nicobar Islands, of which eight species were recorded for the first time from the island group."	No comments
56	There is need to protect all these species instead of proposing activities which will lead to further deterioration and destruction of these species.	Adequate monitoring and mitigation measures have been provided in the chapter 6 and chapter 10 of the EIA

		report. also please refer attachment 1 (ZSI report).
57	Kindly provide the proposed mitigation measures for protection and conservation of all the mangrove species found in the region.	Re-densification of mangroves have been suggested in the GNI. Please refer chapter 10 of the EIA report.
58	Kindly also explain whether the artificial plantation of mangroves is an adequate replacement for the destruction of natural mangrove eco-systems.	Re-densification / re-plantation of mangroves is practices as a mitigation measure all over the world.
59	As per the information provided in the draft EIA at Figure 1.8 (Ring of fire), Several active volcanoes are present near the island. Kindly provide the detailed disaster management plan that would deal with volcanic eruptions, tsunamis, etc.	Only active volcano near to GNI is at Barren Island which is around 580 km away. The disaster management plan has been provided in Chapter 7.
60	The draft EIA states that "The severe tsunami damaged the main market, roads, bridges, and jetty, leaving behind sorrow and grief and homeless people. Embarkation of ships alongside the jetty was not possible as causeway was totally washed away. Lighthouse at Indira point got submerged into sea." This clearly shows that the impact of Tsunami is still visible after more than 16 years. In addition to this there are visible impacts of Climate Change and Sea level rise.	No comments
61	Kindly provide the details of measures proposed to deal with these impacts.	Disaster management plan (DMP) in the event of an earthquake /Tsunami (disaster) has also been suggested. Please refer chapter 4 and chapter 7.
62	The draft EIA fails to provide details of capital and maintenance dredging. Kindly provide full details of the same, as well as the location of the spoil grounds, and the cost of these activities.	Details has been included in Chapter 2A Section 2.5, 2.13 and 2.21 of EIA report.
63	The draft EIA mentions about the increase in tourist passengers and proposes to handle 10 million passengers per annum (MPPA). It fails to provide details of the modelling used to predict the increase in number of passengers over the years.	Please refer chapter 2B, section 2.4 of EIA report.
64	Moreover, the increase in number of tourists will lead to increase in pollution and destruction of environment. It will also put severe pressure on the infrastructure facilities.	sufficient infrastructure facilities has been proposed in the master plan. All the waste will be collected and treated through integrated waste management system for GNI. Please refer Chapter 2C, Section 2.5.
65	Kindly provide proposed mitigation measures for the same.	Same as above
66	The table 1.2 (Environmental Setting – Integrated Development Project) in draft EIA report provides details of Protected areas, protected forest, Rivers /lakes, as well as seismic zone /landslide /cloud	No comments

	burst along with each component of proposed project.	
67	The proposed project will lead to destruction of dense forest habitat along with the deterioration or destruction of several protected areas. Moreover, the location proposed for the project activities is not suitable as it falls under Seismic Zone -V and is also vulnerable to Tsunami and susceptible to floods. As per the records cloud burst occurred in 2020 in Andaman & Nicobar Islands.	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.
68	The project proponent should clarify the site selection procedure in the light of these concerns.	Disaster vulnerability have been considered while selecting the project sites.
69	The proposal was appraised by EAC Infra-1 in its 260th meeting held during 5th – 6th April 2021. The proposed projects consists of Port/ICTT, Township, Airport and Thermal Power Plant, most of which impact the CRZ. It is not clear why the applications were not submitted for appraisal by the EAC Thermal Projects as well as EAC CRZ. Kindly provide clarification for the same.	This is a comprehensive EIA consisting four projects (i.e. ICTT, Airport, Power plant and Township). CRZ mapping by NCSCM has already been finalized, Refer annexure XVII, XVIII & XIX and accordingly application for CRZ clearance is being made.
70	As per the table 1.3 (Environmental attributes and frequency of monitoring) the meteorological data has been collected from only 1 sampling location. This is not in conformity with the requirements for preparation of a draft EIA Report. A proper study needs to be carried out.	One on site met station was installed at the site for the measurement of meteorological attributes which is the general norm for all EIAs.
71	As per the table 1.3, the ecology (Terrestrial and aquatic) data has been collected only once during the study. This is not in conformity with the requirements for preparation of a draft EIA Report. A proper study needs to be carried out.	The EIA is based on one season data as per the ToR issued by MoEF&CC.
72	The area for port falls under ICRZ IA. Part of the area also falls under the tribal reserve. The proposed port will lead to reclamation of ICRZ IA and denotification of tribal reserve.	No comments
73	Kindly provide the consent obtained from the tribals, if any, for the denotification of tribal reserve, as well as copies of any studies carried out in this regard.	The de-notification of tribal resereve area shall be subject to compliance of Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.
74	As pointed out to the Member Secretary of ANPCC vide email dated 20.01.2022, several figures/ layout maps provided in draft EIA report are illegible. Legible maps and charts need to be provided before the public hearing. Even the uncompressed copy of the draft EIA report uploaded after the email sent to Member Secretary has several illegible figures/layouts.	The draft EIA document with clear maps has been uploaded by Andaman & Nicobar Pollution Control Committee, DST Andaman before the Public Hearing.

75	As per the information provided in the draft EIA report more than 20% of the land required for the port will be reclaimed. However, the source of the fill material has not been mentioned. Please provide full details.	All raw materials for construction will be sourced through suitable locations in the mainland from India as well as from the nearby countries.
76	Kindly provide details of the mitigation measures proposed for compensating for the loss of marine biodiversity and habitats.	Please refer chapter 10 of EIA report.
77	Kindly provide full details of the coral habitats that will be destroyed due to the reclamation of the construction of port.	No destruction of coral habitats due to reclamation for port and airport has been envisaged. However, restoration of corals has been suggested if it gets impacted during the construction stage. Please refer Chapter 10.
78	Kindly provide the details of proposal submitted to NBWL for obtaining wildlife clearance.	Project does not fall under any wildlife sanctuary.
79	Kindly provide the details of coral relocation plan, if any, along with the details of the locations proposed for relocation, along with GPS coordinates, and their costs.	No destruction of coral habitats due to construction has been envisaged. However, if there is any destruction of corals due to the project, the same will be relocated. The location has not yet been finalized.
80	There are several ancillary activities proposed such as road connectivity. Kindly provide the detailed impact assessment carried out for ancillary activities, as well as the fragmentation of wildlife habitats, and mitigation measures for the same.	No wildlife habitat fragmentation is expected due to the road construction.
81	Under Chapter-2 of draft EIA, Section 2.3 provides details of traffic projections for ICTT Port. Kindly provide detailed modelling studies used to predict the traffic projections along with the source of information used for modelling.	M/s Mantrana was appointed to conduct the traffic projection study for ICTT. The summary of the traffic projection is included in the EIA report.
82	Under Chapter-2 of draft EIA, Section 2.4.4.1 provides details of waves. The data used for the analysis is between 1994-2007. The post tsunami data needs to be provided and used for this analysis. A proper study needs to be carried out, including the impact of sea level rise on waves and tides.	Detailed studies have been conducted and the summary has been presented in chapter 2A, section 2.4. The modelling study undertaken by Indomer Coastal Hydraulics (Pvt) has been attached with the EIA.
83	Moreover, it is also mentioned that the severe weather conditions would not be recorded. In such cases the other methods to analyse waves should have been used. Kindly provide the clarification for the same, particularly since a number of buoys were set up post tsunami in this region.	The weather conditions are generated by ships passing through the area. However, ships avoid severe weather condition and therefore are not recorded. The wind and wave climate at offshore location were obtained from the Global Reanalysis of Ocean Waves (GROW), USA data base covering a period of 10 years from 1st January 2008 to 31st December 2017 for the study

84	The table 2.7 provides Ship – observed wave height data. Kindly provide year and month wise data for the same.	Summary of 14 year data from 1994 to 2007 is given in table 2.7.
85	In Section 2.4.4.3, the draft EIA states that the current data was collected from 17.03.2021 to 29.03.2021 and based on the tidal variation, the processed APCP data were analysed for the effect of current during the spring and Neap Seasons during the observation. The data for the entire year needs to be collected and used for this analysis. A proper study needs to be carried out.	Beside the data collected from 17 March 2021 to 29 March 2021, additional 10 year data from Global Reanalysis of Ocean Waves (GROW), USA data base covering a period from 1st January 2008 to 31st December 2017 was obtained.
86	The data for analysis of the effect of currents during the spring and neap season should be carried out based on the entire year and not on the data collected for only 12 days. It is well known that there are significant changes in the current patterns over the seasons, and also because of global warming.	Same as above
87	Kindly provide full details of dredging locations along with GPS coordinates, as well as dredging methodologies. Will dredging be stopped during the nesting season of the turtles? And when the eggs hatch?	Detailed of dredging location will be worked out during the detailed design stage. Yes, dredging will be stopped during the nesting season.
88	Kindly provide full details of quantities, location, etc. where material required for reclamation will be obtained and transported, and the impacts of the same.	All raw materials for construction will be sourced through suitable locations in the mainland from India as well as from the nearby countries.
89	Construction of the breakwater will lead to changes in shorelines, and also lead to erosion and accretion in adjacent areas. Kindly provide copies of the study carried out to assess these impacts and the mitigation measures for the same, along with the costs.	Shore line change assessment has been provided in the EIA report section 2.5. The hydrodynamic modelling study undertaken by Indomer Coastal Hydraulics (Pvt) has been attached with the EIA. Please refer attachment **III.**
90	The number of the berths to be provided are not mentioned in the draft EIA report. It is not clear how the impact can be assessed without details about number of berths with detailed layout? This is important since this will also impact the wave and tidal patterns, and the siltation, etc. A proper study needs to be carried out once these details are finalised.	Please refer chapter 2A, table 2.23
91	The draft EIA report under Chapter 2 (A) mentions a shoreline study. The project proponent has carried out the shoreline study using Google Earth imageries over the past 5 years. It seems that these imageries are not taken at the same time of the year or at the same tidal levels. A proper study needs to be carried out.	The hydrodynamic modelling study undertaken by Indomer Coastal Hydraulics (Pvt) has been attached with the EIA. Please refer attachment III.
92	Under Chapter 2 (A), section 2.14 (Reclamation) the project proponent mentions about discharging	Details are already furnished in chapter 2A, section 2.14

	dredged material by Cutter Suction Dredgers (CSD) or Trailing Suction Hopper Dredger (TSHD) into one of the areas proposed to be reclaimed. Please furnish details of the soil analysis carried out that establishes the suitability of the dredged material for reclamation. It is also not clear if the entire requirement for reclamation will be met using the dredged soil.	For the total area under reclamation is 227 ha. It is estimated that around 33.35 million m3 & 15.9 million m3 of material will be required for reclamation during final phase & initial phase respectively. However, only 6.40 million m3 of the dredging is anticipated during phase -1 and it is estimated that out of 6.40 million m3 dredged material, 3.20 million m3 of suitable dredged material shall be used for reclamation, remaining of 12.67 million m3 reclamation shall be achieved by borrowed fill.
93	Kindly provide studies regarding the same along with the details of the reclamation areas with GPS coordinates.	reply is same as point number 87 and 92 above.
94	Kindly furnish a map showing the areas proposed to be reclaimed on the CZMP maps of 1:4000 scale.	Being included in final EIA report
95	Under the road/rail corridor for ICTT Port, the project proponent fails to give details about the total length of the proposed roads. Kindly provide full details regarding the same.	As this project is an integrated project, the details of proposed road network connecting port, airport, power plant and township are presented in chapter 2C, section 2.2 and detail of Road length is added in table no. 2.3
96	Kindly provide the details of the number of trees to be cut for the construction of road corridor for the proposed projects along with the details of species and girth of the trees. How has the value of these trees been calculated?	Details is being added to the EIA report. Please refer annexure X
97	Kindly provide the details of the compensatory afforestation to be carried out for the trees that are proposed to be cut for the road and rail corridors.	Government of Madhya Pradesh has submitted the CA scheme and kml file for double the degraded forest area in the State of Madhya Pradesh in lieu of diversion of 121.87 Sq.km. of forest land and 8.88 Sq.km. of deemed forest land to Forest department of A&N Administration. The tree enumeration details have been enclosed with the EIA. please refer annexure X
98	What are the proposed mitigations to be provided along the road corridors for wildlife? What is the cost of these mitigation measures?	No wildlife habitat fragmentation is expected due to the road construction. However, appropriately designed and suitably located culverts of varying sizes, underpasses and fences provide effective mitigation to overcome barrier effects of roads. Details will be worked out during the detail design stage.

99	Are the mitigation measures proposed in line with the MoEF&CC guidelines and the WII guidelines for mitigation measures for linear projects?	Yes
100	The Map provided in the draft EIA Report showing the road connectivity is without any legends and without the details regarding the length of the road. A proper map may please be provided on 1:4000 scale with proper legends.	Detailed section on transportation is part of the EIA, however, additional map showing roads network detail has been added for clarity. Please refer Chapter 2, section 2.2
101	The draft EIA fails to provide details of the technology to be used for pollution control.	All the pollution control measures have been provided in the EIA report in Chapter 4 and 10.
102	Kindly provide details of the technology to be used for containment and cleaning of oil and chemical spillages.	Please refer chapter 7 – A.
103	Kindly provide details of mitigation measures for oil or chemical spillage over mangroves and mudflats?	Oil or Chemical spillage over mangroves are not expected as these activities are limited to the designated areas. A spill management plan is already shown in Chapter 7.
104	Kindly provide the details of impact of spillage on marine biodiversity. Also provide the mitigation measures proposed for the same.	Please refer chapter 7 – A.
105	Kindly provide the details of the Greenbelt Development along with the number of trees to be planted with species.	Dense greenbelt has been proposed with the local species. The number of trees will be calculated during detailed design.
106	Under the project implementation schedule the draft EIA mentions about preparation of draft EIA and approvals by the end of 2021. All the requisite studies to be carried out have not been completed. The draft EIA should be revised and made available once all the requisite studies are carried out and are made available under the public domain.	The final EIA will be submitted to the MoEF&CC after all the requisite studies.
107	The construction of boundary wall for entire project area will break the important corridor mammals and terrestrial bird species found in the region. What are the mitigation measures proposed for the same?	The boundary wall is proposed only for the Airport project which is essential for its operation and will not affect any movement of the wildlife.
108	The project proponent also proposed the erection of chain link fencing to segregate the operational area with non-operational areas. The erection of chain link fencing leads to deaths of mammals and birds by getting snagged or trapped in the wire fences. What are the mitigation measures proposed for the same?	Same as above
109	The draft EIA mentions that the total manpower required during the construction phase would be approx.1100 personnel including officials, residential labours and daily wagers. What kind of	Please refer chapter 8, section 8.5

	jobs will be provided to the locals? Kindly clarify the same.	
110	It is not clear why the project proponent is planning to dispose the dry waste when there are technologies available for recycling of dry waste. Kindly clarify the same.	Only dry sludge will be disposed to use of its value as a soil conditioner and fertilizer. Only conceptual design of the waste management has been given in the EIA report. the details will be worked out at detailed design stage.
111	Kindly provide the details of the land filling site along with the GPS coordinates and total area required.	Is being added to the EIA report. Kindly refer chapter 2 (C), Section 2.7.4.
112	Kindly provide full details of quarrying proposed in Andaman and Nicobar region for these proposed projects.	No quarry proposed in Andaman & Nicobar Island region. All raw materials for construction will be sourced through suitable locations in the mainland from India as well as from the nearby countries.
113	As per the report, "majority of the construction material like gravels, stones, clay etc will be transported form Indian mainland or from other nearby countries like Indonesia, Malaysia etc depending on availability and market viability." By importing material from foreign shores, there are chances of introduction of foreign species via quarry material/soil. What are the mitigation measures proposed for same?	This has not been covered in the report as it was not mentioned in the ToR issued by the MoEF&CC.
114	Kindly provide the mitigation measures to control the dust pollution during transportation and storage of quarried material?	Dust separation measure have been suggested in the EIA report. Please refer Chapter 10.
115	Kindly provide the detailed mine closure plans for these quarries.	All the measures & necessary environmental norms will be followed.
116	What will be done to replace the top fertile soil after quarrying/excavation?	Same as point number 115 above.
117	Kindly provide full details of industries proposed in industrial area.	Only non polluting industries is preoposd to be develop, like; Coconut, arcenuts, fishing, cold storage, food processing and warehouses etc,.
118	Kindly provide the details of pollution to be generated from the industrial area.	All the industries which have to be set up as mentioned in point 117 above, will have to obtain independent environmental clearance. All the condition to the clearance to ensure that the industries do not pollute, will be monitored and strictly adhere to.
119	Kindly provide the mitigation measures proposed to control the impact of industrial pollution.	Same as point number 118 above.
120	All the zones as mentioned in the table 2.2 are not visible in the figure 2.4 (map showing zoning diagram). Kindly provide maps on 1:4000 scale showing all the zones.	Legible map is given in Fig 2.4.

121	Kindly provide the details of wastewater treatment technology proposed to be used, as well as the details regarding the capacity of wastewater treatment plant along with the area required.	MBR technology is suggested in the EIA report. There will be 3 STPs, one with the capacity of 34 MLD, and other two with the capacity of 16 MLD are proposed.
122	Kindly provide the details regarding the sludge management. Whether the sludge will be disposed of in the environment, or it will be treated and recycled/reused. Kindly clarify.	Please refer Chapter 2C, section 2.7.4
123	Incineration plant should not be promoted as a part of solid waste management plan. The wastes, when incinerated, will produce a large number of extremely harmful pollutants like toxins, dioxins, furans, acidic gases, toxic ash, etc. that are detrimental to both human health and the environment. Incineration of solid wastes by incineration transfers the problem to the air environment.	Double chamber incinerator will be provided. Suitable treatment to the flue gas from the incinerator will be provided to ensure that harmful pollutants are not generated. Incinerator will be fitted with adequate scrubbers. Please refer Chapter 2C, Section 2.5.
124	The bottom ash and fly ash generated from the incineration of waste would be highly toxic.	Bottom and fly ash generated from the incinerator will be chemically stabilised and disposed in a separate engineered land fill. Please refer Chapter 2C, Section 2.5.
125	Gas based thermal power plant is part of the proposed project. Kindly provide the source of LNG for the proposed thermal power plant, as well as full details of how this will be transported and stored. The impacts of LNG transport and storage need to be factored into the DMP.	Source of LNG has not been decided yet. A separate LNG terminal is proposed at ICTT site and will be transported to the power plant through pipeline. Please refer Chapter 7, section C for other details. Also refer Annexure X as a undertaking as a type of fuel used in the power plant.
126	Why the soil sampling, ambient air monitoring, and other studies have not been carried out in the 10 km study area of the proposed projects? A proper study needs to be carried out.	This area being remote and having restricted access as limitations for collection of samples and setting of Air Quality samples. Best possible location within the given restrictions, after discussion with the UT Administration were used for sampling.
127	Kindly provide the details of modelling studies carried out for prediction of air quality during the operational phase of the proposed projects.	Please refer Chapter 4A, section 4.6.2.1, Chapter 4B section 4.3.3, Chapter 4C , section 4.5.1 and Chapter 4D, section 4.2.3
128	The seasonal variation in biodiversity of the region has not been studied, as is required. A proper study needs to be carried out.	Beside the one season data collected, additional data for past decade (from ZSI) were obtained and used.
129	The project proponent should also provide the justification for why the studies were not carried in all the seasons for correct identification during flowering of floral species.	Data collection were based on the ToR granted by MoEF&CC

130	The draft EIA states that "There was no threat of venomous snakes as they do not occur in the Island." The Great Nicobar Island supports the population of the King Cobra, which is highly venomous.	King Cobra (*Ophiophagus hannah)* has not been reported from GNI.
131	The draft EIA also states that "It is a rapid reconnaissance type of survey and it was not intensive except in non-forest residential areas." A proper study needs to be carried out.	Apart from the field studies by Vimta Lab, the available data has also been used in the report. Data collection were based on the ToR granted by MoEF&CC
132-133	The draft EIA states that "Mangrove Forests which are believed to be an insurance against cyclones and flood could not withstand the fury of tsunami and were washed down into the sea." We would like to point out that mangroves acted as shock absorbers. If mangroves were not present, then the impact of tsunami would have been much greater and would have extended further towards the landward side.	Noted.
134	The biodiversity survey for reptiles fails to mention about fresh water and marine snakes.	information provided by ZSI has been included in the EIA report.
135	The draft EIA reports mention that "Apart from human predation, dogs were found to be the major predators of turtle eggs." What are the mitigation measures proposed to control the population of feral dogs and wild pigs? Obviously, the FD's Turtle Management Plan that is supposedly in place is not adequate and needs to be strengthened and improved. Full details of the existing and proposed Turtle Management Plans may please be provided, along with costs.	Currently, forest department collects the eggs after laying into hatcheries located at various beaches of GNI. Once the eggs are hatched, the hatchlings are collected and released directly to the sea to ensure that no predator birds /animals prey on the hatchlings. This interference by the forest department is undertaken to increase the survival rate of the turtles.
136	What will be the Impact of TPP discharge water on coral reefs, mangroves, biodiversity, and turtle nesting sites? What are the mitigation measures proposed for the same?	Zero discharge have been proposed and therefore will have no impact on coral reefs, mangroves, biodiversity, and turtle nesting sites.
137	What will be the impact on livelihood and fishing activities due to proposed projects?	Currently the fishing is on a low scale as there is no adequate facility of trawlers and cold storage facility. The fishes landing at Campbell Bay has to be Sold/consumed immediately whereas the demand is low and there is no adequate cold storage facility available. As per the project master plan local industries including fishing, coconut and archenut will be encouraged by providing additional facilities like cold storage, skill development and export linkages. The tribal will be given the fishing rights as per LAR&R 2013 Act and

		additional facilities if requested will be provided.
138	What will be the livelihood opportunities for locals and tribals during and after the implementation of proposed projects?	Skill development facilities will be created for the locals to improve their employment prospects at the initial stage of the project. This is included in the EIA report Large scale infrastructure development including social infrastructure like education, health and community facilities is envisioned as a part of this project which will generate significant number of jobs for the tribal and local people.
139	The draft EIA states that no development will be planned at the location of turtle and megapode nesting sites. However, there is no mapping done for the Magapodes. Also, what will be the indirect impact of the construction and disturbance caused during construction and operation phase on the turtles and megapodes in the region? A proper study needs to be carried out.	Please refer ZSI report (Attachment 1).
140	What will be the impact of turbidity during the construction and operational phase on marine biodiversity?	During the operation phase higher turbidity in the marine water is not expected. During the construction phase, higher turbidity has expected only in the work area of the port.
141-142-143	The draft EIA states, "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." Kindly provide the details regarding turtle deaths and carcasses found on the coastal stretches near these ports and jetties. Kindly provide the research Reports and statistical data obtained over the years for the turtle nesting at these coastal stretches mentioned above.	These are the examples referred in the ZSI report which are being reflected in the EIA report also. However, detail studies of these ports are not part of the EIA study as per the TOR issued by MoEF&CC.
144	The draft EIA mentions that "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. " What are the number of corals transplanted? And the area of the functional coral reef?	This example has been referred in the ZSI report which is being reflected in the EIA report also. However, detail studies of this is not part of the EIA study as per the TOR issued by MoEF&CC.
145	Kindly provide a copy of a peer reviewed scientific study on this transplantation exercise.	Same as point no. 144.
146	Kindly provide the details of permissions obtained from the CWW and the NBWL.	All requisite details and compliances have been enclosed as part of the EIA.

147	Kindly provide the mitigation measures proposed for arboreal species.	Please refer ZSI report (Attachment 1)
148	The draft EIA states, "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. "We would like to point out that all activities will have to be suspended during the breeding seasons, and not just during the nights. This should form part of the EMP.	Appropriate measures have been suggested as per the recommendation of ZSI. Please refer Chapter 6, 10 and Attachment I.
149-150	The draft EIA also states, "It will be contractor's responsibility to prepare a disaster management plan including evacuation plan for site as well as labour colonies." It is shocking that there is no DMP or evacuation plan has even been attempted for the proposed projects, and that these costs have not been factored in the benefit cost analysis.	The DMP is part of the EIA report, however, to it is also proposed to have project level DMP for each of the activities.
151-152	The draft EIA mentions "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." Details of such practices and mitigation measures to be in place needs to be provided.	Remediation measures depends on quantity, concentration and spreads of the hazardous substance. The technology for the mitigation measures will be decided during the remedial process. Please refer Chapter 7 & 10.
153	Kindly provide the species wise details regarding the total number of mangroves to be destroyed, as well as full details of compensatory afforestation along with GPS coordinates, CZMPs and satellite imagery.	A & N Islands is having only ~6% revenue land, hence, Compensatory Afforestation is being done in Madhya Pradesh, as per the guidelines of MoEF&CC. in this regard, Government of Madhya Pradesh has submitted the CA scheme and kml file for double the degraded forest area in the State of Madhya Pradesh in lieu of diversion of 121.87 Sq.km. of forest land and 8.88 Sq.km. of deemed forest land to Forest department of A&N Administration. No mangroves will be destroyed as part of the compensatory afforestation. Species wise detail will be worked out after the detailed design by the forest department.
154	The draft EIA mentions that "Forest department has also planted casuarina trees on both the eastern and western flank of the Galathea bay. "It is not clear why the plantation of invasive species has been carried out. The FD may kindly be asked to explain, particularly when it is well established that casuarina plantations also interfere with turtle nesting.	No comments on forest department activities.

155	Under the section 4.5.2.3. (Impact on ecology due to reclamation) mentions "The turtles will have a smaller approach path to the western flank of the beach. The experience of ZSI in Dharma and Paradeep port suggests that port activities often do not affect the nesting of turtles. However, as per ZSI recommendation offshore construction activity may be halted to possible extent between November to February, which is the breeding season for the turtles. Offshore Construction during the night time also may be restricted." The offshore activities would obviously include dredging, ship traffic, etc.	Appropriate measures have been suggested as per the recommendation of ZSI. Please refer Chapter 6, 10 & Attachment I.
156	Detailed scientific studies and reports should be provided along with statistical data on number of turtles nesting.	Please refer Attachment 1 & 2 (ZSI and WII reports)
157	Kindly provide the detailed spill contingency plan and Disaster Management Plan.	Please refer chapter 7, section A
158	Kindly provide the proposed impact of noise pollution on marine mammals especially cetaceans.	Please refer Attachment 1 (ZSI report)
159	As per the details provided in Cost Benefit Analysis, Compensatory Afforestation for the diversion of forest land at Nicobar to be undertaken at Madhya Pradesh. Kindly explain that how the diversion of forestland carried out at Nicobar can be compensated by afforestation activities carried out at Madhya Pradesh.	A & N Islands is having only ~6% revenue land, hence, Compensatory Afforestation is being done in Madhya Pradesh, as per the guidelines of MoEF&CC. in this regard, Government of Madhya Pradesh has submitted the CA scheme and kml file for double the degraded forest area in the State of Madhya Pradesh in lieu of diversion of 121.87 Sq.km. of forest land and 8.88 Sq.km. of deemed forest land to Forest department of A&N Administration. The compensatory afforestation will be undertaken as per the norms given in: http://forestclearance.nic.in/writereaddata/addinfo/0_0_1115123012111CA1andGoIRule.pdf
160	We would also like to point out that it is unfair to compare such a pristine ecological area with Singapore, a city that has one of the highest population densities and lacks adequate resources to support its population.	No comments
161	In conclusion, we would urge that this Public Hearing be postponed until such time a revised draft EIA Report is prepared and made available in the public domain.	Public hearing was held on 27th January 2022
162	Request to share the link for the online public hearing and the same should be uploaded on the website of the Department of Science and Technology.	Public hearing was held on 27th January 2022 at Campbell bay community hall.

Anthropological Survey of India (ASI)

S.no	Comments received	Responses
1	Withdrawal of the social and tribal assessment sections of the EIA drafted by VIMTA, Hyderabad.	No comments
2	Fresh study on the social and tribal assessments by anthropologists and social scientists at Tata Institute of Social Sciences, Mumbai in conjunction with Tribal Research Institute, Port Blair and Regional Centre of Anthropological Survey of India, Port Blair who have worked with the Nicobarese and Shompen tribes specifically in Great Nicobar Island.	No comments
3	Old Chingen should continue to remain a tribal reserve and no portion of the area should be allocated to large-scale construction activities or any form of alteration. As per the demands of the captain of New Chingen, Nicobarese/Shompen should be resettled in Old Chingen (pre-tsunami settlement) with option to remain in their current settlements in New Chingen.	A&N Administration will ensure that the rights of tribal are fully preserved and no undue step will be taken.
4	Fulfil existing demands of the Nicobarese of Rajiv Nagar, i.e., better telecommunication services, and free and frequent boat services to and for Campbell Bay after thorough consultation.	the development project envisioned large scape infrastructure improvement including social infrastructure in the area.
5	Strict compliance to Andaman and Nicobar Islands Shompen Policy (2015) for the highest protection and preservation of Shompen tribe, their territory and their culture without any exception	Noted
6	Extensive consultation with all Shompen groups, especially Shompens of Kokeon and with Nicobarese/Shompen of New Chingen village for any form of vegetation/land alteration (including deforestation and construction activities) beyond current demarcated revenue areas.	During the baseline study, focal group discussion was held with locals including tribals. However, there are limitation in approaching the Shompen in deeper part of the forest. Few tribals were present during the public hearing. During the field survey, several focal group discussions were held with Nicobaris. The project details were explained to them and their opinion was noted. However, the Nicobaris do not have any objection for the development. Nicobaris basically wanted improved infrastructure facilities like better internet connection, transport facilities, Health and education facilities, etc. which will be provided as a part of the project.
7	Popularization of traditional lifestyle practiced by Shompen (especially, consumption of local food, physically intensive routine and minimum reliance	No comments

	on imported commodities) to build climate resilience among all inhabitants of Great Nicobar, especially among government officers and defense staff.	
8	Constitute group of accomplished anthropologists, sociologists, and scholars of tribal studies and social work (retired or serving) who have studied indigenous tribes in Andaman and Nicobar Islands from government and non-government organizations to offer constructive and creative alternate plans alongside extensive consultation with all affected groups of Shompen.	No comments

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S.no	Comments received	Responses
1	The geographical coordinates of any of the four projects have not been mentioned in the report (C1-26, Table 1.2). Nor does it contain any information on the elevation of power plant site and ash pond with respect to HFL of Galathea river even though the plant is located in its proximity.	Detail has been updated, Please refer Chapter 1, Table 1.2. Detail has already been mentioned in the table 1.2 of chapter 1. Power plant is a gas-based power plant and does not produced ash.
2	The EIA consultant has put beach and mud-flats under 'waste land' (C3-24). This shows the incompetency and insensitivity of the consultant towards the importance of ecologically sensitive areas as classified by the Island Protection Zone Notification, 2011.	The table has been modified accordingly, Please refer chapter 3,Table 3.4.
3	The EAC committee had directed that the consultant agency for conducting the EIA study should involve the experts from the organisations which were involved in assessing the impact of Tsunami on and its mitigation in the A&N islands, which has not been done.	The ToR does not specify that EIA study should involve the experts from the organisations which were involved in assessing the impact of Tsunami on and its mitigation in the A&N islands Natural Hazard map for Andaman & Nicobar has been added to the EIA.
4	In Ch.5 under analysis of the alternatives, in the multi-criteria analysis for the power plant, the proximity to the Shompen settlement for the site in Galathea has not been considered.	Multi-criterion analysis table has been updated. Kindly refer chapter 5, table 5.3.
5	The EAC committee had directed the EIA agency to examine alternate sites for ICTT and choose one appropriate site having minimum impacts on ecology and environment with specific focus on Leatherback Turtle and other endangered species (both terrestrial and marine). But it is evident that the EIA consultant has not chosen the site based on environmental and ecological concerns. Based on their own 'Merits and Demerits' of each site, Campbell Bay would be the best choice if environment was kept in mind. But due to priority given to economic considerations and having to	The ICTT port location depends on several parameters like Proximity to shipping route, Cost risks, land development, dredging requirement, breakwaters, environmental issues, nearness to tribal reserves etc. ZSI has looked into the environmental sensitivity of all the alternative sites. Based on the above parameters, Galathea Bay site was finally chosen for ICTT.

	deal with diversion of defence area in the case of Campbell Bay and Pemmaya Bay despite these two places not requiring any diversion of tribal area or rehabilitation, Galathea Bay has been presented as the best site. Had the EIA consultant done their work independently, Galathea Bay, with such grave environmental implications would never have been chosen as the best site! The project proponent wanted to build the port in Galathea, which is exactly why the Galathea Wildlife Sanctaury was de-notified even before the EIA was conducted.	Please refer Chapter 5 and Attachment I.
6	The EAC had mandated a comprehensive study of the impact of dredging, reclamation and port operations including oil spills on marine ecology and marine biodiversity with specific focus on corals, mangroves, sandy shores and mud flats which is missing in the report. As per the Environment Management Plan about 12-20 hectares of mangrove patch is present at proposed location of the port. The mitigation measure that has been suggested is re-densification of existing mangroves or planting of mangroves to non-forest area as per the principals of compensatory afforestation, which is set to happen in Madhya Pradesh, where there are no mangroves.	As per the ToR given by EAC, the report is to include key components such as impact of dredging and reclamation, port operations, ship movement, illumination, habitat alteration, breakwater, underwater noise, oil pollution etc on the movement and nesting beaches of Leatherback as well as shore morphology and sand grain profile at the nesting sites. The EIA study includes all the above aspects as suggested by EAC. Please refer Chapter 4 & 10. However, some of the details involving port operation, ship movement etc will be worked out in the detail design stage at later date. Only compensatory afforestation will be done in Madhya Pradesh. However, the re-densification of mangroves shall be done within GNI only.
7	It is to be noted that since the EIA was done before the ToR was announced, the report says that the presence of Megapode is under investigation (C4A-7). The ZSI survey reports the presence of 7 breeding pairs and 14 active mounds. There have been no details of impact assessment or mitigation measure specifically for megapodes anywhere in the report.	"Megapode is under investigation" is a typographical error and has been corrected as the report was already available while working on EIA. However, a long-term study has been initiated by ZSI.
8	The report mentions that the dredged material disposal site study has been performed by Indomer Coastal Hydraulics (P) Ltd and its results are given in Mathematical Model Study Report, July 2021 and Particle Analysis (PA) module of	Summary of the Mathematical modelling study report has been included in the EIA report. The modelling study undertaken by Indomer Coastal Hydraulics (Pvt) has

