DEENDAYAL PORT AUTHORITY
(Erstwhile: DEENDAYAL PORT TRUST)

Administrative Office Building
Post Box NO. 50
GANDHIDHAM (Kutch).
Gujarat: 370 201.
Fax: (02836) 220050
Ph.: (02836) 220038

www.deendayalport.gov.in

EG/WK/4712/Part II/ 114

Dated: 09/12/2025

To,
The Deputy Director General of Forests (C),
Ministry of Environment, Forest & Climate Change,
Integrated Regional Office,
Gandhinagar, A wing-407 & 409,
Aranya Bhavan Near CH-3 Circle,
Sector 10 A, Gandhinagar -382010

Sub: "Development of Integrated facilities (Stage II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat (1. Setting up of Oil Jetty no. 7, 2. Setting up of Barge Jetty at Jafrabadi, 3. Setting up of Barge Port at Veera, 4. Administrative office building at Tuna Tekra, 5. Road connecting from Veera Barge Jetty to Tuna gate by Deendayal Port Authority (Erstwhile Deendayal Port Trust)– **Six monthly compliance report of the conditions stipulated in the EC&CRZ Clearance and Monitoring Report in Datasheet reg.**

Ref.: 1) MoEF&CC, GoI letter F. No. 11-13/2015-IA.III dated 19/02/2020
2) Regional office, western zone MoEF&CC, GOI Bhopal letter dated 30/05/2020
3) DPT letter EG/WK/4751/part/988 dated 29/08/2020 – submission of detail asked by regional office, western zone MoEF&CC, GOI Bhopal letter dated 30/05/2020
4) DPT letter no. EG/WK/4712/EC/Part II/52 dated 29/07/2021
5) DPT letter no. EG/WK/4712/EC/Part II/143 dated 08/02/2022
6) DPT letter no. EG/WK/4712/EC/Part II/139 dated 11/07/2022
7) DPT letter no. EG/WK/4712/EC/Part II/291 dated 03/05/2023
8) DPT letter no. EG/WK/4712/EC/Part II/370 dated 03/10/2023
9) DPA letter no. EG/WK/4712/EC/Part II/108 dated 09/08/2024
10) DPA letter no. EG/WK/4712/EC/Part II/34 dated 24/02/2025
11) DPA letter no. EG/WK/4712/EC/Part II/42 dated 17/07/2025

Sir,

It is requested to kindly refer above cited references for the said subject.

In this regard, it is to state that, Ministry of Environment, Forest and Climate Change (MoEF&CC), GoI vide F. No. 11-13/2015-IA.III dated 19/02/2020 has accorded Environmental and CRZ Clearance for the subject project of the Deendayal Port Authority.

Subsequently, DPA vide above mentioned letters had submitted the compliance report of the stipulated conditions mentioned in MoEF&CC, GOI vide letter No. F No. 11-13/2015-IA-III dated 19/02/2020

.....cont...

Now, as directed in the above referred letter dated 19/02/2020 of the Regional Office, MoEF&CC, GoI, Bhopal, compliance report of stipulated conditions mentioned in the EC & CRZ Clearance granted by the MoEF&CC, GoI dated 20/11/2020 **has been now uploaded in the Parivesh Portal of the MoEF&CC, GOI** along with Monitoring Report in Data Sheet **(Period upto April 2025 to September 2025)** for kind information and record please.

This has approval of the Chief Engineer, Deendayal Port Authority.

Yours faithfully,

XEN (EMC)
Deendayal Port Authority

Annexure –I

Half Yearly Compliance Report
2025
01 Dec(01 Apr - 30 Sep)

Acknowledgement

Proposal Name	Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat. (1. Setting up of Oil Jetty No.7. 2. Setting up of Barge jetty at Jafarwadi 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; 5. Road connecting from Veera barge jetty to Tuna gate by M/s Deendayal Port Trust (Erstwhile Kandla Port Trust
Name of Entity / Corporate Office	Deendayal Port Authority
Village(s)	N/A
District	KACHCHH

Proposal No.	IA/GJ/MIS/27227/2015	**Category**	INFRA-2
Plot / Survey / Khasra No.	N/A	**Sub-District**	N/A
State	GUJARAT	**Entity's PAN**	*****EQUIRED
MoEF File No.	F.No.11-13/2015-1A-III	**Entity name as per PAN**	Deendayal Port Authority

Compliance Reporting Details

Reporting Year	2025
Remarks (if any)	
Reporting Period	01 Dec(01 Apr - 30 Sep)

Details of Production and Project Area

Name of Entity / Corporate Office Deendayal Port Authority

	Project Area as per EC Granted	Actual Project Area in Possession
Private	0	0
Revenue Land	0	0
Forest	0	0
Others	52.46	52.46
Total	52.46	52.46

Production Capacity

Sr. no	Product Name	units	Valid Upto	Capacity	Production last year	Capacity as per CTO

Conditions

Specific Conditions

Sr.No.	Condition Type	Condition Details
1	Statutory compliance	Mitigative measures as given in the Marine Bio-diversity Management Plan prepared by CSIR-NIO for protection of marine environment shall be complied with in letter and spirit.
PPs Submission: Agreed to Comply Point noted for the compliance.		Date: 22/11/2025
2	Statutory compliance	Construction activity shall be carried out strictly according to the provisions of the CRZ Notification, 2011. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.
PPs Submission: Complied The work of project at Sr. No. 1 of EC i.e. Setting up of Oil jetty no. 7 is completed and it is under operation w.e.f January 2023. The Consent to Operate (CCA) from the Gujarat Pollution Control Board has already been obtained dated 20/01/2023 Copy submitted along with compliance report submitted on However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that, construction activities will be carried out strictly as per the provisions of the CRZ notification, 2011 and also no activity other than those permissible in Coastal Regulation Notification will be carried out in CRZ area.		Date: 22/11/2025
3	Statutory compliance	All the recommendations and conditions specified by the Gujarat Coastal Zone Management Authority vide letter No. ENV-10-2015-231-E (T Cell) dated 29.06.2016 shall be complied with.
PPs Submission: Complied The compliance report of CRZ Recommendation issued by the GCZMA dated 29/06/2016 is attached herewith as Annexure A		Date: 08/12/2025
4	Statutory compliance	The project proponent shall ensure that the project is in consonance with the new CZMP prepared by the State Government under the provisions of the CRZ Notification, 2011.
PPs Submission: Agreed to Comply The MoEF and CC, GoI accorded EC and CRZ Clearance for the subject proposal of DPA dated 19/2/2020. Accordingly, implementation of the remaining projects (Project at Sr.no. 2 to 5 No construction activity started yet) will be carried out as per the EC and CRZ Clearance accorded by the MoEF and CC,GoI.		Date: 22/11/2025
5	Statutory compliance	The Project proponent would submit a certificate from Gujarat Water Supply and Sewerage Board (GWSSB) for providing required water. This should be submitted with the first compliance report.
PPs Submission: Agreed to Comply The work of project at Sr. No. 1 of EC i.e. Setting up of Oil jetty no. 7 is Completed and it is under operation w.e.f January 2023. The required water supply is purchased from GWSSB. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.		Date: 22/11/2025
6	Marine/Coastal	The Project proponent shall ensure that no creeks or rivers are blocked due to any activities at the project site and free flow of water is maintained.
PPs Submission: Agreed to Comply The work of project at Sr. No. 1 of EC i.e. Setting up of Oil jetty no. 7 is Completed and it is under		Date: 22/11/2025

