PROPOSED TERMS OF REFERENCE

The President of India acting through the NITI Aayog, Government of India and represented by The Chief Executive Officer (CEO) is engaged in the Holistic Development of Great Nicobar Island at Andaman & Nicobar Islands.

The Great Nicobar Island is located in the Nicobar district to the south of the Andaman Islands. It is the largest of the cluster of islands with an area of 910.074 sq. km and the southernmost of the group of Nicobar Islands located at a distance of approximately 520 km from Port Blair. Indira Point, earlier known as Pygmalion Point, lies at the tip of the Great Nicobar Island and is the southernmost point of the country.

As part of Integrated Development, International Container Transshipment Terminal (ICTT) of 3.0 MTEUs along with Greenfield Airport (4000 Passengers in Peak Hour), Eco tourism & Residential Township and 450MVA Gas/Solar based Power Project for Integrated project has been proposed in Great Nicobar Island.

The environmental baseline studies to be collected for 3 months to represent a season are being carried out on site.

National Center for Sustainable Coastal Management (NCSCM), Chennai has been awarded for conducting CRZ studies and preparation of CRZ Maps for Nicobar Islands in 1: 25,000 scale and the same will be used for the study.

Marine baseline studies and Marine Impact Assessment Study will be carried out.

1.0 PROPOSED SCOPE OF WORK FOR EIA STUDY

The components of the EIA study include:

- Determination of baseline data using primary data generation and secondary data available from various government published reports on air, meteorology, water, soil, flora & fauna, socioeconomics, infrastructure, sensitive areas (forests, archaeological, historical etc). The base line data to be collected for 3 months to represent a season.

- Marine ecological studies will be conducted to represent the ecological conditions in and around the project area and to understand the marine biodiversity. Ecological sensitivity of various patches in the study area like turtle nesting grounds, coral mats, areas with special ecological significance like presence of rare, endangered, threatened and endemic species will be studied. Interactions among organisms and the surrounding environment including their abiotic (non-living physical and chemical factors that affect the ability of organisms to survive and reproduce) and biotic factors (living things or the materials that directly or indirectly affect an organism in its environment) will be studied. The study will be undertaken based on available literature and field sampling and surveys.

- Many areas of Andaman archipelago are rich in Corals. Detailed study of corals will be conducted in the study area. Areas that are rich in Coral is to be marked in a map. Diving needs to be undertaken and appropriate photographs demonstrating the diversity is to be taken and presented in the monitoring report. The areas where bleaching has taken

place, if any, needs to be marked in a map. The health coral reefs and the resilience of the reefs in view of the natural (current, temperature) and artificial (movement of boats and ships etc.) disturbances have to be specifically mentioned. The study will have to carried out up to a depth of about 40 m through appropriate transacts at suitable intervals.

- Andaman and Nicobar Islands are known to have saltwater crocodiles, it can be encountered in open sea, near the shore, mangrove creeks, freshwater rivers and in swamps. The crocodile habitats, if any, in the study area will be mentioned. The possibility of human crocodile conflict during construction and operation needs to be covered in the study.

- Turtle nesting sites, if any in the study area needs to be identified. Even if the nesting sites do not fall within the study area, the nearby nesting sites which could be affected by the project construction and operation will be mentioned. The number of turtles and the species, their habitat and issue related to their survival will be mentioned.

- Transact method of sampling will be used for the sampling of marine water, phytoplanktons, zooplanktons and benthic organisms. The study is to be undertaken up to depth of about 40 m. Appropriate transects and the sampling points have to be chosen judiciously so as to define the marine ecological sensitivity along the coastline involved in phase-I of the project.

- The report will include the monitoring data and its interpretation. All the photographs demonstrating the marine ecological diversity will be submitted along with the reports. ZSI will make the experts available to defend the report to appropriate UT administration and respective Government of India agencies including NITI Aayog and MOEF&CC.