	MIKE was used to assess the fate of dredged material after disposal (C4A-25). It is to be noted that since this Mathematical Model Study Report has not been attached with the EIA, any claims based on the same cannot be verified.	been attached as Attachment III with the EIA report.
9	There is very little detail given about the impact of movements of vessels on turtles and marine mammals.	Impact of movement of vessels on turtles has already been considered in the EIA report. However, a detail routing, no. of vessels, type of vessels will be finalised during the detail design.
10	As per the ToR, the report was supposed to mention the risk analysis for handling different types of cargos. In addition, it was supposed to discuss how such a cargo will affect Leatherback nesting areas. This has not been done.	At present the cargo handling was only for transhipment, and no inland transfer of cargo is envisaged at this stage. Cargo handling area is on the eastern flank of the Galathea bay where no leatherback turtles nesting has been reported. Kindly refer to Chapter 3 & 4(A). Hazard identification & analysis and consequence analysis is given in chapter 7 of the EIA report.
11	The Risk Assessment section of the report (C7) states that Andaman and Nicobar Islands is classified as Moderate Damage Risk Zone-A and 4 to 5 cyclones are likely to occur in the study area per year on average. And yet there are no simulations or mathematical modelling done to determine if the selected site can withstand the cyclone/storm surge and Tsunami as is directed in the ToR. Not only that, the report also says 'It has been presumed that in case of a big Tsunami, a 20 m wave may strike GNI' (C7-82) and there is no mention of any model or research article on which such a huge presumption is based. This is a grave mistake, especially when the EIA consultant did not engage any expert/institution which had assessed the impact of tsunami on the island, as again was mandated by the EAC committee.	In the EIA report, the hazards due to Tsunami and earthquake has been considered. All the construction will have to follow the building codes for earthquake. The 2004 Tsunami, wave height of 15m was presumed. With additional safety margin, a wave height of 20m for a mega tsunami was considered.
12	The ToR also directed that a specific study needs to be undertaken to ascertain the impact of proposed development on the migratory birds covering both inward and return migration period. The studies needed to specially focus on migratory bird species composition, impact due to habitat destruction, impact due to oil spillage and risk of all the hazards that has potential to damage. The EIA report contains none of these. It in fact states that there are no migratory birds in the island	As per ZSI report, this island have not reported migratory birds during their study. After discussions with the Ornithologists who worked in GNI, it is clear that they are "Birds in Migration". During migration over the GNI, weak or sick or hungry or thirsty birds land in GNI for feeding

	which is a blatant mistake since there are two bird flyways, the Central Asia Flyway and the East Asia/Australasia flyway that pass through the archipelago and there are numerous reports of migratory birds from Great Nicobar as it is an important 'resting ground' for the passing birds (Sivaperuman and Gokulakrishnan, 2017; Sivaperuman et al. 2018). Moreover, there is no discussion on the impact of transmission lines on migratory birds and large raptors that are resident to the island, as specified by the EAC.	and gaining sufficient strength to continue their migration. There are no Pelicans or Storks or Flamingos etc. Birds in migration are like passengers in transit. GNI is not the only landing place for the birds in migration. There will be no overhead transmission lines for the GNI development.
13	There is no mention of the plan of the Administration of A & N to prevent further encroachment on the forest land with the proposed increased population as mandated by the ToR.	An undertaking has been provided by department of forest. Pease refer annexure X
14	There is no mention about the mathematical model which was used to predict the shoreline changes due to the port (C4A-6). Based on this unknown model the report has stated the coastline does not experience erosion due to construction of port, the shoreline has negligible changes and will remain stable for over 35 years. These statements are not backed by data or references; and most importantly cannot be verified because the name of the mathematical model is not mentioned. There are several studies showing how all ports have a huge impact on shoreline such as interference with the littoral drift budget (Rodriguez and Sridhar, 2010). In fact, the Integrated Costal and Marine Area Management (ICMAM) report mentions coastal structures constructed for port operations as the major anthropogenic cause of shoreline erosion (MoES 2009). There are examples from various ports like the Pondicherry harbour where the area north of the breakwater lost all its beaches, the sea water intruded the foundation of all structures on cost leading to the state government building a sea wall costing 40 crores. The Krishnapatnam Port in Andra Pradesh, the Ennore Port in Tamil Nadu and the Gopalpur port in Odissa all have reported severe erosion and accretion (see Rodriguez and Sridhar, 2010).	The modelling study undertaken by Indomer Coastal Hydraulics (Pvt) has been attached as Attachment III with the EIA report.
15	It is mentioned in the report, that no development will be planned at the location of Leatherback turtle and Megapode nesting sites (C4A-7). As per the survey conducted by WII (Pg 16, Map 2), there are 7 active nests and 14 breeding pairs in Galathea on both the eastern and the western flank of the bay. There are turtle nests on the	As per the survey, the leatherback turtles are nesting on the western flank of Galathea bay only. ZSI report marks the turtle nesting sites of GNI and refers to the eastern

	western flank as per the map but numerous records from the eastern flank are also available (photographic evidence of nesting exist from 2016-2017) which have not been marked on the map. Moreover, the soft industries, coastal tourism and other infrastructure that is proposed under the Township and Area Development, is going to have an impact on the nesting site on the eastern flank as well; this has not been addressed in the report. Nonetheless, any disturbance in any part of Galathea Bay is going to have a major impact on turtle nesting and there has been no effective mitigation measure suggested for this.	side of the island too. Please refer Attachment I.
16	The report says that there will not be any disturbance to Shompen Tribes as the Shompens stay upstream of the Galathea river (C4A-7). Firstly, the Shompens are a nomadic tribe, they do not stay at one place. They are also known to frequently fish in the Galathea river. The impact of the port will be reflected on the river ecology and might lead to introduction of invasive fish, hazardous wastes, oil and other pollutants making Galathea, an important source of food and water for the Shompens, dangerous for them. Any detection of diseases arising due to consumption of contaminated fish and water will not be detected in the Shompens so easily and immediately, which is why the proposed port will be detrimental to their existence.	Shompens do not move covering the whole island. Their settlements are dependent on water and food availability. The distribution of Shompens is given in the notification on Shompen Policy, 2015. No waste will be discharged in the Galathea River.
17	The report suggests that as per the ZSI report, no coral exists in the bay portion of the Galathea Bay (C4-12). The ZSI report however mentions that there are 117 species of Scleractinian corals (Schedule-I species under IW(P)A, 1972) in Galathea. There are also 8 species of Schedule-I Holothurians. The total benthic cover of reef habitat is 116.4173 hectares. Even if the corals exist outside the construction area as suggested in C10-11, the impact of dredging and other construction activities will definitely have an impact. As stated in the report, dredging activities in the nearshore waters of the developmental projects during the construction phase will "apparently" destroy the corals and coral beds. And coral colonies "if affected" can be translocated in suitable place where the similar environment as well as topographic features prevail in the Great Nicobar Island (C4-12). Firstly, it is the job of the EIA consultant to assess the impact of the proposed projects by using scientific articles, project reports, case studies, satellite	As per the ZSI report no corals exist in the bay portion of the Galathea Bay. However, some corals were found on the eastern and western flank near the peninsular part. These corals are not part of the project site and are away from the proposed construction activities. However, if any coral patch gets affected, the same coral will be restored at the location with similar species. Loss of corals due to rise in temperature is a global phenomenon and shouldn't be confused with the project construction and operation.

	imagery, mathematical modelling, etc. The EIA report then should be able to clearly state whether there will be an impact or not. What is the purpose of conducting an EIA, if the report says things like "apparently" and "if affected"? There are studies that report that increased sedimentation can cause smothering and burial of coral polyps, shading, tissue necrosis and population explosions of bacteria in coral mucus. Furthermore, turbidity and sedimentation also reduce the recruitment, survival and settlement of coral larvae (Erftemeijer et al. 2012). According to the recent IPCC reports, almost 90% of the corals could be lost by 2050 due to the rising sea surface temperatures, which is happening faster in the Indian Ocean than anywhere else across the globe.	
18	Secondly, the only mitigation measure that has been suggested is coral transplantation to alternate suitable offshore habitats in the island. There exists a wide range of sensitivity levels among coral species making them differentially tolerant to being successfully translocated. In 2015, the loss of branching corals in Mithakari in the Gulf of Kachchh due to heavy sedimentation owing to infrastructure development led to reef restoration efforts by the Wildlife Trust of India and the Gujarat Forest Department. This endeavour has required systematic research, ample funding and 6 years for the reefs to show signs of recovery. The researchers say that it will take around 5 more years for the reef to become stable. Besides, translocating corals cannot bring a fully functional reef back.	Funds have been allocated for coral translocation/transplantation activity. Please refer Chapter 10.
19	There are several examples from across the world where the impact of dredging and port construction on corals was systematically recorded. In Australia, the capital dredging for port construction/expansion there was 80% loss of corals at one site within 1 km from dredging site, while there was no discernible change due to dredging at other sites (Blakeway, 2005 and Stoddart and Stoddart, 2005). In Australia Hay Point, capital dredging for port construction/expansion led to 2–5% Loss of coral cover at 2 islands up to 6 km away from dredging site (Smith et al., 2007). In Florida, USA, 26 Projects involving filling and dredging for beach nourishment and port development resulted in 217 acres of reef getting impacted by cumulative effects (PBS&J, 2008).	Loss of corals in other areas like Australia, USA etc need not be compared with the project in GNI.

20	The report has stated that there will be no construction during rainy days or extreme climatic conditions (C4A-20). Moreover, it has been proposed that during the construction phase, offshore activities will be halted to the possible extent especially during November to February to not interfere with the turtle nesting (C4A-13). For a location situated in the tropics, with a wet season spanning across 8 months and frequent torrential rains, it seems highly unlikely that the proposed halt from November to February will be strictly implemented. Time and again, large scale infrastructural projects have given priority to financial viability than environmental concerns.	ANIIDCO is committed to implement the EMP given in EIA report. Moreover, robust monitoring system has been given in the EIA and any deviation on non-compliance of EMP will be addressed. Please refer Chapter 6 & 10.
21	As a mitigation measure for loss of wildlife habitat connectivity due to road construction, there is mention of considering alignment to prevent conflict (C4A-12), which is not supported by any scientific evidence. The second measure which is of appropriately designed culverts, underpasses and fences is also not applicable to the arboreal Nicobar long-tailed macaques, nor is it suited for the Robber crab or Nicobar Megapode. Another mitigation measure that is suggested is radio telemetry and molecular tools like e-DNA to be conducted with displaced animals to understand their biology and behaviour is neither supported with robust references nor is it considering the impact of an invasive technique on displaced and already stressed animals. Besides, the grave ethical concerns (Klegarth et al., 2019) radio-telemetry in free-ranging animals in a densely forested habitat is an extremely challenging and expensive affair that requires sophisticated equipment and training.	The road alignment has been worked out avoiding the human settlements and wildlife habitat. Telemetry is one of the most common practices adopted to study the wild life. No study is available to understand the migration of the turtles, their frequency of visit to the same nesting sites etc. The telemetric study has been suggested to understand the turtles better and will help in their conservation. Telemetry has been suggested for Turtles. Since the diversity of wildlife is restricted in GNI and no telemetry will be undertaken for free ranging animals in densely forested habitats.
22	The mitigation measure suggested to avoid disruption of breeding/nesting activities of Nicobar Megapode, Coconut Crab, Long-Tailed Macaque and Leatherback is to halt the offshore construction from November to February (C4A-13). But this measure will not be helpful in the case of Nicobar Megapode with nesting activity from January-June, the Coconut crab which mates during May-September and migrates to shore for egg release during October-November or the Nicobar long-tailed macaque which breeds year-round. The second measure which is to suspend construction activity during night hours is not applicable to diurnal animals and birds, which are foraging, resting and moving throughout the day. Besides, there is no mention of the impact on	The stoppage of work was suggested only during the nesting season for the leatherback turtles.

	these endemic species during the operational phase of the project.	
23	As per the report, there will be sedimentation around the breakwaters and the berths and no erosion is expected as per the model (C4A-23). But again, there is no information about the mathematical model used to arrive at this conclusion. The report also states that "there will be no erosion on the beach especially on the western flank of the bay where the leatherback turtles breed" and in the very next statement says that "as per the model results there will be sedimentation of around 0.04m/yr on the western beach". In fact, it goes to claim that the beach is likely to be widened over long period giving more space for breeding to the turtles. This claim is not substantiated by any reference. Whereas, there are enough references that show how several metres of beaches are lost due to sedimentation. For example, in Ennore port, the impact of coastal erosion due to breakwaters was seen up to 3 km north of the port and shoreline re-adjustments led to moderate erosion of 50 m/yr (Rodriguez and Sridhar, 2010). The port berths, terminals and breakwaters end up obstructing the littoral drift of sand and sediment. The port causes trapping of sand on the upstream side and the possible bypass causes sedimentation at the entrance. The sedimentation requires maintenance dredging and deposition of the dredged sand. The result is a deficit in the littoral drift budget, which causes lee side erosion along the adjacent shoreline (Bhalla 2007; Schiavina 2007; Puthur 2007 and MoES 2009).	The mathemetical model report undertaken by Indomer Coastal Hydraulics (Pvt) has been attached with the EIA. Please refer Attachment III. There is no logic to compare the erosion and sedimentation of one port with the other.
24-25	The report suggests that sedimentation process may affect the Galathea river mouth to some extent. The model that suggests that no sedimentation will occur has not been named. It also mentiones that due to the deposits on the fan of the mouth of Galathea, it needs to be dredged periodically (C4A-23). In freshwater systems, sediment management can have both direct and indirect impacts on species throughout the food web (Kemp et al. 2011). Direct impacts of sediment can include invertebrate mortality (e.g., via smothering; Kefford et al. 2010). Further, suspended sediments can reduce dissolved oxygen and alter the trophic structure (Kjelland et al., 2015). However, the impact of this periodic dredging on the ecology and flow of the river has not been assessed. The Shompens, not only	The report of mathematical model study undertaken by Indomer Coastal Hydraulics (Pvt) has been attached with the EIA. Please refer Attachment III. Interaction with Shompens are prohibited therefore the social system of Shompens are little known.. Therefore the marriage system and other sociological behaviours has not been covered in the report.

	depend on the river for food and water but also their marriage system is intricately associated with flow of the stream. Although this is a less understood aspect about the tribe, but it will be a serious oversight to assume that any impact on Galathea will be without any consequences on the Shompens.	
26	According to the report, the dredged material will be disposed in the SE area of the GNI peninsula at a depth of about 600m. The model result shows that the sediment plum will disperse within a short distance and therefore not going to have any significant impact in an area where the sunlight penetration is practically nil and the marine life is rare. Very few marine flora and fauna is reported at a depth of 600m at a distance of 7500m from the nearest shoreline (C4A-26). There are no references to indicate which marine biota occur at the said depth. However, it must be noted that wherever the disposal of dredged material in the deep sea is carried on, it is done after a thorough coastal impact assessment. The trace metals in the dredged spoil may affect the flora and fauna in the upper layer of the ocean as well as the deep sea. Moreover, any contaminants associated with the dredged spoil would have a wide distribution and the oxygen demand would be widespread (Tyler, 2003). Stronkhorst and Vethaak (2003) observed a substantial reduction in benthic invertebrates during the period of dumping. The dumping site also contained two-three times higher concentrations of cadmium, mercury, polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAH) and tributylin, than the reference site.	The light penetration at a depth of 700m is minimal and therefore the biota is restricted.
27	It is stated that the Shompens undertake near shore fishing but their fishing activity is restricted near the Casuarina Bay area which is near to their habitation. No fishing activity will therefore be affected due to the location of the port at Galathea Bay area (C4A-27). But in another chapter (C4D-110), it is mentioned that the Shompen often visit near the site (of the power plant) on the Galathea river for drinking water and even fishing.	Fishing is generally practiced in the coastal area. However, they may occasionally fish in the upstream of the Galathea river.
28	It is stated in the report that settlement of the suspended sediments can result in the smothering or blanketing of sub-tidal communities and/or adjacent inter-tidal communities. Presently, the marine biota in Indian Coast is already subjected to considerable changes in turbidity due to large-	No coral is available in the work area of the ports.

	scale littoral movement, which is a recurring regular natural phenomenon. Therefore, it would be able to withstand localised turbidity induced during the dredging (C4A-28). There are no references to any of these statements whereas there are several studies that show that sediment and turbidity associated with offshore dredging has been linked with higher disease prevalence in coral reefs (Pollock, et al., 2014), mass coral mortality (Dodge and Vaisnys, 1977) and killing major reef-building corals resulting in the decline of diversity and abundance of reef fish (Rogers, 1990).	
29	The report gives no specific recommendations to prevent discharge from the dredgers or work boats, but simply states that "discharge shall not be allowed into marine waters". Moreover, it is not discussed exactly how the dredging activity will be confined within the project site (C4A-28).	The exact type of dredger that will be used will be decided at a later stage of the project. However, the contract for the dredging will have strict environmental and operational conditions.
30	As mentioned in Chapter 4A, pg. 32, currently the bay mouth is about 3.8km which will reduce substantially (by approximately 12 times) due to construction and land reclamation. This might hinder the entry of the turtles in the area for breeding and the turtles will have a smaller approach path to the western flank of the beach. As per ZSI recommendation off shore construction activity may be halted to possible extent between November to February, which is the breeding season for the turtles. Off shore Construction during the night time also may be restricted (C4A-32). Halting the off shore construction during the turtle nesting season is not going to undo the constriction of the approach path of the turtles by 10 times! The impact on turtle nesting during the operational phase has not been discussed. Moreover, all the assessment is focussed on the beach, while the importance of the impact on the nearshore waters which are important feeding grounds for juveniles as well as male turtles during the pre-nesting season for courtship.	The purpose of the EIA is to identify the issues and provide the mitigation measures to minimise deleterious impact.
31	It is stated that since Great Nicobar Island is not well developed and is mostly rural in nature, there is a complete lack of educational and healthcare facilities (C4A-51,52). It is important to note that even though there is a lack of institutes imparting higher education including graduate studies, the infrastructure for educational and health care facilities are very much adequate for the current population. What is lacking is equipment and staff	Required Social infrastructure requirement have been included in chapter 8.

	in both the facilities, an issue which is faced by all government run institutes across the country.	
32	The report mentions that the ICTT project shall bring major investments to the region covering a wide range of sectors and setting up ancillary facilities which will provide benefits to the economy and will help livelihood of the people (C4A-52). It is to be noted that by its very nature, construction of a port is always followed by ancillary facilities, and even more so if the site is a poorly connected island. As described in a report by Rodriguez and Sridhar (2010),"It is extremely cost effective for an industry that needs to move large quantities of raw material or final products through a sea route, to be located close to port areas. In port areas where there is a very large movement of goods and where ships berth for a long period of time, there are even facilities such as shopping malls and golf courses within port areas. These are all not necessarily activities that require the waterfront or the foreshore region." Given this scenario, there is a high chance that more Protected Areas and Tribal Reserve will be diverted to make room for the ancillary facilities which will seem necessary once the port is built. So, the port will undoubtedly bring major investments but it will also bring major deforestation and habitat degradation in the island.	No comments
33	Secondly, the livelihood of people will improve if their basic rights of access to frequent ships, chartered flights, cellular connection and ease of doing small businesses is met with. Great Nicobar has the potential to become a beacon of hope for sustainable development which is grounded in justice and equity and does not come at the cost of lives of the indigenous communities, flora and fauna of the island.	No comments
34	As a remedial measure, it has been suggested that no fruiting tree which attract birds will be planted in the vicinity of the Airport site (C4B-103). Additionally, when a bird strike hazard is identified at an aerodrome, it is proposed that the number of birds will be decreased by adopting measures like cracker blasting and generation of the ultrasonic waves to scare the birds (C4-B 63). The report also says citing the ZSI report that, GNI does not fall under any migratory bird route (C4B-104), which is absolutely incorrect. Andaman and Nicobar Islands fall on not one but two bird flyways, the Central Asia Flyway and the East	As per ZSI report, no migratory birds has been reported at GNI.

	Asia/Australasia flyway (Sivaperuman and Gokulakrishnan, 2017, Central Asian Flyway Action Plan, Country Report – India, 2005). In addition to that, the Nicobar group of islands are one among the 221 Endemic Bird Areas (EBA) in the world and the 27 major EBAs in Asia. GNI is an Important Bird Area (IN451) that is categorised as A1 (holds significant numbers of globally threatened species) and A2 (holds a significant population of at least two range restricted species). And yet the only mitigation measure suggested is with respect to avoiding bird hazards during flight operations for the "safety of the flight". There is no discussion about the impact of the airport on the two flyways used by migratory birds or the impact of the noise, light and sound pollution generated at the airport.	
35	Several studies report that bird strike frequencies correspond to migration patterns (Langley 1970, Solman 1973 as cited in Linell et al., 1996; Drey et al., 2014). More frequent bird strikes occur in wet season and during high winds (Linell at al., 1996). High levels of rainfall and wind velocity as seen in an equatorial rainforest ecosystem such as GNI would mean even higher probabilities of the same. Linell (1996) also reports that between military and commercial, commercial air carriers have the highest strike rates.	No comments
36	The impact assessment for the Area and Township Development project seems incomplete. There is no mention of how the diversion of 12187 hectares of forest area for the proposed construction which involves coastal tourism, institutions, soft industries and a transport line will impact the biodiversity of the area or the Shompens.	Please refer scaled map in chapter 2C, figure 2.1. A & N Islands is having only ~6% revenue land, hence, Compensatory Afforestation is being done in Madhya Pradesh, as per the guidelines of MoEF&CC. in this regard, Government of Madhya Pradesh has submitted the CA scheme and kml file for double the degraded forest area in the State of Madhya Pradesh in lieu of diversion of 121.87 Sq.km. of forest land and 8.88 Sq.km. of deemed forest land to Forest department of A&N Administration.
	Besides, this infrastructure is proposed on the western flank of the bay which the report has repeatedly stated, is being left for turtle nesting (C2-106). Even if the development is located away from the beach, crucial details about the distance	No activities have been planned at the western flank of Galathea Bay . Approximately 500m green buffer of has been proposed on the western flank of Galathea bay.

	from the beach, height of the buildings, etc has not been mentioned.	
37	Under the mitigation measures (C4C-162) it is simply mentioned, that degradation of the natural habitat and intrusion of the outsiders in the Tribal Reserve Areas need to be avoided. Exactly what measures will be taken to ensure this, has not been mentioned anywhere.	Please refer chapter 10 16 Number of check points have been suggested which will be guarded 24X7X365 to ensure no trespassing by the outsiders.
38	Even though the EIA consultant has no expertise in either business and defence analytics or anthropology, it declares that the public sector mindset has changed, and that development on GNI can coexist with defence functions, in harmony with nature, aboriginals and the new city development (Ch 4C-162). It is to be noted that the Shompens and some groups of the Nicobarese community still engage in barter system; they do not use currency and do not engage in business. This large-scale development will therefore come at the cost of the two indigenous communities, the local fishing communities, the small-scale farmers, the threatened and endemic flora and fauna who have called GNI their home for thousands of years.	No comments
39	The report states that GNI generally devoid of vertebrate fauna. Apart from wild pigs, monkeys and snakes, there are no other vertebrates in this area and so the impact on the vertebrate fauna will be marginal (C4D-107). Even with this assumed low vertebrate diversity, the report has completely ignored the discussion of the impacts of the four projects and mitigation measures on small mammals like the 'Endangered' Nicobar tree shrew, Tupaia nicobarica and the 'Data deficient' Nicobar spiny shrew, Crocidura nicobarica. There is also no mention of how the project will have an impact on bats like the 'Endangered' Anderson's Roundleaf bat Hipposideros pomona, the endemic Black-eared flying fox, Pteropus melanotus, the Malayan large flying fox, Pteropus vampyrus and the 'Near Threatened' Island flying fox Pteropus hypomelanus. Rodent species like the 'Vulnerable', Palm Rat, Rattus palmarum have also not been mentioned nor have the herpetofauna species like the 'Endangered', Nicobar worm lizard, Dibamus nicobaricum and Nicobarese tree frog, Polypedates insularis or the endemic Shompen frog, Limnonectes shompenorum.	The environmental impact of the project has been considered on overall ecology and accordingly, mitigation measures have been suggested. Please refer Chapter 4,6 & 10.
40	It is mentioned that as per ZSI study, the area is rich in avifauna and it is apparent that when the area will be cleared of forest, the birds have a	This conclusion was drawn by ZSI based on their immense experience and expertise in this field.

	tendency to migrate to a more suitable habitat for relocation (C4D-107). This is also a very unscientific statement that does not consider the impact of such massive clearing of forests on the abundance, richness and assemblage of bird species. According to one study by Watson and Dawson, (2004), deforestation and habitat degradation affect the bird communities in Madagascar, with edge-sensitive bird species, mainly frugivores and insectivores getting the most affected. As per some studies, the effects of deforestation on the pathogens in birds may have resulted in several avifauna going extinct due to infectious diseases and island endemics are particularly threatened by this phenomenon (Sehgal, 2010). Moreover, the results of landscape transformation can have confounding impact of Avian malaria, other haemosporidian parasites and viruses (Sehgal, 2010).	
41	The report suggests that if any reticulated python/snakes, are encountered, the same will be reported to the forest department for relocation in other suitable habitats (C4D-107). However, there are several studies that discuss the issues with reptile translocation (Cornelis et al., 2020) It is observed that mitigation translocation has a history of high failure rates (Sullivan et al., 2015), and particularly for reptiles and amphibians where translocation is successful only in 41% of attempts (Germano & Bishop, 2009). Moreover, translocated reptiles show higher mortality rates than resident individuals, which is attributed to aberrant movement patterns, stress, disease, and inability to survive winters for species, where finding adequate hibernacula are a priority (Nowak et al., 2002; Brown et al., 2008; Massei et al., 2010; Harvey et al., 2014; Sullivan et al., 2015). Studies also point out that translocation influences survivorship and space use in snakes. The translocated snakes show higher activity ranges and travel greater distances over time (Wolfe et al., 2018).	No comments
42	The report mentions that since power plant is located near the river mouth there may a short-term increase in suspended solids and decrease in dissolved oxygen near the discharge point due to runoff from construction area causing a temporary decrease in the photosynthetic activity of Phyto-planktons, rise in conditions and food chain modification (C4D-108). However, the Shompen often visits the near to the site on the	The power plant is Gas based and no bulk water will be used hence, there is waste water discharge anticipated. Further, Chapter 4 describing the potential issues and impacts if no remedial measures are adopted. However, Chapter 10 suggested the mitigation measures to ensure the construction and operations of the

	Galathea river for drinking water and even fishing. Any alterations to the source of food and water of the Shompens will be in violation of the ANI Shompen policy (2015).	projects can be undertaken with minimal environmental degradation.
43	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. Again, there are no references to support this claim. In a study by Eguchi et, al. (2020), a power plant located in the home range of green turtles led to decrease in turtle density and a shift in activity period from nocturnal to more diurnal. The power plant also caused clustering of green turtles away from the plant and closer to seagrass pastures, where there were higher chances of human-turtle interactions like boat-strikes.	The beach is almost 1.2 km away from the Power Plant site boundary and having approximately 15 meter of level difference. Hence no impact of power plant on Leatherback turtle nesting sites has been envisaged.
44	The power project site is the nearest site to the Shompen habitat compared to any other project (C4D-110). The Shompen often use the site on the Galathea river for drinking water and even fishing. The construction phase with large number of labours and limited project management, it will be difficult to keep a check on the workers coming in contact with the Shompens. This will make the Shompens prone to disease transmission, exposure to addictive substances, mockery and exploitation. At no point under mitigation measures is there a mention of a programme or a workshop to sensitize these workers before they are brought into the island, something which the currently floating population of GNI also needs. If this project is approved, it will be equivalent to turning a blind eye to what happened with the Jarawas when the Andaman trunk Road was constructed and the A&N administration was apprehended by the Supreme Court of India and the Survival International.	Galethea river is almost 500 meter away from the power plant site boundary. Further, no movement towards the tribal area is allowed and will be controlled. Four (4) Check point (24X7X365) has been suggested so that no outsider can trespass the tribal area. The mitigation measures have been provided in Chapter 10. Medical check and vaccination programmes for prevention of contagious and vector borne disease have been proposed in the EIA report.
45	The report states that the Nicobarese have assimilated themselves (C4D-111) and there is no assessment or mitigation of any project activity on the Nicobarese, based on this very flawed view. The Nicobarese are a heterogenous community with different dialects used even on the same island. There are parts of Great Nicobar, where the Nicobarese still practice their traditional way of life and are wary of any outsiders mingling with them. The Tsunami of 2004, exposed the	Nicobarese have been largely assimilated to the mainstream. Many of the Nicobarese have been educated and working on government services. The project will create more educational and training opportunities.

	Nicobarese to living close to mainland settlers where they were subject to ridicule and judgement. This pushed a lot of Nicobarese to adopt a more modern way of life and now they lead a dichotomous existence between tradition and modernity (Saini, 2013; Gupta, A. 2016). And this will happen all over again with the Nicobarese living in Chingen village, if the project is approved.	
46	Under mitigation measure to prevent the labours contacting the Shompens, it is suggested that the forest and tribal area should be guarded and even barricaded with barbwires, if necessary (C4D-11). This statement made by the EIA consultant shows their ignorance towards the rights of the indigenous people and the non-existent literature review done before making these suggestions. It will be illegal, unethical and immoral to use a barricade and restrict a nomadic hunter, gatherer community which has called the island its home for about 40,000 years!	The trespassing control is on the non-tribal people (outsiders) and not on the tribal. Tribal, if they wish the can come to the non-tribal areas. Currently representative of Shompen community come the shops to collect ration.
47	The cost-benefit analysis has not been done for all the alternatives of the ICTT as dictated in the ToR, but only the sites chosen by the project proponent keeping in mind the economic factors. Besides, the cost-benefit analysis under the section for 'Ecosystem services losses due to proposed forest diversion' only includes the net present value (NPV) of the forest land being diverted. There is no consideration of the degradation of marine habitat including loss of ecosystem service of coral reefs and mangroves which includes natural barriers from erosion, salt water ingression, etc. The CBA also hasn't considered the economic valuation of turtle nesting beaches, fisheries in reefs, or any biodiversity as was directed by the ToR. The CA scheme which is to be carried in Madhya Pradesh, is not taking into account the valuation of the primary productivity and carbon sequestration function of an old growth Tropical wet evergreen forest and Littoral and Swamp forest of Great Nicobar which is much higher than the Tropical Moist, Tropical dry, Tropical Thorn and Sub-tropical broadleaved Hill forest types that are dominant in Madhya Pradesh.	The cost benefit analysis has been done for the final selected alternative. Please refer Chapter 9, Section 9.2.
48	Under the Cost Benefit analysis (9.2, C9-1), Table-A: Estimation of cost of forest diversion, the cost of Compensatory Afforestation is calculated as Rs.96,706 lakhs. However, directly below the table, while summating the costs, the amount for compensatory afforestation and soil & moisture conservation is given as 78,450.00 lakhs, which is	The amount of 96,706 lakhs Rupees is the cost to be paid to Madhya Pradesh by A&N Administration. However, addition cost as NPV (Rs. 1,36,372.25 lakhs) and Environment losses due to erosion effect on hydrological cycle, wildlife, habitation, micro climatic

	less than the cost of compensatory afforestation alone. There is a deficit of Rs. 18,256 lakhs from the total cost without considering the cost of soil & moisture conservation which is not given independently.	ratting of ecological balances amount to 30% of the NPV (i.e. Rs. 40,911.675 Lakhs) is to be added to the cost. Hence total cost is Rs. 273,989.925 Lakhs. Please refer Chapter 9, Section 9.2. However, the cost benefit analysis is being looked into and if necessary, will be revised and will be included in the EIA report.
49	The cost of habitat fragmentation is NIL and there is no justification given for this.	No habitat is envisioned.
50	As per the Handbook of Forest (Conservation) Act, 1980 and Forest Conservation Rules, 2003 (Guidelines & Clarifications; MoEFCC, 2019), in pursuance of the orders of 29th Oct 2002 of the Supreme Court in Writ Petition (Civil) No. 202/95 in addition to the funds realized for compensatory afforestation, the Net Present Value (NPV) of forest land diverted for non-forest purposes is also to be recovered from the user agencies, for undertaking forest protection, other conservation measures and related activities. The calculation of NPV will then be based on the table given below. 	The calculated NPV is based on the latest rules.
51	Even by the argument that the National Parks and the WLS have been de-notified, by their own admission, the diversion of 13075 hectares of forest land was done to accommodate the holistic development of GNI. Even if the said forest does not fall under a PA, it still is a primary Tropical Wet Evergreen Forest of Eco-class I and Eco-class II and so the cost of forest diversion should also be considered.	No national park is proposed to be de-notified.
52	It seems likely that the decision to divert 130.75 sq. km of forest land by de-notifying Galathea WLS and reducing the area under Campbell Bay NP and Galathea NP was taken partly to circumvent	No area from National parks, eco sensitive zones have been considered under the project area.

	having to bear the cost of diverting forest land falling under a Protected Area. Besides, if all costs are fairly considered, the cost of the project will exceed the benefits by manifolds.	
53	As per the Environment Management Plan about 12-20 hectares of mangrove patch is present at proposed location of the port. According to Chand, et al., (2013) the value of mangroves per hectare in A & N Islands is more than INR 0.2 million. The economic value of the turtle beaches of Andaman and Nicobar is estimated to be around 58,260 crores which includes provisioning services (consumptive value), regulating services (non-consumptive value) and cultural services.	Appropriate mitigation measures have been considered along with the allocation of the fund. Please refer Chapter 10.
54	As per the EIA report, the 34 waders or shorebirds reported from coastal areas, especially the mangrove regions. The report further states that these birds are neither endemic nor are they rare or endangered or threated and they were never found in large groups, presumably during the short survey conducted by the EIA consultant. The report also says that there are no fresh water wetlands in Great Nicobar which is not true. As per the National Wetland Atlas: Andaman & Nicobar Islands, (SAC, ISRO, 2009), there are approximately 2.20ha of inland wetlands in the island as seen in the figure below. It is important to note that the two wetlands fall under the proposed sits for the power plant and the airport. It seems that the consultant opines that least-concerned, under-studied and data-deficient birds will not face any impact due to the project and so are not worthy of a fair assessment or mitigation measures.	No wetland falls under power plant project site.
55	Forest fragmentation is linked to lower reproductive rates in migratory birds due to increased predation and parasitism, amongst other factors (Robinson et al., 1995; Donovan et al., 1995). Both these studies also show that populations in highly fragmented forests (sinks) are dependent upon immigration from other populations (sources) for reproduction. Runge et al. (2015) highlight the importance of protected area networks in the annual cycles of migratory species, as unprotected linkages in the cycle can affect the entire population of the migratory species (Runge et al., 2014).	No migratory bird reported in GNI as per ZSI. However, after discussions with the Ornithologists who worked in GNI, it is clear that they are "Birds in Migration". During migration over the GNI, weak or sick or hungry or thirsty birds land in GNI for feeding and gaining sufficient strength to continue their migration. There are no Pelicans or Storks or Flamingos etc. Birds in migration are like passengers in transit. GNI is not the only landing place for the birds in migration. Further, in the EMP a long-term study has been proposed for the migratory birds and routes. Please refer chapter 10.