operation w.e.f January 2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.			
7	Marine/Coastal	Dredging shall not be carried out during the fish breeding season.	
PPs Submission: Agreed to Comply The work of project at Sr. No. 1 of EC i.e. Setting up of Oil jetty no. 7 is Completed and it is under operation w.e.f January 2023. The Capital Dredging w.r.t. OJ 7 also completed in June 2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.			Date: 22/11/2025
8	Marine/Coastal	Dredging, etc shall be carried out in the confined manner to reduce the impacts on marine environment.	
PPs Submission: Complied The work of project at Sr. No. 1 of EC i.e. Setting up of Oil jetty no. 7 is Completed and it is under operation w.e.f January 2023. The Capital Dredging w.r.t. OJ 7 also completed in June 2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.			Date: 22/11/2025
9	Marine/Coastal	Dredged material shall be disposed safely in the designated areas.	
PPs Submission: Complied The work of project at Sr. No. 1 of EC i.e. Setting up of Oil jetty no. 7 is Completed and it is under operation w.e.f January 2023. The Capital Dredging w.r.t. OJ 7 also completed in June 2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with			Date: 22/11/2025
10	Marine/Coastal	Shoreline should not be disturbed due to dumping. Periodical study on shore line changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six monthly monitoring report.	
PPs Submission: Complied The work of project at Sr. No. 1 of EC i.e. Setting up of Oil jetty no. 7 is Completed and it is under operation w.e.f January 2023. The Capital Dredging w.r.t. OJ 7 also completed in June 2023. No activity started yet for other projects mentioned at Sr. no. 2 to 5. DPA issued work order vide no. EG/WK/4751/Part (EC- Shoreline study) Dated: 12/10/2021 to NCSCM, Chennai for Shoreline Change Study for Deendayal Port Trust, Kandla, Kachchh District, Gujarat, to Study the Effect of Dumping, if any reg. Final Report submitted by the NCSCM, Chennai had already been submitted with the compliance report communicated vide letter dated 11/07/2022.			Date: 22/11/2025
11	Marine/Coastal	The ground water shall not be tapped within the CRZ areas by the PP to meet with the water requirement in any case.	
PPs Submission: Complied The work of project at Sr. No. 1 of EC i.e. Setting up of Oil jetty no. 7 is Completed and it is under operation w.e.f January 2023. Required water supply is purchased from GWSSB. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with			Date: 22/11/2025
12	Marine/Coastal	While carrying out dredging, an independent monitoring shall be carried out by Government Agency/Institute to check the impact and necessary measures shall be taken on priority basis if any adverse impact is observed.	
PPs Submission: Complied The work of project at Sr. No. 1 of EC i.e. Setting up of Oil jetty no. 7 is Completed and it is under operation w.e.f January 2023. The Capital Dredging w.r.t. OJ 7 also completed in June 2023. As			Date: 22/11/2025

already informed, DPA appointed IIT-Mumbai as an Independent agent for monitoring the same And report of same has been submitted along with earlier compliance report.		
13	Statutory compliance	A copy of the Marine and riparian biodiversity management plan duly validated by the State Biodiversity Board shall be submitted before commencement of implementation.
PPs Submission: Complied A copy of Report entitled Holistic Marine Ecological Monitoring of Deendayal Port Environment with Special Reference to Biodiversity and Preparation of Management Plan prepared by M/s GUIDE,Bhuj and validated by Gujarat State Biodiversity Board vide letter dated 24/12/2019 had already been submitted vide DPA letter dated 29/8/2020 - Submission of Detail asked by Regional Office, Western Zone MoEF and CC, GOI Bhopal vide letter dated 30/05/2020.		Date: 22/11/2025
14	Marine/Coastal	A continuous monitoring programme covering all the seasons on various aspects of the coastal environs need to be undertaken by a competent organization available in the State or by entrusting to the National Institutes/renowned Universities with rich experiences in marine science aspects. The monitoring should cover various physico-chemical parameters coupled with biological indices such as microbes, plankton, benthos and fishes on a periodic basis during construction and operation phase of the project. Any deviations in the parameters shall be given adequate care with suitable measures to conserve the marine environment and its resources.
PPs Submission: Being Complied DPA assigned work to M/s GUIDE, Bhuj, vide work order dated 3/5/2021 for Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and Marine sediment samples coupled with biological indices, as per the requirements of EC and CRZ Clearances reg. (for three years (2021-2024)). The copy of the final reports has already been submitted with the last six-monthly compliance report submitted earlier. In continuation of the same, DPA assigned work to M/s GUIDE, Bhuj, vide work order dated 10/6/2024 for Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and Marine sediment samples coupled with biological indices, as per the requirements of EC and CRZ Clearances reg. (for three years (2024-2027)). A copy of final report is attached herewith as Annexure B		Date: 08/12/2025
15	Marine/Coastal	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components as part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity.
PPs Submission: Being Complied DPA assigned work to M/s GUIDE, Bhuj, vide work order dated 3/5/2021 for Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and Marine sediment samples coupled with biological indices, as per the requirements of EC and CRZ Clearances reg. (for three years (2021-2024)). The copy of the final reports has already been submitted with the last six-monthly compliance report submitted earlier. In continuation of the same, DPA assigned work to M/s GUIDE, Bhuj, vide work order dated 10/6/2024 for Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and Marine sediment samples coupled with biological indices, as per the requirements of EC and CRZ Clearances reg. (for three years (2024-2027)). A copy of final report is attached herewith as Annexure B		Date: 08/12/2025

16	Risk Mitigation and Disaster Management	The project proponents would also draw up and implement a management plan for the prevention of fires due to handling of coal.

PPs Submission: Complied Deendayal Port Authority issued a Circular (SOP) to the trade with regard to control of dust pollution arising out of coal handling and ensuring safety in coal handling (circular no. TF/SH/Circulars/2019/1256 dated 10/10/2019). A copy of circular is submitted along with compliance report submitted on 03/10/2023. Further, an additional circular addressing coal-handling related environmental compliance and GPCB requirements was issued on 07/05/2025, bearing Circular No. TF/SH/GPCB/2019-N/434, which is attached herewith as Annexure C. DPA already installed Sprinkling system inside Cargo Jetty area for Coal Dust Suppression in Coal Yard (40 Ha. area) at the cost of Rs. 14.44 crores. Continues water sprinkling is being carried out on the heap of coal, at regular intervals to prevent dusting, fire and smoke.	Date: 08/12/2025

17	WASTE MANAGEMENT	Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution which impacts marine life, particularly benthos. This shall be prevented by suitable precautions and also by providing necessary mechanisms to trap the spillage.

PPs Submission: Complied DPA is already having Oil Spill contingency plan and accordingly, necessary precautions will be taken to prevent spillage of Fuel/Engine oil and lubricants. A copy of updated oil spill contingency plan is Communicated along with compliance report submitted on 24/02/2025	Date: 22/11/2025

18	WASTE MANAGEMENT	Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986.

PPs Submission: Complied No industrial effluent is generated in the port area. Considering the smaller quantity of waste water generated as of now DPA is exploring possibilities of treating the same in bio toilets. DPA appointed GPCB approved vendors for collection of solid waste and they are collecting it regularly DPA has Appointed GEMI, Gandhinagar for the Preparation of Plan for Management of Plastic Wastes, Solid waste including C and D wastes, E wastes, Hazardous wastes including Biomedical . The work is completed. A copy final report submitted along with compliance report submitted on 24/02/2025. Further, for projects at Sr. No. 2 to 5, construction activity not yet started. However, the stipulated condition will be complied with.	Date: 22/11/2025

19	Risk Mitigation and Disaster Management	All the recommendations mentioned in the rapid risk assessment report, disaster management plan and safety guidelines shall be implemented

PPs Submission: Complied All the recommendations mentioned in the Rapid Risk Assessment Report, Disaster Management Plan and safety Guidelines will be implemented	Date: 22/11/2025

20	WASTE MANAGEMENT	Measures should be taken to contain, control and recover the accidental spills of fuel and cargo handle.

PPs Submission: Complied DPA already has an Oil Spill Contingency Plan. A copy of updated oil spill contingency plan submitted along with compliance report submitted on 24/02/2025.	Date: 22/11/2025

21	Risk Mitigation and Disaster Management	Necessary arrangement for general safety and occupational health of people should be done in letter and spirit.