- Detailed description of all elements of the integrated project activities during the pre-construction, construction and operational phases. The elements analysed include the infrastructures of the project including drainage features, roads, waste collection, disposal and management and utility requirements;

- Identification of the sources of pollution and assessing the impacts on the environment due to the proposed integrated project activities. Air dispersion modelling studies will be conducted using AERMOD, CALPUFF modelling software's suitable for the coastal environs.

- Preparation of EIA and EMP documents with recommendations on preventive and mitigative measures for limiting the impact on environment during various stages of project. Development of a suitable post study-monitoring program to comply with various environmental regulations; and

- Risk Assessment (RA) and Disaster Management Plan (DMP) describing the probable risks and preventive & precautionary measures to be followed in the event of emergency situations such as accidents, fire etc.

2.0 BASELINE ENVIRONMENTAL DATA GENERATION

Sr. No.	Attributes	Scope of Work
1	Ambient Air Quality	The baseline air quality will be monitored at 6 locations twice a week for three months during one non-monsoon season for PM_{10}, $PM_{2.5}$, CO, SO_2 and NO_2. AAQ monitoring locations will be selected as per guidelines specified in GSR 176 (E) Notification (Selection of AAQ sites). Design of ambient air quality sampling network with regard to topography, population, sensitive locations, emission sources, background concentrations and possible impact zones, through application of screening air quality models for assessing air quality prior to start of baseline study.
2	Meteorological data	Primary micro-meteorological data will be generated for temperature, wind speed, wind direction, relative humidity (min & max), rainfall, and cloud cover for a period of three months at one location. The data will be compared with meteorological data of the area collected from nearest IMD station (secondary sources) and trend analysis of micro-meteorological data generated at the site.
3	Water Quality	Water samples will be collected once during the study period at 20 locations covering 10 km radius area. The samples will be analyzed as per IS-10500/IS-2296 and EPA Act as applicable.
4	Soil Quality	Soil samples will be collected once during the study period at 20 location from three different levels up to a depth of 90 cm and analyzed for the parameters such as grain size, pH, salinity, electrical conductivity, organic carbon, NPK, TDS, Na, Mg, Ca, Cl^-, F^- etc.
5	Noise Levels	Noise monitoring will be carried out once during the study period at 20 locations by using Integrated noise meter on hourly observations for 24 hr at each location. The observed data will be compiled, and statistical analysis will be done for L_{10}, L_{50}, L_{90}, L_{eq}, L_{day}, L_{night} and L_{dn}.
6	Land use	Land use as per the district census handbooks will be analysed to identify the present land use within the 10-km radius area. Various land use classifications will be computed. The study will be carried out using secondary sources of information.

Sr. No.	Attributes	Scope of Work
		Further land use maps will be prepared using NRSA satellite imageries for delineation of Irrigated/non-irrigated agricultural, barren, pasture, forest, non-forest and human settlements.
7	Ecological Studies (Terrestrial and Marine survey)	Primary as well as secondary data will be collected for flora and fauna of the study area. The survey includes assessment of the species diversity, density, abundance etc in the study area and formulation of ecological indices, assessment of likely changes on flora and fauna due to the project related activities, suggestions for conservation and protection of flora and fauna in the study area. As a part of marine sampling water, phyto-plankton's: zooplanktons, benthic organisms and fish samples will be collected by ZSI and analyzed.
8	Socio-Economic aspects	Socio-Economic aspects will be covered for the project area based of the primary field survey and on the Census documents and NIC database. Local and District administration will be contacted for collecting the required data. The area is inhabited by aboriginal tribes Shompen and Nicobarese. The study should include the current status of these tribes, their habitats, nature of behaviour, sources of sustenance, dependence on natural setting, source of food, disease pattern. The area is habited by settlers from various states of India. Socioeconomic analysis of the settler communities, their sources of livelihood, demographic pattern etc will have to be studied.

3.0 Legislation and Regulatory Considerations

Government policies, legislation and regulations relevant to the proposal will be identified. Local plans and policies will also be evaluated. Project characteristics will be analyzed to ensure compliance with these policies, legislation and regulations. Appropriate recommendations will be provided to ensure regulatory compliance. The legislation relevant to the project will be summarized and presented in the EIA Report.