56	Case study – Exxon Valdez spill in Alaska, March 1989. Total kill was initially estimated between 100,000 to 300,000, with some populations being entirely wiped out (Piatt et al., 1990). The oil took some days to spread and affect other areas such as Gulf of Alaska, with large numbers of birds, especially gulls, seen coated in oil. Other causes of destruction include ingestion of oil and exposure of nests/breeding areas to oil. Various populations showed adverse effects of the oil spill even 10 years after the incident, with some populations still not having returned to pre-spill levels (Irons et al.,2000).	No comments
57	Construction of harbours and jetties along with other associated human impact showed nearly 10% decline in species in a study (Yrjölä et al., 2018), therefore emphasizing the significance of EIA prior to such projects in order to minimize adverse effects on the ecology of the area, lack of which can lead to greater loss of biodiversity. Increase in noise has been shown to decrease numbers of birds (Reijnen et al. 1995). Artificial lights at night associated with the port and harbour operations will lead to subsequent light pollution, which has been shown to cause stranding of seabirds (Rodríguez et al., 2017), disrupt circadian rhythms (Raap et al., 2015) and change flight behaviour (Bruderer et al., 1999).	No comments
58	The period of time over which the EIA has been conducted (8 days of quick primary survey and the baseline study in March) falls grossly short of providing a complete picture of marine mammal species.	Beside the one season data collected, additional data collected by ZSI for past decade were obtained and used.
59	To ascertain marine mammal diversity, ideally one season of systematic surveys in the waters of GNI needed to be conducted to provide an estimate of species diversity and space use patterns of marine mammals from the region. This is because marine mammals may occupy certain areas seasonally based on regional food availability and life-cycle requirements.	Beside the one season data collected, additional data collected by ZSI for past decade were obtained and used.
60-61	We understand that the time provided to conduct the EIA was less than that but even in that case the EIA fails to mention any form of systematic sampling for marine mammals and also fails to provide sources for its documentation of three marine mammal species which is highly inaccurate. With such inadequate baseline research from the proposed site on marine mammals who are listed in the Schedule 1 of the Wildlife protection Act	The study for marine ecology was conducted by ZSI and based on their experience and expertise 3 marine mammals have been reported. Altogether, ZSI has reported that 414 species of coastal and marine faunal communities including 117 species of scleractinian corals, 14 species of octocorals, 11 species of sponges, 3 species of sea anemones, 6 species of

	(1970), it will be reckless to go ahead with such large habitat modifying activities.	polyclads, 43 species of molluscs, 12 species of heterobranchs, 48 species of crabs, 10 species of shrimps, 3 species of lobsters, 24 species of echinoderms, 10 species of ascidians, 110 species of fishes, and 3 species of marine mammals are recorded from this region. Please refer Attachment 1 (ZSI report)
62	The EIA mentions the presence of three marine mammal species from the whole of GNI, viz., the Dugong, False killer whale and the Common dolphin, but as mentioned in the attached document, there are anecdotal stranding and sighting records of at least five species of marine mammals, viz. the Indo-pacific bottlenose dolphin (Tursiops aduncus), Spinner dolphin (Stenella longirostris), Pan-tropical Spotted dolphin (Stenella attenuata), Rissos dolphin (Grampus gresius), False killer whale (Pseudorca crassidens) and the Killer whale (Orcinus orca). These have been reported from GNI waters and apart from these there are two whale species that have also been reported from the waters of Nicobar Islands. They are the Vulnerable Sperm whale (Physeter macrocephalus) and an unidentified baleen whale (Balenoptera sp.)	The study for marine ecology was conducted by ZSI and based on their experience and expertise 3 marine mammals have been reported. Please refer Attachment I.
63	Because most marine mammals are free ranging in their habit their ranges can span over thousands of kms, any species found within the Nicobar archipelago should be considered in the GNI assemblage of species as well; at least till the time more intensive systematic surveys are conducted to assess marine mammal diversity. Therefore, instead of three, the total number of species of marine mammals from GNI comes up to nine, including the Dugong.	Reply as per comment 60-61 above.
64	Bottlenose dolphins (Tursiops aduncus) have been recorded from the coastal waters of Great Nicobar Island (anecdotal data with multimedia documentation available). They are a coastal species which tend to show high site fidelity and are vulnerable to disturbances in their coastal habitats. Since a large part of the project influences coastal waters of south and south east GNI, it is imperative that more thorough examinations of this species population be carried out in the proposed area. If gone unchecked, the port construction and the planned 24hr dredging activities will potentially permanently displace populations of these dolphins from the area.	Reply as per comment 60-61 above.

65	Impact due to port construction activities: The EIA mentions that port construction activities will be timed outside sensitive seasons of marine mammal migrations but no effort has been undertaken so far to study migrations in the region. What are these periods when port construction activities will be avoided?	Please refer Chapter 10 of the EIA report.
66	The Nicobar archipelago is one of the last reserves of undisturbed marine mammal populations in the world and that is largely because pressures such as vessel traffic is limited in the area. Once the port is constructed the area will be bombarded with vessels of all shapes and sizes. The EIA completely forgets to consider how the marine mammals of the area will be impacted by the vessel traffic induced by the transhipment port. This worldwide is one of the most considered aspects of biological assessments for sea-based infrastructure development.	Currently, large number of ships move on the international shipping route which is approximately 40km from the proposed ICTT location at GNI. Ships will not move all around the island but will take a deviation of 40km north from the international shipping route. Therefore, it can be concluded that marine mammals and other species will not be affected all around the island.
67	How is the ship traffic going to be regulated? How will they avoid vessel strikes with marine mammals? How are the noise levels of the ships going to be managed in a way to least impact coastal cetaceans? These are some of the many unanswered questions that need to be asked.	The shipping traffic will be regulated as per international practice. However, some of the details involving port operation, ship movement etc will be worked out in detail by the port operator at later date. During the construction and operation phase, ZSI has suggested Under water noise generation should be restricted with modified equipment. If necessary, the project authorities will issue directives to ensure compliance to low under water noise norms. The measures 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 will be part of the approval process while allowing the ship to enter GNI-ICTT. This is part of the EMP. However, some of the details involving port operation, ship movement etc will be worked out in detail by the port operator at later date.
68	This report completely disregards the well-being of marine mammals from the region. If at all these largely undisturbed populations of dolphins and whales are to be safeguarded, a more critical study needs to be undertaken. Going ahead with the	Currently, large number of ships move on the international shipping route which is approximately 40km from the proposed ICTT location at GNI. Ships will not move all around the island but

	project on the basis of the present knowledge collected by this EIA will lead to an irreversible loss of diversity before we even fully understand it. The table below shows some sighting and stranding records of marine mammals from Nicobar and GNI.	will take a deviation of 40km north from the international shipping route. Therefore, it can be concluded that marine mammals and other species will not be affected all around the island.
69 - 70 - 71 - 72	The Nicobar Megapode with two subspecies Megapodius nicobariensis nicobariensis and M. n. abbotti, both of which are endemic to the Nicobar Islands (Sankaran 1995). The megapodes show a unique characteristic of incubating their eggs in incubation owing to which, they have particular habitat requirements (K. Sivakumar and R. Sankaran 2012). They construct mounds made of sand, loam, coral bits and rotting vegetation inside which eggs are laid. In the 1995 study conducted by Sankaran, out of the 188 active mounds, 97% were found within 100 m and 80% within 60 m of the beach, wherein the habitat present is classified as the "coastal forest" which is consists of both rain forest and deciduous species (Thothathri, 1962; Anil Bharadwaj 2015). The microhabitats of Pandanus spp. and mixed stands were found to be highly preferred for mound construction (Sivakumar and Sankaran 2012). Microhabitats dominated by Pandanus, Macaranga, and Dracaena stands were preferred for breeding as well as foraging in both dry and wet seasons of the year (Sivakumar and Sankaran 2012). The maintenance of mound temperature at a constant rate is essential for successful egg incubation (Sivakumar & Sankaran, 2003), and any impact of nearby sea water on incubation temperature could adversely influence the hatching success and thereby lead to further population declines.	No comments
73	Across the globe, habitat loss is caused majorly due to anthropogenic interferences (Castellatta et al.2000). Growing townships and villages, constructing roads, airstrips and infrastructure for defense establishments, expansion of coconut plantations has all resulted in the loss of habitat, which is the single biggest threat to megapodes Sankaran 1995. The conversion of coastal forest to coconut plantations harms the megapode's primary nesting habitat Sankaran 1995. According to Sankaran 1995, The biggest threat is the proposal to make Great Nicobar a free-trade port and to create a dry dock and refuelling base for international shipping at the mouth of Galathea	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.

	river, which, if carried out will destroy the ecology of Andaman and Nicobar Islands (Sankaran, 1995,1997; Vijayan et al. 2000).	
74	Mainlanders, especially labourers who work on construction projects often trapped megapodes as seen during Project Yatrik on Great Nicobar, With the phasing out of the project along with improved implementation of Wildlife Protection laws, hunting -pressures declined Sankaran 1995. Nicobar Megapodes also face localized hunting pressures from Thai poachers who also collected eggs, in parts of Tillanchong, Great and Little Nicobar. Snares for megapode and wild pig Sus scrofa nicobarica had been observed in the north eastern coast of Great Nicobar and most mounds near Thai camps (Sankaran 1995).	These are illegal activities and should be control by strict enforcement of wildlife protection Act by the UT Administration.
75	Most of the mound-nests found which were constructed post the tsunami were significantly smaller in volume than those present during the study by Sankaran in 1994 (Sivakumar, 2010). The Restoration of suitable habitat is critical for the long-term viability of the Nicobar megapode population. Owing to the declining numbers, continued habitat destruction and hunting the Nicobar megapode should now be qualified to be categorized as Endangered on the IUCN Red List Sivakumar, 2010.	This is a Govt. policy decision. However, wildlife protection Act should be strictly enforced by UT Administration.
76	In the South Asian region, an average of 1,000 leatherback nests is found across the Andaman and Nicobar Islands over the years, making this a significant nesting population in the South Asian region — and the only one in India. Nesting locations for these creatures requires offshore bathymetry and obstructions, slope and elevation of the beach. (Roe, J. H., Clune, P. R., & Paladino, F. V. (2013) The same paper also writes that nesting is negatively impacted by "removal of natural vegetation and construction of jetties, seawalls, buildings and other structures [as this] disrupts natural beach accretion and erosion cycles, ultimately leading to a reduction in beach width, slope and elevation from loss of sand."	The Leatherback turtle nesting site are located mainly on the western flank of the Galathea bay where no constriction is proposed. Further the entire stretch of western flank will remain as is with a buffer of 500m (green buffer) which will protect this area even after the development. The Leatherback turtle are also breed on most of the west coast of GNI (Casurina bay, Pammaya bay etc.) and in smaller numbers near Joginder nagar and Shastri nagar beach. None of these mentioned beaches are in the work area of the development.
77	The port project area also overlaps with the nesting locations of leatherback turtles in Galathea National Park. To build the port, workers will have to excavate the soil, will operate heavy vehicles, transport construction materials, etc. – all of which will alter the local ecology, and directly or indirectly affect the leatherback turtles, according to the ZSI report. Though the remedy for artificial illumination stated is sodium vapour	Currently, forest department collects the eggs after laying into hatcheries located at various beaches of GNI. Once the eggs are hatched, the hatchlings are collected and released directly to the sea to ensure that no predator birds /animals prey on the hatchlings. This interference by the forest department is undertaken to

	lights, this regulation is not always enforced and does not discount lights from possible surrounding traffic that is bound to follow. Disoriented hatchlings will also require constant monitoring and assistance to be steered back to the sea. The Kakinada port's illumination has grossly affected the orientation of adult Olive Ridleys while compromising hatchling life (Deccan Chronicle, 2016).	increase the survival rate of the turtles. The same practice will be followed during construction and operation of the development project at GNI.
78	The EIA report has listed Dhamra, Paradip, Kakinada, Kolkata ports as successful examples of sporadic sea turtle nesting in the nearby sites in spite of these operational ports. But various research articles and reports from these ports suggest a different narrative.	These are the examples referred in the ZSI report which are being reflected in the EIA report also. However, detail studies of these ports are not part of the ToR provided by MoEF&CC.
79	The reality of efforts and involvement behind the impact assessment for Dhamra port had been questionable and negligible from the start. The port exists at a distance of less than 15km from Gahirmatha marine sanctuary one of the world's largest nesting sites for Olive Ridleys. Greenpeace's 40-day ecological survey in 2007 came across 2000+ dead turtles apart from frogs, snakes, horseshoe crabs and dolphins all killed owing to mechanized boats near the port site (Mukherjee, 2007). January 2019 recorded the deaths of 600 Olive Ridley turtles in Gahirmatha Marine Sanctuary due to trawling from illegal fisheries (New Indian Express, 2019). More recently in February, 2021, 800 turtles were found dead in the sanctuary with causes that suggested trawls, fishing nets, and plastics (New Indian Express, 2021).	The proposed ICTT is an international port and will be strictly controlled to ensure that such incidental killings of turtle do not take place.
80	Paradip Port, one of India's major ports was a mangrove forest, nature's barricade against coastal erosions. In 2017, it was demarcated as being "severely polluted" by the Central Pollution Control Board in India. Three dumping sites close to the Olive Ridley nesting by Jayshree Chemicals Ltd were found in contempt of the scientific disposal guidelines. The Gahirmatha beach was 32km long when measured in 1977 versus the drastic reduction to 950 metres by 2010 caused by copious amounts of sand dredging.	Same as point number 79 above. Moreover, integrated waste management measures of international quality have been proposed for GNI. Please refer Chapter 2, Section 2.5.
81	In 2011, 5-6 turtles were seen grappling for space in a 1sqmt area causing interferences to other dug up nests (Bera, 2011). In September, 2009, the port witnessed a major oil spill incident after a vessel carrying 24000 tons of iron ore tipped over into the bottom of the sea. The oil spill threatened destruction to the Olive Ridley nesting site at the	No Comments

	Gahirmatha sanctuary since there were already traces of dead marine life surfacing by the shores (Satapathy, 2009). However, had the oil spill coincided with the hatching period, it would have without a doubt spelled disaster with the hatchlings crawling through the oil sludge on the coast. Not soon after in 2010, MV Malavika carrying coal from Indonesia hit a barge while unloading causing a leak. The spill reached the mouth of Rushikulya, where an Olive Ridley hatching was expected 2 weeks later (New Indian Express, 2010). January, 2020, officially reported more than 200 dead Olive Ridleys on shores near Paradip port due to trawlers in mechanized boats (Hindustan Times, 2020) following another massacre in January 2021, with close to 800 bodies of sea turtles were recorded to have collected over the coast of Orissa in the Gahirmatha sanctuary and Nasi beach (Senapati, 2021).	
82	In January 2017, the beaches on Hope Island saw 54 dead turtles wash up on shore in just a single month owing to illegal trawl nets (Sankar, 2017). The consistent dredging activities by Kakinada Sea Ports Limited has caused severe soil erosion at Hope Island. Decrease in distance between the Agha lighthouse and the sea water, fading away of 500 island plantations for the prevention of soil erosion and a significant 50 metre gap between the head and tail ends of the island are all cause for concern from repetitive and relentless dredging (Srinivas, 2011). Andhra Pradesh Marine Fishing (Regulation) Rules, 1995 states that no mechanized vehicle longer than 15m is allowed to operate within 25km of the coast and that mechanized boats must employ the use of a TED (Turtle Excluder Device) - intervention methods that are neither followed nor enforced.	No comments
83	The nesting is the period when a female turtle comes to lay her eggs on the shore. It is not a solitary event and a single female maybe lay multiple times during one nesting season. Between laying two clutches/nests the female generally uses the nearshore waters of the site to feed and rest. Even after the nesting cycle the female may use the vicinity of the same beach to recuperate before undertaking migrations again. Once the nests start hatching, the hatchlings are known to spend their initial days/months in the nearshore coastal currents. Exposing the turtles to such high levels of anthropogenic activities at such a vulnerable stage will potentially increase the	Currently, forest department collects the eggs after laying into hatcheries located at various beaches of GNI. Once the eggs are hatched, the hatchlings are collected and released directly to the sea to ensure that no predator birds /animals prey on the hatchlings. This interference by the forest department is undertaken to increase the survival rate of the turtles. The same practice will be followed during construction and operation of the development project at GNI.

	chances of juvenile mortality in the population. And not just the females and the juveniles, even male turtles are known to use the nearshore waters in the pre-nesting season for courtship. The entire cycle of courtship pre-nesting and post-nesting of these turtles are in a lot of areas dependent on the coastal habitat.	
84	This EIA treats the nesting beach as the only place which needs to be safeguarded whereas, it is the beach and the surrounding coastal waters which also need to be safeguarded from such habitat modifying activities. The planned project has a radius of 10km into the sea. It is safe to say that the turtles not just use the beach but also the coastal waters for these critical aspects of their life cycle which go on for about 6 months of the year. How do the developers plan to protect the turtles at various stages of development during the construction of the port and its related activities? It is unscientific reasoning on the part of the developers and the institutions involved in the EIA to think that the construction activities, dredging and the induced ship traffic are ok to be carried out when that same area is being used by such an endangered population of sea turtles.	Apart from port (ICTT), and small part of Airport runway will have some construction activities in the sea. Most of the construction will be on the land. Appropriate mitigation measures have been suggested in the EIA. Please refer Chapter 10.
85	The National Marine Turtle Action Plan 2021-26 lists the Andaman and Nicobar Islands as an important Marine Turtle habitat with nest predation and bycatch being the only threat factors. The very first objective of the action plan is to "Reduce direct and indirect cause of marine. Turtle mortality". Ironically, the plan also clearly demarcates activities like coastal development (construction of ports, industries, jetties etc) and pollution (plastic debris from port constructions, resorts and tourism etc) as direct threats from on shore activities. Offshore activities that act as threat include but are no limited to - oil spills, bycatch, industrial waste, destruction of habitat and disturbance from vessel movement etc.	The response is as per point number 83 and 84 above. Oil spill management plan has been detailed in the Chapter 7, Section A.
86	The ZSI report clearly states that there are long term and irreversible effects of pollution as well as dredging and though the claim is to regulate these effects, previous examples of ports have factually stated otherwise. It is imperative we take into consideration the vision and mission towards a healthy marine ecosystem outlined by our very own Ministry of Environment, Forest & Climate Change.	The purpose of the EIA is to ensure that the project can be constructed and operated with minimal environmental degradation.
88	A recent study conducted by Krishnakumar, et al. (2019) points out that there was a significant	The plastic wastes generated on the beaches of GNI is basically from

	number of plastic debris was found at the beaches of the Andaman and Nicobar Archipelago when compared with the listed locations worldwide. The investigation of the plastic litters suggested that the significant contribution of the debris was due to increased shipping activities and improper handling of solid wastes from urban areas of the Andaman and Nicobar Archipelago, and international borders/neighbouring countries.	nearby Sumatra and Malaysian islands and have nothing to do with the current project. Clearance of these plastic waste could be undertaken by the local authorities. However, for the plastic wastes generated due to project activities adequate measures have been suggested in EIA report through integrated waste management facility. Please refer Chapter 2, Section 2.5.
89	According to this study the beaches along the sites for the proposed project are already grappling with the problem of plastic waste. As shown in the figure below, "the maximum population of plastic debris was noticed at Laxmanpur Beach (405 particles) and B-Quarry Beach (335 particles), followed by Laxmi Nagar Beach (275 particles). All the sampling sites were considerably polluted with plastic litter (>20%) except for Gandhinagar and Shastrinagar. The percentage of the available plastic litters in the Nicobar Island sector ranged from 26.2% to 31.6%. Irregular shaped plastics were predominant in the macro-sized varieties in Laxmanpur beach, B-Quarry beach and Laxminagar beach. However, the maximum population of pellet-shaped plastics was noticed at sampling site Laxminagar beach (Fig. 4d). The high population of polyethylene and polypropylene was noticed throughout the Nicobar Island sector. Factors such as Current/wind direction, location of the sampling point, beach profile, and local geomorphological settings play a significant role in the distribution of plastic litters along the coast. The total number of microplastics in this sector was ~88 particles. The distribution of the plastics was in the following order: polyvinyl chloride (43) > polystyrene (58) > others (121) > nylon (128) > polyethylene (550) > polypropylene (669)" (Krishnakumar, et al. 2019). Any activities of these beaches resulting in more waste will only compound the situation severely affecting the coastal and marine biota.	Covered in the response to point 88.

The Executive Committee & Members of the Madras Naturalists' Society, Chennai

S.no	Comments received	Responses
1	In reference to the ZSI report excerpt, MNS stated that These are serious demerits. They clearly indicate that the site is unsuitable for such largescale projects.	As per ZSI report, despite environmental issues, the site can be developed. However, ZSI has suggested several remedial measures which forms part of the EIA report (Refer chapter 6 & 10).
2	Regarding the mitigation measures suggested in the EIA report, MNS stated that this ideal situation is impossible to achieve given the scale of the interlinked projects and their requirement of land, water, infrastructure, and personnel.	EIA report suggested large scale monitoring of various environmental parameters to ensure that the mitigation measures suggested in the EIA report strictly adhere to. Please refer chapter 6 & 10.
3	Survey of the project area carried out from 14-22 Dec 2020 for this EIA is too short and sketchy to fully record and understand the ecosystem. There are impenetrable thick jungle and marshes with rich biodiversity in the south eastern part where the major developments are proposed. These will be irreversibly damaged. The suggested slope stabilisation measures will not be sustainable due to the fragile soil.	Though some preliminary survey through quadrant method were carried out for three months, the study includes significant amount of data generated by ZSI and the forest department over decades and forms part of the EIA report.
4	According to the EIA, 121.87 sq.km. of land in the project area falls under Protected Forest and 8.88 sq.km. of land under Deemed Forest, which is part of revenue land are proposed for diversion. Proposed clearing of forest, denotification of Protected forests is highly destructive and has adverse effects on the native flora and fauna. Even with utmost care, it is not possible for such a massive set of projects to have a low impact.	A & N Islands is having only ~6% revenue land, hence, Compensatory Afforestation is being done in Madhya Pradesh. Though 121.87 sq km of protected forest and 8.88 sq km of deemed forest will be diverted for this project, many of the forest patches will be left "as it is". Forest diverted for around 41 sqkm of land will be used for eco-tourism purpose which will have very low and limits development. most of the area will remain as is. The total deviated land also includes Green land use of around 26 sqkm which no building construction activities are allowed, and the existing forest will remain untouched. Therefore, the ecology will not be affected at any circumstances.
5	Given that India has pledged at COP26 to reduce carbon emission by 1 billion tonnes and reduce carbon intensity by less than 45% by 2030, such a massive deforestation of old-growth rainforest will greatly	Caron sinks as mentioned in the comment will not be affected as compensatory afforestation will be undertaken as per the forest Act.

	reduce carbon sinks leading to non-achievement of these pledges.	
6	Many endangered and vulnerable coral species as listed above will get destroyed in Galathea bay and other coastal/marine areas due to physical damage, disturbance, oil pollution from ships, water turbidity, etc., caused during construction and operation of the interlinked projects.	As per the ZSI report no corals exist in the bay portion of the Galathea Bay. However, some corals were found on the eastern and western flank near the peninsular part. These corals are not part of the project site and are away from the proposed construction activities. However, if any coral patch gets affected, the same coral will be translocated / transplanted. Please refer Chapter 6 & 10.
7	Innumerable economically valuable species of trees and plants including medicinal plants will be lost.	Please refer point number 4 above
8	The macaques are the only non-human primates on Great Nicobar Island. There will be extensive habitat loss due to the projects, which is likely to make them move more into human settlements and cultivations, leading to increased human-wildlife conflict.	Adequate measures have been suggested in EIA report. Please refer Chapter 6 & 10.
9	Leatherback turtle nesting will be severely hampered by the port. Construction is proposed over much of their natural nesting area. There is a risk of mortality due to collision with ships.	Adequate measures have been suggested in EIA report. Please refer Chapter 6 & 10.
10	In reference to ZSI precautionary measure of 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". MNS stated that this is not a feasible solution and not likely to be implemented.	All EMP measures suggested in the EIA report will be strictly adhered to. To ensure compliance to EMP, a robust monitoring system has been suggested. Please refer Chapter 6 & 10.
11	The Dhamra example has a wrong conclusion that Olive Ridley arribada still continues in Gahirmatha even though the port is only 13 km north of the arribada site. Olive Ridleys come to nest at Gahirmatha from the south, ie., from the Sri Lanka coast and they do not have to go towards or cross the Dhamra Channel. Leatherback turtles that nest in significant numbers in the Galathea bay do not nest in a similar fashion anywhere else along the Indian coast. In fact, nesting by Leatherback turtles along the mainland coast is a rarity and less significant along other nesting beaches of Andaman and Nicobar Islands.	The nesting issues related to Turtles were studied in detailed by ZSI. The examples of Dhamra and Paradeep ports are just indicative that turtle often do not gets severely affected due to the port. These are the examples referred in the ZSI report which are being reflected in the EIA report also. However, detail studies of these ports are not part of the ToR provided by MoEF&CC.

12	The proposed Port is a threat to this endangered endemic species (Megapode)	Adequate measures have been suggested in EIA report. Please refer Chapter 10.
13	The proposed developments will further endanger this Schedule 1 endemic species (Coconut Crab)	Adequate measures have been suggested in EIA report. Please refer Chapter 10.
14	Saltwater crocodiles are large free-swimming reptiles found in many locations in the A&N islands. It is not feasible to relocate them from the project sites.	Successful relocation of saltwater crocodiles has been achieved in many parts of the world.
15	The kind of alternatives suggested by ZSI for coral restoration etc., in Great Nicobar need to be peer reviewed and will have to be funded by the project proponent. There is no agency to monitor the clauses on which the clearances are given and if these clauses are being followed by the developers.	If needed, the restoration of corals will be done by the project development agency (SPV). Details have been given in chapter 10. MoEF&CC monitors the implementation of the conditions given in the EC generally on a six-monthly basis. Moreover, the project will also monitor the compliances to the EMP as per chapter 6.
16	Old rain forests will be permanently damaged and can never be replicated through compensatory afforestation as they are complete natural ecosystems with innumerable interdependent species with special climatic and soil requirements .	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.
17	The EIA clearly indicates there will be considerable pollution of air, water and soil in addition to noise. During operational phase these will be inevitable and continuous, not temporary. Mitigation measures will not suffice to minimise or reverse the impact on the natural ecosystem, flora and fauna.	The EIA report identified the possible sources of pollution (Air, Noise and soil). As per the modelling of various environmental attributes, the pollution levels for Air, water, noise etc will be within the stipulated standard during the construction and operation of the project. Please refer Chapter 7.
18	Extensive destruction and smothering of endangered corals and water turbidity will result from reclamation. Pristine coral reefs in Great Nicobar Island are ecosystems with innumerable inter-dependant fishes and other organisms. Replanting cannot successfully replicate these ecosystems.	Corals in Nicobar are generally healthy but are not extensive in spread. They occur in narrow stretches in patchy mats. None of the species found in GNI is endemic. Adequate measures have been suggested in EIA report to ensure that the impact of construction on corals are minimised (if any). No coral area will be used for construction purposes. However, if any coral patch gets affected due to the disturbance during

		construction, the same will be Translocated/transplanted. Adequate amount of finance has been kept for this purpose. Please refer Chapter 10.
19	Noise, air pollution, light and habitat disturbances will adversely affect plants and animals in the vicinity and can get seriously and irreversibly affected by dust deposits. It is not possible for dust to be confined to within the project boundary since there will be strong winds from the sea side.	The power plant site is surrounded with dense plantation and limited to 39ha. The possible dust generation is estimated during the construction phase only. Adequate dust separation measures through water sprinkling have been suggested in the EIA report.
20	Galathea Bay, which is home to a wide range of protected species, has been selected as the best location for the port. The ICTT will cause extensive devastation of this precious biodiversity hot-spot.	ZSI has looked into the ecological setup of all the proposed alternative sites of the port (ICTT). Based on environmental and techno-economic feasibility the eastern flank of the Galathea Bay was chosen for ICTT location. Please refer Chapter 5 & Attachment I.
21	"During construction phase changes in Land use/land cover may arise, Topography changed. Due to construction activity and Soil compaction, consolidation may cause in loss of vegetation and tree cover, soil pollution and even flooding also". "If no care is taken, the marine water may get polluted as a result of releases of contaminants, if any into the marine system including leakage/ spill of oil in port and its surrounded area will impact water quality. As a mitigation measure, no untreated water will be discharged either during the construction or operation phase of the project. Port operators should prepare a Spill prevention, control, and counter measure plan". All this damage anticipated in the EIA is irreversible. Mitigation measures by water treatment will not effectively remove all contaminants.	The EIA report identified the possible sources of pollution to address it properly. However, detailed mitigation measures have been listed to reduce, mitigate, eliminate all the contaminants during construction as well as in operation phases. Zero wastewater discharge philosophy has been adopted. Oil spill management measures have also been suggested in the EIA report. Please refer chapters 4, 7 and 10 of the EIA report.
22	Most of the mitigation measures suggested by ZSI are unlikely to be adhered to – eg., no activity at night so that nocturnal fauna are not disturbed by bright lights. Solid waste – eg., construction debris, garbage, plastics, litter etc are recommended to be cleared regularly, however even if a waste disposal plant is established, its capacity will not be sufficient to dispose all safely. There is no system to 'police' the project development activities to ensure the measures are adopted.	EIA report suggested large scale monitoring of various environmental parameters to ensure that the mitigation measures suggested in the EIA report strictly adhere to. Please refer Chapter 6.
23	Relocation of endangered fauna is not feasible or advisable. They have specific habitat requirements and are extremely sensitive to environmental	Relocation of all endangered fauna has not been suggested in the EIA report.

	changes. This recommendation contradicts the mitigation measures suggested for protecting the habitats of endangered species.	
24	The environmental and ecological impact cannot be negligible for such a large-scale project with multiple developments extending over 166 sq km. Since the impact on the terrestrial and marine biodiversity will be significant and irreversible, this pristine location in Great Nicobar is unsuitable.	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI. The purpose of the EIA is to ensure that the project can be constructed and operated with minimal environmental degradation.

Mr Vinay Tondon IFS (retd), Former PCCF and HOFF, Himachal Pradesh, Veteran member of ANI Group

S.no	Comments received	Responses
1	ANI is one of the last genuine wildernesses left in the country. We are alarmed and shocked that the Gr Nicobar is slated to be the next victim of rapacious and thoughtless development. We understand a voluminous EIA Report has been prepared though few have access to it and even fewer have read it! Since the is little to fully understand the ecological impact of the proposed project, we would very humbly request that the hearing be postponed by at least another month to allow a fair Hearing to happen. This appeal also goes to all decision makers and connected members of MOEF & CC to please reconsider the haste in which this Hearing has been convened.	Public hearing has been conducted on 27th January 2022

Mr Uma Shanker Singh IFS, DSc, Director, Vanashakti, Lucknow, UP

S.no	Comments received	Responses
1	The GNI is covered with about 732.79 Sq. Km. (80.52% of Island area) of Biosphere Reserve. This was included in the World Network of Biosphere Reserves as part of the Man and Biosphere Programme of UNESCO in 2013 to promote sustainable development based on local community effort and science. Presence of the Great Nicobar Biosphere reserve in Great Nicobar also witnesses the presence of a diverse wildlife in the islands. While it is critical that the wildlife species and their habitat are protected, this also presents an opportunity for nature-based tourism. Another notable feature of the Island is the abundant presence of unique forms of corals at certain localities around the islands. This is also a great attraction for tourists looking for diving into the waters. In spite to the development potential, the site has constraints of ecological and anthropological sensitivity. The site is also far away from the main land and is connected only by sea and air.	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.
2	There are many confusions in EIA. Firstly, this is not well drafted and has plenty of mistakes. Secondly, it lacks complete clarity and transparency. In the first para, the EIA states that this project requires diversion of forest land to the tune of 130.75 sq.km and goes on to define in a mathematical term that a proposal has been sent to the ministry of environment, forest and climate change for downgrading / exclusion of 70.60 sq. km of Great Nicobar Biosphere reserve. This has been further revealed that A&N administration proposes to re-notify 45.23 sq. km of land within Campbell bay National Park & Galathea National Park and 31.73 sq. km land outside the project area. Therefore, adding them together this becomes 76.96 sq.km and states further that effectively an area of 7.11 sq. km will only stand to be de-notified. This translates to a total land of 84.07 sq.km to be excluded of Great Nicobar Biosphere reserve and not of 70.60 sq.km. This does not state that from where the proposed area of 45.23 sq.km will be brought in to be added to these protected areas? This will be brought to their knowledge that an ecosystem does not work in isolation. The EIA document does not tell us the status of the area, which are proposed to be added, from the bio-diversity and other ecosystem	The details provided in the EIA has not been understood properly before providing the comments. However, for the clarity details have been reiterated below. Forest land: The area of the tribal reserve is 751.070 sq.km. Of this 84.10 sq.km falling under Project area and is proposed to be de-notified. Andaman & Nicobar Administration proposes to renotify tribal area (45.23 sq.km of land in Campbell Bay and Galathea National Parks and 31.73 sq.km land outside the National parks. Therefor effectively 7.11 sq.km will be required for de-notification of tribal area for the project. Further, two national parks (Galathea national park and Campbell Bay national park) and major portion of the tribal area are proposed to be un touched, which is more than 81% of the total GNI area. Kindly refer chapter 1, Figure 1.2-a.

