Commissioner of Fisheries

Govt. of Andhra Pradesh

EIA STUDIES FOR JUVVALADINNE FISHERY HARBOUR, SPSR NELLORE, ANDHRA PRADESH

EXECUTIVE SUMMARY

वाप्कोस लिमिटेड
WAPCOS LIMITED
(भारत सरकार का उपक्रम - जल संसाधन, नदी विकास और गंगा संरक्षण मंत्रालय)
(A Government of India Undertaking - Ministry of Water Resources, River Development & Ganga Rejuvenation)

WAPCOS LIMITED

(A Government of India Undertaking)

76 C, Sector 18, Gurgaon - 122015, Haryana, INDIA

Tel. +91-124-2397396,

Sl. No. 155, NABET Accredited Consultant

Email: environment@wapcos.co.in

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

The Department of Fisheries Government of Andhra Pradesh proposes to develop Fishery Harbour at Juvvaladinne in SPSR Nellore district of Andhra Pradesh. The proposed fishery harbour shall be designed to accommodate for a fleet size of 1250 fishing vessels comprising 1000 numbers of 9 m length motorized, 100 numbers of each of 12 and 15 meter mechanised fishing vessels, 50 numbers of 24 meter Tuna Liners besides 50 numbers of Non- Motorized boats.

The coordinates of the Juvvaladinne project site are 14°48'29" N and 80°05'03" E and is situated at a distance of 12 km from Bagole, the mandal headquarter in Nellore district. The site is about 1 km from Juvvaladinne village. The nearest railway station to Juvvaladinne is Kavali located at a distance of 25 km. The location of the proposed jetty is shown in Figure-1.

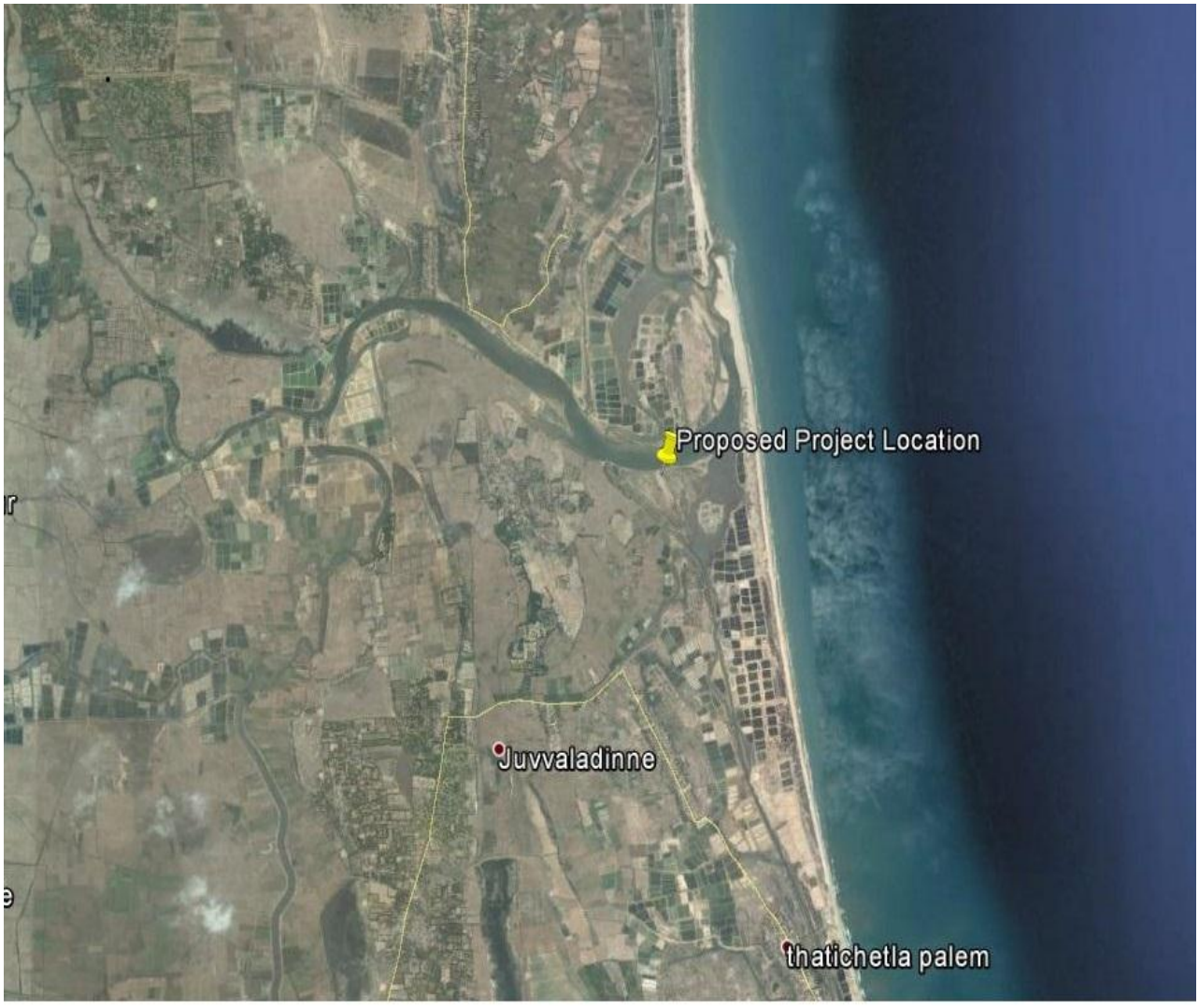

Figure-1: Location of proposed jetties

.2. NEED FOR THE EIA STUDY

As per the list of projects or activities requiring prior environmental clearance given in the EIA Notification issued by MoEF&CC on 14th September 2009, proposed project is listed on S.No. 7e and comes under category "B" project. The project requires Environmental Clearance from State Environmental Impact Assessment Authority (SEIAA), Government of Andhra Pradesh. Since, the project is proposed in the coastal area, CRZ Clearance is also required as per the CRZ Notification of January 2011.

In this connection, Form-I along with TOR in the prescribed format was submitted to SEIAA, Government of Andhra Pradesh. The same was reviewed during meeting of the Expert Appraisal Committee (EAC) held on 7th June 2016. TOR has been accorded by State Expert Appraisal Committee (SEAC), Andhra Pradesh on 13.07.2016.

3. PROJECT DESCRIPTION

3.1 Need for the proposed Juvvaladinne fishing harbour

There is a need to develop fishing harbour due to non-availability of full-fledged infrastructure facilities at Juvvaladinne site. The site is situated on the bay like coast and fishermen are facing difficulty in navigating at the mouth. Mechanised fishing boats of the area in and around Juvvaladinne are operating elsewhere in the state due to non-availability of berthing and landing facilities. Motorised and traditional boats are operating at the site.

The development of the Juvvaladinne fishery harbour will generate employment opportunities. A large number of workers in the fishery harbour are from the fishermen community comprising of boat crew, head-load and ice workers, women fish vendors, fish merchants etc.

3.2 Existing Fishing Activities

A total number of 6,306 fishing fleet including 21 MFVs, 2,738 motorised craft and 3,547 traditional crafts, and 8,033 fishing tackle are being used by the fishermen of Nellore district. The fishing season in Nellore district generally commences in June and lasts up to March. The Nellore district, having a coastline of 169 km produced 74,276 tonne of fish and shrimp during the year 2012-13. The existing shore based facilities in Nellore district includes Ice plants, feed mills, chilled storage and freezing plants etc.

3.3 Proposed Marine and Offshore Facilities at Juvvaladinne Harbour

The proposed Juvvaladinne fishing harbour has been planned for motorised crafts and mechanised fishing vessels. Fishing harbor requirements for both traditional and mechanised fishing vessels are planned side by side. Motorised crafts require beach landing, whereas Mechanised fishing vessels require quays for fish landing and other activities. The proposed fishery harbor shall be designed for a fleet size of 1250 numbers of

fishing vessels. The layout of proposed fishery harbour consists of two training walls which would be constructed normal to the shore line up to normal -5.5 m depth contour. The waterside facilities includes fish landing quay, outfitting quay, landing quay, repair quay, RC sloping hard, supply facilities like fuel, ice, fresh water, etc. The landside facilities includes administration office, navigation aids, radio communication center, restaurants, public toilets, security guards, electric sub-station, overhead tank etc. The project layout of fishing harbour is shown in Figure 2.