4.0 Environmental Impact Assessment

A qualitative and quantitative assessment of pollution aspects of Integrated project (air and dust, wastewater, noise pollution, wastewater discharges etc.) will also be done to identify the adequacy of the proposed control measures as well as the likely impact on existing critical areas. The short-term and long-term impacts, particularly on sensitive targets such as

endangered species, plants and historically important monuments, will be identified and mitigation measures to reduce adverse impacts will be suggested.

Air Impacts

Emission Inventory will be carried in an area of 10 km around the proposed integrated project. A computer based internationally recognized mathematical air quality models – **AERMOD/CALPUFF** and other model suitable for the region will be identified and run to predict the concentration of SO_2, NO_x & PM due to the operation of the proposed construction and operation of the integrated development project. The dispersion model results will be included in the report using isopleths or other graphical methods, over laying a land use map of the surrounding area.

- Prediction of short-term and long-term ground level concentrations of SO_2, NO_x, PM and graphical representation in the form of isopleths through application of air quality models taking effects of terrain and requirements specified in the publication by Central Pollution Control Board, New Delhi – 'Assessment of Impact on Air Environment: Guidelines for conducting Air Quality Modeling'.

- Justification of air dispersion modeling used with a detailed listing of all assumptions; and

- Combined impacts due to the proposed integrated development projects will be estimated.

Water Environment

- Estimation of water balance for each of the proposed integrated development projects.
- Characterization/collection of data on wastewater streams;
- Assessment of the nature of effluents likely to be discharged and its impact;
- Assessment of feasibility of water recycles, and reuse for greenbelt development and irrigation;
- Recommendations on water conservation measures based on past experience on similar projects.

Land Environment

- Collection of data on soil characteristics and soil types;
- Quantification of solid wastes likely to be generated during operation and suggestions on proper collection, treatment and disposal methods;
- Delineation of environmentally compatible options for value added utilization of solid wastes;
- Strengthening of greenbelt keeping in view the selected plant species and attenuation factors for noise and air pollutants.

Biological Environment

- Collection of the existing and available information on flora and fauna in the study area including rare and endangered species;
- Assessment of the species diversity, density, abundance etc. in the study area;
- Assessment of likely changes on flora and fauna due to the projects and related activities;
- Delineation of conservation measures for the protection of flora and fauna in the study area.
- Delineation of eco-sensitive zones in the development area and adjacent regions.

Marine Environment

As a part of Marine study, the following Biological parameters will be analyzed

The marine water will be collected from 6 appropriate locations within the marked area once during the monitoring period.

a) Primary productivity, mg C/m3 day
b) Chlorophyll, mg/m^3
c) Phaeophytin, mg/m^3
d) Oxidizable particulate organic carbon, mg/m^3
e) Light penetration

Phytoplanktons:

a) Abundance
b) Number and name of groups, present
c) Total number and name of species of each group present
d) Density (Total numbers of individual of each species/l)
e) Total Biomass

Zooplanktons:

a) Abundance
b) Number and name of groups, present
c) Total number and name of species of each group present
d) Density (Total numbers of individual of each species/l)

Benthic Organisms:

Micro-benthos and Macros-benthos

a) Abundance (Nos./10 cm^2)
b) Number and name of each group, present
c) Total number and name of species of each group present
d) Density (Total numbers of individuals of each species/m^2)

Fisheries:

The following data will be collected through secondary data sources:

a) Major aquatic floral and faunal species
b) Pisciculture as being practiced in the area
   Type of fishes, endemic/exotic, annual yield etc.

Noise Environment

Sources of noise during construction and operation and its impacts on the environment would be clearly brought out. The noise level at varying distances for multi-sources will be predicted using suitable model. A comparison of measured noise (L_{eq}) at monitoring locations to that of predicted noise levels (L_{eq}) would be made and mitigatory measures required, if any, will be recommended to conform to regulatory ambient air noise standards. For airport project Integrated Noise Model (INM) developed by Federal Aviation Administration (FAA), Office of the Environment and Energy, USA will be utilized for determination of the noise from the aircrafts.