3	The EIA states that while it is critical that the wildlife species and their habitat are protected, this also presents an opportunity for nature-based tourism. Another notable feature of the Island is the abundant presence of unique forms of corals at certain localities around the islands. This is also a great attraction for tourists looking for diving into the waters but probably the government forgets that wildlife tourism has a very bad impact on the wildlife ecosystem and this has been amply demonstrated in many national parks and wildlife sanctuaries namely, Gir national park of Gujarat . This should be borne in the mind that the proposed site has many constraints of ecological and anthropological sensitivity. This further reveals that 81.74% of the Island Area comes under national parks, Great Nicobar Biosphere reserve and Forest including tribal conservation areas. And only 166.1 sq.km of area has be designated for Development purpose.	No wildlife tourism is planned in the area. However, eco-tourism and coastal tourism plan has been formulated for GNI.
4	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 with varied thicknesses. The island has plates of dead and live corals. New coral recruits were also observed have been seen in some of the new areas. Along the coastal beaches of the Nicobar Island, Leatherback and Olive Ridley turtles are known to nest. The tsunami of 2004 has been so devastating that it has 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. Each Leatherback turtle lays about 100 eggs, and the succession rate of the hatchlings is around 63.5% in 2020. Various reports suggest that one out of one thousand turtles reach adulthood therefore, this area should be left undisturbed	Nicobar Island did not experience large scale bleaching. Corals in Nicobar are generally healthy but are not extensive in spread. They occur in narrow stretches in patchy mats. None of the species found in GNI is endemic. Adequate measures have been suggested in EIA report to ensure that the impact of construction on corals are minimised (if any). No coral area will be used for construction purposes. However, if any coral patch gets affected due to the disturbance during construction, the same will be Translocated/transplanted. Adequate amount of finance has been kept for this purpose. Please refer Chapter 10.
5	This surprises most of us that the standing committee of the National Board for Wildlife (NBWL), India's apex body for wildlife conservation, took a decision to de-notify in its entirety the 11.44 sq.km of Galathea Bay wildlife sanctuary in one go without any justification	No comments on NBWL recommendations.

	except, ironically, that the area was needed for an "international shipment project". It is India's most iconic nesting site for leatherback turtles. The leatherback turtle can grow up to six feet long and weigh as much as 900 kg. There hasn't been much research worldwide on the ideal characteristics of a leatherback's nesting site. However, factors that seem to matter include offshore bathymetry and obstructions, slope and elevation of the beach. The nesting is going to be negatively impacted by "removal of natural vegetation and construction of jetties, seawalls, buildings and other structures [as this] disrupts natural beach accretion and erosion cycles, ultimately leading to a reduction in beach width, slope and elevation from loss of sand. This is well known that leatherbacks prefer sloping beaches with deep offshore waters and this is most likely the same reason why Galathea Bay is good for turtles as it is also for a port. The breakwaters and the construction will only erode the beach and the associated disturbance from dredging, lights and increased human presence will dissuade leatherbacks from nesting, since these reptiles are very sensitive to lights during nesting.	ZSI has looked into the nesting of turtle. Measures have been suggested to ensure that the impact of project construction on the turtle nesting is minimum. The remedial measures suggested by ZSI has been included in EMP. Please refer Chapter 10. Hydrodynamic model conducted by DPR consultant suggests no erosion of the beach due to the construction of the breakwaters. The modelling study undertaken by Indomer Coastal Hydraulics (Pvt) has been attached as Attachment III with the EIA report.
6	The recommended port site, the proposed design and the breakwaters are only some of the issues that will impact the turtles. There's also the disturbance during construction, if and when it begins, the eventual shipping traffic and the ever-possible threats in the form of toxic spills and coastal pollution. Taken together, the best mitigation plan will be to not have the project at all. If the project begins, nothing can mitigate the disasters awaiting Galathea Bay and its turtles.	Adequate measures have been suggested by ZSI and is included in the EIA report. Robust monitoring measures have been suggested in Chapter 6 to ensure that the mitigation measures suggested in the EIA report are strictly adhered to. Please refer Chapter 6 & 10.
7	There are four projects as envisaged earlier and one of them is the construction of an international container transhipment terminal and the backup area for this will have to be developed by reclamation which will extend up to the intertidal zone. The total reclaimed land (227 Hec) has been redistributed between berths (13%), container storage (71%), building & utilities (1%), road & pavements (9%) & Green areas (6%). This will be possible through Capital dredging of approximately 17.7 million cum in Final phase & 6.4 million cum in initial Phase. It is estimated that only part of the dredged material will be suitable for reclamation (only 50 %). Predominantly the port land proposed to be reclaimed is an intertidal zone and seaward which is saline in nature and	Adequate measures have been suggested in EIA report. During the turtle breeding season, it has been recommended that construction work at night will ceased to ensure no disturbance to the nesting turtle population. Please refer Chapter 10. The dredging operation will not include any rock blasting therefore, not much of ecological impact is expected.

	also low lying area having slope towards sea. In phase I, the dredged material will be used for port reclamation and unusable material, if any, will be disposed of in the designated marine disposal location. But the major question remains unanswered that what will be the impact of dredging on the local ecosystem, turtle breeding, slope of the ocean and its impact on other fauna. The stated area has not been studied fully because Turtle nesting sites and Megapode nesting sites are present at the mouth of Galathea River.	
8	The damage sustained by buildings and structures in the Andaman and Nicobar Islands area in past was due to earthquake shaking and/or giant tsunami waves. This has been found that while damage on Little Andaman Island and all the Nicobar Islands was predominantly tsunami-related, damage on islands north of Little Andaman Island was primarily due to earthquake shaking even though tsunami waves and high tides were also a concern. In general, a number of new reinforced concrete structures suffered severe damage or even collapse. Also, extensive damage occurred to the coastal and harbour structures in the Andaman and Nicobar Islands if we go back to damage suffered severely during the 2004 tsunami. The Sumatra earthquake (Mw 9.3) of 26 December 2004 was one of the most important earthquakes from the point of view of plate tectonics. This event occurred along the plate boundary marked by the subduction zone between the Indian Plate and the Burmese Plate (a part of the Eurasian Plate). The southern portion of the proposed area seems to have subsided by about 3 m, as supported by changes in the natural water levels. The entire Megapode Wildlife Sanctuary was submerged due to the submergence and does not exist anymore. The eastern coast also, the sea has advanced to the coast by about 200-500 m, depending on the topography. This sudden 'land drowning' (due to tectonic subsidence), coupled with the tsunami, altered the structure of mangrove forests. As per the study by WII, the mangrove covers in the Nicobar Islands declined by around 97 percent, which is higher than the earlier estimation. The researchers form Centre for Ornithology and Natural History (SACON) documented 20 mangrove species from 34 sites across the Nicobar Islands, of which eight species were recorded for the first time from the island group. There could	All the required studies, analysis and modelling have been done for this project, and are included in the EIA report. Please refer Chapter 7. Further, appropriate mitigation measure have been suggested in Chapter 10.

	be two major reasons for the new reports of eight mangrove species. These islands are often underexplored, so the species could have been there but not reported. The second factor could be that the tsunami may have carried the seed material of the unreported species from nearby sources (such as Malaysia, Indonesia and Singapore) along with the huge pile of debris that it dumped on the Nicobar coasts) bit the chances of the former are very high. Therefore, we have million dollar question is: can we afford a kind of development as envisaged in the project?	
9	The area is shielded from sea with two high grounds of approx. 70 to 100 m elevation above MSL for almost 70 % of length of airport. The site passes through an inundated patch of approximately 0.73 Sq km in the centre of Site. This patch was earlier agricultural land but got inundated during the 2004 tsunami and remained inundated till date but let us not forget that Indian coastal regions may have another Tsunami. There are a number of studies which shows that several independent indicators imply a high probability of a great (MN8) earthquake rupture of the subduction megathrust under the Mentawai Islands of West Sumatra. The human consequences of such an event depend crucially on its tsunami genic potential, which in turn depends on unpredictable details of slip distribution on the megathrust and how resulting seafloor movements and the propagating tsunami waves interact with bathymetry. There is yet another problem of sea reclamation for the runway construction which has not been addressed in the EIA.	Reclamation of the inundated portion (71ha) for Airport is also part of the EIA.
10	The project reveals that while reclaiming the creek area, the crocodiles will have to be relocated to suitable habitat but not yet known what that suitable place is and how is this possible to relocate them when we are not knowing their numbers. The coral loss will not be mitigated at any cost. The airport will need 55.46 ha of forest land. This area is generally densely vegetated. The removal of vegetation will impact the birds and other fauna which depends on the flora. However, ZSI assertion that the impact will be limited as most of the faunal species will be able to relocate to other areas where the vegetation is significant is not acceptable scientifically. We don't know the number of species available nor is their density	Most of Andaman & Nicobar groups of islands have suitable habitat for salt water crocodiles. In view of the spread of the crocodile habitat, it will not be difficult to relocate few crocodiles from the creek area. There is no endemic coral species in GNI. The coral patches are generally healthy but patchy. The coral patches are narrow and no extensive reefs are found in GNI. The reclamation of the Airport area does not have any coral patch. However, ZSI has reported isolated

	therefore, this is premature to say that there shall not be any ecological impacts on the ecosystem.	coral patches away from the work area. EIA has suggested that if there is any degradation of coral mats during the construction work, translocation / transplantation has to be undertaken. Adequate amount of fund has been kept for this purpose. Please refer Chapter 10.
11	Another assertion of ZSI that GNI do not fall under any migratory bird route is not acceptable because the migratory routes of all the birds have not been studied in detail as yet.	As per ZSI, no migratory birds have been reported in GNI, however, after discussions with the Ornithologists who worked in GNI, it is clear that they are "Birds in Migration". During migration over the GNI, weak or sick or hungry or thirsty birds land in GNI for feeding and gaining sufficient strength to continue their migration. There are no Pelicans or Storks or Flamingos etc. Birds in migration are like passengers in transit. GNI is not the only landing place for the birds in migration.
12	This was observed where the hills were steep and trees on the slopes were tall and large are allowed to be undertaken in the project. We all understand that it is identified as a major problem for a fragile ecosystem. Islands like Andaman and Nicobar might not be inhabitable in a few years due to rise in sea level and increase in climatic events like cyclones and other disruptions. The IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC), has cautioned that warming of oceans will increase the frequency and severity of climatic events like cyclones in India. This further reveals that Islands like Andaman and Nicobar, Maldives etc. will have to be vacated. People will have to be migrated from there as due to rising sea levels, these places will become non-inhabitable. Therefore, this is requested that this project may kindly be deferred for ever.	Rise of sea water level is a controversial topic and there is no agreement on the quantum of sea level rise among the experts.

Mr. Pankaj Sekhsaria, on behalf of members of Kalpavriksh

S.no	Comments received	Responses
1	Procedural violations i) As per EIA consultants own admission, they were in the field collecting data for the EIA as early as December 2020. This is at least seven months prior to the issue by the EAC of the ToR for the EIA. ii) How is it possible that the EIA consultants knew that they would be granted the contract for EIA before the issue of the ToR? iii) How is it possible that the EIA consultant knew the details of the project and the study to be undertaken even before the project report was prepared and presented to the EAC in March 2021? iv) This is clearly violation of due process and we would like to object to the fact that the EIA consultant was allowed prior access to the content of the project details. v) The above also suggests that the information of the project details were made available to the EIA consultant either by the project proponent and/or AECOM, which prepared the pre-feasibility report (pFR). This raises another serious question on the independence of the EIA consultant. If the consultant is dependant on the project proponent and on the pFR consultant for information and access to the field site, it raises serious questions of independence and autonomy. vi) This also appears a violation of Point 5 of the ToR, where it has been clearly stated that the 'consultant agency for conducting the EIA study shall be independent of the agency involved in preparation of the DPR.'	The work being undertaken as per the Scope of Services defined in the agreement with NITI Aayog. All projects defined in the Draft EIA are listed in the Terms of Reference of the signed agreement. Environmentalists working on the project are aware of the environmental and social issues that will be encountered in the development of the project. Since, the EIA work was to be completed within a given timeframe, DPR consultant framed the terms of reference for baseline studies and appointed Vimta labs Pvt Ltd as an independent consultant to started the work early. As per MoEF guidelines, there is a need to prepare a pre-feasibility report which has to be submitted along with TOR application. All surveys and studies were carried out prior to submission of TOR. Alternative site assessment based on the surveys and investigation conducted from December 2020 onwards were included in in the pre-feasibility study and were part of site recommendations. The baseline environmental studies were carried out representing the winter season as per the MoEF&CC Office Memorandum No: J-11013/41/2006-IA-II(I) dated – 29th August, 2017. (Point No-vii) stated as under: "The baseline data used for preparation of EIA/EMP reports may be collected at any stage, irrespective of the request for TOR or the issue thereof. However, such a baseline data and the public consultation should not be older than 3 years, at the time of submission of the proposal, for grant of Environment Clearance, as per ToRs prescribed".

2	The consultants have only one empanelled expert on ecology and biodiversity in its team. The area of the expertise of the person is also not mentioned.	According to QCI-NABET scheme which is approved and enforced by the MoEF&CC, one approved Functional Area Expert (FAE) is required. The detailed ecology and biodiversity survey was carried out by Prof. K.Bayapu Reddy, a Retired Professor of Environmental Sciences and QCI-NABET scheme approved FAE in Ecology & Biodiversity. Prof. K.Bayapu Reddy has vast practical experience of over 38 years in conducting Ecology and Biodiversity studies involving many Islands in India and abroad. It is to be noted that Ecological studies were also carried out by Zoological Survey of India (ZSI). ZSI have been undertaking the studies in the island over decades and the data generated over the years have been included in the EIA report. WII also provided a report "An assessment of the environmental sensitiveness of sea turtle nesting beaches of the Great Nicobar Island" to ANIIDCO. The content of the report has also been included in the EIA study. Both the ZSI and WII reports are attached as attachment to the EIA report.
3	It needs to be noted further that a number of specific ToRs have not complied and this has been admitted in the EIA report itself. This should make the EIA report incomplete and nonacceptable for conducting of the public hearing. Pls see below for details of non-compliance of specific ToRs: a) The two reports annexed to the EIA – Attachment 1 which is the 'Report by ZSI' and Attachment II, which is 'An assessment of the environmental sensitiveness of sea turtle nesting beaches of the Great Nicobar Island' by the Wildlife Institute of India (WII) were also commissioned before the grant of ToR. The study by WII was conducted for only a few days and concludes by acknowledging (Point 18, Conclusions & Recommendations) that the 'WII has very limited expertise to conduct EIA study covering all aspects of the ToR provided by EAC or MoEFCC'. It is evident from this admission that a detailed and comprehensive assessment has not	The draft EIA report has been prepared considering all the TOR points. Zoological Survey of India (ZSI) has carried out the marine baseline study which is in-line with the MoEF&CC Office Memorandum no: J-11013/41/2006-IA-II(I) dated – 29th August, 2017. Please refer to the clarification under Query No-3. During the presentation to MoEFCC for grant of TOR, it was informed that national level institution ZSI has been appointed for assisting in the EIA study as they are the only agency having full familiarity with the island.

	been made of the possible impacts of the project on turtle nesting in Great Nicobar Island. This is non-compliance of a number of specific ToRs – for eg.: A (i), A (ii) and A (iii).	
	b) ToR A (vi) asks for detailed study related to cyclone/storm surge and tsunami including through use of strong historical data and through stimulation studies. This ToR has not been complied with in the detail asked for. This is particularly important considering the vulnerability of the island to earthquakes and tsunamis.	Historical data has been considered for the DMP with respect to earthquakes, cyclone/strom surge and Tsunami.
	c) ToR A (iv & viii): not complied with as mentioned in the EIA report itself. This is a serious matter considering there are many CRZ-1 areas in the project site. These include mangroves, coral reefs and also sea turtle nesting sites	The draft ICRZ plans under 2019 notification available and referred with the draft EIA. Further, the draft superimposed maps of 1:4000 scale was provided by NCSCM and the final maps has been included in the final EIA report. Refer annexure XVII, XVIII & XIX.
	d) ToR A (x): Factually incorrect information has been provided in the EIA report. It is well known that the Andaman and Nicobar Islands are located along two globally significant bird flyways – the Central Asian Flyway and the East Asia/Australasia flyway. There is recorded evidence of more than 40 species of migratory birds from Great Nicobar.	ZSI has not reported any migratory birds in GNI.
	e) ToR B (iii): As mentioned above, factually incorrect information is included in the EIA. There is considerable evidence that migratory birds are found on Great Nicobar Island.	Write-up on migratory bird with reference to central Asian flyway is being added to the EIA report.
	f) ToR B (vi): The EIA report displays a casualness about matters related to CRZ. The ToR has asked for specific and comprehensive details of CRZ-I areas. None of this has been provided.	As per the TOR provided by MoEF&CC CRZ-1 will be demarcated on 1:4000 scale map. The draft ICRZ plans under 2019 notification available and referred with the draft EIA. Further, the draft superimposed maps of 1:4000 scale was provided by NCSCM and the final maps has been included in the final EIA report. Refer annexure XVII, XVIII & XIX. Comprehensive information on mangorves, corals and sea turtle nesting sites have been provided in the EIA report.

	g) ToR C (i): The project site includes mangrove forests, coral reef areas and also sea-turtle nesting sites. A lot of this information is already available in scientific literature and is in the public domain. Non-inclusion of the information suggests that the EIA report as mandated is not complete. When the information is available and the EIA report itself says the process is ongoing, what was the hurry in submitting a EIA report which is incomplete? Why could the EIA consultant not wait for the information and ensure that all ToRs were complied with? h) ToR C (ii): Details provided of the seismic and tsunami hazards in the EIA are not sufficient or complete. This region experienced one of the biggest earthquake and tsunami in human history on 26 December 2004. The coast of Great Nicobar saw subsidence of upto 15 feet and loss of huge coastal land. If the coastline is now built up with a port, airport and a township the damage to life and property will be immense if another such event is to occur. Extra care will have to be taken, which is not reflected in the EIA report at the moment. Future such events have also not been considered. i) ToR D (Ii): This ToR has not complied with at all. It is a matter of serious concern that the project proponent for a Rs. 72000 crore integrated project in one of the most ecologically sensitive zones does not have an environment policy. The project proponent appears not to have even made an effort coming up with an environment policy. This is a serious gap and indicates lack of concern for the environment on part of the project proponent. This is a serious matter and makes the EIA incomplete and unacceptable.	In chapter 1, section 1.8 of the EIA report, it has been mentioned that *"ZSI is studying the megapode nesting sites as a part of the EIA. The report is awaited."* This is a typographical error. The study has already been completed and included as a part of the EIA report. See Attachment 1. However, A long-term study has been initiated by ZSI. Please refer to Chapter 3, section 3.1.4 The GPS observations between Bangalore and Port Blair suggest that the Indian plate is approaching the Burma plate at a rate of15.3±3 mm/yr. The GPS measurements suggest that great earthquakes with slip that is similar to the 2004 event cannot occur more frequently than once every 1,000 years; a shorter recurrence interval of 400 years has been calculated for the epicentral region, where convergence rates are higher (Bilham et al. 2005). The section on earthquakes is being augmented in the EIA report based on the available data and models. Disaster management plan has been suggested for earthquakes / Tsunami. All the TOR points provided by MoEF&CC have been complied in the EIA report. The project proponent committed that the development will take place in an environmentally sound manner complying with all legislative and regulatory requirements and supports all efforts in achieving this objective. Environment policy and commitment details are given in Chapter-10, Pg-C10-2 of EIA report. And the same is presented below: "Environmental Policy" The management will actively initiate, develop and support the environmental policy, which is relevant to its proposed activities and services and their environmental effects.

Association of Indian Primatologists (AIP)

S.no	Comments received	Responses

1	After going through the EIA report, it is evident that the subject experts failed to not only understand the current relation between Nicobar long-tailed macaque and the residents of GNI (see Lenin, 2021) and the ecological link between the macaque and island ecosystem but also in analyzing the severe impact of the proposed projects on the population of these threatened macaques.	Macaque are highly mobile primates and move to various areas for search of food. They often invade human residential areas for easy availability of food. Assessment in the EIA also includes the discussion held with the local residents to understand the impact of macaque behaviour.
2	Furthermore, the duration of four days for the 'quick survey' is extremely low and highly insufficient to make the case that the macaques will not be affected by the projects. By their admission, "It is a rapid reconnaissance type of survey and it was not intensive except in non-forest residential areas" (C3-74, EIA Report).	Beside the one season data collected, additional data from ZSI for past decade were obtained and used.
3	Most importantly, biodiversity assessments were carried out by Vimta labs in December 2020 and in February 2021 and by Zoological Survey of India-Kolkata during February-March 2021, which were before the Expert Appraisal Committee (at the Ministry of Environment, Forest and Climate Change) issued the Terms of Reference for conducting a comprehensive EIA on 25th May 2021 and therefore, violates EIA Notification (2006) and should not be accepted by the EAC committee.	The baseline environmental studies were carried out representing the winter season as per the MoEF&CC Office Memorandum No: J-11013/41/2006-IA-II(I) dated – 29th August, 2017. (Point No-vii) stated as under: "The baseline data used for preparation of EIA/EMP reports may be collected at any stage, irrespective of the request for TOR or the issue thereof. However, such a baseline data and the public consultation should not be older than 3 years, at the time of submission of the proposal, for grant of Environment Clearance, as per ToRs prescribed".
4	The term 'rampant' which means 'something undesirable that is getting out of control', has been repeatedly used throughout the EIA report for a Schedule I (WPA, 1972), Vulnerable (IUCN, 2020), range-restricted and endemic species whose population estimates are available based on the measure of 'encounter rate', a highly crude method of estimation (Table 1). Methodologically, the encounter rate of groups cannot be used to determine population abundance/density and leads to biassed estimates. Determining population trends require long-term population monitoring based on standardised population survey methods (like distance sampling and occupancy modelling). Further, the subspecies of Nicobar long-tailed macaques are constrained by limited distribution, relatively small population	No long-term monitoring of Long tailed macaque has been undertaken in the EIA report. However, provision for long-term study has been suggested as part of the EIA report.

	size, and low genetic diversity and therefore, highly vulnerable to habitat alteration/loss, human disturbances, and climate change. Based on peer-reviewed studies, the encounter rate of 0.23 macaque groups per kilometre (Umapathy et al., 2003) in 2000 throughout Great Nicobar, dipped to 0.10 (Sivakumar, 2006) and again rose to 0.30 in 2013 (Velankar et al., 2016) (Table 2). Since the group size of the species varies drastically from 13-80 individuals (Das et al., 2020; Velankar et al., 2016), alteration in population size, i.e., the number of macaques cannot be reliably stated. Therefore, crab-eating macaques being rampant is unsubstantiated and unscientific! Moreover, accidental deaths of macaques due to anthropogenic factors such as electrocution, vehicles running over, falls while being chased, and drowning (in a water tank) are completely disregarded. Other direct threats to macaques include intentional and retaliatory killings by poisoning, beating up with sticks, and mauling by guard dogs (IUCN, 2020). These deaths are hardly reported and don't get recorded despite being legally mandated. Further causes of life-threatening and incapacitating injuries are snares meant for trapping wild boars which routinely lead to amputation of the limbs and lose ropes left hanging around buildings and jars and cans lying in open garbage dumps (Umapathy et al., 2003; Rajeshkumar et al., 2017). None of these direct and indirect anthropogenic threats are included in the EIA report, let alone discuss their mitigation.	
5	"Besides intentional or unintentional introductions by humans, all these domesticated animals and the Macaques exert profound impact on distribution and spread of the introduced species" The role of macaques in the distribution and spread of introduced species on the island has never been studied. In fact, studies on invasive species ecology are limited to plants on the island despite such requirements being prescribed by the UNESCO Man and Biosphere program. It is a poorly framed statement that lacks any references. Macaques do play a very important role in seed dispersal in habitats where there are no large herbivores (Lucas and Corlett, 1998) and such a role is critical for overall ecosystem functioning. Seed dispersal by macaques aids the restoration of degraded habitats (Kaplin and	No comments

	Lambert, 2002) and conservation of forest fragments by maintaining keystone plant species (Kone et al, 2008). For example, pig-tailed macaques in Sumatra (Indonesia) have been shown to be the most effective seed disperser among co-occurring large terrestrial mammals and were instrumental in maintaining high plant diversity wherever they occurred (Lindsell et al., 2015). Some studies also suggest that primates maintain rainforest diversity (Link and Fiore, 2006) which could also curb the spread of invasive species – an ecological service that is crucial in an island that is a Biosphere Reserve in sharp contradiction with the statement made in the EIA report. Ironically, despite concerns over the spread of invasive species, GNI has no bio-quarantine measures to keep a check on invasives.	
6	"The Crab eating macaque has now become a menace in residential areas" The macaques of peri-urban groups have been pushed to adapt to altered and fragmented habitat following the settlement in 1969 (Pabla, 2018) and rehabilitation of tsunami-affected communities (Umapathy et al., 2003; Shivakumar, 2010). Due to high site fidelity and inter-group competition (see Pal et al., 2018), some groups that used to live in the areas that were cleared to make residential spaces are unable to move away from there, despite the constant negative encounters with humans. The residents too acknowledge that their encounters with macaques have increased post-tsunami. They believe that since macaques lost their food sources during the tsunami, they began visiting plantations and human settlements more often. Further, the repeated use of the terms, 'menace' and 'conflict' is inaccurate, misconceived, and ill-defined since many islanders harbour positive emotions towards the macaques, and therefore, the relationship of the islanders with the macaques is best characterised as dynamic and complex, and should not be described as exclusively negative (Ramakrishna et al., In press).	Assessment has been done based on the discussion with local residents and communities.
7	"Though the Crab eating macaque is included under the Vulnerable category, it has become a menace locally in Campbell Bay" It has been implied repeatedly that the highest protection status, of being a Schedule-I species, given to the macaques, is no longer necessary and is a hindrance in adopting severe measures to control the macaque population. There are several	Same as point no 6 above.

	factors responsible for the increased foraging by macaques in and around human settlements. Even though the species is 'Vulnerable' (IUCN, 2020) and endemic, there is a lack of awareness among the residents about the consequences of feeding the macaques (Rajeshkumar et al., 2017). Due to the fragmentation of the macaque habitat, the macaques are compelled to use human settlements to pass from one forest fragment to another, during which the residents chase them by shouting, clapping, using sticks, stones, etc (IUCN, 2020; Lenin, 2021). This has resulted in the desensitization of the groups to these methods and the loss of fear of humans. In other words, data suggest that the presence of macaques in a plantation or human area does not contribute to crop loss, property damage, or even negative interactions (Das et al., 2020). In most cases, macaques are using urban spaces either passively or for resting. Furthermore, there is no waste management system on the island due to which macaques forage in open garbage dumps which familiarises them with food containers which they then seek when they enter households for foraging. Public sensitization, education, and awareness on macaque behavior/ecology is the most judicious and scientifically valid approach as opposed to vilifying the species (Rajeshkumar et al., 2017).	
7	"During the current survey it was found that it has become a pest in residential villages along the coast from Campbell to Shastri Nagar. It was not seen in the Campbell National Park" The survey in question was done in 4 days which is highly insufficient to determine whether macaques have become a pest or not. All population surveys done previously have reported coastal groups of macaques in and around the sites of the proposed project and within Campbell Bay National Park (Figure 1). The survey teams failed to undertake a systematic literature survey to comprehensively assess the sensitive situation of the macaque in the archipelago.	Same as comment number 4 and 6 above.
8	"According to Khatri and Khatri (2010), they escaped the fury of the 2004 Tsunami but lost a major source food, the fruits of Pandanus and hence they took to Coconut, Areca Nut and other fruits" The EIA report neither adequately cites pertinent studies nor mentions full references of cited articles. In this statement, the chapter that has	Same as point number 6 above.

	been cited, Khatri and Khatri (2010) is on the conservation of butterflies in bay islands and does not have any mention of the impact of the tsunami on the long-tailed macaques (instead see Porwal et al., 2012). The claim that the macaques escaped the fury of the tsunami is not only unsubstantiated but highly erroneous. According to a study conducted by the Wildlife Institute of India (Sivakumar, 2010), the tsunami-affected both the population and demography of the coastal groups of macaques, while there was no change in the population of the groups dwelling in the interior of the island. Secondly, some studies clearly show that the coastal groups of macaques used to feed on coconut before the tsunami as well (Das and Ghosal, 1977). However, the inland groups of macaques showed no familiarity with coconuts according to a recent study (Das et al., 2020).	
9	"They eat all fruits and cause damage to Areca nut and Coconut also" The coastal groups of macaques that have had exposure to farms and plantations feed on cultivated fruits and vegetables familiar to them (see Rajeshkumar et al., 2017 for a list of items). The inland groups of macaques do not feed on any cultivated fruit because they are unfamiliar with it (e.g., coconut). Macaques also feed on leaves and insects (Umapathy et al., 2003). Macaques foraging in farms and urban areas have been observed to feed on several alien insect species including agriculture pests of coconuts, like the Rhinoceros beetle, slug-moth caterpillar, earwig, etc., (Mazumder and Kaburu, 2021). In the case of areca nuts, macaques only feed on the fleshy outer portion and discard the seed (Personal communication; Mishra et al., 2020). According to a recently conducted socio-economic survey, many farmers think that macaques are helpful in harvesting areca nuts as they throw the seeds down thereby saving labor costs for harvesting areca nuts (Personal communication; Mishra et al., 2020). The EIA report does a serious disservice to the scientific and truthful reporting of the situation of macaques in GNI by concentrating the interviews and focus group discussions within the 3 villages closest to Campbell Bay (Rajeevnagar, Govindnagar, and Joginder Nagar) instead of covering all of them (an additional 3 villages, Vijaynagar, Gandhinagar and Shastrinagar).	Same as point number 6 above.
10	"They could not be quantified as they jump, run and vanish into bushes but according to locals	No comments

	there are at least 250 to 400 in Campbell alone" Authors of the EIA report state that the macaques could not be quantified because 'they jump, run and vanish', however other long-term studies with robust methodologies and multiple observations have provided more reliable estimates. According to Pal et al. (2018), there are four groups in Campbell Bay. Their ranges have been marked as seen in Figure 2. The sum of the mean group sizes of these four groups across three years comes to 175 macaques as opposed to 250-400. Authors should have taken the information from these studies which are published in reputed international journals.	
11	"The crab eating macaques go on rampage in groups ranging from 4 to 40. Occasionally, 1 or 2 are also found but in forest" In technical writing, conflict is regarded as any negative human-wildlife interaction. Calling such interactions as rampage implies negative and violent attributes to macaques. However, studies published by several authors suggest that they often remain and feed in areas that were cleared for making settlements (Pabla, 2018; Ramakrishna, 2019; Velankar et al., 2016). Most macaques are skittish (Ramakrishna, 2019), cryptic, and fearful of humans (Umpathy et al., 2003; Rajeshumar et al., 2017). Groups that are unhabituated to humans inevitably produce alarm/fearful vocalizations (Rajeshkumar et al., 2017). Even groups that move around in human-dominated areas avoid humans, avoid direct confrontations, and show evasive movements on detecting humans (Personal communication from K. Shankar, resident). Very few macaques numbering in 2-4 (foraging parties) from the large peri-urban group enter unattended households/shops, that too occasionally (Das et al., 2020; Ramakrishna, 2021). The entire group (and even beyond 2-4 macaques) have never been reported to enter closed human spaces. Foraging in plantations or from kitchen gardens also typically includes a small subset of the entire group and never the entire group (Ramakrishna, 2021). There are several groups that go beyond 40 individuals. Migrating young males (1 or 2 in number) move in solitary conditions or in small groups but such groups are temporary and are observed throughout the island (Umapathy et al., 2003).	No comments

12	"The macaque population has attained a logistic or exponential growth phase" To check the validity of this statement, we fitted exponential and logistic growth rate patterns to data provided by the authors in the report (Table 1). Even with all available data points (Table 2) drawn from four population surveys, neither logistic growth model nor exponential growth model could be adequately fitted (Figure 3). This shows that the statements made by the authors in the EIA report are more ad hoc and lack scientific reasoning.	No comments
13	"There is no simple solution mainly because it is endemic and restricted to just 5 islands in the Nicobar group but yet it has become a menace in the area where it occurs" Although wildlife/environmental conservation is a wicked problem, there are multi-thronged approaches to many of the issues faced by the residents concerning macaques. For instance, there is a need to implement a waste management program on the island, sensitize locals about the consequences of feeding macaques, introduce macaque-proof dust bins and make the wider windows of residents' shelters inaccessible to macaques (e.g., by tying ropes around them similar to the situation in Singapore, Thailand, and Indonesia; Rajeshkumar et al., 2017). Secondly, the long-tailed macaque is only found in the three islands of Nicobar and not five. They are Great Nicobar, Little Nicobar, and Katchal (Umapathy et al., 2003). Regarding the inappropriate use of the word 'menace' here, please refer to 1.4 and 1.5.	Same as point number 6 above.
14	Comments on the measures suggested in the Environment Management Plan to mitigate the impact of the proposed projects on the Nicobar long-tailed macaques Relocation of wildlife as a mitigation measure during the road construction for the ICTT Under the environment management section, mitigation measures for 'conflict' arising due to the construction of roads for the ICTT, the EIA consultant has stated an unintelligible statement that reads: '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'. The suggestion of 'road alignment to prevent conflict' is a mitigation measure that	No comments

	lacks any specific details or successful examples. Moreover, the differential impact of roads on each of these coastal-dwelling species (megapode, crab, and macaque) is missing in the report, which is ideally supposed to be used for mitigating adverse impacts. For instance, egg-laden female coconut crabs require access to shores for a brief period of 2 weeks for depositing their eggs and hatchlings need to emerge from the shores on their way to terrestrial habitats. In contrast, roads are notorious for fatally injuring and killing macaques attempting to cross them. Secondly, as another 'mitigation measure', relocation of the wildlife encountered during construction of roads has been proposed. The recurring mitigation measure suggested for almost every wildlife, regardless of their behaviour, ecology, endemicity, and conservation status is relocation, which apart from many other things reflects the blatant ineptitude, imprudence, and callousness of the consultant.	
15	In addition, it is important to emphasize that the relocation of wild animals is illegal under the Wildlife Protection Act, (1972). Studies on the relocation of macaques report that these attempts are often unsuccessful as the entire social group is not successfully captured, there are many fatalities (especially of infants) during capture, they experience tremendous trauma during transportation and groups do not always survive after relocation due to unsuitability of habitat (Struhsaker and Siex, 1998). Studies show that the translocated animals can disturb the ecology of their new habitat (Conant, 1988) and/or the resident community of conspecifics (Caldecott & Kavanagh,1983). There are also reports of relocation of commensal macaques leading to transmission of novel endoparasites to their forest counterparts that can severely affect population stability/health (Kumar et al., 2018).	Relocation / capture (if required) will be undertaken as per section 11 of The Wild Life (Protection) ACT, 1972. States "Explanation. — For the purposes of clause (a), the process of capture or translocation, as the case may be, of such animal shall be made in such manner as to cause minimum trauma to the said animal"
16	Culverts and underpasses to allow passage for wild animals The report only states that appropriately designed and suitably located culverts of varying sizes, underpasses and fences provide effective mitigation to overcome barrier effects of roads based on Rajvanshi et al. (2007). There are no details regarding where and how these structures will be constructed, what kind of materials will be used, etc. It should also be noted that long-tailed macaques can cross roads arboreally and for any	Culverts and or underpass will be provided during the road construction if necessary, however, the details will be worked out at the implementation stage along with the Forest Department.

	of such wildlife passages to be successful, the design has to be systematically tested before construction. For macaques, natural/artificial canopy bridges might be more effective than underground passes.	
17	Radio telemetry of displaced species Applying radio telemetry and other techniques like e-DNA on displaced species (like Nicobar Megapode, Coconut Crab, and Long-Tailed Macaque) is an extremely ill-informed measure that cannot be characterized as 'mitigation'. The claim that these techniques will assist in understanding the understudied biology and behaviour of these animals is also an exaggeration. Radio telemetry of species mentioned above is impractical in a rainforest habitat and is tremendously stressful to animals that will be already facing stress due to displacement. Moreover, radio telemetry of none of the species mentioned before has ever been successfully executed worldwide. There is enough literature that shows that conserving the habitat of these endemic and range-restricted species is the only way to ensure their survival. It is not judicious to destroy their habitats and then use radiotelemetry to ensure their survival post-relocation and develop conservation strategies.	Radiotelemetry has been suggested by ZSI and been included in the EIA report. Please refer Chapter C4, Section 4.2.2.
18	Temporary halting of onshore and off-shore activities To minimize the impact of construction activities, it has been suggested that during the construction phase, the off-shore activities will be suspended during night hours and halted 'to the possible extent' during November to February to enable feeding, breeding, nesting, and roosting of various species including the long-tailed macaque. The Nicobar long-tailed macaques are active from 0500hrs and roost between 1700-1745hrs; feeding intermittently throughout the day. They breed throughout the year, with births peaking in the wet season (May-November; Pal et al, 2018). The report does not specify the exact timings when the work will be suspended and assumes that the suspension of work at night will accommodate the requirements of all species. Similarly, the suggestion to halt work from November to February will not reduce the impact on a species that breeds throughout the year and in fact, has relatively lower births during these months.	Temporary halting of work on-shore and off-shore activities have been suggested with specific reference to leatherback turtles. However, the nesting depends on various environmental parameters like temperature, humidity, ocean currents etc and vary from year to year. The halting of activity also will depend on the arrivals of leatherback turtles which is being monitored by forest department. Please refer Chapter 10.