PPs Submission: Complied DPA has included tender clause regarding the safety of all activities on the site.	Date:

		22/11/2025
22	PUBLIC HEARING	The commitments made during the Public Hearing conducted in 2013 for earlier project and recorded in the Minutes shall be complied with letter and spirit. A hard copy of the action taken shall be submitted to the Ministry
PPs Submission: Complied The commitments made during the Public Hearing conducted will be complied with letter and spirit. In this regard, the details of CSR Activities implemented as well as proposed are enclosed herewith as Annexure D.		Date: 08/12/2025
23	Statutory compliance	All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to the RO, MoEF and CC along with half yearly compliance report
PPs Submission: Complied Compliance of the mitigation measures suggested in the EIA report in the matrix format is attached herewith as Annexure E		Date: 08/12/2025
24	Corporate Environmental Responsibility	As per the Ministry's Office Memorandum F.No. 22-65/2017-IA.III dated 1stMay, 2018, the project proponent has proposed that an amount of Rs. 2.97 Crore (at 0.75 percent of project Cost) shall be earmarked under Corporate Environment Responsibility (CER) for the activities such as Drinking water, Sanitation, Health, Education, Skill Development Roads, Electrification including Solar Power, Scientific support and awareness to local farmers to increase yield of crop and fodder, Rain water harvesting, Soil Moisture Conservation work and Avenue plantation and plantation in community areas. The activities proposed under CER shall be restricted to the affected area around the project. The entire activities proposed under the CER shall be treated as project and shall be monitored. The monitoring report shall be submitted to the Regional Office as a part of half yearly compliance report, and to the District Collector. It should be posted on the website of the project proponent
PPs Submission: Being Complied Out of 5 projects, only work of Oil Jetty no. 7 is completed and it is under operation w.e.f January 2023. DPA has appointed GEMI Gandhinagar for the work of Planning and Monitoring of the activities to be under Environment management plan (EMP) under EIA and EC. Vide work order dated 01/11/2023. The work is completed and final report is attached herewith as Annexure F		Date: 08/12/2025

General Conditions

Sr.No.	Condition Type	Condition Details
1	WATER QUALITY MONITORING AND PRESERVATION	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.
PPs Submission: Agreed to Comply Point noted		Date: 22/11/2025
2	MISCELLANEOUS	Full support shall be extended to the officers of this Ministry/ Regional Office at Bhopal by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation

		measures and other environmental protection activities.
PPs Submission: Agreed to Comply It is assured that full support will be extended to the officers of this Ministry/Regional Office at Gandhinagar by the project proponent during inspection of the project for monitoring purposes.		Date: 22/11/2025
3	Statutory compliance	A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bhopal regarding the implementation of the stipulated conditions.
PPs Submission: Being Complied DPA has been regularly submitting six monthly monitoring report to the Regional Office at Bhopal/Gandhinagar regarding implementation of the stipulated conditions.		Date: 22/11/2025
4	Statutory compliance	Ministry of Environment, Forest and Climate Change or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.
PPs Submission: Agreed to Comply Point noted		Date: 22/11/2025
5	Statutory compliance	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry.
PPs Submission: Agreed to Comply Point noted		Date: 22/11/2025
6	MISCELLANEOUS	In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment, Forest and Climate Change.
PPs Submission: Agreed to Comply Point noted		Date: 22/11/2025
7	MISCELLANEOUS	The project proponents shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.
PPs Submission: Complied For one of the project out of 5 projects i.e. Construction of Oil Jetty No. 7, the Board of Trustees of DPA vide Resolution No. 25 in its meeting held on 08/06/2015 approved the project (Block estimate - 72 Crores). Accordingly, the work for construction of the Oil Jetty No. 7 started on 24/03/2020 now, it is under operation w.e.f January 2023.		Date: 22/11/2025
8	Statutory compliance	A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion/ representation has been made received while processing the proposal.
PPs Submission: Complied No such representations have been received. Hence, not applicable.		Date: 22/11/2025
9	Statutory compliance	A copy of this clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The Clearance letter shall also be displayed at the Regional Office, District Industries centre and Collector's Office/ Tehsildar's office for 30 days.

PPs Submission: Complied --		Date: 22/11/2025
10	Statutory compliance	Consent to Establish/Operate for the project shall be obtained from the State Pollution Control Board as required under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.
PPs Submission: Complied The Consent to Establish (CTE) from the GPCB had already been obtained vide CTE No. 74134 granted by the GPCB vide letter no. PC/CCA-KUTCH 1319/GPCB ID 48573 dated 27/11/2015. Subsequently, DPA obtained EC to CTE (PCB ID 48573) vide GPCB Order dated 13/10/2020 after obtaining Environmental and CRZ Clearance from MoEF and CC, GoI vide F. No. 11-13/2015-IA-III dated 19/02/2020. The copy of EC to CTE also obtained from the GPCB In addition to this as the construction work for the project at Sr 1 is completed and it is under operation w.e.f January 2023 therefore CCA has obtained from the Gujarat Pollution Control Board vide GPCB/CCA-Kutch-1319/ID-48573/701442 dated 20/01/2023. Copy of same is submitted along with compliance report submitted on 03/10/2023.		Date: 22/11/2025
11	Statutory compliance	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.
PPs Submission: Agreed to Comply Point Noted for the compliance.		Date: 22/11/2025
12	Statutory compliance	The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental and CRZ Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment, Forest and Climate Change at http://www.envfor.nic.in. The advertisement should be made within Seven days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bhopal.
PPs Submission: Complied DPA has already given advertisement in two local newspapers viz. KUTCHMITRA (In Gujarati) dated 23/2/2020 and in the Indian Express (In English) dated 23/02/2020 and also forwarded to the Regional Office , MoEF and CC,Bhopal vide letter dated 28/2/2020 (Submitted along with the compliance report submitted on 03/05/2023)		Date: 22/11/2025
13	Statutory compliance	This clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.
PPs Submission: Agreed to Comply Point noted.		Date: 22/11/2025
14	Statutory compliance	Any appeal against this clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

PPs Submission: Agreed to Comply Point noted.		Date: 22/11/2025
15	Statutory compliance	Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent in its website.
PPs Submission: Being Complied DPA regularly uploads the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website www.deendayalport.gov.in		Date: 22/11/2025
16	Statutory compliance	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parisad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.
PPs Submission: Complied No suggestions/representation received. Public Hearing exempted. Copy of the EC letter has been uploaded in the website of DPA www.deendayalport.gov.in		Date: 22/11/2025
17	Statutory compliance	The proponent shall upload the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF and CC, the respective Zonal Office of CPCB and the SPCB.
PPs Submission: Being Complied DPA regularly uploads the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website www.deendayalport.gov.in.		Date: 22/11/2025
18	Statutory compliance	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF and CC, the respective Zonal Office of CPCB and the SPCB
PPs Submission: Being Complied DPA is regularly submitting the report of compliance of the stipulated Clearance conditions including results of monitored data to the IRO Gandhinagar and copy to Office of MoEF and CC, GPCB, CPCB. Last compliance submitted on 17/07/2025.		Date: 26/11/2025
19	Statutory compliance	The environmental statement for each financial year ending 31stMarch in Form V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of Clearance conditions and shall also be sent to the respective Regional Office of MoEF and CC by e-mail.
PPs Submission: Agreed to Comply Point Noted.		Date: 22/11/2025
20	Statutory compliance	The above stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance)

		Act, 1991 and EIA Notification 1994, including the amendments and rules made thereafter

PPs Submission: Agreed to Comply Point Noted.	Date: 22/11/2025

Visit Remarks

Last Site Visit Report Date:	N/A
Additional Remarks:	

Note: This acknowledgement is as per the details submitted by project proponent. In no way is this document to be considered as conclusion on any action on the compliance of the project. This is strictly for the project proponent's reference purpose.