In a fishery harbor, quays are required by the fishing vessels for various purposes like fish landing, outfitting, idle-berthing and repair of vessels. The economical length of these quays in the proposed fishery harbor is planned as per is given in Table-1.

Table-1: Summary of length of various Quays

S.No.	Description	12 m Gill Netter	15 m Trawlers	24 m Trawlers	Total (m)
1	Fish Landing Quay	27	50	53	130
2	Outfitting Quay	27	17	27	71
3	Repair Quay	14	17	27	58
4	Idle- berthing Quay	210	263	184	657
	Total	**278**	**347**	**291**	**916**

The dredged level of the harbor is proposed at -4.0 m which gives a depth of 3.84 m at MLWS. This provides a clearance of 0.64 m for 24 m boats having a draft of 3.20 m. Dredging is required to be taken up to -4.0 m level in the harbour basin. Accordingly, 6.2 lakh cum of material is required to be dredged for this purpose. The average ground level is +1.50 m on the creek side. Based on this level, the quantum of material required for land reclamation is of the order of 5.853 lakh cum. About 4.682 lakh cum of the material obtained from the dredging in the harbour basin itself can be utilized for reclamation of land to RL +2.00 m level and about 1.17 lakh cum of good quality borrowed earth or gravel is required for reclamation from RL +2.00 m to +2.50 m level. Hence this dredged quantity is enough for reclamation for locating the shore-based facilities in an area of 21.7 ha as depicted in the fishery harbour layout. The remaining 1.562 lakh cum of dredged materials is proposed to be disposed in the nearby low laying area, which can be used in future for harbour expansion. RC sloping hard of 30 m wide inside basin is proposed to haul up vessels requiring regular maintenance and necessary repairs. The 60 m thick hand packed rough stone revetment with slope of 1 V: 1.5H, is proposed to protect reclaimed land. At present, there are no navigation aids in the harbour area. For the entrance channel to be visible during night, marker/lighted buoys need to be installed for ensuring safe navigation of fishing vessels. The total daily fresh water requirement of the project is 0.2 mld. The clean and bacteria free seawater will be drawn from the shallow tube wells as an alternative. The seawater requirement is 0.95 mld. One kilometer length of approach road is required to reach the site in addition to other internal roads in the fishery harbor complex.

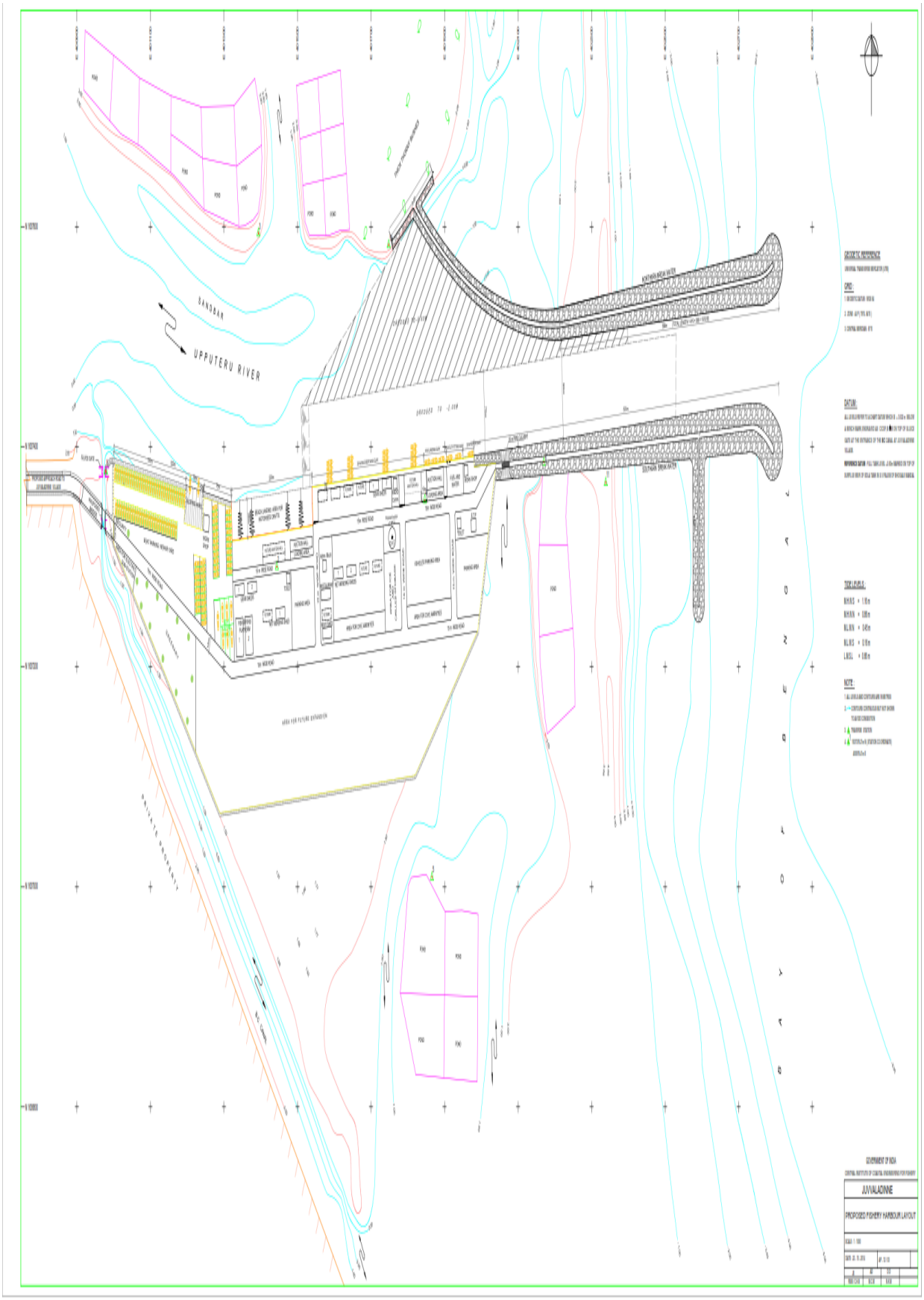

Figure-2: Project Layout

These roads are proposed to be of cement concrete and the length of concrete proposed road is 1838 m. The separate drainage and sewerage systems for both storm water and sewage and a compact effluent treatment plant of suitable capacity is proposed at harbor complex. In case of outbreak of fire at any location within the fishery harbour complex fire extinguishers have been installed at important locations. The other landside facilities and the area demarcated in the layout for these units as per DPR are given in Table-2.

Table-2: Other Landside Facilities

S.No.	Unit	Area (sq.m.)
1	Fish handling and auction hall	360.00
2	Fish loading area	936.00
3	Fish Administrative Office	186.00
4	Fishermen's Gear Sheds	1451.70
5	Net mending sheds	827.80
6	Boat Repair shops	190.68
7	Restaurant	127.70
8	Fishermen Rest shed	213.44
9	Public Toilet Blocks	67.73
10	Fish Merchants Dormitory	265.77
11	Coastal Police Station	121.60
12	Community Hall	746.40
13	Radio- Communication Tower	83.00
14	Security/ Guard House and Compound Hall	27.20
15	Areas for vehicles	8749.00
16	Boat parking/repair yard	24,142.80
17	Waste water treatment system	1560.00
18	Boat building and timber yard	2600.00
19	Civic amenity sites	5210.00
20	Greenary and landscaping	11,100.00

3.4 Project Cost

As per the DPR the total project cost of proposed Juvvaladinne harbour facilities works out to Rs. 242.22 crore.

3.5 HTL/LTL Demarcation

The CRZ mapping for the proposed dredging of navigation channel project has been done through Institute of Remote Sensing (IRS) Anna University, Chennai. The HTL demarcated by the IRS, Chennai, shows that the dredging area falls in CRZ-IV (A) and CRZ-IV (B) category.