19	Impact of the proposed projects on the Nicobar long-tailed macaque population in GNI a) Rapid deforestation of such a large area will inevitably compel the macaques to be dependent on human-grown food crops and push them to live closer to human settlements. Adequate case studies of forced commensalism in nonhuman primates as a result of habitat destruction exist around the world. b) The projected rise of human population on the island will exert immense pressure to locally cultivate crops, which will enhance human-macaque encounters and use of more hostile methods to prevent the macaques from crop foraging c) Since the habitat of the coastal groups will be altered completely and the inland groups will also become dependent on plantations for food, there will be more inter-group conflicts due to the limitation of resources following the clearing of forests. The encounters between humans and macaques will increase multi-fold leading to rising hostility towards macaques. d) There is no holistic waste management system on the island even with the current population of ~8000 people. The overwhelming number of people (~3,33,000 by 2052) that will be brought into the island for the proposed project will only worsen the situation of waste management. This will have a direct impact on the feeding behaviour and health of long-tailed macaques by exposing them to processed food, biomedical wastes, hazardous wastes, polluted water, polluted soil, etc. Even in the current scenarios the temporarily commensal groups of macaques in Great Nicobar are routinely exposed to DDT (an internationally banned pollutant and carcinogen), insecticides, bitumen, discarded medicines, and bio-medical wastes.	The maps provided by (Rajeshkumar, 2017) clearly shows that most of the macaque are near to the human habitation and not on the area where no human activity has ever taken place (north and west of the GNI). Therefore, the primate concertation near the habitation is not because destruction of the habitat but for the easy availability of the food. No comments An integrated waste management system have been proposed to cater the waste generated by the projected population. No waste will be left uncollected during the construction as well as during the operations. Please refer Chapter 2C of the EIA report.
20	In conclusion, we would like to assert that allowing the clearance of such large-scale development projects in an island which is a Biodiversity Hotspot, a Biosphere Reserve and a Tribal Reserve, a HOPE spot, an Important Bird Area, and an Endemic Bird Area, will be against India's commitment to the Convention on Biological Diversity (1993), CoP 26 and the Man and	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.

	Biosphere Program of UNESCO. The clear-felling of acres of primary, old-growth rainforest, which is 145-66 million years old will be an irreversible action, the devastating consequences of which will be faced not just by the Nicobar long-tailed macaques, but by each organism that resides on the island, including humans.	

Rajeev Suri, Environment Action Group

S.no	Comments received	Responses
1	The stated 'Holistic' Development, which roughly can be interpreted as all encompassing development, fails in the first instance as being either holistic or all encompassing; as it violates all fundamental Environmental Laws Rules and Regulations of the country, preserving the Great Nicobar Biosphere, Protection of National Parks of Great Nicobar, Protecting endemic and endangered Wildlife of Great Nicobar, and encroaching on Reserved Forest of indigenous tribes and against the Tribal Policy of on Shompen Tribe of Great Nicobar; Hence, The above stated "Holist Development" is against nature, indigenous tribes, endangered and endemic flora and fauna and pursues a solely economic agenda, and therefore deserves to be scrapped forthwith and the Great Nicobar Island left in its pristine condition without any further anthropogenic interventions.	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI. The EIA report has been prepared in the line of TOR granted MOEF&CC
2	Great Nicobar Island is inhabited by aboriginal Shompen and Nicobarese, Shompen are approximately 237 and the Nicobarese 1,094 individuals. Though the Nicobarese have joined mainstream, the Shompen Tribes still prefer living in the forests and continue their lives as aboriginal people, living deep within forests, as indigenous tribes world over, in their traditional manner (can be explained in greater detail if required, however Government instrumentalities have extensive knowledge and know the necessity of protecting and preserving the indigenous people in their own lands/forests)	Shompens and their habitat has been covered in the EIA. Further, the tribals were present in the public hearing held on 27th January 2022. All were given adequate opportunity to raise any concerns. Minutes of the public hearing is attached in the EIA report.
3	To this extent attention is drawn to A &N Administration Directorate of Tribal Welfare Notification "Policy of Shompen Tribe of greater Nicobar of Great Nicobar Island" Notification No. 89/2015/F. No. 1-892/2009-TW/557 Wherein in Clause 2 'Objectives' clearly enunciates • Clause 2.1 Recognise the social, ecological and economic diversity among Shompen. • Clause 2.5 Preserve and protect their cultural heritage including language. • Clause 6. Of the Notification states; Clause 6.3 With regard to large scale development proposal in the future for Greater Nicobar, Island the welfare and integrity of the Shompen community should be given priority .... "	No comments
4	The areas where the tribals dwell have been declared as Tribal Reserve being 751.070 sq.km. However, 84.10 sq.km falling under tribal reserve is proposed to be denotified violating the principles of the stated	84.10 sq. km of project area falls under tribal reserve and de-notification is under process. Out of this, an area of 11.032 sq. km of tribal reserve also falls within

	Notification and the Article 21 Right to Life of the Constitution of India. Thus, the culture and traditions of the aboriginal people when "Development" arrives at their reserves would deleteriously impact these vulnerable aboriginal tribes; leading to exposing them to a system the alien to them, and being as they are unexposed to disease and pestilence as we know it to be as well as exposing them to new diseases/health issues. The habitat degradation due to urban development needs to be therefore stands against policies/ regulations, some of which are already in existence- Shompen Policy (2015) and PAT Regulation (1972). Even though the EIA and Pre-Feasibility take into account the need to safeguard the aboriginals, there is absolutely no doubt their habitat will be invaded, dwindle and continue to shrink. eventually to wiping out the entire aborigines. that have survived millions of years on their lands/forest and traditional means of existence.	the revenue villages and required to be de-notified otherwise also. A&N administration proposes to re-notify 45.23 sq. km of land within Campbell bay National Park & Galathea National Park and 31.73 sq. km land outside the project area. Therefore, effectively an area of 7.11 sq. km of Tribal reserve will be De-notified. Further, two national parks (Galathea national park and Campbell Bay national park) and major portion of the tribal area are proposed to be un touched, which is more than 81% of the total GNI area. 16 Number of check points have been suggested which will be guarded 24X7X365 to ensure no trespassing by the outsiders. Facilities to be provided to the tribal only when it is requested by Shompens and or Nicobarese.
5	The Great Nicobar Island is a sheer treasure trove of biodiversity, consisting Biosphere Reserve, Tribal Reserve, National Parks and Wildlife Sanctuaries. This island is perhaps one of the last untouched tropical evergreen rain forests of the world, with endemic fauna and flora much of which is undocumented and unknown to the scientific community. The Island covers an area of 910 sq. of which 865.84 (95.2%) is densely forested, within which is the tribal reserve for the Aboriginal Shompen Tribe comprising of 751.40 sq. kms. Two national parks, as part of the biosphere, the Galathea National Park (GNP) spread over 107.10 sq. kms and the and Campbell National Park (CNP) 391. 75 comprising of sq. kms. Hence there is a very a strong case of leave this	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.

	last bastion of nature and biodiversity untouched in its pristine form for future generations.	
6	However, the proposed project cuts through the biosphere and apportions 70.6 sq.km into the project area, and an application has been submitted to MoEF&CC for exclusion of Biosphere area from the project boundary.	No comments
7	In its 44th meeting on 18th Jan 2022, MoEFCC Expert Committee for Declaration of Eco Sensitive Zone (ESZ) for purposes of the proposed project, reduced the mandated 10 kms ESZ around National Parks to Zero Extent around Galathea and Campbell National Parks. This was done to make way for a contiguous stretch of land in the South Eastern and South Western part of the Great Nicobar Island for the Developing an Airport, an ICTT and Township/Mass Rapid Transit system. This clearly alludes to the fact the ESZ was amended for both Galathea and Campbell National Parks without Environmental considerations and purely for the creation of Maritime, Air and Township infrastructure, which is untenable in environment non regression laws.	No comments on ESZ notification
8	Further, in the 60th Meeting of Standing Committee the National Board for Wildlife (NBWL) held on 5th Jan 2021 took a decision to de-notify the Galathea Bay Sanctuary an area of 11.44 sq. kms under the specious plea that a final notification had not been issued. Consequently, The Andaman & Nicobar Administration (Department of Environment and Forests) issued Notification No. 15/2021/F.No. CWLW/WL/163 dated 25th January 2021 de notifying 11.44 sq. kms of Galathea Bay Wild Life Sanctuary.	No comments on NWBL meeting outcome.
9	The Galathea Bay WF Sanctuary is the home of Leatherback Turtles nesting ground. In Galathea bay, nesting, egg laying and hatchling of the Leatherback turtle is far more than the other regions of Great Nicobar Island. The Wild Life Institute (WII) Study titled "An Assessment of the Environmental Sensitiveness of Sea Turtles Nesting Beaches of the Great Nicobar Island" in its 'Conclusion and Recommendation' identified Galathea Bay, Alexandria Bay and Casuarina Bay as important for sites Leatherback turtles, with Galathea Bay with the highest number of nesting. The recommendation continues to recognise the connectivity between the Galathea River and the bay, and the imperatives of this continuity remaining for the Leatherbacks to nest.	ZSI has looked into this issue and have recommended remedial measures which is a part of the EIA report. (Chapter 6 and Chapter 10).
10	The Leatherback turtles currently approach the bay through a mouth opening estuary which is more than 3 Kms wide. If the proposed project reaches fruition and breakwaters are constructed on both sides of the bay, it would leave an opening of merely 300 mtrs. between the	Leatherback turtle can reach the nesting sites on the western flank of the Galathea Bay through gaps between the breakwaters. There will be a gap of 300m + 500m on

	breakwaters for the leatherbacks (who grow to six feet long and 900 kgs) to try and squeeze in or out of the bay. This will result in the Leatherback turtles abandoning Galathea as a nesting site.	the western side of Galathea bay. Adequate measures have been suggested in the EIA report
11	Quite clearly, the measure by the NBWL to de-notify the Galathea Sanctuary was taken under extraneous considerations and not in the interest of Wild Life. This is viewed as an illegal act under Sections 18 and 26A of the Wild Life Act and Article 48 A of the Constitution of India; hence, its status as a Sanctuary should be restored and the appropriate action would be to scrap the proposed project in totality.	No comments on the denotification process
12	Without going into details; under threat in the Great Nicobar Island are the well-known Crab-eating Macaque, Nicobar Tree Shrew, Dugong, Nicobar Megapode, Serpent Eagle, salt water crocodile, marine turtles and Reticulated Python; are endemic and/or endangered.	WII and ZSI did not find the presence of Dugong in GNI. The EIA report adequately describes the eco sensitivity of the Island.
13	The Avi Fauna of GNI, endemic to the Island but unique to the world; Nicobar Megapode, Nicobar Parakeet Nicobar sparrow hawk, great Nicobar serpent eagle, Nicobar imperial pigeon, Nicobar scops-owl, Nicobar bulbul, and Nicobar jungle flycatcher, Nicobar imperial pigeon will not be able to withstand the onslaught of anthropogenic activity and habitat destruction and will soon lead to their extinction.	The EIA report adequately describes the eco sensitivity of GNI.
14	At the present moment, 95.2 % of the Great Nicobar Island is under 166 sq. kms. from the total 910 sq. kms which amounts to 18.25 % of the Island's total land mass being diverted for the project.	Comment is not clear.
15	The envisaged land requirement for the project is proposed to be met by diverting 130 sq. Kms of finest tropical forests in the world. To this extent the EAC in MoEFCC noted that no details of the trees to be felled had been given, which could run into millions, (130 sq. kms of which Forest area =121.87 sq. kms, Deemed Forest= 8.88 sq.).	Number of trees to be felled is about 852245 in number. Please refer to Annexure X.
16	Strangely, all submissions made by the Project Proponent starting from Appendix 1 Form 1 are silent about the number of trees to be felled, perhaps because such an overwhelming number it will lead to serious protestations that may even jeopardise the project.	Same as point number 15.
17	Appendix 1 Form 1 under the heading (II) Activity: 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.)	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.

18	The Project proponent reply is astounding; the nonchalant, cavalier manner is indicative of the scant respect and regard for the environment, which is the primary objective of the Impact Assessment. The Environment Impact Assessment through all the various submissions made to EAC and other instrumentalities, remains silent on the number of trees that will felled; clearly the devastation will be so extensive, on a scale not witnessed in recent past and will for all time to come.	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI. The basic purpose of the EIA is to ensure that the impact of the habitat loss on natural flora and fauna is at the minimum levels.
19	Simultaneously, a highly anachronistic outdated extractive method of calculation has been applied, purely in monetary terms to justify the cost of forest diversion for non forestry purposes According to MoEF&CC guidelines for conducting Cost Benefit Analysis (vide file no. & 69/2011-FC(Pt.) dated 1st August 2017), the guidelines values loss of eco-system services due to diversion of forests on the net present value (NPV) of the forest land being diverted as prescribed by the MoEFCC. According to MOEFCC guidelines, the proposed forest area under Forest Conservation Act, 1980, diversion of forest land for non-forestry purposes the guidelines for calculation of Net Present Value (NPV) is an average value of Rs. 10,43,000/- per hectare. "Hence the total NPV for the diverted project shall be Rs. 10.43 x 13075 hectares = Rs. 1,36,372.25 lakhs."	the NPV cost of 1,36,372.25 lakhs given in the comment has already been considered in the analysis. However, the cost benefit analysis is being looked into and Updated, if Any.
20	Further in a most irresponsible manner the EIA Report states to compensate the loss of (millions of tropical mature biodiverse forest trees), "Compensatory afforestation will be done by the government at some reserved site for such purposes in Madhya Pradesh and the cost of deforestation in Nicobar Islands will be paid to government to do compulsory afforestation at the reserved site. Total area to be considered for plantation will be 261.5 sq. km i.e., 26,150 hectares in MP where Rs. 96,706 lakhs will be incurred. The estimation of this cost is based on the cost of developing trees per hectare in that area."	A & N Islands is having only ~6% revenue land, hence, Compensatory Afforestation is being done in Madhya Pradesh, as per the guidelines of MoEF&CC. in this regard, Government of Madhya Pradesh has submitted the CA scheme and kml file for double the degraded forest area in the State of Madhya Pradesh in lieu of diversion of 121.87 Sq.km. of forest land and 8.88 Sq.km. of deemed forest land to Forest department of A&N Administration. The compensatory afforestation will be undertaken as per the norms given in :

		http://forestsclearance.nic.in/writereaddata/Addinfo/0_0_1115123012111CAlandGoIRule.pdf
21	The Great Nicobar Island has been recognised by United Nations Education, Scientific, and Cultural Organisation (UNESCO) Great Nicobar Biosphere Reserve. UNESCO recognises the Great Nicobar Biosphere Reserve for its "wide spectrum of ecosystems comprising tropical wet evergreen forests, region recognised for its rich biodiversity/I, The has been accorded UNESCO recognition on account of the fact the Island "houses 650 species of angiosperms, ferns, gymnosperms, bryophytes and lichens among others. The Islands rich in plant diversity and is home to rare and endemic species, which may not have been documented in totality. A total of 14 species of mammals, 71 species of birds, 26 species of reptiles, 10 species of amphibians and 113 species of fish have been reported. A large number of endemic and endangered species of fauna i.e. 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 Crab-eating Macaque, Nicobar Tree Shrew, Dugong, Nicobar Megapode, Serpent Eagle, salt water crocodile, marine turtles and Reticulated Python are endemic and/or endangered."	The ecological importance of GNI has been included in the EIA report. Most of the species mentioned have been reported in the EIA. Total of 25 species of mammals have been reported in table 3.34 in Chapter 3 of the EIA report. The mammals basically include macaque, pig, rodent and bats. Out the listed 25 species, 13 area endemic, 3 are vulnerable, 11 are of least concern and 5 are endangered.
22	It is therefore incumbent upon the Indian people to preserve the Biosphere recognised by UNESCO; There is no room for doubt that all such rare flora and fauna will head for gradual extinction is the project is permitted eating away 20% of the landmass and leading to habitat loss of this unique Heritage Biosphere.	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.
23	From a present population of 8500, the project envisages the population will grow to 6.5 lakhs over the next three decades. If for arguments sake, the project gets a go ahead, it will put extreme pressure on the scarce water resources of the Island, such as water and food, on account of little to no agriculture practices besides coconut/ arecanut.	The projected population of the development is approximately 3.32 lakhs and not 6.5 lakhs The water requirement due to the development has been worked out in detail and have been included in Chapter 2.
24	The project allocates 22% of land for residential purposes, thereby indicating a heterogenous migration of people on to the Island, who will totally overrun the indigenous people, their culture and traditions. The township being devoid of roots being inhabited unknown /unconnected entities will have an identity crisis, leading to social tensions, mental health issues and unconnected	The EIA suggested strict measures to ensure that the workers, tourists and residents do not trespassing the tribal areas. 16 control points with 24X7X365 have been suggested in the EIA report to ensure no trespassing

	emotions. On this very premise, the project deserves to be scrapped, as it seems merely as an endeavour to colonise GNI rather that the other stated considerations.	by outsiders to the tribal area. Please refer Chapter 6 & 10.
25	The most serious consideration is the role of rain forests being the carbon sinks of the world, and essential to the control of Co2 emissions, which is essential to restrict warming of the planet. While India has enhanced NDC @Cop 26, it refrained from signing the Deforestation Pledge. In view of the seriousness with which the world is pursuing transitions from fossil fuels to clean energy for curtailing carbon emissions / global warming, if India proceeds with deforestation on such a massive scale, its will show the country as one of double speak, speaking on global forums, and doing the opposite in its country. Such a negative image must be avoided under all circumstances.	Carbon sinks as mentioned in the comment will not be affected as compensatory afforestation will be undertaken as per the FC Act.
26	Further, no studies have been undertaken on what impact such extensive deforestation will have on ocean temperatures; it will certainly lead to a rise in ocean surface temperatures, which will give rise to the El Nino effect, As is well known the El Nino impacts rainfall on the Indian peninsula, which will put an existential threat on the mainland with skewed rainfall patterns and an increased intensity and frequency of extreme/freak weather events.	There is no evidence that deforestation of ~130sq km in GNI will lead to rise in oceanic temperature and will affect El Nino. If the commenter has any literature to this effect, please provide the same and it can be considered in the EIA report.
27	From the above averments it is abundantly clear the project is ill conceived, and a rash decision based purely on economic and geostrategic considerations, with little attention the mass scale devastation it would wreak on the ecosystem and environment. For the existence of mankind, the eco systems must flourish, consequently, the Great Nicobar Island Biosphere must be left untouched, protected and nurtured in its present form, for our survival and for the future generations. Hence, the project may be scrapped in totality at the earliest.	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.

Madhuri Mondal

S.no	Comments received	Responses
1	Biodiversity: The project proponent in the introduction part of draft EIA has acknowledged the unexplored exquisite nature, unique combination of mountain and beaches, that the GNI is part of the world network of protected areas, contains diverse wildlife, and is home the world's most unique coral reefs as well as numerous endemic species of flora and fauna. It is obvious from the scale of the proposed projects that this will lead to severe degradation and destruction of such ecosystems, as well as the potential loss of certain species. However, these issues have not been addressed satisfactorily in the draft EIA Report, which is not accompanied by any plan for protection of such species and their habitats.	The EIA report has been prepared in the line of TOR granted MOEF&CC There is no endemic coral species in GNI. The coral patches are generally healthy but patchy. The coral patches are narrow, and no extensive reefs are found in GNI. The Galathea bay area where the port will be located do not have any corals. There is no coral patch in the work area. However, EIA has suggested that if there is any degradation of corals during the construction work, translocation / trans plantation has to be undertaken. Adequate amount of fund has been kept for this purpose. Please refer Chapter 10.
2	Leatherbacks: a) With respect to the Giant leatherback turtles, a (Schedule-I species on the Wild Life Protection Act, 1972) the report mentions that the design of the ICTT was changed and shifted to the eastern flank of the Galathea Bay keeping in mind that the turtles' nesting sites are on the western flank. However, there have been multiple reports of turtles nesting along the eastern flank (photographic evidence of nesting exist from 2016-2017). Besides, the two flanks are not independent of one another. Any disturbance in Galathea Bay will definitely have a major impact on turtle nesting and no mitigation measures are suggested for this. Reports by both, WII and ZSI-Kolkata do not mention the rookery at Joginder Nagar (13 km) as a turtle nesting site. Evidence of nesting by leatherbacks is as recent as 21 January 2022. b) Even the very process and de-reservation of the Galathea bay/South bay Sanctuary is in itself to be treated as illegal and has been challenged by numerous conservation experts. This denotification has been done by the wildlife advisory board, with little justification or mandate to de-reserve biodiversity conservation areas, ad hoc. c) By their own admission, VIMTA, Hyderabad states, "It (Biodiversity assessment) is a rapid reconnaissance type of survey and it was not intensive except in non-forest residential areas."	Please refer to Attachment 1. ZSI has studied the area with specific reference to turtle nesting sites. Please refer Chapter 1, figure 1.5 for location of Turtle nesting sites. The mitigation measures suggested by ZSI has been incorporated in the EIA report (Refer Chapter 4 and Chapter 10 No comments on the denotification. Environmental assessment of alternative sites have been undertaken by ZSI and is included in

	(pg. C3-74). Despite requirements of EAC, cost-benefit assessments of alternate ICTT sites (beyond Galathea) are not done. Bird hazard assessment to the airport should have been done by WII, SACON and the likes; instead, it has been done by VIMTA. 4. No information provided on the impact of moving vessels on turtles despite being asked by the EAC. Despite significant reduction of approach area of Galathea Bay due to construction of berths and breakwater structures, VIMTA says that 'the experience of ZSI in Dhamra and Paradip ports suggests that port activities often do not affect the nesting of turtles'. The scenarios of Dhamra and Paradip ports are very different from Galathea and are not directly comparable (false equivalence). Moreover, the statement in the report that no effect of the port has been observed on turtle nesting is patently untrue.	the EIA report as Chapter 5, Attachment I. Only the most environmentally suitable site was considered for locating the ICTT. The nesting issues related to Turtles were studied in detailed by ZSI. These are the examples referred in the ZSI report which are being reflected in the EIA report also. However, detail studies of these ports are not part of the EIA study as per the TOR issued by MoEF&CC.
3	Corals and Marine ecosystems: a) Marine ecosystems also play a crucial part in the cultural lives of people. These ecosystems form an integral part of the survival and sustenance of tribal and coastal communities in GNI. Globally, marine ecosystems, coral reefs, in particular, have been bearing the brunt of the combined effects of climate change and rising anthropogenic pressures. Recent estimates suggest that >50% of the world's corals may already be dead. We feel the current project does not align with India's commitment to various climate treaties (Sustainable Development Goals, Aichi targets, COP, etc.) and may prove to be a socio-cultural and ecological disaster if allowed to follow through. b) The EIA report justifies the present site selected for development by conveniently focusing on select aspects of the system while completely ignoring others. It does not cite recent research and documents (most of the literature is pre-tsunami) that have repeatedly highlighted the immense diversity of the Nicobar Islands and the need to conserve it. The uniqueness of coral reefs and mangroves lies in the high level of biodiversity these systems support. As the report points out, the Galathea Bay is home to numerous species of reef fish, mammals and invertebrates, many of which are Endangered, Near Threatened or Vulnerable. Various threats, as brought out in the document, including sediment deposition, air, water and noise pollution, terrestrial discharge and erosion, increased possibility of anthropogenic activities, etc., may severely damage the ecology and	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI. The report was envisaged by Government of India after due considerations including India's commitments. Coral bleaching is a global phenomenon and this project in particular do not have direct impact on the bleaching. However, if nay coral gets affected due to the project construction, translocation / transplantation has been suggested in Chapter 10 of EIA report. Adequate budgetary provision has also been kept for this purpose. The EIA report adequately addresses eco sensitivity of GNI.

	behaviour of these animals. However, the survey does not provide an estimation of the abundance, biomass and diversity of species associated with corals and mangroves which also stand to get affected by the proposed activities.	
	c) The EIA report states that there are no corals located in the Galathea Bay region which is in contradiction to the ZSI report annexed in the report which states that there are 117 species of scleractinian corals (Schedule-I species under IW(P)A, 1972) in Galathea. There are also 8 species of Scheduled-I holothurians. The total benthic cover of reef habitat is 116.4173 hect. including Dead Coral - 1.72%, Live coral-17.46%, other animal-2.48%, Other algae-51.75%, and Abiotic-26.59%, which occur in the rim of the Bay. In addition to overlooking this information, the report also seems to operate on the principle that "what is not reported does not exist". This is an extremely problematic approach to take because the lack of published studies from these sites can be attributed to the logistical and infrastructural limitations that make exhaustive surveys in these regions a huge challenge. Assuming that the lack of reports equates to absence of such critical natural resources can have huge adverse effects on our islands' marine wealth.	Coral distribution pattern and IUCN status has been detailed in the ZSI report. please refer Attachment 1. As per the ZSI report no corals exist in the bay portion of the Galathea Bay. However, some corals were found on the eastern and western flank near the peninsular part. These corals are not part of the project site and are away from the proposed construction activities. However, if any coral patch gets affected, the same coral will be restored at the location with similar species.
	d) The EIA survey elaborated on the methods used to collect data on plankton and coral reefs. The report also mentions that the ZSI has been collecting data at fixed points for multiple years. However, despite a rich database with spatial and temporal replication, the report relies on a snapshot survey carried out in 2021. e) The biodiversity of reef-associated fauna has also been an important source of subsistence, nutrition and income for local fishing communities (Advani et al, 2013). As the survey points out, most species landed in Campbell Bay are high-value species including lobsters, snappers, groupers, etc. Fish also forms a crucial part of the culture of the islands and the Nicobarese have relied on various traditional systems of resource management for their governance. The present survey doesn't take into account how the proposed activities would affect fishing grounds and consequently the well-being of subsistence and small scale fishers in the region.	Though the data based have been used in the study only the current data collected by ZSI during the filed visit of 2021 has been reported in the study. Currently the fishing is on a low scale as there is no adequate facility of trawlers and cold storage facility. The fishes landing at Campbell Bay has to be Sold/consumed immediately whereas the demand is low and there is no adequate cold storage facility available. As per the project master plan local industries including fishing, coconut and archenut will be encouraged by providing additional facilities like cold storage, skill development and export linkages. The Shompens and Nicobarese undertakes some limited fishing activities for their own consumption on country made boats, along the western cost of the GNI near

		Casuarina Bay. The proposed activities area mainly restricted to the eastern coast of the GNI and does not affect the fishing activities by the tribes.
	f) The report states that there will be considerably less direct damage to coral reef ecosystems as part of the project. While this is important, it is also necessary to consider the inherent fragility of reef systems. Direct damage is seldom the primary reason for reef degradation. Degradation often occurs due to other causes which include sedimentation, effluent runoff, etc. that are a result of activities such as dredging, erosion, forest clearance, improper waste disposal, etc. Coral reef restoration, replantation or reallocation is proposed as a means to counter the potential loss of reefs. However, this needs to be clarified further. As the survey suggests, Galathea Bay has close to 116 ha of reef land that could get damaged. However, no alternative restoration sites have been suggested for the relocation. Similarly, the survey doesn't mention the implementation process, monitoring protocols and testing the feasibility of such restoration activities. Furthermore, globally it has been acknowledged that restoration is not a solution to reverse degradation, but rather an activity to support other management efforts. This is because the restored systems never mimic natural reefs and only a select few species can be restored.	As per the ZSI report no corals exist in the bay portion of the Galathea Bay. However, some corals were found on the eastern flank near the peninsular part. These portions of corals are not part of the project site and are away from the proposed construction activities. Corals in Nicobar are generally healthy but are not extensive in spread. They occur in narrow stretches in patchy mats. None of the species found in GNI is endemic. However, if any coral patch gets affected, the same coral will be restored at the location with similar species.
	g) Beyond coral reefs and mangroves, the Galathea Bay is also home to nine species of seagrasses. Seagrasses, Halophila sp and Halodule sp form primary food sources for the Critically Endangered and Schedule 1 species Dugong dugon (Thangaradjou et al. 2010; D'Souza et al., 2015). The islands have few remaining Dugong populations in India. The loss of seagrass meadows and the rising anthropogenic activities could further threaten these species. The EIA report fails to acknowledge the presence of seagrass meadows in the proposed area, the potential damage to them and measures to prevent their decline. The report also does not mention the impact of the ICTT during either the construction or operational phase, on the three species of marine mammals Dugong Dugong dugon, False Killer Whale Pseudorca crassidens and Common Dolphin Delphinus delphis which are recorded from Galathea.	Based on the survey undertaken by ZSI no seagrass exists in any of the beaches. WII study could not find the presence of seagrass beds, even after drone survey, in the bay areas of these nine beaches. Therefore, the occurrences of dugong in these bays is doubtful.

	h) There has been no discussion anywhere in the EIA report about bio-quarantine measures that will be adapted to keep a check on invasive marine species that can travel through the ballast waters of the shipping vessels nor the same has been discussed with respect to the terrestrial invasive species that will enter along with lakhs of people that is to be brought in the island from outside.	The detail regarding ballast water is provided in Chapter -2(A), Section-2.20.1.
	i) Underwater Noise: A project such as a transhipment port brings along with it a gamut of habitat disturbing activities such as large-scale ship traffic, underwater noise brought about by moving ships, construction activities, dredging. Changes in behavioural responses, foraging patterns, displacement, longer dive times and stress have been recorded as consequences of marine traffic and underwater noise in marine mammals (Gordon et.al 1992, Lusseau 2005, Noren et.al. 2013, Pirotta et.al. 2015).	Issues related to underwater noise and its mitigations has been addressed in the ZSI report section 14 (11).
	j) Oil Spills: One of the ancillary activities to a transhipment port is bunkering or re-fuelling of ships requiring tonnes of petroleum to be transported from the bunkering hubs on land to vessels. Any untoward incident either on land or at sea can be the most hazardous to human and wildlife alike. An oil spill in a remote region like Great Nicobar will be manifold more difficult to clean up than one occurring near mainland waters. Coastal marine mammals are more vulnerable to these incidents because these populations tend to show site fidelity and such an incident might displace them. Oil spills will also impact the health of local populations and the livelihood of fishermen. Risk assessments considering all vulnerable groups and across multiple scenarios need to be undertaken before going ahead with a project of this magnitude.	For oil spill contingency plan, please refer chapter 7, section A.
4	4) Terrestrial Mammals of GNI: The EIA report states that the vertebrate diversity of GNI is poor. Even with this low vertebrate diversity, the report has completely ignored the discussion of the impacts of the four projects and mitigation measures on small mammals like the 'Endangered' Nicobar tree shrew, Tupaia nicobarica and the 'Data deficient' Nicobar spiny shrew, Crocidura nicobarica. There is also no mention of how the project will have an impact on bats like the 'Endangered' Anderson's Roundleaf bat Hipposideros pomona, the endemic Black-eared flying fox, Pteropus melanotus, the Malayan large flying fox, Pteropus vampyrus and the 'Near	The EIA has noted the terrestrial fauna in GNI. Please refer Chapter 3, section 3.9.