Annexure–A

Subject: Point-wise Compliance Status Report for CRZ Clearance for Developing Integrated facilities (Phase-II)- within the existing Kandla Port at Kandla Dist: Kutch by M/s. Kandla Port Trust – Regarding (<u>for the period from April, 2025 to September, 2025</u>)

1. **Setting up of Oil Jetty No.7**
2. **Setting up of Barge jetty at Jafarwadi**
3. **Setting up of Barge port at Veera**
4. **Administrative office building at Tuna Tekra**
5. **Road connecting from Veera barge jetty to Tuna gate**

Ref No: - GCZMA CRZ recommendation vide Letter No- <u>ENV-10-2015-251-E (T Cell)</u> dated 29.06.2016

S No	CRZ Conditions	Compliance Status
	SPECIFIC CONDITIONS	
1.	The provision of the CRZ notification 2011 shall be strictly adhered to by the KPT. No activity in contradiction to the provision of the CRZ notification shall be carried out by the KPT.	The work of project at Sr. No. 1 of EC i.e. ***"Setting up of Oil jetty no. 7"*** is Completed and it is under operation w.e.f January 2023. The Consent to Operate (CCA) from the Gujarat Pollution Control Board has already been obtained dated 20/1/2023 **<u>Copy submitted along with the compliance report submitted on 03/10/2023.</u>** However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that, the provisions of the CRZ Notification, 2011 will be strictly adhered to by DPA
2.	All necessary permissions under various laws/Rules/Notifications issued thereunder from different Government Department/agencies shall be obtained by M/s. KPT before commencing any enabling activities for proposed project.	The Consent to Establish (CTE) from the GPCB had already been obtained vide CTE No. 74134 granted by the GPCB vide letter no. PC/CCA-KUTCH 1319/GPCB ID 48573 dated 27/11/2015. In addition to this as the construction work for the project at Sr 1 is completed and it is under operation w.e.f January 2023 therefore CCA has obtained from the Gujarat Pollution Control Board vide GPCB/CCA- Kutch-1319/ID-48573/701442 dated 20/01/2023. **<u>Copy submitted along with the compliance report submitted on 03/10/2023.</u>**
3.	The KPT shall have to ensure that there shall not be any damage to the existing mangrove area.	The construction work for the project at Sr 1 is completed and it is under operation w.e.f January 2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that, there shall not be any damage to the existing mangrove area
4.	The KPT shall effectively implement the mangrove Development, Protection & Management plan for control of indirect impacts on mangrove habitat	DPA has undertaken Mangrove Plantation in an area of 1650 Hectares since the year 2005. carried out through various agencies. The copy of the details has already been communicated with the earlier compliance reports submitted. In addition to the above, DPA appointed M/s GUIDE, Bhuj, for "Regular Monitoring of Mangrove Plantation carried out by DPA" (period 15/9/2017 to 14/9/2018 vide work order dated 1/9/2017 and 24/5/2021 to 23/5/2022 vide work order dated 3/5/2021). The final report submitted by M/s GUIDE, Bhuj, for the years 2017 to 2018 as well as for the year 2021 to 2022 has been submitted in the earlier compliance report submitted. Further, vide work order dated 10/06/24 DPA appointed M/s GUIDE, Bhuj, for "Regular Monitoring of Mangrove Plantation carried out by DPA" (Period 10/06/2024 to 09/06/2025). The work has completed and the final report submitted by GUIDE, Bhuj is attached herewith as **Annexure A.**

5.	The KPT shall have to make a provision that mangrove areas get proper flushing water and free flow of water shall not be obstructed	The construction work for the project at Sr 1 is Completed and it is under operation w.e.f January 2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that, provision will be made for mangrove areas will get proper flushing of water and free flow of water is not obstructed.
6.	The KPT shall have to dispose of the dredged material only after scientific study to be carried out by the Institute of National repute and at a location suggested by them.	The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. Capital Dredging at O.J. completed on 14/04/2023. It is submitted that, in compliance of specific condition no. xi of the EC dated 19/02/2020 DPA appointed IIT- Mumbai as an Independent agency for monitoring the dredging activities undertaken, vide work order no. HD/WK/1078/2022/OJ7/dredging/ENV610 dated 21/12/2022. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with.
7.	The KPT shall have to maintain the record for generation and disposal of capital dredging and maintenance dredging.	Point noted for the compliance.
8.	No dredging, reclamation or any other project related activities shall be carried out in the CRZ area categorized as CRZ I (i) and it shall have to be ensured that the mangrove habitats and other ecologically important and significant areas, if any, in the region are not affected due to any of the project activities	It is hereby assured that DPA will undertake only those activities recommended by the GCZMA vide letter dated 29/06/2016 and as permitted under the EC & CRZ Clearance accorded by the MoEF&CC, GoI, vide letter dated 18/02/2020. DPA has already prepared a comprehensive mangrove preservation plan for the entire Kandla area. In addition to the above, DPA appointed M/s GUIDE, Bhuj for "Regular Monitoring of Mangrove Plantation carried out by DPA" for the period 15/09/2017 to 14/09/2018 vide work order dated 01/09/2017, and again for the period 24/05/2021 to 23/05/2022 vide work order dated 03/05/2021. The final report for 2017–2018 was submitted along with the earlier compliance report, and the final report for 2021–2022 was submitted with the compliance report dated 03/05/2023. In continuation of the same, DPA has appointed M/s GUIDE, Bhuj for "Monitoring of Mangrove Plantation (1600 ha) carried out by DPA" for the period 10/06/2024 to 09/06/2025 vide work order dated 10/06/2024. A copy of the final report is attached herewith as **Annexure A**. Further, DPA had assigned to M/s GUIDE, Bhuj the work of "Regular Monitoring of Marine Ecology in and around Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the coastal environs, including physico-chemical parameters of marine water and marine sediment samples, coupled with biological indices, as per EC & CRZ clearance requirements," for the period 2021–2024. The final reports for this work have already been submitted along with the earlier compliance reports. In continuation of this activity, DPA has again assigned M/s GUIDE, Bhuj the work of "Regular Monitoring of Marine Ecology in and around Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the coastal environs, including physico-chemical parameters of marine water and marine sediment

		samples coupled with biological indices," for the period 2024–2027 vide work order dated 10/06/2024. A copy of the final report is attached herewith as **Annexure B**. It is relevant to mention that DPA has already undertaken mangrove plantation over an area of 1650 hectares since 2005. The detailed statement of mangrove plantation activities was submitted along with the compliance report dated 09/08/2024.
9.	The KPT shall participate financially for installing and operating the vessel traffic management system in the Gulf of Kutch and shall also take lead in preparing and operational sing the Regional Oil Spill Contingency plan in the Gulf of Kutch	DPA had already contributed an amount of Rs. 98.955 crore i.e 25% of the total project cost of 395.82 crore for installing and operating VTMS in Gulf of Kachchh
10.	The KPT shall strictly ensure that no creeks or rivers are blocked due to any activity at Kandla	The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that condition mentioned will be complied with
11.	Mangrove plantation in an area of 50 ha shall be carried out by the KPT within 2 years in a time bound manner on Gujarat coastline either within or outside the Kandla port Trust area and six-monthly compliance report along with the satellite images shall be submitted to the ministry of Environment and Forest as well as to this Department without fail.	DPA has signed MoU with Gujarat Ecology Commission, Gandhinagar to carry out mangrove plantation through PPP mode for the year 2020-2021. DPA (Erstwhile KPT) had already undertaken Mangrove Plantation in an area of 1650 Ha. till date since the year 2005. A statement showing details of the mangrove plantation and the cost incurred has already been submitted along with compliance report submitted on 09/08/2024 In addition to the above, DPA appointed M/s GUIDE, Bhuj, for "Regular Monitoring of Mangrove Plantation carried out by DPA" (period 15/9/2017 to 14/9/2018 vide work order dated 1/9/2017 and 24/5/2021 to 23/5/2022 vide work order dated 3/5/2021). The final report submitted by M/s GUIDE, Bhuj, for the years 2017 to 2018 has been submitted in the earlier compliance report, and the final report for the year 2021 to 2022 is Submitted along with the compliance report submitted on 03/05/2023. In continuation of same, DPA appointed M/s GUIDE, Bhuj, for "Monitoring of Mangrove Plantation 1600 ha carried out by DPA" (period 10/06/2024 to 09/06/2025 vide work order dated 10/6/2024. A copy final report is attached herewith as **Annexure A**
12.	No activity other than those permitted by the competent authority under the CRZ Notification Shall be carried out in the CRZ area.	The construction work for the project at Sr 1 is completed and it is under operation. The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. The Consent to Operate (CCA) from the Gujarat Pollution Control Board has already been obtained dated 20/1/2023 .Copy of same is already submitted in the earlier compliance report submitted on 03/10/2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet), it is assured that, no activity other than those permitted by the competent authority under the CRZ Notification Shall be carried out in the CRZ area
13.	No ground water shall be tapped for any purpose during the proposed expansion/modernization activities.	The work of project at Sr. No. 1 of EC i.e. "Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023 required water supply is purchased from GWSSB. However, for other projects mentioned at Sr. no. 2 to 5 (no