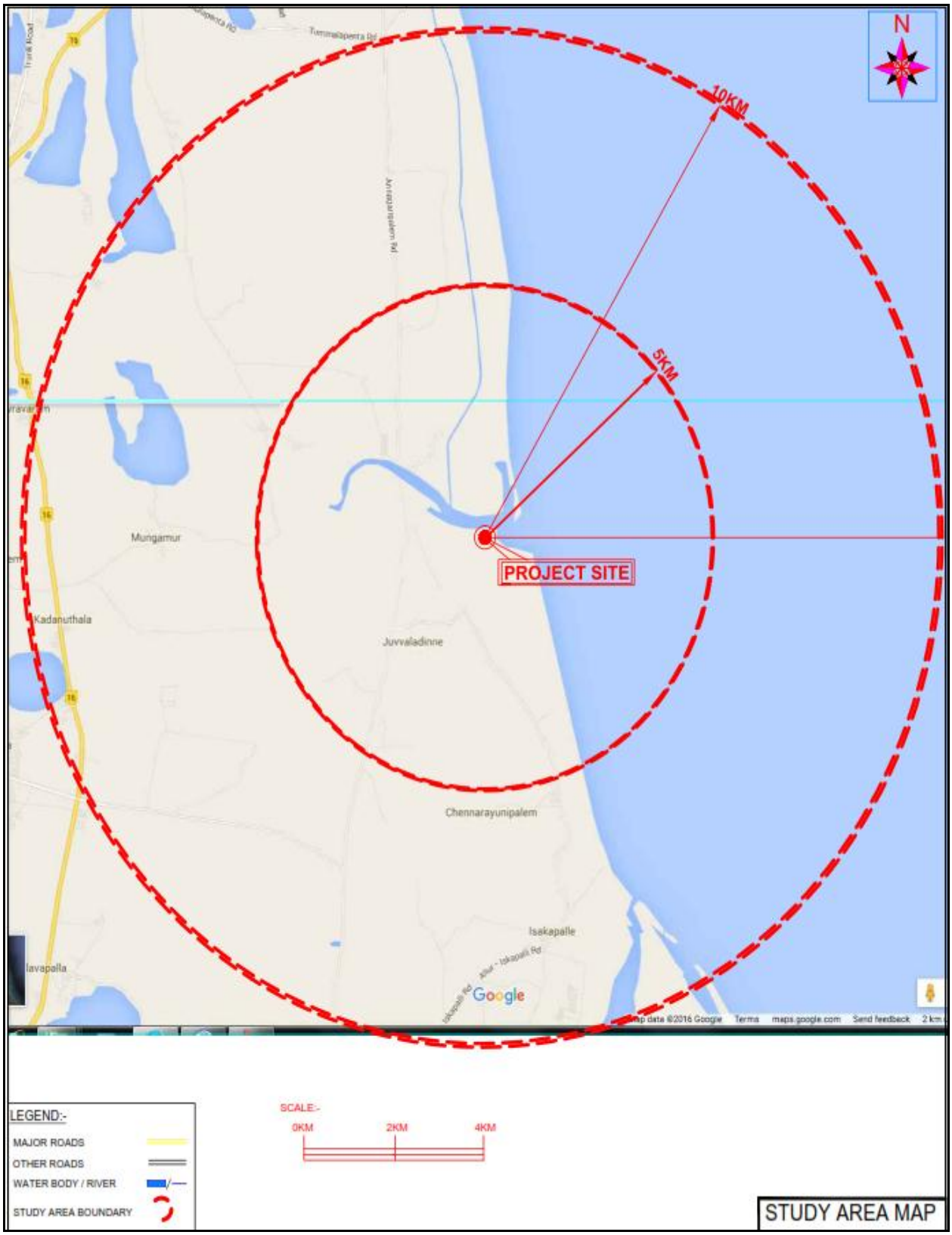

Figure-3 Study area map

4. ENVIRONMENTAL BASELINE STATUS

The assessment of baseline environmental setting is an essential component of any EIA study. The study area is depicted in Figure 3.0. The baseline data collection has been done through primary & secondary data sources, for physio-chemical parameters, biological parameters and socio-economic parameters.

4.1 Meteorology

Meteorological data with respect to wind speed, wind direction, temperature, rainfall, humidity etc. monitored by IMD at nearest observatory was collected and utilized in the EIA study.

4.2 Tides & Waves

It could be observed from above tide levels, the tidal variations during heap tides is of the order of 0.41 m while the same during spring tides is 1.0 m, the tides are of mixed type generally exhibiting semi-diurnal nature.

As per NIO Goa data, wave height reaches up to 5 m in December to January during north east monsoon and in July and August during south-east monsoons. The wave periods in the monsoon month ranges from 5 to 14 sec. During monsoon months, viz. from March to May, average wave height varies between 0.5 to 3.5 m. Mostly calm period could be observed in this month. The predominant wave direction ranges between west and south-west.

4.3 Geomorphology

Geomorphologically the district can be broadly divided into 3 distinct units, viz., western hills, central pediplains and eastern deltaic and coastal plains. The higher relief is represented by hill ranges of Eastern Ghats, in the western border of the district.

4.4 Ambient Air Quality

As a part of field studies, ambient air quality monitored at various locations in the study area from 4th March 2016 to 28th May 2016. The ambient air quality monitoring was carried out with a frequency of two samples per week for twelve consecutive weeks at four locations in the study period. The parameters monitored as a part of the study includes $PM_{2.5}$, PM_{10}, Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2) etc. It was observed that the ambient air quality for all the parameters is well within the permissible limits for industrial, residential and rural areas.

4.5 Noise Environment

The ambient air quality readings were taken at 5 locations in the study area. The day and night time equivalent noise level at various sites located close to residential areas were observed to be well below the permissible limit specified for residential areas.

4.6 Land Use Pattern

The land use pattern of the study area for proposed fisheries harbour at Juvvaladinne has been studied through digital satellite imagery data procured from National Remote Sensing Agency (NRSA), Hyderabad. The data was processed through ERDAS imagine software package. The major landuse category in the study area is water body, (48.74%) followed by Scrub (18.22%), agricultural fields (16.74%) area under open/barren land (15.16%) area under Aqua culture (0.97%) Settlements (0.17%) of the study area.

4.7 Terrestrial Ecology

During the field survey, thorny scrub forest observed in the project area. *Prosopis juliflora* is gregarious covering vast tracts of wastelands throughout the study area and form pure patches. Coastal vegetation of the study area is mainly occupied by strand vegetation (sand & rock) which is characterized with open, mat forming pioneer species followed by scattered herbs, shrubs and trees dispersed along the relief beyond the high tide limit or the backshore region. The top community layer is dominated by tree species like *Boras susflabellifer*, *Cocosnucifera, Acacia nilotica, Azadirecta indica etc*. The dominant shrubby plants in this area include *Prosopis juliflora, Barleria prionitis*, etc. The common herb species include are *Eclipta prostrate, Borreria articularis* etc. The grass *Halopyrum mucronatum* forms gregarious patches along sea shore, mixed with other associates such as *Chloris barbata, Aristida adscensionis, .*Salt Marsh in the study site are abundantly occupied by halophytic species like *Aleuropous lagopoides, Etriplex repens, Cressacretica,* etc.

4.8 Marine Ecology

Marine Ecological Survey was carried out by experts from the Centre of Advanced Study (CAS) in Marine Biology of Annamalai University, during 27th and 28th Dec 2016. During the survey, water, sediment and biological samples (plankton, benthos and microbial samples) were collected across two different depths (surface and subsurface) from 10 different stations in three different zones (Creek, Creek mouth, Open Sea). Besides the above, status of other sensitive groups like sea weeds, sea grass, mangroves, corals, turtles et., was also studied in the present survey.

a) Marine Water Quality

The depth in the study area varied between 2.5 and 11.0 m. The water temperature fluctuated from 26.2 to 31.0°C. The water salinity varied from 28.3 to 32.7 PSU. The water pH varied between 7.65 and 8.18. The Total Suspended Solids values ranged between 148.5 and 268.9 ppm. The turbidity values were between 3.7 and 6.3 NTU. The Dissolved Oxygen level in the water varied between 3.78 and 6.82 mg/l. The BOD values varied between 0.102 and 0.786mg/l. The Nitrite level varied from 0.36 to 0.97µmol/l. Nitrate concentration ranged

between 3.03 and 5.58µmol/l. The Ammonia concentration varied from 0.033 to 0.096 µmol/l. The Total nitrogen values ranged from 14.46 to 20.84µmol/l. The Total phosphorous value ranged from 1.33 to 2.97 µmol/l. The range of physico-chemical parameters was found to be within the permissible range. Similarly, the ecologically sensitive chemical parameters such as Dissolved Oxygen, BOD, nutrients were also at the optimal concentration with a few exceptions which might be owing to the prevailing seasonal variation.