	Threatened' Island flying fox Pteropus hypomelanus. Rodent species like the 'Vulnerable', Palm Rat, Rattus palmarum have also not been mentioned nor have the herpetofauna species like the 'Endangered', Nicobar worm lizard, Dibamus nicobaricum and Nicobarese tree frog, Polypedates insularis or the endemic Shompen frog, Limnonectes shompenorum.	
5	5) Endemic Birds in GNI: a) There has been no detailed discussion about the impact of road construction and sound and light pollution on the Nicobar Megapode Megapodius nicobariensis, a ground nesting bird endemic to the Nicobar islands. There are 14 breeding pairs and 7 active mounds found in Galathea Bay in the current survey and yet the only mitigation measure suggested is relocation and radio-telemetry of displaced animals. The report says "ZSI is studying the megapode nesting sites as a part of the draft EIA. The report is awaited." It is not clear how the mitigation measures and impact of the proposed project has been assessed without the report on Megapode nesting sites. b) The report mentions that "The endemic birds include the Nicobar sparrow hawk, great Nicobar serpent eagle, Nicobar megapode, Nicobar parakeet, Nicobar imperial pigeon, Nicobar scops-owl, Nicobar bulbul, and Nicobar jungle flycatcher, all now threatened by human settlements and resulting habitat modification. The beautiful Nicobar imperial pigeon is a large bird that prefers being on the ground and is the closest living relative to the extinct dodo." This endemic biodiversity will be impacted due to the proposed project. It is not clear if the long-term impact of the proposed activities on the endemic species has been studied. c) The report states that there are no migratory birds in the island which is a blatant mistake since there are two bird flyways, the Central Asia Flyway and the East Asia/Australasia flyway (Bamford et al., 2008; Ghuman, 2021) that pass through the archipelago and there are numerous reports of migratory birds from Great Nicobar as it is an important 'resting ground' for the passing birds. And yet the only mitigation measure suggested is with respect to avoiding bird hazards during flight operations which includes that no fruiting trees will be planted in the vicinity of the airport. There is no discussion about the impact of the airport on the two flyways used by migratory birds or the impact of light and sound pollution.	The study has already been completed and included as a part of the EIA report. See Attachment **I.** However, A long-term study has been initiated by ZSI. The Central Asian Flyways is near to the GNI and not directly on the path of the migratory birds. After discussions with the Ornithologists who worked in GNI, it is clear that they are "Birds in Migration". During migration over the GNI, weak or sick or hungry or thirsty birds land in GNI for feeding and gaining sufficient strength to continue their migration. There are no Pelicans or Storks or Flamingos etc. Birds in migration are like passengers in transit. GNI is not the only landing place for the birds in migration.

6	Impact on Reptiles: Eco-sensitive Zone of just 0-1 km for Galathea NP is insufficient to buffer the adverse ecological impact of any human alteration to natural vegetation or any human intrusion. Research on the effect of human disturbance /alteration /construction on distribution /occurrence of native reptiles, amphibians and insects has shown substantial shrinkage. A study on the impact of roads found the construction to affect reptile density up to 10 km. Therefore, ESZ of just 1 km is insubstantial in conserving the rich reptile and amphibian biodiversity of Great Nicobar.	The ESZ is as per the notification dated 28th October 2013 Please refer annexure XII
7	Impact on Mangroves: The EIA does not mention any studies on the impact of the project on mangrove ecosystems. Moreover, the EIA does not highlight the planned mitigation measures. Mangrove ecosystems are recognised as important 'bioshields' against extreme events such as storm surges and tsunamis (Feagin et al. 2010). The mangroves of Galathea Bay were majorly impacted by the Sumatra-Andaman earthquake and Indian Ocean tsunami in 2004. The remnant smaller patches of mangrove forest are critical for the natural succession and faster recovery of mangroves in this area (Prabhakaran et al. 2021). The construction of the planned port will destroy these surviving mangrove patches and hinder the recovery of mangroves. This will further negatively impact the role of mangrove vegetation as protective barriers against future extreme events in GNI.	The EIA report has been prepared in the line of TOR granted MOEF&CC. About 12-20ha of mangroves in the port area might get affected due to the construction activities. Adequate measures for re-densification of mangroves have been suggested in the EIA report. Please refer Chapter 6 & 10.
8	8) Geological Vulnerability: a) The site falls under seismic Zone-V, is cyclone prone and has the highest risk of suffering earthquakes. The project area is also susceptible to tsunami and floods. Some of the coastal stretches along the western and eastern end are erosion prone. After the earthquake and Tsunami in 2004, the lighthouse at Indira Point, the southernmost tip of the Great Nicobar Island, which was on high ground before the earthquake is now under water, indicating a land subsidence of about 3-4 m. Several houses, the helipad, and vegetation near the lighthouse have been washed away by the tsunami. Thousands of people lost their lives due to the Tsunami. Loss of life and property then was limited because the Great Nicobar coast is largely uninhabited. The site of the proposed project with the massive investment of 72,000 crores and plan to inhabit a population of 4.6 lakhs is situated where	It is true that the site is located in Zone V and is cyclone prone. Adequate Disaster Management Plan have been suggested in the EIA report. Pleaserefer Chapter 7, Section 7.3 & Chapter 10 of the EIA report.

	there is the highest risk of natural calamities ignoring all these critical facts. EIA states that coastal systems would be damaged due to the proposed activities and suggests restoration as an alternative measure. However, it doesn't account for the threats natural calamities could pose to the areas from which terrestrial and marine ecosystems have been displaced. b) The Indian Ocean has been recently identified as a hotspot for climate change and tectonic activities (earthquake swarm phenomenon) by global experts who have warned of strong cyclones, frequent storm surges, rapid sea-level rise, aridity in tropical islands, especially ones with less green cover, etc (Roxy et al., 2016, 2020; Zhang et al., 2018). The EIA does not provide the details of measures proposed to deal with these impacts. c) Seismic risk assessment, tsunami risk assessment, cyclone risk assessment and sea-level rise projections have not been included in the report. Probable direct and indirect damage to infrastructures due to weather extremities like high rainfall, high humidity (leading to high rate of corrosion) and high salinity of air/wind and maintenance requirements as a result are not discussed.	
9	Impact on Indigenous Tribes a) GNI is home to two indigenous tribes - the Shompens and the Nicobarese. The de-reservation of areas has not taken into account that the said area also is a legally reserved area notified as a Tribal Reserve also. The southernmost distribution of the PVTG (particularly vulnerable tribal groups) Shompen is found in the area of South Bay. The southernmost family of Indians, are actually a joint family of Shompen who live in the forested vicinity, and their foraging and hunting area is along the Galathea bay, out of sight of the outsiders. They and other Shompen community members have already expressed anguish and requested the Govt to leave their forests alone for their Bonafide forage and livelihood. b) Some members from both these tribes as well as few local settlers were asked about their opinion on the development plans in the islands. Their views can be found in the link below. YouTube link (Andaman CollectiveEp-01): https://www.youtube.com/watch?v=y1Q92LXYsdg. Opinion of Kokeon group of Shompen (who will be affected by development plans) can be found between 28:32 - 29:05 - They clearly state ask all	The Public hearing was held on 27th January 2022. All the participants were given adequate opportunity to express their concerns on the project. The minutes of the public hearing is attached as annexure XIII. Public hearing was attended by 120 local citizens including settlers and tribal people. Further, representatives of Tribal council, Andaman Adim Janajati Vikas Samiti (AAJVS) and concerned Government officials were also attended the public hearing. The Public hearing was held on 27th January 2022. All the participants were given adequate opportunity to express their concerns on the project. SIA will be undertaken as per LAR&R Act 2013.

	activities to be limited coastal area only. Opinion of Nicobarese, represented by Chairman Tribal Council (CTC) and Vice-CTC can be found between 29:06-30:02 - They are averse to leaving their ancestral land and to tourism. c) A separate Social Impact Assessment (SIA) as per Section 4 of the R&R Act, 2013 is to be conducted by UT Administration. The details of SIA should be published before Public hearing.	
10	Legal protection categories of the sites a) WLPA: Given the rich biological diversity and ecological value of GNI and the specific sites such as Galathea Bay, the region is currently under a matrix of legal protective mechanisms. Firstly, these sites and the species within them are protected under the WLPA, 1972, where not just the species mentioned, but the site itself was accorded protected area status as a Wildlife Sanctuary. As mentioned earlier, the denotification is being challenged and is by no means to be treated as a fait accomplii. b) Given all the ecological features and relevant criteria (cultural and historical uniqueness) several of the proposed sites, particularly Galathea Bay, has been historically categorised as belonging to the highest protection categories under the various versions of the coastal regulations, whether the CRZ, 1991, IPZ 2011 or the latest ICRZ 2019. Under each version of these laws, the coastal zone management plans and maps all consider this entire region to be a top protection category (i.e currently ICRZ -1A). The present EIA glosses over the spirit of these laws but also its protective clauses, which is tantamount to presenting misleading information.	The EIA report has been prepared in the line of TOR granted MOEF&CC. No comments on the denotification. The EIA followed the current status of the notifications. The draft ICRZ plans under 2019 notification available and referred with the draft EIA. Further, the draft superimposed maps of 1:4000 scale was provided by NCSCM and the final maps has been included in the final EIA report. Refer annexure XVII, XVIII & XIX. The CRZ clearance is under process and the project will proceed only after obtaining the CRZ clearances.
11	Other Concerns with the EIA Report and the Project a) It seems many studies for EIA are still pending. The public hearing should be conducted only after all the studies are completed and made available in the public domain, and the draft EIA suitably revised. b) Cost-benefit analyses have not considered ecosystem services of biodiversity, nesting beaches,	The study has already been completed and included as a part of the EIA report. See Attachment I. The EIA is being modified incorporating the comments of public during the public hearing process. However, a long-term study on Megapode has been initiated by ZSI. Adequate mitigation measures and monitoring of the mitigation measures have been suggested in

	forest ecosystem, coral reefs, marine biota, etc. and are thus inadequate. c) An EIA is supposed to predict whether there will be significant adverse environmental effects, even after mitigation is fully implemented. The current EIA does not address that.	the EIA report. (Refer Chapters 4 and 10) The proposed development at GNI is for next 30 years. The entire development is being included in application for seeking EC. There is no envisioned phase II for the project.
	d) As per the information provided in the draft EIA report, the proposal is for Phase I of the project. Splitting the project into phases leads to piecemealing of clearances, and the environmental and ecological impacts of the entire project cannot be assessed in its totality, as per this draft EIA Report. Hence the draft EIA should be revised and resubmitted for public comments. e) The water supply as it stands currently is grossly insufficient. Using the water flowing from the Galathea alone may be a bad idea, and it's sensible to have multiple sources, which include augmentation of existing sources. Currently Great Nicobar has an approximate human settlement population of ~ 8000-10000 people. For this population itself the existing water harvesting, storage and distribution is grossly inadequate and poorly maintained. The proposal is talking of approximately 5 lakh people. The plan seriously falls short of any intelligence in specifying how this will take place given existing inadequacy.	A detailed study has been conducted to assess the water source, demand and distribution. The identified source (2 reservoirs) are sufficient to cater the demand for the entire development. To preserve the natural streams, no tapping of water has been envisaged from any of the rivers. The proposed population is estimated to 3.32 lakh. Water harvesting is proposed at plot level through the development control regulation.
	f) Issue of Solid Waste Management (SWM): The projects and the expected population and tourism growth will create a huge crisis of solid waste management. Currently all the islands in ANI are facing extreme difficulties in SWM. None of the islands have recycling facilities. All the waste generated is either dumped in the sea or in the forests creating further threat to the unique ecosystems and endemic wildlife.	Integrated solid waste management facility has been proposed in the development in GNI. The waste management during construction has been covered in Chapter 2C of the EIA report
	g) EIA doesn't mention proper plans to dispose of untreated effluent from the construction sites. The port development will impact marine water quality which in turn will impact the corals, marine ecosystems, fisheries stocks and health of islanders.	Three STPs has been proposed to cater the treatment of 100% wastewater collected
	h) As per EIA, the approximate number of affected families due to the project has been estimated to be about 400. Each affected family which is displaced	The Rehabilitation and resettlement will be undertaken as per LARR 2013 Act.

	from the land acquired shall be given a monthly subsistence allowance equivalent to three thousand rupees per month for a period of one year from the date of award. This amount is inadequate. The impact of displacement is also not clear.	
	i) The nature of employment to locals during and after the construction is not clear. The islanders do not want a Havelock model of development, whereas the creation of township and tourism is worse than the Havelock model because it will create resource deficit throughout the year for the islanders.	Skill development facilities will be created for the locals to improve their employment prospects at the initial stage of the project. This is included in the EIA report
	j) As the main aim of the project is strategic development, it is also not clear whether the strategic interests of our country would be strengthened by allowing foreign ships to freely enter this area or by allowing millions of tourists to fly into this strategic location. Instead of constructing a commercial port and privatizing it, strengthening the naval base in GNI would have been a better option.	Considering the national importance of the project in view of security, socio-economic benefits to the local populace and strategic location of transhipment terminal, the Government of India have conceived this project after careful consideration of Environmental status of GNI.
	k) Lastly, the project and the EIA talk about connectivity of GNI with the mainland. However, the connectivity of Port Blair and many other more populated islands from mainland and inter-island via the sea route is still very poor. Overlooking the development of the rest of the islands and focusing on extensive infrastructure development on highly biodiverse GNI is not a model of development the islanders appreciate. It will further threaten and alienate GNI for the rest of the Andaman and Nicobar Islands.	For safety reasons the ships to GNI operates only under favourable condition of the sea conditions. As the development proceeds it is likely that frequency with better quality of ships will increase. The comments of the resident population during the Public Hearing process are attached with the EIA report.
12	In conclusion, we would urge that these points on the threats to the ecosystem and indigineous tribes and the shortcomings of the EIA process are taken into serious consideration. Public Hearing should be postponed until a revised EIA Report with detailed studies for all the phases of the project and mitigation plans is prepared and made available in the public domain.	Public hearing was conducted on 27TH January 2022 at Campbell Bay.

Bombay Natural History Society (BNHS)

S.no	Comments received	Responses
1	BNHS Comment: It appears the NABET validity of the EIA Consultants was up to November 2021. The draft EIA Report submitted for this Public Hearing is dated December 2021 i.e. after the expiry of the accreditation. This draft Report needs to be prepared and submitted by an accredited consultant. We also note there is only one empanelled biodiversity expert as part of the study. This is completely inadequate as Andaman and Nicobar is a biodiversity hotspot and includes many Endemic Bird Areas.	NABET accreditation of EIA consultant has already been extended up to February 2022. Same is being attached in the final EIA report. Please refer Chapter 12.
2	Rapid assessment study of WII – The WII study is a rapid assessment study, and the field visit seems to have taken a few days. This is not acceptable. A full-fledged long-term study on the turtles needs to be carried out and included in the draft EIA.	Even though a short field visit was conducted under this study, additional data for past decade were also used.
3	ZSI Report – It seems that though the ZSI Report does include a lot of baseline data, it is not clear how much field work has been carried out by the ZSI after May 2021 for the purposes of preparing their Report, which forms part of the draft EIA Report.	ZSI team from Kolkata visited the island for study. Apart from the data generated during the study, additional data for past decade were also used.
4	Both these studies were commissioned even before the Terms of Reference were issued by the MoEFCC.	The draft EIA report has been prepared considering all the TOR points. Zoological Survey of India (ZSI) has carried out the marine baseline study which is in-line with the MoEF&CC Office Memorandum no: J-11013/41/2006-IA-II(I) dated – 29th August, 2017. Please refer to the clarification under Query No-3. During the presentation to MoEFCC for grant of TOR, it was informed that national level institution ZSI has been appointed for assisting in the EIA study as they are the only agency having full familiarity with the island and have been working in GNI for decades.
5	BNHS Comment: The draft EIA Report does not include the possibility of natural disasters such as earthquakes, undersea volcanic eruptions, tsunamis, etc. and the impact of such disasters. This is surprising as such disasters have indeed occurred on the A&N islands. The probably of disaster occurring, and the preparedness in dealing with such disaster and risk should form a vital component of the draft EIA given the	There is no system through which disasters like earth quakes, volcanic eruptions can be predicted. For disaster preparedness, please refer to Chapter 7 of the EIA report.

	vulnerability of the proposed project to disaster and risk.	
6	BNHS Comment: The draft EIA report by WII contains old and outdated data on turtles and sea-level rise. This is concerning as turtles and other flora and fauna have been severely impacted by the tsunami. The report should be redone with latest baseline data	WII report refers to turtles data collected from 1991 to 2021. However, since the turtles did not return for breeding no data was collected after Tsunami till 2015. Please refer Attachment I.
7	BNHS Comment: Most of the mitigation measures suggested by ZSI are unlikely to be adhered to – such as no activity at night so that nocturnal fauna are not disturbed by bright lights. Solid waste – like construction debris, garbage, plastics, litter etc are recommended to be cleared regularly, however even if a waste disposal plant is established, its capacity will not be sufficient to dispose all safely. Even on the mainland, this is not possible. There is no system to 'police' the project development activities to ensure the measures are adopted.	ANNIDCO is committed to ensure that all the measures suggested in the EIA will be strictly followed. Please refer annexure X
8	ZSI says.. "the proposal is for holistic development in Great Nicobar Island which comprises of above developmental activities, for which there will be developmental components both in the aquatic and terrestrial ecosystems of Great Nicobar Island, the environmental impact is presumed to be negligible". BNHS Comment: it is clear that the environmental and ecological impact will be significant	The basic purpose of the EIA is to ensure that the impact of the habitat loss on natural flora and fauna is at the minimum levels. The EMP has been given in Chapter 10 of the EIA.
9	ZSI report says: "No endangered faunal communities such reticulated python, bird megapode and coconut crab distributed in the proposed and if at all found them during construction phase they can be relocated in safe and suitable place. The proposed alignment is well away from the settlement of semi-nomadic tribes Shompen in Great Nicobar Island". BNHS Comment: Relocation of endangered fauna is not feasible or advisable. They have specific habitat requirements and are extremely sensitive to habitat change.	It is unlikely that endangered species will be encountered during construction and the construction sites are away from the wildlife habitat. However, if they are encountered, they will be relocated by the forest department. Relocation is not a new phenomenon and successful relocation has been undertaken in many instances.
10	The report says: "Approximate number of affected families has been estimated to be about 399 (230 for Airport and 169 for township road infrastructure). However, the exact number of families to be affected will be known after the SIA study under section 4 of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement	The land acquisition and SIA process will be conducted as per the LARR Act, 2013 and have not started yet.

	(RFCTLAR&R) Act 2013. All the affected persons will be rehabilitated under the same Act". BNHS Comment: For resettlement of revenue village families, their informed consent and cooperation is necessary. This is a lengthy process. Has this been done?	
11	Further, noise, light and dust pollution is likely to harm the plants and fauna that Shompen consume. Such impacts on the tribe need to be factored into the EIA, in the spirit of Social Impact Assessments. Impacts of Township "Township construction phase has the potential to change the topography of the land which may also disrupt the natural drainage of the area. This is because the construction activity involves cut and fill earthworks. The cut and fill works will normally change the natural topography of the land which will result in a disruption of the natural drainage of the land and the surrounding vicinity The development is proposed outside the Campbell Bay National Park and Galathea National Park. On account of a permanent change from an age-old tropical rain forest to the power plant, the project is going to cause damage to dense forests in 39 Ha. Major negative impacts of the project on terrestrial Ecology and Biodiversity is the loss of a small patch of thick forest. However, compensatory afforestation as per the FC act has been proposed". BNHS Comment: Old and pristine rain forests can never be replicated through compensatory afforestation. They are complete natural ecosystems with innumerable interdependent species with special climatic and soil requirements. The region has amongst the best forest areas in India, as evidenced in the Forest Survey of India.	Light and noise generally do not affect plants. EIA has considered adequate measures to ensure that dust generated during construction is suppressed to ensure that plants do not get affected. All Natural drainage will be maintained and will not be affected due to construction. Further, detailed storm water management will be implemented under this development. Please refer Chapter 2A, section 2.20.1 A & N Islands is having only ~6% revenue land, hence, Compensatory Afforestation is being done in Madhya Pradesh, as per the guidelines of MoEF&CC. in this regard, Government of Madhya Pradesh has submitted the CA scheme and kml file for double the degraded forest area in the State of Madhya Pradesh in lieu of diversion of 121.87 Sq.km. of forest land and 8.88 Sq.km. of deemed forest land to Forest department of A&N Administration.
12	Impact on Endangered and endemic fauna of the whole project area: MACAQUE: The report says: "Habitat loss is the major threat to Nicobar Long-Tailed Macaques apart from the isolation of population Continuing habitat loss may result in forest fragmentation and the groups even within a single island may become isolated. Increasing number of villages, roads, airstrips and infrastructure for defence establishments have all resulted in habitat loss.	The basic purpose of the EIA is to ensure that the impact of the habitat loss on natural flora and fauna is at the minimum levels.

	Further habitat destruction, especially by mainland settlers must be curbed immediately". TURTLES: The report says: "The southern bay of Great Nicobar is Southeast Asia's largest leatherback turtle nesting site. In Galathea bay, nesting, egg laying and hatchling are more for Leatherback turtle compared to the other regions of Great Nicobar Island. The nesting leatherback populations of this species have 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." BNHS comment: As India's largest leatherback turtle nesting site, this site deserves protection and not destruction. Leatherback nesting will be severely hampered by the port. There is a risk of mortality due to collision with ships. Deflectors for turtles are unlikely to work.	ZSI has looked into this aspect and have recommended several steps to be taken as remedial measures. The ZSI recommendation forms a part of the EMP. Kindly refer Chapter 10.
13	MEGAPODE: As per the survey by ZSI, "there are ~ 100 active mounds were recorded and ~ 202 megapodes were detected during the point-transect and playback surveys Megapodius nicobariensis abbotti occurs in all of the southern group of islands, it was estimated that 7 active mounds and 14 breeding pairs in Galathea……The prime hazard hanging over the megapode population of the Nicobars will be a suggestion to make Great Nicobar a free port and to create a dry dock and refuelling base for international shipping at the mouth of the Galathea River. Another possible threat for the Nicobar Megapodes is ongoing road construction from Shastri Nagar to Indira Point via Galathea, which results in the loss of micro and macro habitat as well as the surrounding environment needed to maintain the micro climatic condition for the mounds". BNHS Comment: This is self-explanatory. The Nicobar Megapode is an endemic species with a restricted range. Habitat of the Megapode has suffered because of the tsunami [leading to the submergence of Megapode sanctuary], and the loss of Tillangchong island which has been used as a missile firing range. It is incumbent for India to save this bird.	ZSI has considered Megapod nests and have recommended several steps to be taken as remedial measures. The ZSI recommendation forms a part of the EMP. Kindly refer Chapter 10. So far as we understand, the Tillanfchong missile testing range was rejected by MoEF&CC wide 6-18/2011/WL-I dated October 2012.
14	COCONUT CRAB: This is a Schedule 1 species. The report mentions the coconut crab populations are threatened with extinction in the Nicobar group of Islands.	

	CROCODILES: "Salt-Water crocodiles sighted at Indira Point, Mahar Nallah, Gandhi Nagar, Shastri Nagar, and Galathea Bay…..crocodiles can be shifted to alternate suitable habitat, away from the proposed developmental projects", the report says. BNHS Comment: This is not a feasible proposal. Crocodiles are known to swim tremendous distances and return to their original sites. Relocation of endangered and site-specific species is not a feasible options. From the ZSI's own admission, the project will impact several endangered species.	As per section 11 of The Wild Life (Protection) ACT, 1972. States "Explanation.—For the purposes of clause (a), the process of capture or translocation, as the case may be, of such animal shall be made in such manner as to cause minimum trauma to the said animal" Salt water Crocodile has been removed and shifted to different sites in many countries, especially in Australia. There are systems like crocodile traps which prevents crocodiles to interact with humans.
15	BNHS Recommendation: The Andaman and Nicobar islands are amongst the greatest biodiversity hotspots on earth. The EIA report, conducted during the COVID-19 pandemic, is not adequate, neither does it have proper terms of reference. Further, even these short studies point to serious damage to local ecologies. BNHS recommends a fresh EIA be conducted with three seasons data and proper terms of reference. It should be placed before the public hearing and the public hearing should be held only after this is done.	Public hearing has been conducted on 27TH January 2022 at Campbell Bay.

Annexure R-6

Extract of EIA Chapter- 5 regarding Analysis of Alternatives (Sites)

CHAPTER 5

5.0 ANALYSIS OF ALTERNATIVES

5.1 Alternative Site Analysis

Site analysis was undertaken for the existing and potential conditions in and around the proposed sites. The purpose of the analysis is to provide thorough information about the site assets and liabilities prior to starting the design process.

Many of the possible alternatives concerning type, scale, and location will be influenced by technical, economic and environmental considerations. The proposed project for development has considered approaches to the project and means of preventing damage to the environment.

The alternatives have been studied with indication of the reasons for selecting the proposed alternatives have been presented in subsequent sections of this chapter being a good practice to consider alternatives during project planning, to examine their environmental impacts in deciding which alternative to choose at project design or to methods of construction or operation stages to avoid, reduce or remedy environmental effects.

In the proposed holistic development of GNI, the following are the analysis four alternative sites examined for the each of the project considered under the holistic development of GNI:

5.2 Alternative Site Analysis for ICTT Project

The site alternatives are listed below and given in brief in the subsequent sections:

- Site 1 – Galathea Bay
- Site 2 – Casuarina Bay
- Site 3 – Anderson Bay
- Site 4 – Pemayya Bay

The harbor layouts at each of the above alternative sites have been developed considering the direction of waves, water depths to minimize dredging and ensuring while the breakwater does not extend to deeper waters that would increase the cost of development.

The location of the four alternate sites in the Great Nicobar Island is shown in **Figure 5.1.**

Figure-5.1(A): Alternative Site Locations (Galathea Bay and Casuarina Bay)

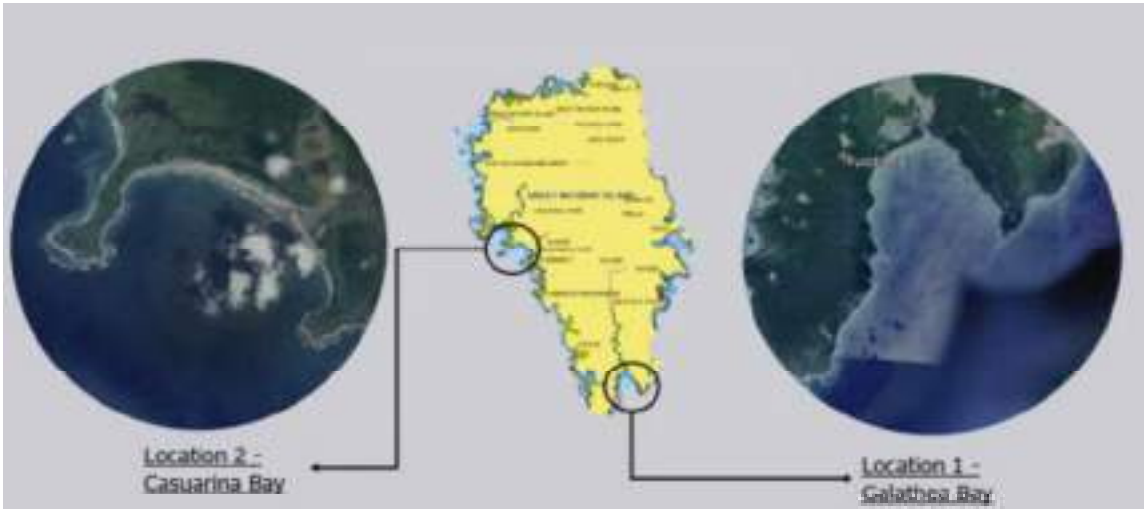
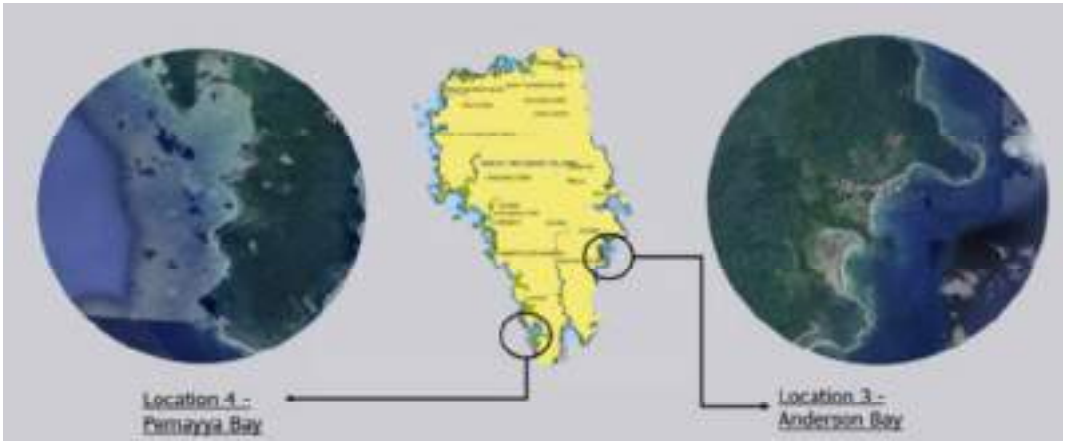


Figure-5.1(B): Alternative Site Locations (Anderson Bay and Pamayya Bay)

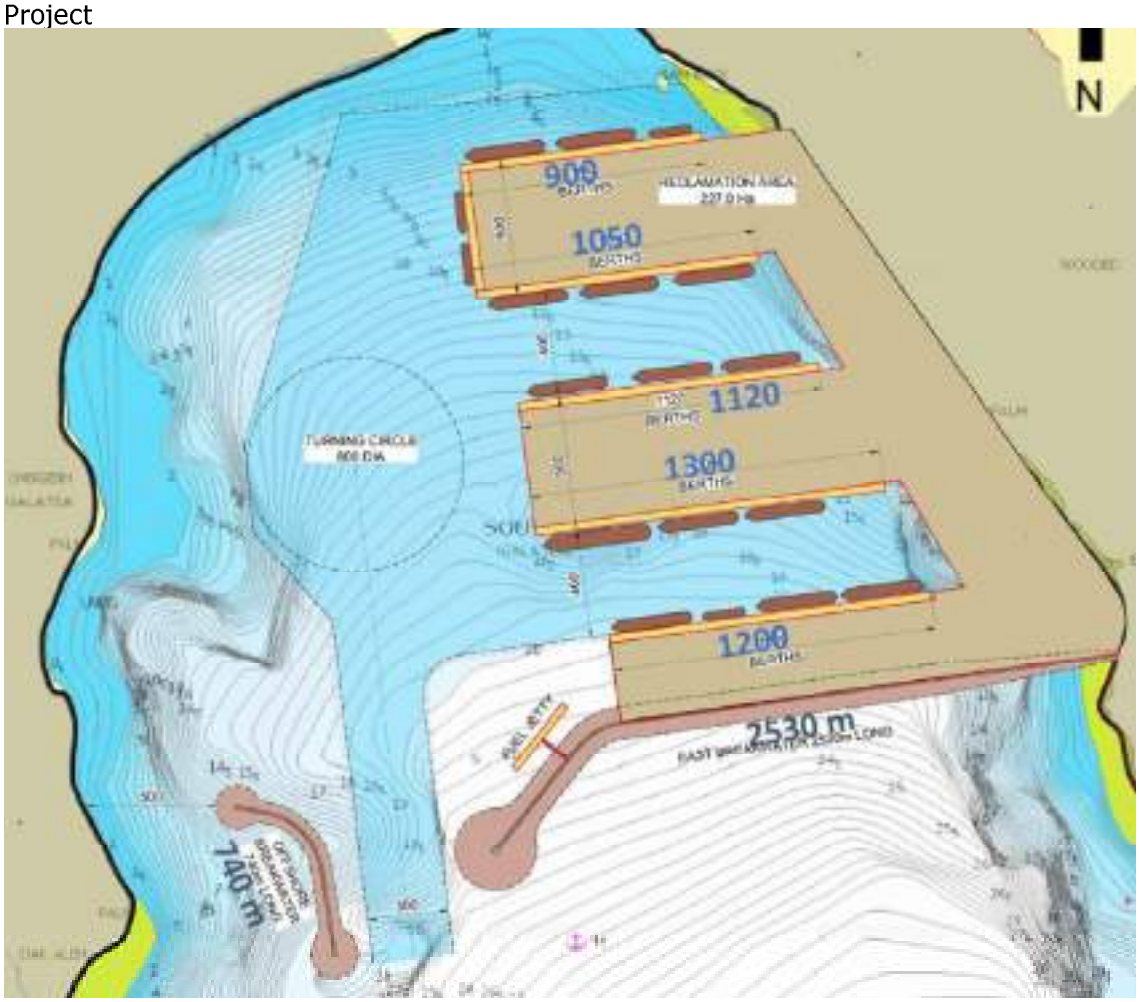


5.2.1 Site 1 – Galathea Bay

This site is located near the southernmost tip of the Great Nicobar Island and is approximately 40 km away from the mainline shipping route. The sea-bed contours are steep, and the water depths of 20 m and 30 m are available within 2.3 km and 3.6 km from the shoreline respectively. The site offers the water area of about 517.60 ha between shoreline and the 20 m contour which could be optimally utilised for the development of the harbour facilities. The site is away from habitation. Part of the site falls under ICRZ Zone 1A. The indicative layout of the container Transshipment port is presented in **Figure-5.2**.

It could be observed that about 6.07 km of total berth length is possible to be developed on the western side of the bay. Two breakwaters of length 2.53 km and 0.74 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. However, the breakwaters would need to be fully constructed at the initial phase only.