		construction activities started yet), it is assured that condition mentioned will be complied with.
14.	All necessary permissions from different Government Departments/agencies shall be obtained by the KPT before commencing the expansion activities.	DPA had already obtained the necessary EC & CRZ clearance for the project on dated 19/02/2020. Further, Consent to establish from GPCB had already been obtained from GPCB for the same. Subsequently, DPA obtained EC to CTE (PCB ID 48573) vide GPCB Order dated 13/10/2020 after obtaining Environmental and CRZ Clearance from MoEF&CC, GoI vide F. No. 11- 13/2015-IA-III dated 19/02/2020 In addition to this as the construction work for the project at Sr 1 is completed and it is under operation w.e.f January 2023 therefore CCA has obtained from the Gujarat Pollution Control Board vide GPCB/CCA- Kutch-1319/ID-48573/701442 dated 20/01/2023. Copy of same is already submitted in the earlier Compliance report submitted on 03/10/2023.
15.	No effluent or sewage shall be discharged into the sea/creek or in the CRZ area and it shall be treated to confirm to the norms prescribed by the Gujarat Pollution Control Board and would be reused/recycled with in the plant premises.	In this regard, it is to state that, DPA is in process to install bio toilets at the oil jetty area. DPA has been conducting regular monitoring of Environmental parameters through NABL Accredited laboratory since the year 2016 in continuation of this DPA appointed M/s Gujarat Environment Management Institute (GEMI), Gandhinagar (NABL Accredited laboratory) for regular Monitoring of environmental parameters vide work order dated 15/02/2023. The work is in progress & DPA is submitting the monitoring data regularly to all the concerned authorities along with compliance reports submitted. The latest Environmental Monitoring Reports is enclosed herewith as **Annexure C.** Further, necessary provisions will be made for the projects at Sr. No. 2 – 5 to not discharge effluent or sewage into the sea/creek or in CRZ area
16.	All the recommendations and suggestions given by the Mantec Consultant Pvt. Ltd. New Delhi in their Comprehensive Environment Impact Assessment report for conservation/protection and betterment of environment shall be implemented strictly by the KPT.	DPA has installed Mist Canon at the Port area to minimize the dust Further, DPA has already installed continuous sprinkling system to prevent dust pollution. Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done. Regular sweeping of spilled cargo from roads is done by parties on regular basis. DPA has been conducting regular monitoring of Environmental parameters through NABL Accredited laboratory since the year 2016 in continuation of this DPA appointed M/s Gujarat Environment Management Institute (GEMI), Gandhinagar (NABL Accredited laboratory) for regular Monitoring of environmental parameters vide work order dated 15/02/2023. The work is in progress & DPA is submitting the monitoring data regularly to all the concerned authorities along with compliance reports submitted. The latest Environmental Monitoring Reports is enclosed herewith as **Annexure C.** For ship waste management, DPA issued Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" and "Dry Solid Waste (Non- Hazardous)" from Vessels calling at Deendayal Port" through DPA contractors Further, it is to state that, all ships are required to follow DG

		Shipping circulars regarding the reception facilities at Swachch Sagar portal DPA assigned work to M/s GUIDE, Bhuj, for regular monitoring of Marine Ecology since the year 2017 (From 2017 – 2021), and reports of the same are being submitted regularly to the Regional Office, MoEF&CC, GoI, Gandhinagar as well as to the MoEF&CC, GoI, New Delhi along with compliance reports submitted. The final report for the Holistic Marine Ecological Monitoring for the period up to May 2021 was submitted on 22.05.2021. Copy of the report was communicated vide earlier compliance report submitted vide letter dated 29/6/2021 Further, it is to submit that DPA issued a work order to M/s GUIDE vide its letter no. EG/WK/ 4751 /Part (Marine Ecology Monitoring) /11 dated 03/05/2021 for Regular monitoring of Marine Ecology in and around Deendayal Port Authority (Erstwhile Deendayal Port Trust) and continuous Monitoring Program covering all seasons on various aspects of the Coastal Environs for the period 2021-24. The copy of the final reports has already been submitted along with compliance report submitted earlier. In continuation of the same, DPA had assigned the work to M/s GUIDE, Bhuj for "Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and marine sediment samples coupled with biological indices as per the requirements of EC & CRZ Clearances reg. (for three years (2024-2027) vide its work order dated 10/06/2024. Copy of final report is attached herewith as **Annexure B** As already informed, DPA entrusted work of green belt development in and around the Port area to the Forest Department, Gujarat at Rs. 352 lakhs (Area 32 hectares). The work is completed DPA has appointed Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May, 2022. The work completed. A copy of Final report is submitted along with the compliance report submitted on 03/10/2023. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The work is completed and final report is communicated along with compliance report submitted on 24/02/2025 Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase III) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 5000 saplings at DPA and 200 saplings at Gopalpuri colony. The inception report is attached herewith as **Annexure D**. For dredged material management, DPA assigned work to

		M/s GUIDE, Bhuj for analysis of dredged material since the year 2017 and the reports are being submitted from time to time along with compliance reports submitted DPA assigned work to M/s GUIDE, Bhuj for analysis of dredged material since the year 2017 and the reports are being submitted from time to time along with compliance reports submitted. The work is completed and final report for the year 2023-2024 has attached and submitted along with compliance report submitted on 02/06/2025 In continuation of same, DPA had issued work order to GUIDE, Bhuj for Study on dredged material for presence of Contaminants for year 2024-2027 vide work order dated 07/10/2024. The Copy of 2nd season report is attached herewith as **Annexure E** Further, Dredged Material will be disposed of at designated location as identified by the CWPRS, Pune For energy conservation measures, DPA is already generating 20.7 MW installed capacity of Wind energy. In addition to it, DPA has commissioned a 45 kWP Solar Plant at Gandhidham. Further, it is relevant to mention that, two out of four Nos. of Harbour Mobile Crane (HMC) made electric operated. Balance 02 Nos. shall be made electric operated by 2025 end. Four Nos. of Deisel operated RTGs converted to e-RTGs. Retrofitting of hydrogen fuel cell in Tug Kalinga and Pilot Boat Niharika to be done as a pilot project under the guidance of MoPSW. Also, 14 Nos. of EV cars to be hired in this year and Hydrogen Buses to be procured in the year 2025-26. Further, for Oil Spill Management, DPA is already having Oil Spill Contingency Plan in place and Oil Response System as per the NOS-DCP guidelines. Copy already submitted along with compliance report submitted on 24/02/2025.
17.	The construction and operational activities shall be carried out in such a way that there is no negative impact on mangrove and other coastal/marine habitats. The construction activities and dredging shall be carried out only under the constant supervision and guidelines of the Institute of National repute like NIOT	The construction work for the project at Sr 1 is completed and it is under operation w.e.f January 2023 and due care is being taken for so that, there is no negative impact on mangrove and other coastal/marine habitats. Further, for project at Sr. No. 2 to 5 (Construction not yet started); however, the specified condition will be complied with
18.	The KPT shall contribute financially for any common study or project that may be proposed by this Department for environmental management/conservation /improvement for the Gulf of Kutch	Point noted for the compliance.
19.	The construction debris and/or any other type of waste shall not be disposed of into the sea, creek or in the CRZ areas. The debris shall be removed from the construction site immediately after the construction is over.	The work of project at Sr. No. 1 of EC i.e. ***"Setting up of Oil jetty no. 7"*** is Completed and it is under operation w.e.f January 2023. The Consent to Operate (CCA) from the Gujarat Pollution Control Board has already been obtained dated 20/1/2023. Copy of same submitted along with compliance report submitted on 03/10/2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet) DPA had already issued general circular vide dated 3/9/2019 regarding Construction and Demolition Waste Management for strict implementation in DPA. Copy is already submitted during the compliance report submitted on 03/05/2023