The iron level varied from 10.21 to 22.18µg/l**.** The zinc level varied from 8.975 to 15.22µg/l. The Manganese level varied from 17.84 to 22.83 µg/l. The Cadmium level varied from 0.02 to 0.084 µg/l. The Nickel level varied from 0.21 to 0.68 µg/l. The Chromium level varied from 1.27 to 2.56 µg/l**.** The Lead level ranged from 0.16 to 0.69 µg/l. The Copper level varied from 0.28 to 0.81 µg/l**.** The Mercury level varied from 0.012 to 0.014 µg/l. The concentration of heavy metals is also within permissible limits expected in marine port waters.

b) Sediment Characteristics

The soil pH varied between 8.47 to 7.90. The sand content varied from 10.43 to 56.29 %, the maximum silt content was (64.42%) and minimum was (29.65%).The maximum clay content was (53.94%) and minimum was (5.18%). As regards soil texture, the sand, silt and clay fraction at each station along with their textural classification indicated that the sand and silt composition was higher when compared to clay during this survey.

The total organic carbon ranged between 0.326 and 3.057mgC/g. The sediment PHC level varied from 0.230 to 0.975 µg/g.

The Iron level varied from 2031 to 4689 µg/g**.** Zinc level varied from 18.24 to 27.79 µg/g**.** The Manganese level varied from 20.51 to 27.93 µg/g. The Cadmium level varied from 0.26 to 0.49 µg/g. The Nickel level varied from 6.12 to 11.69 µg/g. The Chromium level varied from 0.20 to 0.81 µg/g. The Lead level varied from 0.43 to 0.9 µg/g. The Copper level varied from 1.03 to 1.98µg/g. The Mercury level varied from 0.14 to 0.42 µg/g. The concentration of heavy metals in sediment samples indicates that it is well within the ERM (Effective Range Median) which means there are no possibilities of Heavy metal contamination in the region. Similarly sediment samples showed more concentrations compared to water samples.

c) Biological Characteristics

Chlorophyll `a', Primary productivity and Plankton

In the present study, chlorophyll '*a*' in water sample varied from 1.125 to 0.543 mg/m^3 with. The Phaeopigments content varied from 0.625 to 1.265mg/m^3. The primary productivity values varied from 150.83 and 247.78 mg$Cm^{-3}d^{-1}$. Total biomass values varied from 2.022 to 4.525.

Phytoplanktons

In the present survey, species belonging to three groups namely diatoms, dinoflagellates and blue greens were recorded. Of these, diatoms were found to be the dominant group with 40 species. Dinoflagellates formed next group with 9 species and blue greens came last in the order with 4 species in all the stations. Density of phytoplankton varied from 3,994 to 7,651 cells/l. The diatoms constituted the maximum with 74% to the total followed by dinoflagellates with 17% and blue greens with 9% of the total organisms recorded. The species diversity (H') varied 4.762 to 5.295. The species richness (d) ranged between 4.971 and 6.69. The species evenness varied from 0.9385 to 0.9872

Zooplanktons

Three groups of macro zooplankton namely, Calanoida, Cyclopoida, and Harpacticoida and two groups of micro zooplankton namely, spirotricha and larval forms and group "others" were recorded. Among these, calanoida were found to be the dominant group with 12 species. Larval forms came as next dominant group with 7 species. Cyclopoida and Harpacticoida came next in the order with 5 species each and spirotricha with 4 species. While group "Others" showed only meager (2 species) contributions in the collection. The zooplankton density varied from 1469 to 5789 Nos/m^3. Among zooplankton, calanoida emerged as the dominant group by constituting 29%, followed by larval forms with 21%, cyclopoida 15% and Harpacticoida with 16%, spirotricha with 12% of the total percentage composition, and group "others" with 7%. The zooplankton species diversity (H') varied from 3.856 to 4.604. The species richness (d) ranged between 2.902 and 4.286. The species evenness varied from 0.9575 to 0.9856.

Benthos

Amongst Macro-benthic organisms, four groups of benthic organisms namely Polychaetes, Crustaceans, Bivalves and Gastropods were recorded. Of these, Polychaetes constituted the dominant group followed by Crustaceans, Gastropods and Bivalves. A total of 44 species of macro- fauna were recorded. Of these, Polychaetes topped the list with 30 species. Bivalves and Gastropods were found to be the next dominant group in the order of abundance with 6 species of the total benthic organisms collected. Arthropods were found to be least dominant group with 2 species. The population density varied from 600 to 1325 Nos. m^{-2}. The dominant group amongst benthic organisms was Polychactes accounting for 52% of the total organism. Gastropods, bivalves and arthropods contributed 28%, 15% and 5% respectively to the total benthic organism. The macrobenthos species diversity (H') varied from 3.971 to 4.563. The species richness (d) ranged between '3.522 to 4.711'. The species evenness varied from 0.9523 to 0.9967.

In the present study, as many as 40 species of meio-benthic organisms belongs to Foraminiferans, Nematodes, Ostracodes and Harpacticoids groups. The details of the population meiofauna of population varied from 205 to 375 no/m^2 or cm^2. The Foraminiferans constituted the maximum with

60% amounting for 60% of the total meio-benthic organisms. Ostracodes, Nematodes, and Harpacticoids contributed 21%, 16% and 3% respectively to the total meio-benthic samples collected**.** The meio-benthos species diversity (H') varied from 4.378 to 4.737. The species richness (d) ranged between '4.981 to 5.892'. The species evenness varied from 0.9818 to 0.9900.

Vegetation

The dominant species observed was *Prosopis juliflora* which contributed about 80% of the biomass of vegetation in the area. *Prosopis juli flora* is an alien invasive weed tree and the present project onshore area seems to be a *Prosopis* invaded ecosystem.

Corals and Other Endangered Species

The occurrence of corals, turtle nesting grounds and other endangered species like Dugongs were not found during the present survey.

Sea Weeds and Sea Grass Distribution

The seaweeds were seen washed ashore, including *Gelidium* sp*., Caulerpa* sp*., Ulva fasciata*, *Gracilaria corticata*, and *Padinatetra stomatica* were recorded in the present study. Similarly, the sea grass species namely *Cymodocea serrulata* was reported during the present survey.

Fisheries

Fishing is an important livelihood activity in the district. Marine finfish and shellfish are exploited along the coast with a multitude of gears, comprising shore-seines, boat seines, drift gill nets deploying catamarans, and mechanized vessels and shrimp and fish trawl using mechanized vessels. In pelagic fishing anchovies, sardines, seer fish, mackerel, ribbonfish & tunas are caught using gillnets trawlers& bag nets. Demersal fisheries resources are primarily exploited by bottom trawling and the important species caught are perch, silver bellies, scads, ribbon fishes, sciaenids, lizard fishes, goat fishes, sharks, rays, prawns, crabs, sand lobster, squids and cuttlefishes.

4.9 Socio-economic aspects

The aim of the socio-economic study is to assess the overall impact on various facets of socio-economic environment due to establishment of the project in the Study Area.

Profile of Juvvaladinne village

Juvvaladinne is a Village in Bogole Mandal in Nellore district. The total population of Juvvaladinne is 10675 comprising males are 5,469 and females are 5,206 living in 3020 households. The total literate population is 4748.

Demographic profile of study area

The total population in the study area villages is of the order of 152716 .The male and female population comprises about 50.02. % and 49.98% respectively of the total population. The population comprising of children below the age of 6 years accounts for about 10.3% of the total

population. The numbers of females per 100 males and average family size in the study area villages is 999 and 4 persons per family respectively.