Figure-5.2: Galathea Bay Location – Proposed Layout – Selected Site the Present Project



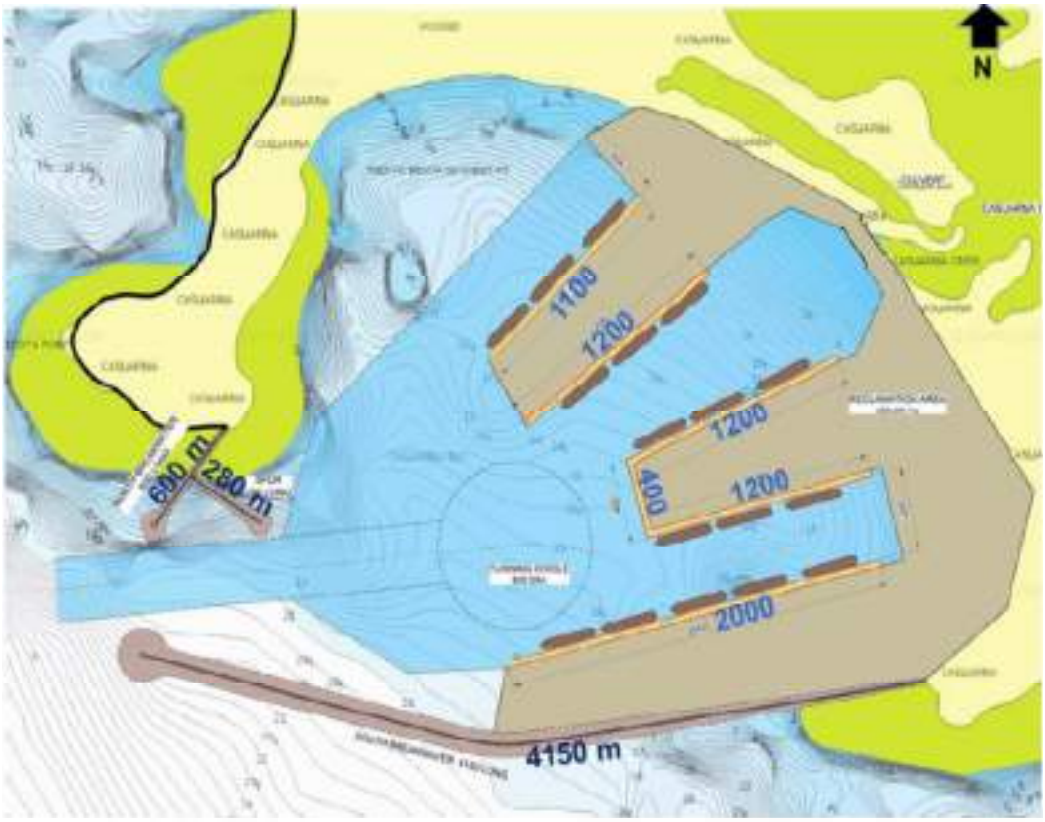
5.2.2 Alternative Site 2 – Casuarina Bay

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)

5.2.4 Alternative Site 4 – Pemayya 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 away from any habitation. Further, this area may conflict with the proposed Naval facilities planned near the Indira Point. Only small part of the area falls under ICRZ Zone 1A. Nesting of sea turtles has been reported on the Pamayya Bay site but is not being monitored by the forest department. Two breakwaters of length 4.20 km and 1.55 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-5.5.**

Figure-5.5: Alternative Site-4: Pamayya Bay (Layout)

Multi-criteria Analysis of Alternative Sites

All the proposed alternative sites were evaluated using Multi-criteria Analysis as presented in **Table-5.1**. The comparison and site evaluation were carried out considering the various factors and the outcome of the evaluation is given in.

Table-5.1: Comparative Analysis of Alternate Sites

Sr No.	Factor Description	Galathea Bay	Casuarina Bay	Anderson Bay	Pemayya Bay
1	**Proximity to shipping routes**	Closest to the International Shipping line (only 40 km away)	Additional distance of 35 km from Site 1	Additional distance of 25 km from Site 1	Additional distance of 15 km from Site 1
2	**Cost Risks**	Minimal	Risk of rock dredging higher as compared to site 1	Significant as hills have to be cut for creating the harbour basin. Presence of rock would make dredging very expensive	Significant as hills have to be cut for creating the harbour basin. Presence of rock would make dredging very expensive
3	**Land Development**	Requires Reclamation of Land to develop Onshore Storage facilities. Minimal hill cutting is required	Reclamation Required is slightly more as compared to Galathea Bay. Minimal hill cutting is envisaged	Reclamation required is less than in Galathea bay. However significant hill cutting is involved	Reclamation required is slightly more than in Galathea Bay. Hill cutting required is maximum of all locations
4	**Dredging Requirement**	Sufficient water depth is available close to shore. Minimal dredging is required	Shallower water depths near to shore. Dredging volume required is slightly more than Galathea bay but less than Anderson and Pemayya bay	Shallower water depths near to shore. Significant volume of dredging required. Dredging required is max among all locations	Shallower water depths near to shore. Significant Dredging required. It is more than Galathea bay and Casuarina bay

Sr No.	Factor Description	Galathea Bay	Casuarina Bay	Anderson Bay	Pemayya Bay
5	**Breakwaters**	Smallest length of breakwaters required.	Length of breakwater is more than Galathea bay but less than Anderson bay and Pemayya bay	Length of breakwaters is significantly more than the length required for Galathea bay	Length of breakwaters required is max of all locations
6	**Environmental Issues**	Part of the area falls under ICRZ Zone 1A, Turtle nesting sites haven been reported	part of the area falls under ICRZ Zone 1A. Area within biosphere reserve and Campbell National Park, Turtle nesting sites have been reported	Part of the area rea falls under ICRZ Zone 1A, Turtle nesting sites have been reported	Very Small area as compared to other locations falls under ICRZ Zone 1A, Turtle nesting sites have been reported
7	**Tribal**	-	Presence of Tribal in the adjoining area	-	-
8	**Gel with Overall development plan**	The location gels well with the overall development plan. However, its proximity with the proposed air strip needs to be confirmed with regard to the 150m high cranes	Location falls outside the proposed project boundary and is very far from the other project components.	Site requires displacement of habitation and therefore has Rehabilitation issues.	Development is restricted. It may overlap with the defence land

Recommended Trans-shipment Port Layout

It could be observed from above that Transshipment Port site at Galathea Bay appears to be the most feasible in terms of overall considerations for technical, environmental and financial parameters and thus selected for further detailed evaluation.

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.

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 Island and Sacramento uninterruptedly.

Strategic reason: Presently, Foreign powers are expanding its footprint around India in the Indian Ocean Region. Foreign powers have developed and funded different types of ports in our neighboring countries to enjoy sovereign guarantees and facilities. Foreign powers have developed and funded a deep-water port at nearby country. This will help Foreign power's oil imports to bypass transport on the Indian Ocean and specifically through the Strait of Malacca. Foreign powers providing economic and technical aid to some countries for the expansion of the port and bunker facility. Foreign powers are using Naval and commercial access to nearby country's port along with harboring and refueling of aircraft.

Under the above-mentioned situation, the outer boundary is chocking, and some initiatives are required to counter these predominant activities of Foreign powers in Indian Ocean Region. The Great Nicobar Island is the southernmost landmass of India with notable strategic importance which may provide a valid platform to counter the Indian strong activities against Foreign powers. The proposed project came out with some specific goals in terms of the development program in Great Nicobar Island like to strengthen India's participation in the regional maritime economy by establishing a new port city; to develop a diverse economy that combines transshipment, trade, and tourism; to leverage the Island's world-class ecological resources to attract international and Indian tourists. The development plans are designed in terms of some specific master plan assignments such as to provide an inspiring and agile framework for the physical development of the new city; to ascertain the best location and most appropriate size for major infrastructure facilities (port, airport, urban infrastructure); to chart a balanced path forward that can achieve economic development goals, conserve the natural environment, and improve the quality of life of residents.

5.3 Alternative Site Analysis for Airport

The airport site analysis was carried out based on reviews of available secondary data, existing reports and a field visit. Numerous elements were considered in the airport site context analysis, including a review of surrounding and site-specific conditions with regards to wind direction, topography, adequacy of development space, air traffic safety considerations, environmental issues and existing infrastructure. This examination of the existing site conditions provides key insights that help shape future development decisions.

The key factors that need to be taken into account when selecting a suitable location for an airport include the following:

- Open, fairly leveled and well-drained site.
- Prevailing wind directions that support available runway configuration options.
- Absence of obstructions to air navigation systems.
- Environmental concerns, national parks, tribal areas etc.
- Earthwork economics and need to minimise land cut and fill.
- Propensity for flooding and tidal variations.
- Connectivity and accessibility.

Five potential airport sites were selected for initial evaluation, see Figure 5.6 below.

Figure-5.6: Five Potential Airport Aites

Examination of Sites 2 (Centre) and 4 (West) indicated they are deficient in two important aspects:

- Restricted length of runways availability; and
- Prevailing wind directions would cause crosswinds for significant periods and hence would risk regular interruptions to runway operations.

Moreover, other major disadvantages of Site 4 (West) are as follows:

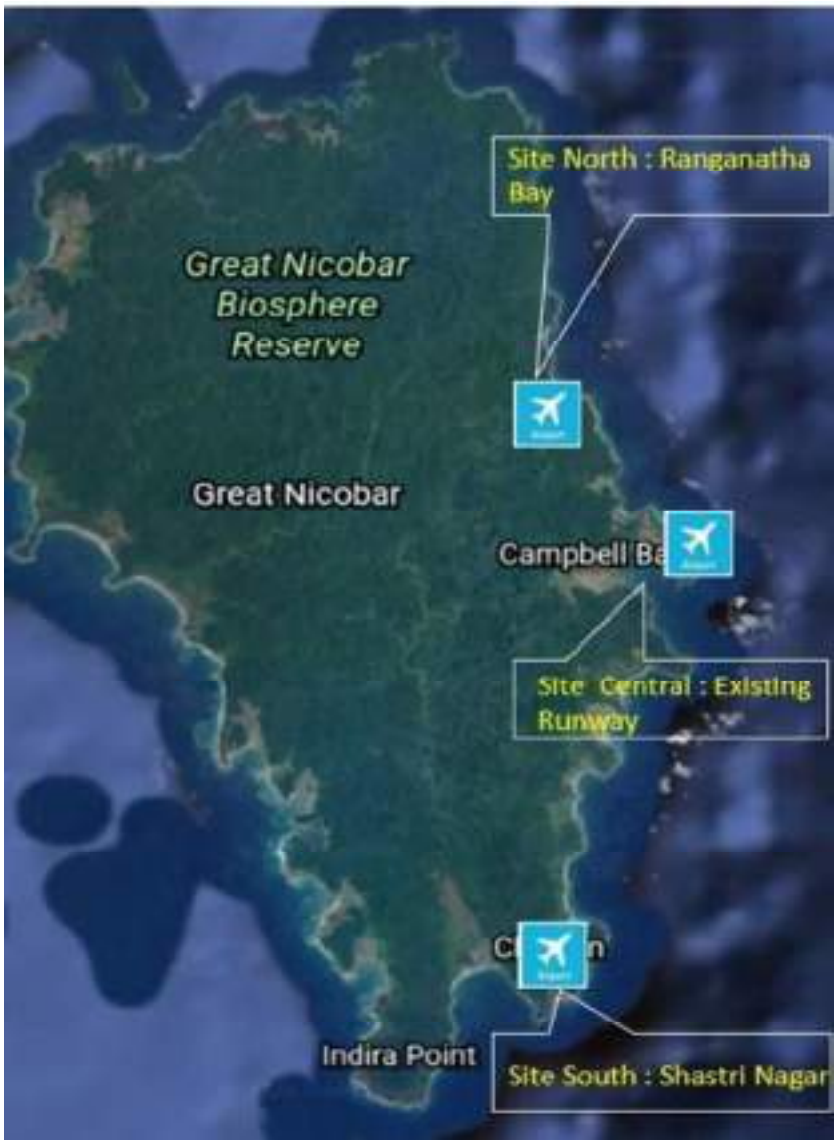
- Proximity to Shompen tribe areas
- No connectivity either by land/ road or by sea; and so
- Would require the cutting of a new road through a virgin forest zone to provide ground connectivity; and
- The proposed island development would be on the east coast and the airport would relatively far away and located on the west coast of the island.

As a result of these considerations, Site 2 (Central) and Site 4 (West) was rejected.

The three remaining shortlisted airport sites were further analysed. These sites are as follows and are shown in Figure 2.1 below.

- North Site – Ranganatha Bay.
- Central Site – Existing runway at Campbell Bay.
- South Site- Shastri Nagar.

Figure-5.7: Alternative Sites for Airport



5.3.1 Ranganatha Bay – North Site

Topography: The airport site is along the length of a seasonal stream. The stream runs south to north and which discharges to the sea at the north. The airport site is adjacent to a ridge line to the west and a number of high isolated knolls to the east. A number of ridge spurs protrude from west ridge into the valley and these would need to be removed if the site was selected for the airport.

Wind Direction: The runway at this site would be oriented in an approximate north-south direction and this would be quite suitable for the prevailing north-east/south-west wind direction.

Obstructions to Air Navigation: These are significant, as follows:

- The ridge line to the west of the airport site runs north-south and is over 100m high, and therefore it penetrates the Inner Horizontal Surface, the Conical Surface and the Outer Horizontal Surface.

- The runway approach from the south is obstructed and hampered by hill features which lie directly in the runway approach and take-off climb surfaces. These hills are significant obstructions to aircraft, risking safe flying operations.

Air Approaches to the Site:

a. Approach from North

The approach is over Sea and mostly clear except for some obstructions on the coastline.

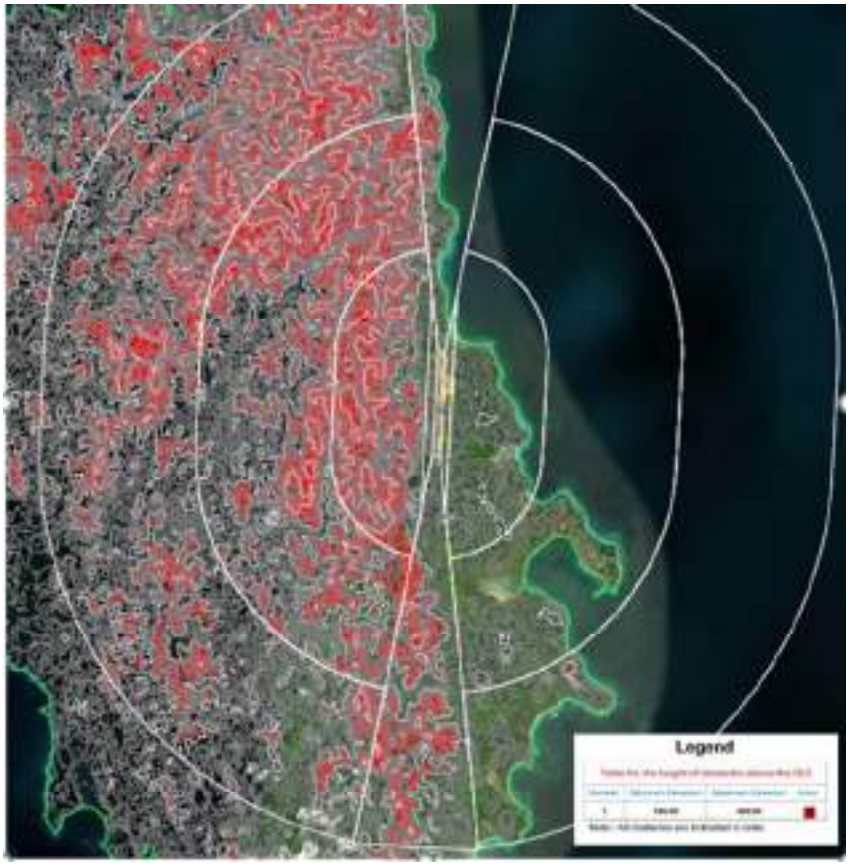
b. Approach from South

The approach from South is obstructed and hampered by hill features which lie right in the Approach surface. These hills are serious obstructions to approaching aircraft and will endanger safe flying operations.

Airport Availability

Due to the restrictions of approach from South, the Airport could be approached from Single direction only; hence, the airport will be available for operations only when the Wind is from third quadrant or is in calm realm. Thus, the availability of airport would be about 50% of the time.

Figure-5.8: Ranganatha Bay – North Site – Obstruction to Navigation



Runway Usability: Due to the restrictions on the runway approach from the south, an airport at this site can only be approached from a single direction and so the airport will be available for operations only when the wind is calm/light or from the south-west. Therefore, the availability of airport would be severely restricted and would not meet the ICAO requirement for an airport runway system to be available 95% of the time and so all-weather, around the clock operations may not be possible at this site.

Environmental Issues: This site lies close to hilly areas and is covered with dense forest growth. This will entail clearing of the forest cover and a general levelling of the site. The drainage pattern of the valley in which the airport would be located will need to be retrained thereby increasing the capital expenditure to ensure that the catchment area on the slopes does not direct the discharge towards the airport. The entire area will require diversion / acquiring forest land and part of area will be in wetlands. The northern end of runway will be in the CRZ and will require some reclamation at the seashore. Access to inhabited areas and Campbell Bay is currently non-existent and new roads will need to be constructed.

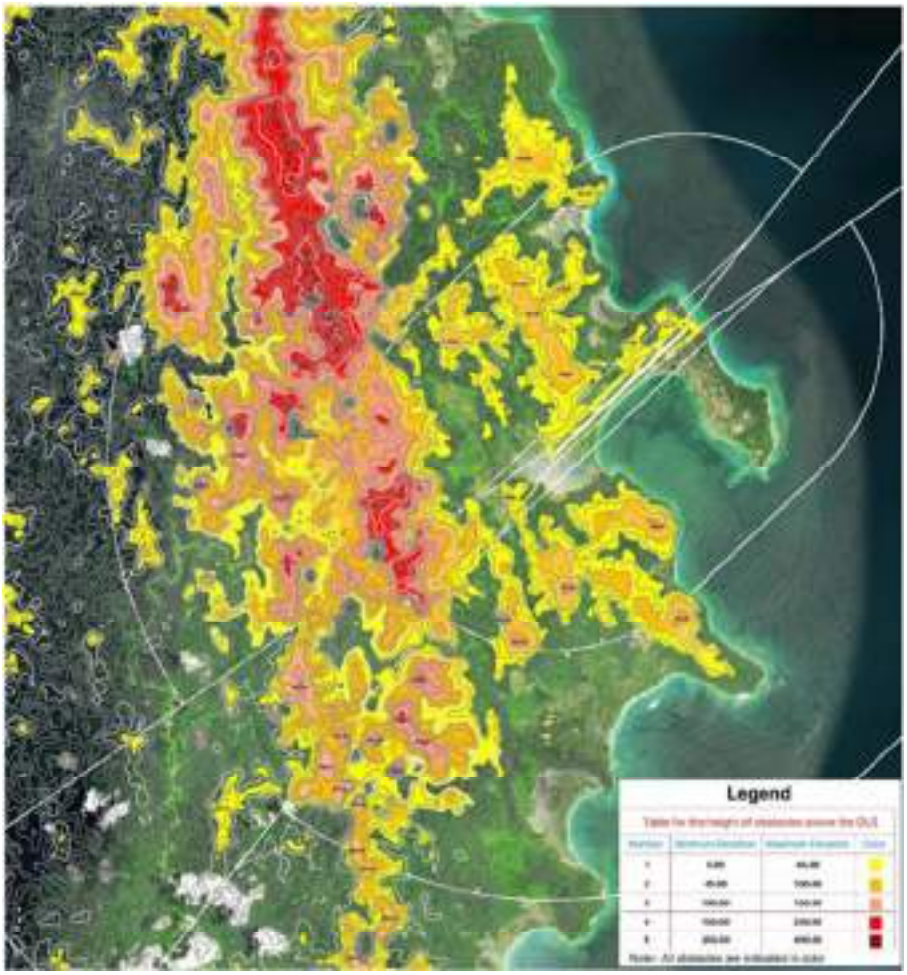
5.3.2 Existing Runway of INS Baaz – Central Site

Topography: The site is the existing Indian Navy airstrip. The runway is approximately 1,000m long and would need significant extension to allow commercial Code C aircraft operations the site is dominated by a hill feature to the north and the southern edge of the site is the Campbell Bay shoreline. The site has very limited scope for future expansion and will not be able to accommodate the required infrastructure for development of an international airport. Expansion of the site will require extensive land reclamation in Campbell Bay along the length of the runway. The existing Indian Navy infrastructure extends to the fringes of the existing short runway and safety clearances are not adequate for a Code 4 runway and so these existing facilities will need to be demolished. In addition, the extension of the runway to the north-east will protrudes into and bisect an existing settlement area and this will also require some demolition of existing buildings including a temple.

Wind Direction: The runway at this site would be oriented in an approximate north-east/south-west direction and this would be suitable for the prevailing north-east/south-west wind direction.

Obstructions to Air Navigation: The site is dominated by a hill feature to the north over 80m high and this would penetrate the Inner Horizontal Surface and the Conical Surface. Similarly, the approach and take-off climb surfaces from/to the south-west are also penetrated by other hilly terrain.

Figure-5.9: Ins Baaz Central Site – Obstruction to Navigation



Air Approaches to the Site:

Approach from North- East.

The approach is over Sea and is mostly clear.

Approach from South.

The approach from South is obstructed and hampered by hill features which lie right in the Approach surface. These hills are serious obstructions to approaching aircraft and will endanger safe flying operations.

Airport Availability:

Due to the restrictions of approach from South, the Airport could be approached from Single direction only; hence, the airport would be available for operations only when the Wind is from third quadrant or calm realm. Thus, the availability of airport would be about 50% of the time.

Runway Usability: Due to the restrictions on the runway approach from the south, an airport at this site can only be approached from a single direction and so the airport will be available for operations only when the wind is calm/light or from the south-west. Therefore, the availability of airport would be severely restricted and would not meet the ICAO requirement for an airport runway system to be available 95% of the time and so all-weather, around the clock operations may not be possible at this site.

Environmental Issues: This site lies close to hilly areas and is covered with dense forest growth. This will entail clearing of the forest cover and a general levelling of the site. The drainage pattern of the valley in which the airport would be located will need to be retrained and will require substantial funds to ensure that the catchment area on the slopes does not direct the discharge towards the planned assets of airport. The entire area will require diversion / acquiring forest land and part of area will be in wetlands. The northern end of extended runway will be in the CRZ as it will require some reclamation at the seashore. adjacent area is having habitation and may require displacement of population.

5.3.3 Shastri Nagar – Southern Site

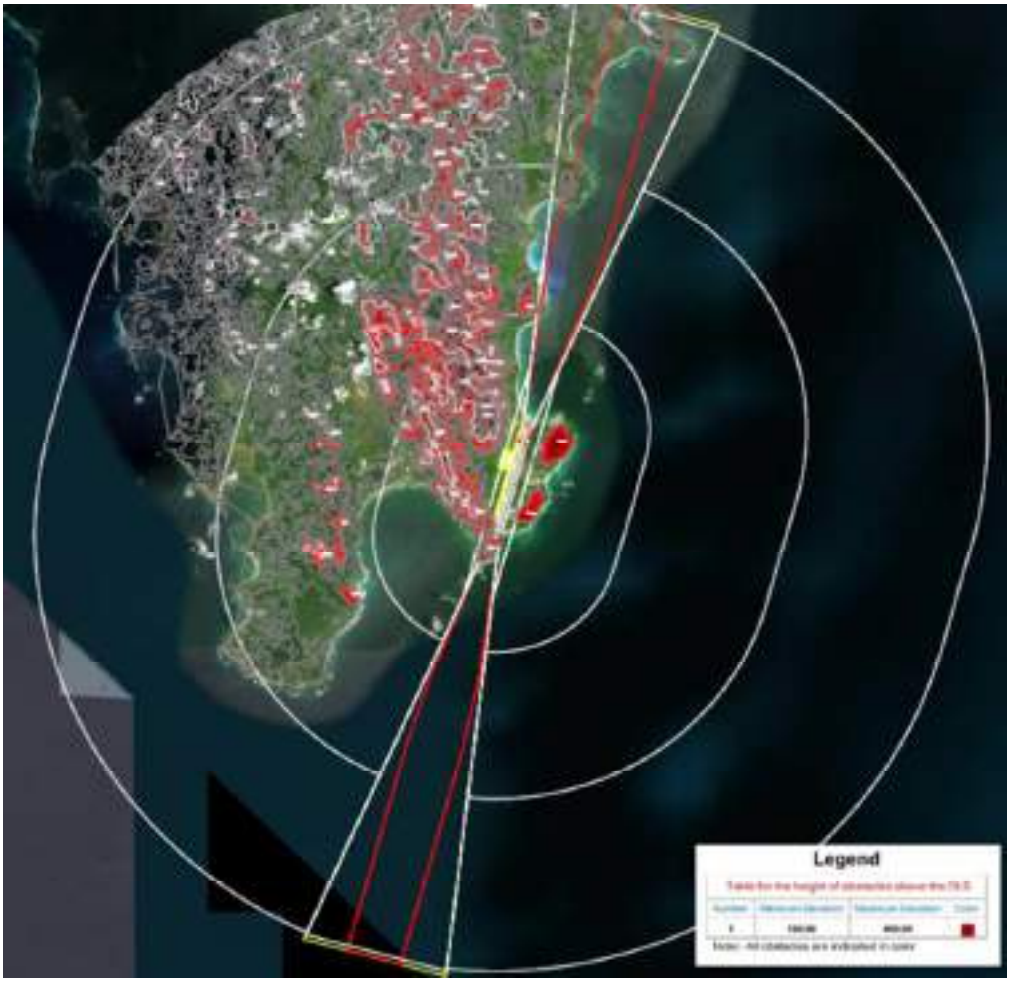
Topography: The South Site is approximately 4,000m long, running along a flat open patch of land. The site is dominated by a 100m high ridge line to the west and there are two isolated knolls to the east. The site has a tidal inlet area to the east which would need to be filled and levelled.

Wind Direction: The runway at this site would be oriented in an approximate north-east/south-west direction and this would be suitable for the prevailing north-east/south-west wind direction.

Obstructions to Air Navigation: The ridge line to the west of the site running over 100m in parts and therefore the Inner Horizontal Surface and Conical Surface are penetrated. However, this ridge line also separates the airport site and the proposed port site at Galethea Bay and provides a buffer zone between the two. The sea port will have tower cranes for loading and unloading of ships; these cranes are also likely to be aerodrome safeguarding obstacles and their obstacle impact needs to be assessed by the Airport Authority of India (AAI) as the cranes will lie in the shadow of the separating ridge line. Suitable and appropriate ATM procedures need to be established by AAI for safe navigation if this airport site is selected. The ridgeline and knoll penetrations of the aerodrome safeguarded surfaces are shown in Figure below. Whilst there some penetrations of the aerodrome safeguarded surfaces beyond the south-west end of the runway these

are minimal compared to the North and Central Sites, and the approach and take-off climb surfaces beyond the north-eastern end of the runway are clear.

Figure-5.10: Shastri Nagar Southern Site – Obstruction to Navigation



Air Approaches to the Site:

a. Approach from North: The approach is over Sea and is mostly clear.

b. Approach from South:

The approach is over Sea and mostly clear except for some levelling on the Coastline and reclamation of land. Obstacle Limitation Surface (OLS) Airport Availability: The airport is available from both the approaches and hence is

assessed that it will be available for over 95 % of time which is a requirement of International Civil Aviation Organisation (ICAO).

Runway Usability: The airport is available from both the approaches and hence is assessed that it will be available for over 95% of time, therefore meeting ICAO usability criteria.

Environmental Issues: The South Site is a fairly open area. Minimal forest land will be affected by the airport development. There is an existing road connection to existing main areas of habitation on the island habitation. No land reclamation will be required for a Code C runway; however, runway approach lighting systems will extend into the sea. Reclamation will be required for the existing tidal inlet area to the east which is under CRZ. The aircraft approach and take-off paths will be over the sea at both runways ends and there will be minimal disturbance to the local population and tribal areas due to overflying aircraft at low altitude.

5.3.4 Multi criteria Analysis of Alternative Sites

In **Table-5.2** below the international airport site selection evaluation for the three shortlisted airport sites (North, Central and South) has been summarised. The evaluation takes account of a variety of key site selection criteria including impact of island terrain on airport operations & usability and potential environmental impacts of airport development.

Table-5.2: Analysis of Alternative Sits for Airport Project

S/N	Evaluation Criteria	Site Evaluation		
		North Site	Central Site	South Site
1	Approximate Length of Land Available	4,200 m	3,900 m	4,000 m
2	Aircraft Approaches	Single, only from north	Single, only from north-east	Both
3	Obstructions to Air Navigation	High Ridge Lines Venturi effect	Small Hill on North	Hills on West and East; Port Cranes in Galathea Bay
4	Prevailing Wind Direction and Airport Usability	Only partial availability of Airport	Only partial availability of Airport	Airport available most of the year
5	Earthworks Economics	Expensive	Intermediate	Intermediate
6	Environmental	Most Sensitive	Fairly Sensitive	Fairly Sensitive

S/N	Evaluation Criteria	Site Evaluation		
		North Site	Central Site	South Site
	Sensitivity	Virgin Forest area	Large part is Revenue Land	Large part is Revenue Land Minimal forest Land affected
		No Habitation on Site	Existing Town will Split in two parts	Existing Town of Shastri Nagar and part Gandhi will need to be shifted
		Needs new greenfield highway for connectivity	Existing Road Connectivity	Existing Road Connectivity
		Needs some land reclamation beyond the shoreline	Needs significant land reclamation beyond the shoreline	Requires land reclamation of the tidal inlet area
		Flight paths over entire length of island and habitation	Flight paths over entire width of island, tribal areas and over habited areas	Flight paths over the sea with minimal disturbance to habited areas
		Likely disturbance of tribal areas	Likely disturbance of tribal areas	Unlikely disturbance of tribal areas
7	Avifauna impacts	Flight path may interfere with avifauna flight paths and habitats	Flight path may interfere with avifauna flight paths and habitats	Flight paths over the sea and likely minimal disturbance to avifauna
		Active and passive measures would need to be instituted at the airport to safeguard flight operations and avifauna	Active and passive measures would need to be instituted at the airport to safeguard flight operations and avifauna	Active and passive measures would need to be instituted at the airport to safeguard flight operations and avifauna
8	Turtle Nesting Areas	Not affected	Not affected	Not affected

S/N	Evaluation Criteria	Site Evaluation		
		North Site	Central Site	South Site
9	Crocodile Infested Areas	Not affected	Not affected	Affected
	Corals	Not affected	May get affected	May get affected
10	Megapodes	Nests reported	Not affected	Not affected
11	ICRZ	Impacts at the north end of the airport site and around the central part of the runway: Mangroves/ICRZ Zone IV B	Minimal impacts on the southern side of the runway: Partly in ICRZ Zone IV B	CRZ is impacted at the north and south ends of the runway and around the centre of the airport site there are two water bodies: Partly in ICRZ Zone 1 A, I B & IV B
12	Access can be planned by:			
a	Road	Yes	Yes	Yes
b	Speed Boats	No	Yes	Yes
c	Sea Aerodrome	No	No	Yes

Site Selection recommendation: The number of sites on Great Nicobar Island suitable for development of an international airport on Great Nicobar Island are very limited. The island terrain is characterised by hills with only a relatively narrow strip of land on the eastern and southern coasts where urban and tourism development can take place. Various National Parks, environmentally sensitive areas and local tribal areas add further development constraints. The significant constraints imposed by the island terrain and characteristics mean that there is no perfect site available on the island. All sites are compromised to some degree and the most suitable site is the one where these compromises can be managed and the one which provides a high degree of runway usability in line with ICAO recommendations, with aircraft approaches and take-offs available to/from both ends of the single runway. Based on our comparative site assessment and selection analysis, only the South Site should be pursued as this is the only site, we believe can be developed without wholescale terrain modification to allow runway operations in both directions. Having said that, the South Site does present some challenges that still need to be overcome, these include the following:

- The need for some terrain modification to reduce penetration of the aerodrome safeguarded surfaces by natural terrain obstacles to ensure safe aircraft operations, and also to provide an airport platform onto which the airfield and apron areas can be constructed to stringent ICAO longitudinal and transverse profile standards;

- Air Traffic Control procedures to restrict aircraft approach, take-off, missed approach routes etc. based on the agreed terrain modifications.

- The need for some land reclamation to allow construction of a 3,000m runway with 240m Runway End Safety Areas and ILS Localisers at both ends of the runway. This land reclamation requirement will invariably encroach upon the CRZ, and so environmental clearance and some environmental management/mitigation will be required.

- Some reclamation is also necessary in the central part of airport at the current tidal inlet area to create sufficient area for all anticipated airport functions. This will also require environmental clearance and some environmental management/mitigation.

The selected airport site is shown in **Figure-5.12**.

Figure-5.12: Map showing Location of selected Airport site

Figure-5.13: Airport Overlap on ICRZ Map

5.4 Alternative Site Analysis – Power Plant

Three alternative sites were examined for the proposed LNG power plant. The alternative sites are listed below:

Site-1: Near Campbell Bay;
Site-2: Near Shastri Nagar; and
Site-3: Near proposed port.

The alternate sites are shown in **Figure-5.13**. The selected site is option 3 which is near to the ICTT facility.