20.	The construction camps shall be located outside the CRZ area and the construction labour shall be provided with the necessary amenities, including sanitation, water supply and fuel and it shall be ensured that the environmental conditions are not deteriorated by the construction labours.	The work of project at Sr. No. 1 of EC i.e. ***"Setting up of Oil jetty no. 7***" is Completed and it is under operation w.e.f January 2023. The Consent to Operate (CCA) from the Gujarat Pollution Control Board has already been obtained dated 20/1/2023 Copy of same is already submitted in the earlier compliance report submitted on 03/10/2023. However, for other projects mentioned at Sr. no. 2 to 5 (no construction activities started yet) the condition will be complied with
21.	The KPT shall regularly update their Local oil spill contingency and disaster management plan in consonance with the National oil Spill and Disaster Contingency plan and shall submit the same to this Department after having it vetted through the Indian Coast Guard.	DPA already has updated Disaster management plan and Local oil spill contingency plan. Copy already submitted along with compliance report submitted on 24/02/2025. DPA has also executed MOU with Oil companies, i.e., IOCL, HPCL, BPCL etc, for setting up of Tier I facility for combating the Oil Spill at Kandla.
22.	The KPT shall bear the cost of the external agency that may be appointed by this Department for supervision/monitoring of proposed activities and the environmental impacts of the proposed activities.	Point noted for the compliance.
23.	The KPT shall take up massive green belt development activities in and around Kandla and also within the KPT limits.	DPA assigned work for green belt development in an area of about 32 hectares to the Forest Department, Govt. of Gujarat, in August 2019 at the cost of Rs. 352.32 lakhs. The work is completed. Further, DPA also undertook massive green belt development in and around the Port area and at the Gandhidham area. DPA has appointed Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-I)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May, 2022. The work completed. A copy of Final report is submitted along with the compliance report submitted on 03/10/2023. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The work is completed and copy of final report submitted along with compliance report submitted on 24/02/2025. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase III) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 5000 saplings at DPA and 200 saplings at Gopalpuri colony. The inception report is attached herewith as **Annexure D**.
24.	The KPT shall have to contribute financially for taking up the socio-economic upliftment activities in this region in consultation with the Forests and Environment Department and the District Collector/District development officer.	DPA has already been undertaking CSR activities. The details of CSR Activities implemented as well as proposed are enclosed herewith as **Annexure F.**
25.	A separate budget shall be earmarked for environmental management and socio-economic activities and details there of shall be furnished to this Department as well as the MoEF,GOI. The details with respect to the expenditure from this budget head shall also be furnished.	DPA has already kept Rs. 585 lakhs in RBE. 2024-25 under the scheme "Environmental Services & Clearance thereof".

26.	A separate environmental management cell with qualified personnel shall be created for environmental monitoring and management during construction and operational phases of the project.	-DPA is already having Environment Management cell. Further, DPA has also appointed expert agency for providing Environmental Experts from time to time. DPA appointed M/s Precitech Laboratories, Vapi for providing Environmental Experts vide work order dated 4/10/2024 (Copy of work order is attached herewith as **Annexure G**. In addition, it is relevant to submit here that, DPA has appointed a Chief Manager (Environment and Safety) and two Managers (Environment and Safety) on contractual basis for the period of 3 years and further extendable to 2 years (Copy of duty report is attached herewith as **Annexure H**. Further, DPA had assigned the work of monthly environmental monitoring to M/s A 2 Z Envirotech vide Work Order dated 15/09/2022. The copy of the monitoring report has already been communicated with the earlier compliance report submitted. Recently, DPA has assigned the work of monthly environmental monitoring to GEMI, Gandhinagar for a period of 3 years vide letter dated 18/04/2023. The work is in progress and the latest monitoring report submitted by GEMI is attached herewith as **Annexure C**.
27.	An Environmental report indicating the changes if any, with respect to the baseline environmental quality in the coastal and marine environment shall be submitted every year by the KPT to this Department as well as to the MoEF&CC,GOI	DPA has been conducting regular monitoring of Environmental parameters through NABL Accredited laboratory since the year 2016 in continuation of this DPA appointed M/s Gujarat Environment Management Institute (GEMI), Gandhinagar (NABL Accredited laboratory) for regular Monitoring of environmental parameters vide work order dated 15/02/2023. The work is in progress & DPA is submitting the monitoring data regularly to all the concerned authorities along with compliance reports submitted. The latest Environmental Monitoring Reports is enclosed herewith as **Annexure C.** DPA has been submitting the environmental monitoring report along with the compliance report to IRO, MoEF&CC, GoI
28.	The KPT shall have to contribute financially to support the National Green Corps Scheme being implemented in Gujarat by the GEER foundation. Gandhinagar in consultation with Forests and Environment Department.	Point noted for the compliance.
29.	A six monthly report on compliance of the conditions mentioned in this letter shall have to be furnished by the KPT on regular basis to this Department/MoEF&CC,GOI	DPA has been regularly submitting a six-monthly report in compliance with the conditions mentioned to GCZMA and MoEF&CC, GOI. Last compliance submitted on 17/07/2025.
30.	Any other condition that may be stipulated by this Department and MoEF&CC,GoI from time to time for environmental protection / management purpose shall also have to be complied with by DPT.	Point noted.

Annexure–B

First Year - Annual Report
(2024-2025)

Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme

Submitted to

DEENDAYAL PORT AUTHORITY

DEENDAYAL PORT AUTHORITY
Administrative Office Building
Post Box No. 60, Gandhidham (Kuchchh)
Gujarat-370201

Submitted by

Gujarat Institute of Desert Ecology
P.O Box No. #83, Opp. Changleshwar Temple,
Mundra Road Bhuj - 370001
Gujarat - India

May 2025

First Year - Annual Report
(2024-2025)

Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme

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Mundra Road Bhuj - 370001
Gujarat - India

May 2025

Gujarat Institute
of Desert Ecology

Dr. V. Vijay Kumar
Director

CERTIFICATE

This is to state that this final report of work entitled "**Regular monitoring of Marine ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme**" has been prepared as per the work order issued by DPA vide no :EG/WK/4751/Part (Marine Ecology Monitoring)/72 dt.10.06.2024 for the period 2024-2025 as per EC and CRZ clearance accorded by the MOEF& CC, GOI dated 19.12.2016,18.2 2020.19.2.2022 and 20.11.2020 with specific conditions xviii, xxiii, xv iv and xxv respectively.