We propose to estimate increase in noise levels over the baseline conditions in different zones like industrial, residential and sensitive areas like hospitals, wildlife habitation etc. The potential noise level exposure will be determined and evaluated for acceptable limits of exposure.

Socio-Economic and Health Environment

- Study of parameters to assess/characterize the quality of life in the study area with special reference to indigenous tribals and settlers inhabiting the area.
- The likely change in livelihood pattern, the socioeconomic conditions, social behaviors, disease pattern, dependency on natural resources etc. due to the construction and operation of the project will have to be studied in detail.
- Assessment of changes from the baseline in the socioeconomic parameters due to proposed integrated project operations;
- Assessment of economic benefits to community.

Aesthetic/Cultural

- Identification of all historical/archeological sites/monuments in the study area.

5.0 Environment Management Plan

For each potential negative impact identified, recommendations will be presented for avoidance, minimization or mitigation of impacts along with costs associated with potential mitigation.

An EIA/EMP, based on three months baseline study, will be prepared for the proposed integrated development project. The EMP will address the following:

- Identify and summarize all anticipated significant adverse environmental impacts from the proposed development;
- Identify and summarize all mitigation measures, including the type of impact to which it relates and the conditions under which it is required;
- Define a set of policies and objectives for environmental performance and continual enhancement of performance;
- Greenbelt development plan;
- Recommend monitoring and reporting procedures including the parameters to be monitored, methods to be used, sampling locations, frequency of measurements, detection limits and definition of thresholds that will signal the need for corrective actions;
- Recommend capacity development and training requirements for implementation of EMP;
- Recommend an organizational structure for effective implementation of the EMP; and
- Draw up an implementation and cost schedule for EMP.

An environmental monitoring and management plan will be developed for the sensitive elements of the environment that may require monitoring during construction and implementation of the proposed project. Recommendations will be made on the institutional arrangements that will be necessary to ensure effective monitoring and management.

A detailed management and monitoring program will be developed to reduce the effects of potential negative environmental impacts.

6.0 Risk Assessment and Disaster Management Plan

Risk Assessment studies comprising sub-activities such as hazard identification, assessment and quantification of risk for suggesting risk mitigation measures based on Maximum Credible Accident (MCA) Analysis to be carried out for the integrated project. Preparation of the Risk Assessment Report will be followed by Disaster Management Plan (DMP) and Emergency Preparedness Plan (EPP) based on the quantitative Risk Assessment of the project activity and associated infrastructure for the project.

The study includes identification of process hazards, preliminary assessment of hazardous sections of the project site and that of storage with recourse to fire and explosion index for these units, analysis of major inventories in process and storage and identification of major hazardous locations of the project site with recourse to GoI Rules, 1989.

7.0 Occupational Health and Safety

We will review the safety management and occupational health surveillance system in the proposed facility project site and recommend for further appropriate measures.

8.0 Post Project Monitoring Plan

The Post Project Monitoring (PPM) plan will be prepared considering the following:

- The proposed pollution control measures for air, wastewater and solid waste (hazardous/non-hazardous) disposal;
- Waste minimization, wastewater management, waste reuse and resource recovery, waste segregation to make the treatment and disposal cost-effective;
- The monitoring requirements for ensuring that the statutory as well as process data is collected; and
- The organizational set-up required meeting the above.

CRZ Study and Mapping

Coastal Regulation Zone is applicable for the entire Indian Coast including the Andaman & Nicobar Islands and the Lakshadweep Islands. It broadly covers the coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters influenced by tidal action up to the defined distance into the land from High Tide Line (HTL). The CRZ studies will be carried out by National Centre for Sustainable Coastal Management (NCSCM), MOEF&CC.

The CRZ mapping will be carried as per the ICRZ 2019 notification.

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