The General Castes are the dominant caste groups in the study area accounting for about 74.5% of the total population followed by Schedule Castes 16.06% of the total population. The Schedule Tribe population accounts for 9.43% of the total population in the study area villages. The literacy rate in the study area is 65.05%.The literacy rate among male and female population is 70.21% and 59.89% respectively. It is observed that 40.83% of the total population is engaged in some form of economically productive activity or vocational activity. Amongst the population that is working about 82.54% are designated as main workers while the remaining 17.46% have been designated as marginal workers.

5. ASSESSMENT OF IMPACTS

Based on the project details and the baseline environmental status, potential impacts that are expected to accrue as a result of the proposed project during project construction, pre-construction and operation phase assessed and briefly described in the following sub-section.

5.1 Impacts on land environment

a) Construction Phase

Impacts due to Quarrying Operation

The proposed fishing harbor project would require construction materials including fine and the coarse aggregates, which are proposed to be excavated from local quarries. Cement and steel will be purchased from local market. No new quarry is proposed to be opened for the construction of Juvvaladinne fishing harbor.

Impacts due to construction activities

Pre-construction activities like clearing, stripping and leveling of sites, construction of bunds for protection from flooding, earth filling and excavation for foundations, will lead to some disturbance to the habitat. The level of construction activities in the proposed project is not of such level and nature, to cause any significant adverse impact on this account.

Surface runoff and drainage from the fish processing and ancillary fish industries, ice and chilled storage plants etc. be properly disinfected and treated for contaminants. The sewage shall be connected to the existing community sewerage system only after treatment.

The natural drainage in the area is such that the entire water would outfall in the marine water. This could lead to marginal increase in turbidity levels. However this impact is not expected to be significant.

Impacts due to Reclamation

A total area of 21.7 ha needs to be reclaimed. It is proposed to use 4.682 lakh m^3 of dredged material for reclamation, the balance reclamation material of about 1.171 lakh m^3 shall be brought to the project site from nearby existing quarries. The dredged material to be used for reclamation is non-toxic and uncontaminated. Hence, adverse impacts on marine water quality on account of the use of dredged material for reclamation are not anticipated.

b) Operation phase

Generation of Garbage at Port

The problem envisaged during operation phase could be the disposal of garbage, line floating materials, packaging, polythene plastic materials, garbage accumulated on the deck from the fishing trawlers and boats etc. needs to be suitably disposed.

A system shall be developed, to reduce the quantity of garbage to be accumulated in the fishing harbor and it's disposed on the low lying areas in a scientific manner.

Impacts on landuse pattern of the area

The total land requirement for the project is 21.7 ha, which is intertidal zone and the land belongs to state government of Andhra Pradesh.

The construction and operation of the project will provide facilities for fish storage, packing, ice plant, etc. in the project area and its surroundings. The construction and operation of the project will provide an impetus to development in the area. The fisheries harbour area would lead to development of shops, restaurant, repair shops, etc. in and around the port area. This will lead to conversion of barren land into commercial use and diversion of agricultural land to avail greater economic opportunities. The employment potential would also improve in the amount.

Solid Wastes

The solid waste comprises of all bulky rubbish, old pieces of rope and netting, broken fish boxes etc. is likely to be generated in project operation phase. Metal items shall be collected and sold to scrap dealers. Tyres can be turned into fenders and timber fish boxes can be sold as fuel wood. Styrofoam boxes shall be avoided, as they break easily and cannot be recycled safely.

Fish Offal

Solid fish waste is inevitable in a fishery harbour. This may consist of:

- discarded by catch (small fish of no commercial value)
- viscera from the gutting of medium to large fish
- fish heads and trimmings from the cutting of large fish.

The disposal of fish offal in the land side portion will generate bad odour because of decomposing of offal. Besides health implications, due to decomposition of fish offal in the harbour area, it also

attracts pests, flies and domestic animals. If, the offal is not disposed properly. Fish shall be cleaned and gutted on the journey back to the landing centre. Offal shall not be allowed to be dumped inside the fish landing centre. A plastic 100-litre drums with airtight lids shall be used to collect offal from various sources in the fishing harbour.

5.2 Impacts on Tranquility and Sedimentation

The coast line at the port site can be taken to be aligned approximately in NNW-SSE. The reclamation carried out is mostly in the inter-tidal area. Central Water & Power Research Station (CWPRS) has conducted mathematical modelling studies for (i) estimation of seasonal and annual littoral drift rates and their cross-shore distributions and (ii) assessment of shoreline changes due to the proposed development of fishery harbor at Juvvaladinne.

Based on simulation of littoral drift annual net and gross transport of the order of 0.297 and 0.298 million m^3 were estimated. It can be observed that littoral drift towards south was estimated to be minimal (almost negligible) during all seasons. The proposed site at Juvvaladinne falls in mild littoral drift zone. It was also observed that northward transport was occurring during all periods. After 10 years, maximum cross-shore advancement would be about 170 m while, maximum recession would be about 130 m. The corresponding long-shore effect of deposition and erosion was felt for 1500 m and 1300 m respectively. It is suggested that to reduce deposition on south side of southern training wall and erosion on north side of northern training wall, sand bypassing arrangement may be provided.

5.3 Status of Erosion in the Nellore Coast

As per the study conducted by Institute for Ocean Management, Anna University for assessment of coastal erosion Nellore coast falls under Stable Coast Category. Apart from this the Juvvaladinne village comes along the Uppateru creek and it is away from the shore line and the proposed fishery harbor site is protected from waves.

5.4 Water Environment

a) Construction phase

Impacts due to Effluents from Labour Camps

The average and peak labour strength likely to be deployed at the proposed fishing harbour will be about 125 and 250 respectively. The proposed project area is situated close to village Juavvaladinne, and, most of the labour force will come from this village or from nearby villages. The labor force engaged by the contractor could come from outside areas.

Thus, total water requirement works out to about 48 m^3/day. The source of water will be from ULB supply and bore wells. The sewage generated will be (0.8 x 48.0) 38.4 m^3/day, which shall be treated, prior to disposal.

Impacts due to Dredging

The dredging and other construction activities normally increase the turbidity levels in the water column. The total quantity of material to be dredged is 6.0 lakh m^3. The change in water-column turbidity during dredging is a short-term impact. The increase in turbidity lasts as long as the material is being dredged. The turbidity level returns to the pre-project level on cessation of dredged material. In the proposed project, it is suggested that dredging be done by a `Cutter Suction' dredger as it does not provide adequate time for the elemental transfer between the sediments and the water phase. Thus, no major change in marine water quality due to transfer of ions from sediments to water is anticipated. The method is preferred as it has minimal environmental impacts as far as increase in water turbidity is concerned. It can be concluded that apart from short-term increase in turbidity levels, no other significant effect on marine quality due to dredging is anticipated due to proposed project.

Impacts due to Disposal of Dredged Material

The almost entire amount of dredged material shall be used for the reclamation in the project area. Thus, no impact on the marine water quality due to the disposal of dredged material is envisaged.

Impacts due to Reclamation

The chemical impacts due to the disposal or backfilling are dependent on the redox potential and pH. Normally, if pH remains around 8, heavy metals like zinc, copper and mercury will remain bound to the solid phase. The pH of the sediments as well as the marine water is slightly alkaline in the project area. In the post-project phase, after the reclamation of land, pH and redox potential in the adjacent water is not expected to change. Since no change is anticipated in the pH and redox potential, heavy metals are likely to remain bound to the sediments. Thus, no impact on the marine water quality is anticipated due to reclamation.

It has been generally found that, if sediments are not toxic in-situ, they do not become so even after the disposal. The dredged material to be used for backfilling is non-toxic and uncontaminated; hence, adverse impacts on marine water quality are not anticipated.

b) Operation Phase

During project operation phase, water would be required for domestic water requirements, fish washing, Ice plant, firefighting and other uses. The major source of waste includes only bilge discharge, dumping of used engine oil, deck and fish hold washings, auction hall, toilet waste, junk metal ports, plastic containers, fish waste, and untreated waste water. Within the harbour area,

solid waste and from the boat yard, living quarters, canteen, administrative building, etc. shall be generated, which needs to be regularly collected and disposed.

The sullage generated from auction hall, pre-processing unit, Ice plant etc. will be collected in the manholes at the respective location and finally let into the Effluent Treatment Plant.