Authorized signatory

Gujarat Institute of Desert Ecology
Bhuj
Institute seal

P.O. Box No. 83, Opp. Omnageshwar Temple, Mundra Road, Bhuj (Kachchh) - 370 001, Gujarat (India)
Tel : 02832 - 235025-29
www.gujaratdesertecology.com, E-mail : desert_ecology@yahoo.com

Project Coordinator

Dr. V. Vijay Kumar, Director

Principal Investigator		
Dr. Durga Prasad Behera	Scientist	Phytoplankton & Zooplankton, Physico-chemical parameters, Seaweed, Seagrass , halophytes, Marine Fisheries and Intertidal fauna
Co-Principal Investigator		
Dr. Kapilkumar Ingle	Project Scientist	Mangrove Ecology
Dr. Dhara Dixit	Project Scientist	Physico-chemical
Team Member		
Dr. L. Prabha Devi	Advisor	Management Plan
Dr.S.K Sajan	Scientist	Avifauna
Mr. Viral. D. Vadodariya	Project Fellow	Avifauna
Mr. Dayesh Parmar	Project officer	GIS & Remote sensing
Mr. Rupak Kumar Dey	Project Scientist	GIS & Remote sensing
Mr. Samir Mashru	Project assistant	Physico-chemical& Macrobenthos
Ms, Shivani Singh	Project assistant	Physico-chemical& Biological

Abstract May-2024 to May 2025

S. No	Components of the Study	Remarks
1	**MoEF & CC Sanction Letter and Details**	• EC & CRZ clearance granted by the MoEF &CC, GoI dated 19/12/16 Dev. Of 7 integrated facilities – specific condition no. xviii. • EC & CRZ clearance granted by the MoEF &CC, GoI dated 18/2/2020 Dev. Remaining 3 integrated facilities – specific condition no. xxiii. • EC & CRZ clearance granted by the MoEF &CC, GoI dated 19/2/2020 Dev. integrated facilities (Stage II-5 -specific condition no. xv. • EC & CRZ clearance granted by the MoEF &CC, GoI dated 20/11/20 – Creation of waterfront facilities (OJ 8 to 11- Para VIII Marine Ecology, specific condition iv. • EC& CRZ clearance granted by MoEF CC , GOI dated 1/1/2024 augmentation of iquid cargo handling facility specific condition no XXV.
2	Deendayal Port letter Sanctioning the Project	DPA work Order: WK/4751/Part/ (Marine Ecology Monitoring)/72
3	Duration of theProject	Three years-from 24.05.2021 to 23.05.2024
4	Period Of Survey Carried out	Three years-from 2024-2027
5	Survey Area Within the Port limit	All major and minor creek systems from Tuna to Surajbari and Vira coastal area.
6	Number of sampling locations	Fifteen sampling locations in and around DPA port jurisdiction
7	**Components of the report**	
7a	**Mangroves**	During the monsoon 2024, the overall average tree density recorded was 2,189 trees/ha, with Tuna Creek exhibiting the highest mean density (2,535 trees/ha) and S-6 having the highest individual density (3,673 trees/ha). During post-monsoon 2024-2025, the overall tree density recorded as 1,986 trees/ha, with Kharo Creek leading at 2,788 trees/ha and S-6 remaining the densest (3,156 trees/ha). During pre-monsoon 2025, the overall tree density recorded was 1,907 trees/ha and S-6 continued to show the highest density (3,113 trees/ha), with an impressive 6,774 trees per hectare

7b	**Mudflats**	The sediment organic carbon of DPA varied from may 2024 to May 2025 was 0.5% to 3.2 % with average variation of 1.8% to 2.5%. Through out season the highest percentage of organic carbon was observed in post-monsoon followed by monsoon and pre-monsoon. The sediment bulk density varied from 1.10 gm/cm3 to 1.89 gm/cm3 with overall average variation of 1.21 gm/cm3 to 1.68 gm/cm3 . Highest bulk density was observed in Pre-monsoon followed by post-monsoon and post-monsoon

	Phytoplankton	The density of different phytoplankton group varied from 4000 No/L to 24320 No/L with average variation of 7,627 No/L to 24, 320. Highest phytoplankton density was observed in post-monsoon followed by Pre-monsoon and Monsoon. During monsoon 15 genera such as *Cheatoceros, Coscinodiscus, Dictylum, Eucampia, GyrosigmaMelosira, Navicula, Nitzschia, Odontella, Pleurosigma, Pseudonitzschia, Rhizosolenia, Synedra, Thalassionema, Thalassiothrix* represent 100% of occurrence. But in Post-monsoon and pre monsoon represent less number i.e 8 and 5 number of genera represent 100% of occurrence.
7c	**Zooplankton**	The density of zooplankton from May 2024 to May 2025was 8,000 No/L to 20,000 No/L with average variation of 7,653 No/L to 17,660 No/ L. Highest Zooplankton density was observed in Post-mon soon followed by pre-monsoon and Monsoon. 12 genera such as *Acartia, Acrocalanus, Bivalve larvae, Brachyuran larvae, Calanus, Cirripede nauplius, Codonellopsis, Eucalanus, Gastropod larvae,Globigerina, Microsetella, Tintinnopsis* occurred 100% of occurrence.
7d	**Intertidal Fauna**	The survey of the intertidal Fauna of DPA Kandla area recorded the presence of 4 phyla (Arthropoda, Chordata, Mollusca). The faunal diversity was the highest for phylum Mollusca followed by Arthropoda and Chordata respectively. The organism such as Austruca iranica, Austruca sindensis, and Austruca variegata contribute highest percentage of composition. The density of Intertidal organism among different station was varied from 17No/m2 to 133 No/m2 with overall variation in 3 season was 18 No/m2 to 97No/m2. Monsoon contribute highest density of organism followed by Pre- and Post-Monsoon.
7e	**Sub-tidal Macrobenths**	The number of macro benthic fauna of the various groups from the DPA port environment includes Annelida, Arthropoda, Mollusca and Nematoda. The average density and population of subtidal macrobenthos from May 2024 to May 2025 varied from 307 N0/m2 to 507 No./m 2 and 12 to 20 in number. In station wise density of subtidal macrobenthos varied from 25 no/m2 to 1150 no /m2 with average variation of 100 no/m2 to 754 no/m2 . Highest dinsith was observed in Pre-monsoon and lowest was observed during post-monsoon. The species such as *Mysis larvae, Nereis sp, Glauconome angulata* and *Pirenella cingulata* was dominated

7f	Seaweeds and Seagrasses	No species of sea weeds and sea grass was recorded from the the stations sampled.
7g	Halophytes	During the period of May 2024 to May 2025 four major halophytes were recorded along the selected study stations of Deendayal Port Authority sites during the 3 seasons, were Salicornia brachiata, Aeluropus lagopoides, Salvadora persica and Sesuvium portulacastrum. Maximum percentage coverage of halophytes belongs to species Salicornia brachiate shared highest percentage of coverage in all season (100%) followed Sesuviumportulacastrum (30-45%)
7h	**Mammals**	No species of mammals was recorded from the stations sampled
7i	**Reptiles**	During the Monsoon AND Post- period of 2024-2025 field surveys it was encounter at S-10 located in the Southern part of Sat Saida bet
7j	**Fisheries**	The major fish catch activity is carried out in extensive creek systems of Khari creek, Tuna creek, Navalakhi creek and Jhangi creek. For the period of period 2024-2025, cast net was operated in different creek system of Kandla and major fish catch was include during monsoon Mugil cephalus, is major catch within 10 minutes around 1 km of distance.
7k	**Avifauna**	A total of 64 species (34 species terrestrial and 30 aquatic bird) representing 11 order, 26 families and 46 genera were recorded during the study period. Among 64 species, only five species viz. Painted Stork Mycteria leucocephala (Pennant, 1769), Black-headed Ibis Threskiornis melanocephalus (Latham, 1790), Glossy Ibis Plegadis falcinellus (Linnaeus, 1766), Black-tailed Godwit Limosa limosa (Linnaeus, 1758) and Eurasian curlew Numenius arquata (Linnaeus, 1758) are under the Near Threatened

Comparison Study of Marine Biodiversity of Deendayal Port Authority (DPA) Since 2019-2025

Habitat/ Groups	Major Taxa/Genera/Species	Year		Year		Year			Year		
		2019-2020		2020-2021		May 2021- May 2022			May 2022- May 2023		
		Pre Monsoon	Post monsoon	Pre monsoon	Post monsoon	Monsoon	Post monsoon	Pre monsoon	Monsoon	Post monsoon	Pre monsoon
Mangroves	*Avicennia marina*, *Ceriops tagal*, *Rhizophora mucronata, Aegiceras corniculatum*	4	4	4	4	4	4	4	4	4	4
Intertidal Habitat	Gastropods, Bivalves, Crustaceans Polychaetes, fishes, amphipods and Isopods	19	10	10	12	21	16	16	14	14	13
Subtidal Habitat	Polychaetes, molluscs, crustaceans,echinoderms	26	28	30	48	22	22	11	14	21	32
Phytoplankton	*Bacillaria, Navicula, Nitzschia, Chaetoceros, Coscinodiscus, Triceratium, Bidulphia, Melosira, Thassiosira*	32	26	23	19	35	23	23	24-33	22-26	21-26
Zooplankton	Copepods, Harpacticoids, Cyclopoids. brachyurans, cirripedes, Bivalve veligers	33	36	29	27	42	35	42	41	45	40
Seaweeds	Nil (Drifted tufts only)	Nil	Nil	drifted	drifted	drifted	drifted	drifted	NIL	NIL	NIL