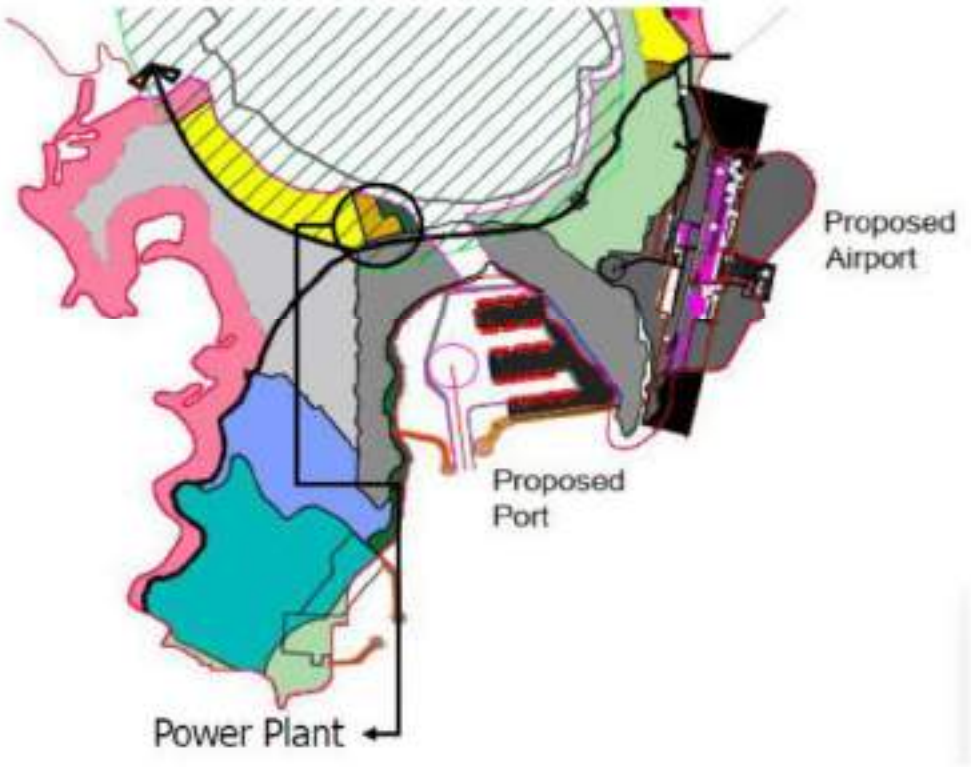
Table-5.3: Comparison Statement for Site Selection of Power Plant

Sr. No	Description	Near Campbell Bay Site-1	Near Shastri Nagar Site-2	Near Galathea Bay Site-3
1	Approx. Area of land available	96 acres	96 acres	96 acres
2	Earth work economics	Expensive	Intermediate	Intermediate
3	Environmental Sensitivity	Less Sensitive	Fairly Sensitive	Fairly Sensitive
a	Turtle Nesting Areas	Not affected	Not affected	Not affected
b	Megapode	Not affected	Not affected	Not affected
c	ICRZ	Not affected	Not affected	Not affected
4	Equitable growth of different areas	Long distance from load centre	Long distance from load centre	Near load centre
5	Transportation of fuel	Expensive transportation cost of fuel	Intermediate transportation cost of fuel	Less transportation cost of fuel
6	Generation expenses	High	Intermediate	Less
7	Nearness to the tribal settlement	Not applicable	Near to the tribal area	Near to the tribal area

Figure-5.14 Alternative Sites for Power Plant

Figure-5.15: Power Plant Overlap on ICRZ Map

Figure-5.16: Selected Site for Installation of Power Plant



- **Power Plant Location**

✓ The power plant site has been finalized at the Galthea Bay considering the minimal impact on the ecology as well as to have cost effective development. The proposed site is near to the major activities (Port & Airport) where bulk of load to be cater. An integrated location of power plant is suggested to feed the entire development on island; and

✓ The location is near to proposed LNG jetty and is suitable for establishing all the multiple sources of Power Generation for Great Nicobar Island viz., DG and LNG plant

Annexure R-7

A&N (Protection of Aboriginal Tribes) Regulation, 1956

सत्यमेव जयते

The Andaman and Nicobar Gazette

EXTRAORDINARY

PUBLISHED BY AUTHORITY

No. 4, PORT BLAIR, SATURDAY, JUNE 30, 1956.

OFFICE OF THE CHIEF COMMISSIONER
Andaman and Nicobar Islands.

NOTIFICATION

Port Blair, the 18th June 1956.

No. 76/56—The following Regulation promulgated by the President under clause (2) of article 243 of the Constitution and published in the Gazette of India, Extraordinary, Part II, Section I, dated the 14th May 1956, is hereby re-published for general information :—

THE ANDAMAN AND NICOBAR ISLANDS (PROTECTION OF ABORIGINAL TRIBES) REGULATION, 1956

No. 3 of 1956

Promulgated by the President in the Seventh Year of the Republic of India.

A Regulation to provide for the protection of the interests of socially and economically backward aboriginal tribes in the Andaman and Nicobar Islands.

In exercise of the powers conferred by clause (2) of article 243 of the Constitution, the President is pleased to promulgate the following Regulation made by him :—

1. (1) This Regulation may be called the Andaman and Nicobar Islands (Protection of Aboriginal Tribes) Regulation, 1956. Short title, extent and commence ment

(2) It extends to the whole of the Andaman and Nicobar Islands.

(3) It shall come into force on such date as the Chief Commissioner may, by notification*, appoint.

Definitions

2. In this Regulation, unless the context otherwise requires, —

(a) "aboriginal tribe" means any of the following tribes or tribal communities in the Andaman and Nicobar Islands, and includes parts of, or groups within, such tribes or tribal communities, namely:

Andamanese, Jarawas, Onges, Sentinalese, Nicobarese, and Shom Pens;

(b) "Chief Commissioner" means the Chief Commissioner of the Andaman and Nicobar Islands;

(c) "Deputy Commissioner" means the Deputy Commissioner of the Andaman and Nicobar Islands;

(d) "notification" means a notification published in the Official Gazette;

(e) "pass" means a pass granted under section 7; and

(f) "reserved area" means an area which the Chief Commissioner has, by notification under section 3, declared to be a reserved area.

Declaration of reserved area

3. (1) The Chief Commissioner may, by notification, declared any area which is predominantly inhabited by aboriginal tribes to be a reserved area and specify the limits of such area; and may, from time to time, in like manner, alter such limits.

(2) If any question arises whether any area falls within or without a reserved area, it shall be decided by the Chief Commissioner and his decision shall be final.

Allotment of land for agricultural purposes.

4. No waste or unoccupied land at the disposal of the Government in a reserved area shall be allotted for agricultural purposes to any person other than a member of an aboriginal tribe:

Provided that the Chief Commissioner may allot any such land to any person other than a member of an aboriginal tribe —

(a) if the Chief Commissioner is satisfied that such land is not required by any such member; or

(b) if in his opinion the allotment of land to a person other than a member of an aboriginal tribe is necessary for the purpose of consolidation of land or is otherwise in the public interest.

Transfer and attachment of land to be void in certain cases

5. (1) No member of an aboriginal tribe shall, except with the previous sanction of the Chief Commissioner, transfer by way of sale, exchange, mortgage, lease or otherwise any land to any person other than a member of an aboriginal tribe.

(2) No land held or occupied by a member of an aboriginal tribe shall be liable to attachment or sale in execution of any decree or order of a civil or revenue court.

(3) Any transfer, attachment or sale of any land made in contravention of this section shall be void.

Acquisition of interest in land, etc., and carrying on of trade or business.

6. (1) No person other than a member of an aboriginal tribe shall, except with the previous sanction of the Chief Commissioner, acquire any interest in any land situated in a reserved area or in any product of, or crop raised on, such land, or shall, except under and in accordance with the terms and conditions of a licence granted by the Chief Commissioner, carry on any trade or business in any such area.

(2) The provisions of sub-section (1) shall apply to any person who, at the commencement of this Regulation, is carrying on any trade or business in any such area after the expiration of sixty days from such commencement.

Entry into reserved area.

7. The Chief Commissioner may, by notification, prohibit any person other than a member of an aboriginal tribe or any class of persons other than members of an aboriginal tribe from entering a reserved area except on the authority and subject to the observance of the conditions and restrictions of a pass granted by the Deputy Commissioner or by such other officer as the Deputy Commissioner may authorise in writing in this behalf.

Penalties.

8. (1) Whoever in contravention of the provisions of section 6, acquires any interest in or in any product of, or crop raised on, any land, or carries on any trade or business, in a reserved area, shall be punishable with imprisonment which may extend to one year, or with fine which extend to one thousand rupees, or with both; and the interest so acquired shall be disposed of in such manner as the Chief Commissioner may, after taking into consideration the circumstances of the case, direct.

(2) Whoever, in contravention of a notification issued under section 7, enters a reserved area shall be punishable with imprisonment which may extend to one year, or with fine which may extend to one thousand rupees, or with both.

(3) Whoever, does anything in contravention of any of the conditions or restrictions subject to which a pass has been granted to him under section 7, shall be punishable with imprisonment which may extend to one year, or with fine which may extend to one thousand rupees, or with both.

Procedure.

9. (1) The Chief Commissioner, or any person authorised by him in this behalf, may arrest without a warrant any person who has committed, or is suspected of having committed, any offence punishable under this Regulation.

(2) Every person arrested under sub-section (1) shall be produced before the nearest magistrate within twenty-four hours of such arrest excluding the time necessary for the journey from the place of arrest.

Power to make rules.

10. (1) The Chief Commissioner may, by notification, make rules to carry out the purposes of this Regulation.

(2) In particular, and without prejudice to the generality of the foregoing power, such rules may provide for the form in which, the conditions and restrictions subject to which, and the fee not exceeding rupees fifty on payment of which, a pass under section 7 shall be granted.

Regulation to override other laws.

11. The provisions of this Regulation and of any rule made thereunder shall have effect notwithstanding anything inconsistent therewith contained in any other law for the time being in force or in any instrument having effect by virtue of any such law, or in any usage or agreement, or in any decree or order of any court or other authority.

RAJENDRA PRASAD,
President.

K. Y. BHANDARKAR,
Secy. to the Govt. of India.

By order,
RAM SARAN DAS,
Assistant Secretary (Judicial) to the Chief Commissioner, A. & N. Islands

---

OFFICE OF THE CHIEF COMMISSIONER,
ANDAMAN AND NICOBAR ISLANDS

NOTIFICATION

Port Blair, the 19th June 1956.

No. ANPATR.1(3)/1.—In exercise of the powers conferred by sub-section 1 of the Andaman and Nicobar Islands (Protection of Aboriginal Tribes Regulation, 1/56 No. 3 of 1956), the Chief Commissioner, Andaman and Nicobar Islands is pleased to appoint the first day of July 1956 to be the date from which the said Regulation shall come into force.

C. RAMACHANDRAN,
Chief Commissioner, A. & N. Islands.
[F. 1-89(1)/54-56]
G.P. 77/56

Ranger's Channel along the Bush Police Line subject to an adjustm that the line may coincide with an alignment to be aligned by Andaman and Nicobar Islands Forest Department in Porlob and Bor Yol areas between the Yeratil-Charalungta Bush Police posts provi that sufficient land is left to the west of such alignment on the east side of the Range to provide enough hunting ground to Jarawas w they are on the move and bearing in mind the suitability of s alignment, from the point of view of water and terrain, as a pa path.

(c) The entire area comprised in, and enclosed within the coast line of e of the following Islands.

(i) Rutland.
(ii) North Sentinel.
(iii) Cinque.
(iv) Passage.
(v) Sisters.
(vi) Brothers.
(vii) South Sentinel and other Islands and Islets situated south ward the territory of the Andaman and Nicobar Islands upto and cluding Little Andaman.

(d) The entire area comprised in, and enclosed within the coast lin each of the following Islands but excluding the area comprising air-field in Car Nicobar and the ports of Camorta and Car Nicobar:

(i) Car Nicobar.
(ii) Batti Malv.
(iii) Chowra.
(iv) Tilangchong.
(v) Teressa.
(vi) Bompoka.
(vii) Camorta.
(viii) Trinkat.
(ix) Nancowry.
(x) Katchall.
(xi) Meroe.
(xii) Trak.
(xiii) Treis.
(xiv) Menchal.
(xv) Little Nicobar.
(xvi) Pulo Milo.
(xvii) Great Nicobar
(xviii) Kondul.
(xix) Kabra.

T. G. N. AYYAR,
Chief Commissioner, A & N. Islands.
[F. 1-89(1)/56-G]
G.P. 43/57.

Annexure R-8

No objection letter dated 18.11.2020 for de-notification of Tribal Reserve Area issued by Ministry of Tribal Affairs

F. No. 23011/30/2020- FRA (Corp No 17632)
Government of India
Ministry of Tribal Affairs
(FRA Division)

1st Floor, Gate No. 5,
Jeewan Tara Building,
Patel Chowk,New Delhi- 110001
Dated: 18th November, 2020

To,

Secretary (TW),
The Directorate of Tribal Welfare,
Andaman & Nicobar Administration,
Port Blair.
Email: director.tribal@gmail.com

Subject: **Proposal for obtaining views of Ministry of Tribal Affairs (MoTA) on de-notification of tribal reserve area in Great Nicobar Island - reg.**

Sir,

The undersigned is directed to refer to your letter No. 1-999/2020- TW / GNI/ 285 dated 8th September 2020 on the above subject seeking views of Ministry of Tribal Affairs, Government of India on De-notification / re-notification of Tribal Reserved Areas in Great Nicobar Island as also sending therewith project proposal for sustainable development in Great Nicober Island after the said de-notification and to say that the said proposal, sent along with the letter under reference, has been examined by this Ministry in detail and ***this Ministry has no objection for the said proposal*** subject to the following conditions / compliance under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA in short):-

i. As per FRA, it is only Gram Sabha, as defined therein, which is the competent authority to certify that there is no claim pending for settlement under the Act i.e. there is no claim pending for recognition and vesting of forest rights and occupation in forest land in forest dwelling Scheduled Tribes (FDSTs) and other Traditional forest dwellers (OTFDs) under FRA, 2006. The forest rights, especially the habitat rights, of the Shompens, who are eligible, should, therefore, be recognized as per

Uttam Kumar

P2/-

the statutory requirement under FRA, 2006, which is a law passed by the Parliament. This may be ensured in accordance with Section 4(5) of the FRA.

ii. Since FRA is a regulatory kind of Act, for initiating any development project on forest land, **compliance of FRA** is required in such projects. MoEFCC issued an order dated 03.08.2009 on ensuring compliance of FRA. This may be adhered to while processing the matter.

iii. Further, the **Hon'ble Supreme Court in its order dated 18.04.2013** ruled that the consent of the Gram Sabha is required for setting up of development projects on forest land.

iv. The Shompens are eligible under the FRA, 2006 and the RFCTLARR, 2013 for compensation for the loss of their habitat. Such a fair compensation may be devised and the compensatory package may be deployed exclusively and in addition to the resources already available, for the welfare and development of the Shompens, while ensuring that their survival as a community, unique identity, culture and heritage are protected and preserved.

v. Care should also be taken to ensure that the adverse impact of development on the life and survival of the Shompens is prevented and the development process is able to enable them to thrive.

2. This issues with the approval of the competent authority.

Yours faithfully

(Uttam Kumar Kar)
Under Secretary to Government of India
Ph 011 23340473

Annexure R-9

Delegated Powers of the State Govt. to the Administrator / Hon'ble Lt. Governor – Gazette Published dated 07.06.2022

रजिस्ट्री सं. डी.एल.-33004/99 REGD. No. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

सी.जी.-डी.एल.-अ.-08062022-236403
CG-DL-E-08062022-236403

असाधारण
EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)

प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 2504] नई दिल्ली, बुधवार, जून 8, 2022/ज्येष्ठ 18, 1944
No. 2504] NEW DELHI, WEDNESDAY, JUNE 8, 2022/JYAISTHA 18, 1944

गृह मंत्रालय

अधिसूचना

नई दिल्ली, 7 जून, 2022

का.आ. 2631(अ).—संविधान के अनुच्छेद 239 के खण्ड (1) के अनुसरण में, राष्ट्रपति एतद्द्वारा निर्देश देते हैं कि संघ राज्य क्षेत्र अंदमान एवं निकोबार द्वीप समूह के प्रशासक (उप राज्यपाल), राष्ट्रपति के नियंत्रण के अधीन और अगले आदेशों तक, उक्त संघ राज्य क्षेत्र के भीतर, "अनुसूचित जनजाति और अन्य पारंपरिक वन निवासी (वन अधिकारों की मान्यता) अधिनियम, 2006 (2007 का 2)" के अधीन राज्य सरकार की शक्तियों का प्रयोग एवं कार्यों का निर्वहन भी करेंगे।

[फा. सं. यू-11023/1/2021-यूटीएल]
आशुतोष अग्निहोत्री, संयुक्त सचिव

MINISTRY OF HOME AFFAIRS

NOTIFICATION

New Delhi, the 7th June, 2022

S.O. 2631(E).—In pursuance of clause (1) of article 239 of the Constitution, the President hereby directs that the Administrator (Lieutenant Governor) of the Union territory of Andaman and Nicobar Islands shall, subject to the control of the President and until further orders, also exercise the powers and discharge the functions of the State Government under *"the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006" (No. 2 of 2007)* within the said Union territory.

[F. No. U-11023/1/2021-UTL]
ASHUTOSH AGNIHOTRI, Jt. Secy.

3866 GI/2022

Uploaded by Dte. of Printing at Government of India Press, Ring Road, Mayapuri, New Delhi-110064
and Published by the Controller of Publications, Delhi-110054.

Annexure R-10

Committee formation vide order No. 148 dated 26.07.2022

अण्डमान तथा निकोबार प्रशासन
ANDAMAN AND NICOBAR ADMINISTRATION
जनजाति कल्याण निदेशालय
DIRECTORATE OF TRIBAL WELFARE
****

Port Blair dated the 26th July, 2022

Order No. 149

In exercise of powers conferred by Sub Section (3) (5) & (7) of Section 6 of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 read with Rule 5, 7, & 9 of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Rules 2008 as amended from time to time and S.O 2631 (E) dated 7.6.2022, the Hon'ble Lieutenant Governor, Andaman and Nicobar Islands is hereby pleased to constitute the Sub-Divisional Level Committee (SDLC), District Level Committee (DLC) and State Level Monitoring Committee (SLMC) with the composition as under:-

I) Sub-Divisional Level Committee

A) South Andaman District

1	Assistant Commissioner, South Andaman	Chairman
2	Concerned Assistant Conservator of Forest	Member
3	i) Pramukh, Panchayat Samiti Ferrargunj	Member
	ii) Pramukh, Panchayat Samiti Prothrapur	Member
	iii) Pramukh, Panchayat Samiti Hutbay	Member
	iv) Smti Deepa Paul, Pradhan (RK Pur, Gram Panchayat, Little Andaman)	Member
	v) One Andamanese (for Port Blair Tehsil) or Onge (Little Andaman Tehsil) as the case may be, nominated by Director (TW)	Member
4	An officer of the Tribal Welfare Department In-charge of the Sub-Division or where such officer is not available the Officer-Incharge of the Tribal Affairs.	Member

B) North & Middle Andaman District

1	Concerned Assistant Commissioner	Chairman
2	Concerned Assistant Conservator of Forest	Member
3	(a) Rangat Tehsil	
	i) Smti Sita Majhi, Pramukh, Panchayat Samiti, Rangat	Member
	ii) Shri Vijay Mondal, Panchayat Samiti Member, Sundergarh	Member
	iii) Shri Niranjan Halder, Panchayat Samiti Member, Kaushalyanagar	Member
	i) Tribal Welfare Officer, AAJVS, Kadamtala (represent on behalf of Jarawa PVTGs)	Member
	(b) Mayabunder Tehsil	
	i) Smti Shibani Mazumdar, Pramukh, Panchayat Samiti, Mayabunder	Member
	ii) Smti Mary Colostika Kujur, Panchayat Samiti Member, Rampur	Member
	iii) Shri Joshy P John, Panchayat Samiti Member, Pahalgaon	Member
	(c) Diglipur Tehsil	
	i) Shri Dipanker Mistry, Pramukh, Panchayat Samiti, Diglipur	Member
	ii) Shri Madhai Murshid, Panchayat Samiti Member, Subashgram	Member
	iii) Smti Reva Rani Biswas, Panchayat Samiti Member, Ramnagar	Member
4	An officer of the Tribal Welfare Department In-charge of the Sub-Division or where such officer is not available the Officer-Incharge of the tribal affairs.	Member

C) Nicobar District

1	Concerned Assistant Commissioner	Chairman
2	Concerned Assistant Conservator of Forest	Member
3	(a) Car Nicobar Tehsil	
	i) Shri Lawrence Methew, First Headman R/o Tapoiming Village	Member
	ii) Shri Manuah Thomas, First Headman R/o Big Lapathy Village	Member
	iii) Smti Everlyn Herbertsen, Second Headman R/o Malacca Village	Member
	(b) Nancowry Tehsil	
	i) Shri Athonai Edward, Chairman Tribal Council R/o Teressa	Member
	ii) Shri Silas Nathan First Headman R/o Japan Tikery village, Katchal	Member
	iii) Smti Helena, First Headman, R/o Bada Enaka Village, Kamorta	Member
	(c) Campbell Bay Tehsil	
	i) Shri Barnabas Manju Chairman Tribal Council R/o Campbell Bay	Member
	ii) Smti Rupa Tirkey, Panchayat Samiti Member R/o Campbell Bay	Member
	iii) Shri Sanjay Ekka, Up-Pramukh, Panchayat Samiti R/o Govind Nagar	Member
	iv) Tribal Welfare Officer, AAJVS, Campbell Bay (represent on behalf of Shompen PVTG)	Member
4	An officer of the Tribal Welfare Department In-charge of the Sub-Division or where such officer is not available the Officer-Incharge of the tribal affairs.	Member

Terms of reference of Sub-Divisional Level Committee shall be to:-

a) provide information to each Gram Sabha about their duties and duties of holder of forest rights and others towards protection of wildlife, forest and biodiversity with reference to critical flora and fauna which need to be conserved and protected ;
b) provide forest and revenue maps and electoral rolls to the Gram Sabha or the Forest Rights Committee;
c) collate all the resolutions of the concerned Gram Sabhas;
d) consolidate maps and details provided by the Gram Sabhas;
e) examine the resolutions and the maps of the Gram Sabhas to ascertain the veracity of the claims;
f) hear and adjudicate disputes between Gram Sabhas on the nature and extent of any forest rights;
g) hear petitions from persons, including State agencies, aggrieved by the resolutions of the Gram Sabhas;
h) co-ordinate with other Sub-Divisional Level Committees for inter sub-divisional claims;
i) prepare block or tehsil-wise draft record of proposed forest rights after reconciliation of government records;
j) forward the claims with the draft record of proposed forest rights through the Sub Divisional Officer to the District Level Committee for final decision;
k) raise awareness among forest dwellers about the objectives and procedures laid down under the Act and in the rules ;
l) ensure easy and free availability of proforma of claims to the claimants as provided in Annexure-I (Forms A, B & C) of Clause (l) of Rule 6, substituted by G.S.R. 669(E), dated 06.09.2012
m) ensure that the Gram Sabha meetings are conducted in free, open and fair manner with requisite quorum.

II) District Level Committee

A) South Andaman District

1	Concerned Deputy Commissioner	Chairman
2	Concerned Deputy Conservator of Forest	Member
3	a) Shri Vasudevan Nair, Member, Zilla Parishad Constituency Hutbay	Member
	b) Smti Rajani, Member, Zilla Parishad Constituency Tushnabad	Member
	c) Ms V.K Mariyam Bibi, Member, Zilla Parishad Constituency Bamobooflat	Member
4	One Andamanese (for Port Blair Tehsil) or Onge (Little Andaman Tehsil) as the case may be, nominated by Secretary (TW)	Member
5	An officer of the Tribal Welfare Department In-charge of the District or where such officer is not available the Officer-Incharge of the tribal affairs.	Member

B) North & Middle Andaman District

1	Concerned Deputy Commissioner	Chairman
2	Concerned Deputy Conservator of Forest	Member
3	a) Shri Subrata Basu, Zilla Parishad Member, Kadamtala	Member
	b) Shri Pradip Das, Zilla Parishad Member, Subashgram	Member
	c) Smti Basanti, Zilla Parishad Member, Pahalgaon	Member
4	Tribal Welfare Officer, AAJVS, Kadamtala (represent on behalf of Jarawa PVTG)	Member
5	An officer of the Tribal Welfare Department In-charge of the District or where such officer is not available the Officer-Incharge of the tribal affairs.	Member

C) Nicobar District

1	Concerned Deputy Commissioner	Chairman
2	Concerned Deputy Conservator of Forest	Member
3	a) Shri Paul Benjamin, First Headman R/o Tamaloo, Car Nicobar	Member
	b) Shri Irenious Benjamin, First Headman R/o Kinmai Village	Member
	c) Smti Mebal Johnie Joseph First Headman, R/o Kakana Village	Member
4	Tribal Welfare Officer, AAJVS, Campbell Bay (represent on behalf of Shompen PVTG)	Member
5	Project Officer, ITDA, Car Nicobar	Member
6	An officer of the Tribal Welfare Department In-charge of the District or where such officer is not available the Officer-Incharge of the tribal affairs.	

Terms of reference of District Level Committee shall be to:-

a) ensure that the requisite information under clause (b) of rule 6 has been provided to Gram Sabha or Forest Rights Committee;

b) examine whether all claims, especially those of primitive tribal groups, pastoralists and nomadic tribes, have been addressed keeping in mind the objectives of the Act;

c) consider and finally approve the claims and record of forest rights prepared by the Sub-Divisional Level Committee;

d) hear petitions from persons aggrieved by the orders of the Sub-Divisional Level Committee;

e) co-ordinate with other districts regarding inter-district claims;

f) issue directions for incorporation of the forest rights in the relevant government records including record of rights;

g) ensure publication of the record of forest rights as may be finalized;

h) ensure that a certified copy of the record of forest rights and title under the Act, as specified in Annexures II & III to these rules, is provided to the concerned claimant and the Gram Sabha respectively ;

i) ensure that a certified copy of the record of the right to community forest resource and title under the Act, as specified in Annexure IV to these rules, is

provided to the concerned Gram Sabha or the community whose rights over community forest resource have been recognized under clause (i) of sub-section (1) of section 3.

III) State Level Monitoring Committee (SLMC)

1	Chief Secretary	Chairman
2	Principal Secretary/ Secretary (Revenue)	Member
3	Principal Secretary/ Secretary (TW)	Member
4	Principal Secretary/ Secretary (Environment & Forest)	Member
5	Principal Secretary/ Secretary (Rural Development)	Member
6	Principal Chief Conservator of Forests	Member
7	Three Scheduled Tribes member of the tribal Advisory Councils, to be nominated by the Chairperson of the Tribes Advisory Councils and where there is no Tribes Advisory Councils, three Scheduled Tribes members to be nominated by the State Government	Member
10	Director (Tribal Welfare)	Member Secretary

Terms of reference of State Level Monitoring Committee shall be to:

a) devise criteria and indicators for monitoring the process of recognition and vesting of forest rights;
b) monitor the process of recognition, verification and vesting of forest rights in the State;
c) meet at least once in three months to monitor the process of recognition, verification and vesting of forest rights, consider and address the field level verification and vesting of forest rights, consider and address the field level problems, and furnish a quarterly report in the format appended as Annexure V to these rules, to the Central Government on their assessment regarding the status of claims, the compliance with the steps required under the Act, details of claims approved, reasons for rejection, if any and the status of pending claims;
d) on receipt of a notice as mentioned in section 8 of the Act, take appropriate actions against the concerned authorities under the Act;
e) (c) monitor resettlement under sub-section (2) of section 4 of the Act;
f) specifically monitor compliance of the provisions contained in clause (m) of sub-section (1) of section 3 and sub-section (8) of section 4.

The committees shall follow the procedure as prescribed under Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Rules 2008 as amended from time to time

Director (TW)
F. No. 1-822/2019/TW

Office Order Book

Copy to:-

1) Sr PS to Hon'ble Lt Governor, A&N Islands
2) Sr PS to Chief Secretary, A&N Administration
3) The Principal Secretary (Rev), A&N Administration
4) The PCCF, Van Sadan, Port Blair
5) The Commissioner-cum-Secretary (E&F), A&N Administration
6) The Secretary (TW), A&N Administration
7) The Dy Commissioner, North & Middle Andaman District, Mayabunder
8) The CCF, North & Middle Andaman District, Mayabunder
9) Officials/parties concerned for information and necessary action
10) Spare copy

Copy also forwarded to

1) The Additional Secretary (UT), Ministry of Home Affairs, Govt of India for favour of information
2) The Joint Secretary to the Govt of India, Ministry of Tribal Affairs, Govt of India, FRA Division, Shastri Bhawan, New Delhi for favour of information

Director (TW)

Annexure R-11

RoFR Certificate under FRA Act, 2006 dated 18.08.2022

F. No. TCN/DIVERSION/FRA/FORESTLAND/2014/ 1111
अंडमान तथा निकोबार प्रशासन / **A & N ADMINISTRATION**
उपायुक्त का कार्यालय / **OFFICE OF THE DEPUTY COMMISSIONER**

निकोबार जिला / **NICOBAR DISTRICT**

****

Car Nicobar, dated the 18th August, 2022

To,
The General Manager (Projects) (ANIIDCO),
Andaman and Nicobar islands.

Sub: RoFR certificate under FRA Act, 2006 for Holistic Development of Great Nicobar Island – reg.

Sir,

In pursuance to your letter No. 1-1658/ANIIDCO/Projects/2021-22/1479 dated 26th July 2022, kindly find enclosed herewith the RoFR certificate in original vide No. TCN/DIVERSION/FRA/FORESTLAND/2014/1110 dated 18th August, 2022.

This issues with the approval of the competent authority.

Yours faithfully,

Assistant Commissioner (HQ),
Car Nicobar.

Copy to:

1. The PS to Secy.(Rev.), for the kind information of Secretary Revenue, A & N Administration.
2. The PA to ED(ANIIDCO) GNI-I, for the kind information of ED(ANIIDCO), GNI-I.
3. The PA to DC(N), for the kind information of Deputy Commissioner, Nicobars.
4. The PA to Secy.(TW), for the kind information of Secretary Tribal Welfare, A & N Administration.
5. The Assistant Commissioner, Campbell Bay for information.
6. The GM(ANIIDCO), for kind information.

Copy also forwarded to:

1. The Sr. PS to Chief Secretary, A & N Administration for the kind information of Chief Secretary, Andaman and Nicobar Administration.
2. The Sr. PS to MD (ANIIDCO), A & N Administration for the kind information of Managing Director (ANIIDCO), Andaman and Nicobar Administration.

Assistant Commissioner (HQ),
Car Nicobar.

FORM-II
(For projects other than linear projects)

Government of India
Office of the Deputy Commissioner
Nicobar District
****

No.TCN/DIVERSION/FORESTLAND/2014/1110 Dated the 18th August, 2022

TO WHOMSOEVER IT MAY CONCERN

In pursuance of GM (Projects), ANIIDCO's letter No. 1-1658/ANIIDCO/Projects/2021-22/1479 dated 26.06.2022 and in compliance of the Ministry of Environment and Forests (MOEF), Government of India's letter No. 11-9/98-FC (pt.) dated 3rd August, 2009 wherein the MOEF issued guidelines on submission of evidences for having initiated and completed the process of settlement of rights under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Right) Act, 2006 ('FRA' for short) on the forest land proposed to be diverted for non-forest purposes, it is certified that Protected Forest area 121.87 Sq. Kms and Deemed Forest 8.88 Sq. Kms falling under project of Holistic Development of Great Nicobar island i.e, Integrated Development of International Container Transhipment terminal (ICTT) along with greenfield International airport, township and area development and 450 MVA Gas and Solar based plant, falls within the jurisdiction of Campbell Bay Tehsil, Great Nicobar.

It is further certified that:

(a) The complete process for identification and settlement of rights under the FRA has been carried out for the entire Protected Forest area of 121.87 Sq. Kms and Deemed Forest of 8.88 Sq. Kms falling under project of Holistic Development of Great Nicobar island.

(b) The proposal for such diversion (with full details of the project and its implications) have been placed before each concerned Gram Sabha of Forest-dwellers (wherever applicable), who are eligible under the FRA;

(c) The each of concerned Gram Sabha(s) (wherever applicable), has certified that all formalities/processes under the FRA have been carried out, and that they have given their consent to the proposed diversion and the compensation and ameliorative measures, if any, having understood the purpose and details of proposed diversion.

(d) The discussion and decision on such proposals had taken place only when there was quorum of the members of Gram Sabha (wherever applicable) present;

(e) The diversion of forest land, if any, for facilities managed by the Government as required under section 3(2) of the FRA have been completed and the Gram Sabhas (wherever applicable) have given their consent to it;

(f) The rights of Primitive Tribal Groups and Pre-Agricultural Communities, where applicable have been specifically safeguarded as per section 3(1)(e) of the FRA.

(g) The decision wholly attracts the consent of the Gram Sabhas (wherever applicable) and the SDLC conclusions.

Deputy Commissioner
Nicobars

Annexure R-12

Guidelines of Forest (Conservation) Act, 1980
formulated by the MoEF&CC dated 22.05.2019

F. No. 11-423/2011-FC
Government of India
Ministry of Environment, Forest and Climate Change
(Forest Conservation Division)

Indira Paryavaran Bhawan,
Aliganj, Jorbagh Road,
New Delhi - 110003
Dated 22nd May 2019

PCCF's Coordinating Cell
आई डी संख्या /RD. No. 2113
दिनांक /Date 06/6/19

To

The Principal Secretary (Forests),
All States/UT Governments

Sub: Proposal seeking diversion of forest land for non-forestry purposes under the Forest (Conservation) Act, 190 - Special consideration of compensatory afforestation in forest rich States – reg.

Sir,

I am directed to refer to the minutes of the meeting dated 23rd April, 2019 of the Forest Advisory Committee (FAC) wherein the FAC considered the issue mentioned in the subject above. The FAC, after deliberation on the issue, recommended as under:

(a) The states/UTs having forest land of more than 75% of their respective total geographical area, shall not be insisted upon providing non-forest land (for subsequently notifying into RF/PF) equal to the forest area diverted for non-forest purposes in the same state/UT. However, the same may be taken up in any other state/UT having deficient forest land/cover and having land bank for CA.

(b) Isolated patches having area less than 5 ha are difficult to manage as forests. Hence, no non-forest land, having area less than 5 ha area shall be accepted for CA purpose. However, land parcels, if contiguous to RF/PF, can be accepted for CA irrespective of their sizes, subject to their suitability for CA. In case of forest area under diversion is less than 5 ha, efforts should be made to identify non-forest land contiguous to some RF/PF. User agency shall fence all such land parcels properly and mutate the same in the name of Forest Department before handing them over to the Forest Department. All such land parcels shall be compact (i.e. without any pockets of habitation or non-forest land) and free from any encumbrances.

(c) Land parcels, if contiguous to National Parks/WL Sanctuaries, can be accepted for CA irrespective of their sizes and suitability for CA, subject to condition that the same shall be mutated in the name of Forest Department, notified as RF/PF and thereafter merged with concerned National Park/Wildlife Sanctuary with suitable declaration, prior to stage-II approval by MoEF&CC.

This issues with the approval of the competent authority in the Ministry.

Yours faithfully,

(Sandeep Sharma)
Assistant Inspector General of Forests (FC)

Copy to:-

1. The Principal Chief Conservator of Forests (HoFF), All States/UT Governments.
2. The Addl. Director General (Central), All Regional Offices of the MoEF&CC.
3. The Addl. PCCF & Nodal Officer (FCA), All States/UT Governments
4. Monitoring Cell, FC Division, MoEF&CC, New Delhi.
5. Guard File.

(Sandeep Sharma)
Assistant Inspector General of Forests