5.5 Impacts on Noise Environment

a) Construction Phase

The major sources of noise during construction phase are due to operation of various construction equipment. Modeling studies were conducted to assess the increase in noise level due to operation of various construction equipment. It is clear observed , that at a distance of 100 m and 200 m from the construction site, the increase in noise levels will be about 10 dB(A) and 15 dB(A) respectively. The nearest residential areas are at a distance of about 500 m from the proposed project site. Hence, there could be adverse impacts anticipated on noise levels in the proposed project area.

The other source of noise during construction phase will be due to movement of trucks, which will transport the construction material. The variation in noise level due to increase in vehicular movement has been studied. It was observed that the increase in noise level due to vehicular movement is not expected to be significant during construction phase.

b) Operation Phase

The major source of noise in the operation phase in the fishing harbor area could be the increased vehicular movement to transfer fish from the landing centre to fish market, etc. The increase in ambient noise levels in the project operation phase due to increased vehicular movement is studied through model. The noise at a distance of 500 m will be 49 dB (A) without control. At least 20-30 dB (A) of noise levels get attenuated due to various factors. Thus, within a distance of 50 m some adverse impact on ambient noise level is anticipated leading to adverse impacts on the population residing in the affected stretch. Beyond a distance of 50 m, increase in ambient noise level will be too insignificant to create any adverse impact.

Impacts on Marine Ecology

Fish species generally move away from the high noise areas and trawler return, once the noise subsides or the source of noise moves away. In the proposed project small ships, i.e. 15 m trawlers and 12 m gill netter are likely to be used during project operation phase. The impact of noise generated due to these ships is not significant to cause any significant adverse impact on marine life.

5.6 Impacts on Air Environment

a) Construction phase

Impacts due to fugitive emissions

The major pollutant in the construction phase is particulate matter being air-borne due to various construction activities. The vehicular movement generates pollutants such as NOx, CO and HC.

However, the fugitive emissions generated due to vehicular movement are not expected to travel beyond a distance of 200 to 300 m. The impact on air environment during construction phase is not expected to be significant, since, there are no habitations in the vicinity of the site.

Impacts due to Construction Equipment

The major pollutant likely to be emitted due to combustion of diesel in various construction equipment shall be SO_2. The short-term increase in SO_2 concentration has been predicted using Gaussian plume dispersion model. The incremental concentration is quite low 0.00119 $\mu g/m^3$ at a distance of 200 m from the emission source and does not require any specific control measure. Thus, operation of construction equipment is not expected to have any major impact on the ambient air quality as a result of the project.

b) Operation Phase

The major source of air pollution in the post-project phase is the vehicular movement for transportation of fish catch to different destinations of markets. On an average about 37 to 40 trucks per day will move in the area. The pollution levels due to those are not expected to be significant to cause significant adverse impact on ambient air quality.

5.7 Impacts on Ecology

a) Impacts on Terrestrial Flora

The direct impact of construction activity for any project is generally limited in the vicinity of the construction sites only. There is no forest with tree cover in the vicinity of the project site. Hence, no significant impacts are envisaged on terrestrial flora as a result of the construction and operation of the proposed project.

b) Impacts on Marine Ecology

Impacts due to Dredging

Dredging is proposed to be carried out at berthing area, and a part of the dredged material will be used for reclamation. In the areas to be dredged, the existing marine life would be affected, however, such sites are re-colonized within short duration after the cessation of the dredging activities. It was observed during the marine ecological survey that the project area has moderate productivity and berthing area has less and occasional presence of fish larvae. Hence, no major impacts are anticipated on marine ecology due to construction and operation of the proposed project.

Impacts due to Reclamation

The existing marine ecology in the area proposed to be reclaimed shall be disturbed on account of disposal of dredged material for land reclamation. However, based on the ecological survey conducted and the review of existing data, the area to be reclaimed does not exhibit high primary

productivity. Hence, no significant impact on marine ecology is anticipated due to reclamation of land.

Impacts on Benthic Organisms

In areas to be covered under maintenance dredging well-developed benthic communities are not expected to occur in or around the area. Since, significant macro-and meio-fauna is not developed in the area, hence dredging is not expected to lead to significant adverse impacts. None of macro-and meio-faunal species observed during the study are under rare, endangered or threatened category. All the species are common benthic organisms.

Impact on Phytoplankton and Primary Productivity

Biomass of phytoplankton depends mainly on the availability of light in nutrient rich waters. Dredging and disposal may lead to increased turbidity and consequent reduction of light penetration for short periods. Hence, impacts on this account are expected to be marginal in nature.

Impact on Fisheries

The high turbidity due to heavy suspended solid load during dredging or disposal of dredged materials results in clogging of gills of fishes thereby causing asphyxiation. But since fishes are free swimming they avoid such areas and move to safer areas. Once the turbidity disperses due to current and wave disturbances, they come back to the area. Due to this capability of the fishes there is virtually no impact on fishes and fisheries by dredging and disposal. The study also did not show the existence of breeding grounds for fisheries. No significant impact on marine ecology is anticipated during operation phase.

5.8 Impacts on Marine Environment

a) Construction Phase

Proposed fishery harbor will be developed in intertidal area. The land near see shore is saline and having low nutrients & low fertility and no major vegetation found in within area of project site. Hence there will not be significant impact on ecology due to development works for proposed project.

The proposed project area is barren and covered by muddy inter-tidal zone having low nutrients. Salt tolerant plants and vegetation are observed in this region. During site preparation, only wild shrubs over the project area will be removed. There are no major faunal species observed in an around the project area. Therefore, no major impacts on flora and fauna are envisaged. The potential impacts on marine water quality may arise due to dispersion of impurities is expected to be rare as runoff from site to marine environment will be prevented by providing adequate drainage system. Thus, potential impact on marine environment due to contamination of water by dumping/fall/spill of construction materials, debris, fuel, wastes like garbage, municipal solid waste, etc. be avoided by the necessary training instructions for workers.

b) Operation Phase

The major quantity of liquid waste that would be generated in the normal day to day operations at the proposed harbor includes sewage, washing, run off from domestic activities, etc. This wastewater together with sewage has a potential to pollute marine water if disposed untreated. However, treatment of sewage, will minimize the impact and the treated sewage will be reused within the premises. Hence, marine pollution due to sewage disposal is not envisaged.

A separate Refueling Station is proposed within the complex where vessels shall be refueled as and when required to avoid spillage/leakage of fuel while refueling activities. Adequate boat parking area and loading and unloading facility shall also be provided

5.9 Impacts on Socio-Economic Environment

a) Construction phase

About 125 labor and their family members are likely to stay near construction sites which can lead to pressure on existing infrastructure facilities. Thus, it is necessary to develop adequate infrastructure facilities, so that the requirements of the immigrating labour population are met.

b) Operation Phase

The proposed project will give a boost to fishing activities in the area. The occupation of most of the village Juvvaladinne and other nearby village is fishing and related activities.

Due to heavy siltation in the harbor basin and approach channel, the harbor is not being utilized fully. The construction of Juvvaladinne fishing harbor would meet the long standing requirement in the area. Thus, the project would have a significant positive impact on the fish production and shall provide an impetus to increase in income level, employment potential and overall economy of the area.

6. ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) for the proposed fisheries harbour is suggested to maximize positive impacts and to minimize negative impacts.

6.1 Land environment

The surface roads, which are proposed to be utilized during construction, shall be black topped to avoid fugitive dust. No new quarry is proposed to be specifically opened and the construction material is to be extracted from existing operating quarries, located outside the study area. Hence, project proponents are not required to implement management measures related to quarry slope stabilization.

6.2 Solid Waste Disposal

Many of the waste items can be recycled and reused. This involves collecting and sorting the discarded materials suitable for recycling, paper, plastic, glass and aluminium cans, etc. Wet

organic matter can be converted into compost. It is advisable to have separate containers to facilitate the segregation of wastes into bio-degradable and non-biodegradable components. Floating garbage is best collected by small boats using a scoop net or two vessels working together using a floating net boom at the designated dumping areas of the local administration.

Plastic drums of 100-litre capacity with airtight lids shall be bought and used to collect offal from fish markets or moored boats. Other organic fish wastes generated near the wharf and auction hall area will be collected in air tight containers and sent to the organic waste composter, bio-mechanical composter.

6.3 Water Environment

The major source of water pollution in the construction and operation phases is the sewage generated by the workers and employees. As a part of control of water pollution 20 'community toilets' and 1 'septic tank' need to be constructed.

The main source of wastewater generated during operation phase, will be the effluent generated from the fish washing, auction hall cleaning etc. The sewage will be generated from administrative block, toilet blocks etc. and it will treated in septic tank. Effluent treatment plant is proposed to be located near the Boat repair area in proposed layout of Juvvaladinne Fishery harbour.

6.4 Control of Impacts of Dredging on Marine Environment

The impact on coastal environment during construction phase would be mainly from the activities in the inter-tidal phase due to construction of fishing harbour. Hence, as a part of the management strategy various activities shall be well coordinated and optimized to avoid time and cost over-run, which are given below:

- Construction especially on marine front including dredging shall not be carried out during the fish breeding season (during April 15 to May 31) and will be carried out in confined manner to reduce the impacts on marine environment. The dredger shall be equipped with spill response kits.
- Dredging and construction activities to be scheduled and planned to minimize impacts on fishermen and marine ecology providing necessary mechanisms to trap the spillage of fuel / engine oil and lubricants from the construction site to minimize impacts on benthos.
- Temporary colonies of the construction workers would be established sufficiently away from the High Tide Level (HTL) with adequate sanitation facilities.
- Construction debris shall be disposed safely in the designated areas.
- Sufficient number of barges shall be used for dumping, transporting and disposal of the dredged material to the project site and dumping site.
- Waste consignment notes to be prepared and documented for the disposal of dredged material.
- Aqueous discharge in to sea during dredging shall be prevented.
- Disposal of sewage from the labor colonies, shall be prevented with suitable wastewater treatment measures

- After completion of construction activities, adequate clean-up of the area including the inter-tidal area should be undertaken and all discharged materials should be removed from the site.

6.5 Control of Oil Pollution

To mitigate oil pollution, fishery harbour incharge shall take necessary action to:

- Provide shore-based reception facilities for oily wastes (bilge water and spent oil) from vessels
- Minimise leaks while bunkering.
- Assist those responsible for containment and clean-up operations if, a major oil spill occurs in the vicinity.

The oil collected by the separators may then be returned to a recycling plant by authorised collectors. Reception facilities for used engine oil inside harbours are intended as a temporary storage only, whereas reception facilities for bilge water needs to separate the oil from the considerably larger volume of water. The oil may then be transferred to the used oil storage facilities for collection at a later date, and the treated water returned to the sea. Waste or spent engine oil can be recycled 100% and it is now very common for refineries to collect used oil from harbours, car repair shops and petrol stations.

6.6 Control of Oil Spills

When a oil spill occurs in the vicinity of the fishery harbour, the harbour incharge will render assistance to the team responsible for combating the spill and for subsequent clean-up operations. Considering the size of the proposed fisheries harbour mechanical containment in the form of booms is recommended. Booms prevent the spreading, and facilitate oil recovery.

6.7 Air Environment

Control of Emissions

The following measures are recommended to control air pollution:

- Contractor will be responsible for maintaining properly functioning of construction equipment to minimize exhaust.
- Construction equipment and vehicles will be turned off when not used for extended periods of time.
- Unnecessary idling of construction vehicles to be prohibited.
- Effective traffic management to be implemented.
- Road damage caused by sub-project activities will be promptly attended to with proper road repair and maintenance work.

Air Pollution Control due to DG Sets

The Central Pollution Control Board (CPCB) has issued emission limits for generators upto 800 kW. The same standards needs to followed by the contractor operating the DG sets.

Control of Pollution due to Increased Vehicles

The vehicles emitting pollutants above the standards should not be allowed to ply either in the project construction or in the operation phases. Vehicles and construction equipment shall be fitted with internal devices i.e. catalytic converters to reduce CO and HC emissions.

All the roads in the vicinity of the project site and in the project are paved or black topped to minimize the entrainment of fugitive emissions. Water sprinkling shall be done at least thrice a day at the construction sites, haul roads and other access roads. Measures such as covering the trucks while transporting the construction material shall be initiated to control fugitive dust as also to control the re-suspension of particulate matters from the excavated materials.

Staff involved in construction shall be provided with suitable Personnel Protective Equipment (PPE) such as dust masks, ear plugs, gum boots, gloves, etc. Idling of delivery trucks or other equipment shall be avoided during loading and unloading of construction material.

6.8 Control of noise

It is proposed to develop a greenbelt along the road stretches near to the habitation sites. Three rows of trees will be planted. The contractors will be required to maintain properly functioning equipment and comply with occupational safety and health standards. The construction equipment will be required to use available noise suppression devices and properly maintained mufflers. Ear protective devices should be used by the construction workers where they are exposed to steady noise levels above 85 dB. Noise from the DG set shall be controlled by providing an acoustic enclosure. A proper routine and preventive maintenance procedure for the DG set shall be set and followed in consultation with the DG set manufacturer which would help to prevent noise levels of the DG set from deteriorating with use.

To prevent the adverse effects of noise the exposure period of affected persons be limited as specified by Occupational Safety and Health Administration (OSHA) in Table-3.

Table-3: Maximum Exposure Periods specified by OSHA

Maximum equivalent continuous Noise level dB(A)	**Unprotected exposure period per day for 8 hrs/day and 5 days/week**
90	8
95	4
100	2
105	1
110	½
115	¼
120	No exposure permitted at or above this level

It is also proposed to purchase noise meter, for monitoring of ambient noise at different places at project site.

6.9 Greenbelt Development

It is proposed to develop greenbelt around various project appurtenances, which will go a long way to achieve environmental protection and mitigation of pollution levels in the area. The maintenance of the plantation area will also be done by the project proponents. About 1 to 2 ha of land is proposed to be afforested with indigenous species/local species as a part of Greenbelt Development Plan.

6.10 Prevention of Soil Contamination

Vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided within the construction camps. All spills and collected petroleum products will be disposed off in accordance with Ministry of Environment, Forest and Climate Change (MoEF&CC) and Andhra Pradesh Pollution Control Board (SPCB) guidelines.

Fuel storage and refilling areas will be located at least 1000 m from water bodies as directed by the Site Engineer. In all fuel storage and refueling areas, if, located on agricultural land or areas supporting vegetation be avoided for fuel storage and refilling area.

6.11 Safety Practices during Construction Phase

The Contractor is required to comply with all the precautions as required for the safety of the workers. The contractor will supply all necessary safety appliances such as safety goggles, helmets, masks, etc., to the workers and staff. Efficient lighting and safety signs shall be installed on temporary roads during construction and adequate traffic regulations shall be adopted and implemented for temporary roads. Contractor shall follow all relevant provisions of the Factories Act, 1948. Construction camps shall not be proposed within 1000 m or sufficiently away from nearest habitation Safety and sanitation facility should be provided in the labour camp.

6.12 Disposal of Construction Waste

Debris generated from pile driving or other construction activities shall be disposed off in systematic manner such that it does not flow into the marine water or form mud puddles in the area. The contractor as per regulations in force shall identify dumping sites.

6.13 Awareness Campaigns

An awareness campaign needs to be conducted for various fishermen. This campaign could comprise of:

- Inter-personal communication
- Use of video and slide shows
- Deployment of posters, videos, stickers and signboards
- Organizing group activities.

6.14 Traffic Management

The following measures are recommended as a part of Traffic Management Plan.

- Locals will be informed about the construction schedule.
- Traffic management with diversion through alternate routes will be implemented by providing adequate sign boards.
- Upon project completion, quick clearance of debris, etc. will facilitate access by customers to local business and residents to their households
- Placement of traffic staff to facilitate easy of movement.

6.15 Decontamination of Containers

The container will be cleaned properly with disinfectant and then rinsed with water. The containers will be completely dried and reused. The damaged container will be sold to the nearest recyclers

6.16 Odour Management

There are a number of systems that have the potential to reduce the impact of typical odour from fishing harbour areas. These technologies includes Odour neutralising agents, Windbreak walls, Air scrubber, Bio filter, Short, Active oxygen, Ozone treatment,etc.

6.17 First-aid posts

It is proposed to develop 1 first-aid post manned by a doctor and support staff are recommended to be developed during construction phase. The first-aid post shall be located such that they are close to major construction sites and labour camps/colonies.

A semi-permanent building shall be constructed for each first-aid post. These posts will have the facilities like essential medicines including ORS packets, First aid appliances, splints and dressing material, stretcher, wheel chair, etc.

The doctor posted at the first-aid posts, shall also coordinate the anti-malarial campaign be carried out under his immediate personal supervision. An Ambulance Van will be available 24x7 for use in case of any emergency.

6.18 Social Upliftment of the Fishermen Community

The recommended social upliftment of the fishing villages includes Village roads, Community halls, Bus shelters, Footpaths, Distribution of free medicine, etc.

6.19 Energy Conservation Measures

Energy conservation measures would be implemented to ensure that the use of non-renewable resources is minimised. A key component of achieving energy conservation would be the development of an Energy Management Action Plan. This plan would be included as part of the Construction and Operational EMPs.

The following mitigation measures would be undertaken during construction works.

- Efficient work scheduling and methods that minimise equipment idle time and double handling of material;
- Throttling down and switching off construction equipment when not in use;
- Switching off truck engines while they are waiting to access the site and while they are waiting to be loaded and unloaded;
- Regular maintenance of equipment to ensure optimum operations and fuel efficiency extent.

The mitigation measures to be implemented during site operations are listed as below:

- Design of buildings and terminal layout would aim to achieve the energy efficiency;
- Employing renewable energy sources such as day lighting and passive solar heating;
- Designing roads on the site to reduce transportation distances.

7. DISASTER MANAGEMENT PLAN

Disaster Management planning is an integral and essential part of loss prevention strategy. The nature of the proposed project is such that there are minimal chances of accidents. The project operations do not entail any risk or hazard. However, there still remains a small possibility that disaster may occur. This Disaster Management Plan also sets out the procedures and measures to be taken into account in the event of loss of containment and consequence thereof in the Juvvaladinne fisheries harbour.

The main objectives of the Disaster Management Plan would be:

- Ensure that loss of life and injuries to persons are minimized
- Damage to environment is minimized, property loss is minimized
- Relief and rehabilitation measures are effective and prompt
- Minimize the outage duration of the facilities.

The details of DMP includes likely emergencies, communication systems, medical services, early warning systems etc. This has been discussed in detail in Rapid EIA report.

8. HSE MANAGEMENT SYSTEM

An HSE management system is an effective means of ensuring that proper attention is paid to the health and safety of individuals working in the project site as well as the protection of the environment from the environmental impacts associated with construction activities. It is recommended that if the Fisheries Department intends to assign a contract to carry out work, whether construction or repair, it should be ensured that potential project have an HSE policy and perform all work under a formal HSE Management system. This system shall be adequately documented within a HSE Manual and be shown to be effective in implementing the aims and objectives of the HSE Policy.

9. ENVIRONMENTAL MONITORING PROGRAMME

The summary of Environmental Monitoring Programme for implementation during project construction and operation phases is given in Tables-4 and 5.

Table-4: Summary of Environmental Monitoring Programme for implementation during project construction phase

S. No.	Aspects	Parameters to be monitored	Frequency of monitoring	Location
1.	**Marine water**			
	Physico-chemical parameters	pH, Salinity, EC, TDS, Turbidity, Phosphates, Nitrates, Sulphates, Chlorides.	Once in three months	3 to 4 sites
	Biological parameters	Light penetration, Chlorophyll, Primary Productivity, Phytoplanktons, Zooplanktons	Once a year	3 to 4 sites
2.	**Sediments**			
	Physico-chemical parameters	Texture, pH, Sodium, Potassium, Phosphate, Chlorides, Sulphates	Once in three months	3 to 4 sites
	Biological parameters	Benthic Meio-fauna, Benthic Macro-fauna	Once in a year	3 to 4 sites
3.	Ambient air quality	PM_{10}, SO_2 and NO_2	- Summer, Post-monsoon and Winter seasons. - Twice a week for four consecutive weeks per season.	Close to construction site(s)
4.	DG set	PM_{10}, SO_2, NO_2 and HC	Once in a month	DG set site
5.	Noise	Equivalent Noise Level	During peak construction activities	Construction Site(s)

Table-5: Summary of Environmental Monitoring Programme for implementation during project operation phase

S. No.	Aspects	Parameters to be monitored	Frequency of monitoring	Location
1.	**Marine water**			
	Physico-chemical parameters	pH, Salinity, EC, TDS, Turbidity, Phosphates, Nitrates, Sulphates, Chlorides.	Once in three months	3 to 4 sites
	Biological parameters	Light penetration, Chlorophyll, Primary Productivity, Phytoplanktons, Zooplanktons	Once a year	3 to 4 sites
2.	**Sediments**			
	Physico-chemical parameters	Texture, pH, Sodium, Potassium, Phosphate, Chlorides, Sulphates	Once in three months	3 to 4 sites
	Biological parameters	Benthic Meio-fauna, Benthic Macro-fauna	Once in a year	3 to 4 sites
3.	Ambient air quality	PM_{10}, $PM_{2.5}$, SO_2 and NO_2	- Summer, Post-monsoon &	Villages

S. No.	Aspects	Parameters to be monitored	Frequency of monitoring	Location
			Winter seasons. - Twice a week for four Consecutive weeks per season.	
4.	Noise	Equivalent Noise Level	Once per month	Project area and sites within 1 km of the project area
5.	Greenbelt Development	Rate of survival and growth of various species	Once per month	Various plantation sites.

10. COST ESTIMATES

10.1 Environmental Management Plan (EMP)

The cost estimates for implementing EMP shall be Rs.17.47 million. The details are given in Table-6.

Table-6: Summary of cost estimate for implementing Environmental Management Plan

S. No.	Parameter	Cost (Rs. million)
1.	Solid Waste Management	6.87
p2.	Sanitary facilities at labour camps	0.9
3.	Greenbelt development	1.0
4.	Purchase of noise meter	0.1
5.	Provision of Social Up-liftment of fishermen community	0.8
6.	Disaster Management Plan	2.0
7.	Implementation of Environmental Monitoring Programme during construction phase (Refer Table-7)	5.8
	Total	**17.47**

10.2 Environmental Monitoring Programme

The cost required for implementation of Environmental Monitoring Programme during construction phase is Rs.5.8 million. The details are given in Table-7.

Table-7: Summary of cost estimates required for implementation during project construction phase.

S. No.	Parameter	Cost (Rs. million)
1.	Marine Ecology	2.52
2.	Ambient air quality	0.76
3.	Emission from DG sets	2.52
	Total	**5.8**

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LISTOF FIGURES

Commissioner of Fisheries

Govt. of Andhra Pradesh

EIA STUDIES FOR JUVVALADINNE FISHERY HARBOUR, SPSR NELLORE, ANDHRA PRADESH

EXECUTIVE SUMMARY

वाप्कोस लिमिटेड
WAPCOS LIMITED
(भारत सरकार का उपक्रम - जल संसाधन, नदी विकास और गंगा संरक्षण मंत्रालय)
(A Government of India Undertaking - Ministry of Water Resources, River Development & Ganga Rejuvenation)

WAPCOS LIMITED

(A Government of India Undertaking)

76 C, Sector 18, Gurgaon - 122015, Haryana, INDIA

Tel. +91-124-2397396,

Sl. No. 155, NABET Accredited Consultant

Email: environment@wapcos.co.in

SEPTEMBER 2017

The cost required for implementation of Environmental Monitoring Programme during operation phase is Rs.1.56 million/year. The details are given in Table-8.

Table-8: Summary of cost estimate for implementing Environmental Monitoring Programme during operation phase.

S. No.	Parameter	Cost (Rs. million/year)
1.	Marine water quality	1.20
2.	Ambient air quality monitoring	0.36
	Total	**1.56**

WAPCOS LIMITED

(A Government of India Undertaking)

76 C, Sector 18, Gurgaon - 122015, Haryana, INDIA

Tel. +91-124-2397396,

Sl. No. 155, NABET Accredited Consultant

Email: environment@wapcos.co.in