Habitat/ Groups	Major Taxa/Genera/Species	Year		Year		Year			Year		
		2019-2020		2020-2021		May 2021- May 2022			May 2022- May 2023		
		Pre-M	Post-M	Pre-M	Post-M	Monsoon	Post-M	Pre-M	Monsoon	Post-M	Pre-M
Sea grasses	Nil (Drifted tufts only)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Halophytes	*Sesuvium portulacastrum, Salvadora persica, Aeluropus*	3	4	4	4	4	4	4	4 Salicrnia dominance	4 Salicrnia dominance	5 Salicrnia dominance
Avifauna	Charadriiformes, Phoenicopteriformes, Pelecaniformes, Passeriformes	49	89	49	69	62	84	52	49	79	53
Fishes	*Mugil cephalus, Harpodon nehereus, Pampus argenteus, Hilsa, Engraulis, Coilia* sp. *Peneaus,Portunus,lobester*	10	8	5	4	7	5	7		160 kg	50 kg
Marine Mammals	Dolphin, *Sousa plumbea*	1	1	Nil	Nil	1	Nil	Nil	1	1	Nil
Reptiles in the	The saw-scaled viper, *Echis*	1	1	Nil	1	Nil	Nil	1	1	1	Nil

For the period May 2023 to May 2024

Habitat/ Groups	Major Taxa/Genera/Species	Year		
		May 2023- May 2024		
		Monsoon	Post monsoon	Pre monsoon
Mangroves	*Avicennia marina*, *Ceriops tagal*, *Rhizophora mucronata, Aegiceras corniculatum*	4	4	4
Intertidal Habitat	Annelida, Arthropoda, Chordata Mollusca	15	15	14
Subtidal Habitat	Annelida,Arthropoda,Mollusca Chordata	26	21	15
Phytoplankton	*Coscinodiscus* dominance in all season	20-25	8-27	11-20
Zooplankton	The phylum Arthropoda was the predominant represented 16 groups in monsoon and post-monsoon (9) and pre-monsoon it contain 6 group which mainly include Copepoda, Harpacticoida, Cyclopoida, Decapoda, Crab larvae and Malacostrac	29-36	15-36	15-31
Seaweeds	No observation of seaweed during the study period	NIL	NIL	NIL

Habitat/ Groups	Major Taxa/Genera/Species	Year		
		May 2023- May 2024		
		Monsoon	**Post monsoon**	**Pre monsoon**
Sea grasses		NIL	NIL	NIL
Halophytes	*Sesuvium portulacastrum*, , Aeluropus lagopoides, *Salicornia brachiata*, *Suaeda nudiflora*	Present	Present	Present
Avifauna	55 species, 71 species , 68 species	55 species 8 order,24 families 23 genera	71 species 9 orders 29 families 55 genera	68 species 8 orders 28 families 53 genera
Marine Mammals	*Sousa plumbea*	No observation	S-6 and S-11	No observation
Fishes	*Mugil cephalus, Planiliza klunzingeri, Planiliza planiceps, Planiliza macrolepis*	*Mugil cephalus* More catch	*Mugil cephalus* More catch	Mugil cephalus
Reptiles	*Echis carinatus sochureki*	No observation	S-10	No observation

For the period May 2024 to May 2025

Habitat/ Groups	Major Taxa/Genera/Species	Year		
		May 2024- May 2025		
		Monsoon	Post monsoon	Pre monsoon
Mangroves	*Avicennia marina*, *Ceriops tagal*, *Rhizophora mucronata, Aegiceras corniculatum*	4	4	4
Intertidal Habitat	Arthropoda ,Chordata, Mollusca	Total density 53	Total density 42	Total density 45
Subtidal Habitat	Annelida,Arthropoda, Mollusca, Nematoda 307, 412,508	Total density 307	Total density 42 412	Total density 42 548
Phytoplankton	*Pennales, Centrales* dominated	65.1% 54.55	59.4% 33.9%	42.4% 33.1%
Zooplankton	The phylum Arthropoda was the predominant represented include Copepoda, Harpacticoida, Cyclopoida, Decapoda, Crab larvae and Malacostrac	14420	20000	18560
Seaweeds	No observation of seaweed during the study period	Nil	Nil	Nil

e

Habitat/ Groups	Major Taxa/Genera/Species	Year		
		May 2024- May 2025		
		Monsoon	**Post monsoon**	**Pre monsoon**
Sea grasses		NIL	NIL	NIL
Halophytes	*Sesuvium portulacastrum*, , Aeluropus lagopoides, *Salicornia brachiata*, *Suaeda nudiflora*	Present	Present	Present
Avifauna	A total of 64 species (34 species terrestrial and 30 aquatic bird) representing 11 order, 26 families and 46 genera were recorded during the study period.	53	64	60
Marine Mammals	*Sousa plumbea*	no	no	no
Fishes	*Mugil cephalus, Planiliza klunzingeri, Planiliza planiceps, Planiliza macrolepis*	*Mugil cephalus*	*Mugil cephalus*	Mugil cephalus
Reptiles	*Echis carinatus sochureki*	S-10	S-10	NO

List of Plates

1. Introduction

Deendayal Port is located at Kandla in the Kachchh district of Gujarat state, operated by Deendayal Port Authority (DPA) (constituted under the major port Authority Act and the administrative control of the Ministry of ports shipping & water way (GOI) is India's busiest major port in recent years and is gearing to add substantial cargo handling capacity with private participation. DPA being one of the 12 major ports in India is situated at latitude 22°59'4.93N and longitude 70°13'22.59 E on the Kandla creek at the inner end of Gulf of Kachchh (GoK). Since its formation in the 1950s, the Deendayal Port provides the maritime trade requirements of states such as Rajasthan, Madhya Pradesh, Uttar Pradesh, Haryana and Gujarat. Because of its proximity to the Gulf countries, large quantities of crude petroleum are imported through this port. About 35% of the country's total export takes place through the ports of Gujarat in which the Deendayal port has a considerable contribution. Assortments of liquid and dry cargo are being handled at DPA Port. The dry cargo includes fertilizers, iron and steel, food grains, metal products, ores, cement, coal, machinery, sugar, wooden logs, etc. The liquid cargo viz. chemicals, edible oil, crude oil and other petroleum products etc. DPA has handled 132.3 MMTPA during the year 2023-2024. Presently, the Port has total 1-16 dry cargo berths, 7 oil jetties, and one barge jetty at Bunder basin, dry bulk terminal at Tuna Tekra, barge jetty at Tuna and two SPMs (2 local & 1 Nayara energy Limited and two product berths-Nayara energy Limited) at Vadinar for handling crude oil and petroleum products. Regular expansion or developmental activities such as the addition of jetties, allied SIPC and ship bunkering facilities oil jetty No 8 and container terminal at Tuna Tekra are underway in order to cope with the increasing demand for cargo handling during the recent times. A developmental initiative of this magnitude is going on since the past 7 decades, which will have its own environmental repercussions. Being located at the inner end of Gulf of Kachchh, Deendayal Port Authority encompasses a number of fragile marine ecosystems that includes a vast expanse of mangroves, mudflats, creek systems and associated biota. Deendayal Port is a natural harbour located on the eastern bank of North-South trending Kandla creek at an aerial distance of 90 km from the mouth of Gulf of Kachchh. The Port's location is marked by a network of major and minor mangrove lined creek systems with a vast extent of mudflats. The coastal belt in and around the port has an irregular and dissected configuration. Due to its location at the inner end of the Gulf, the tidal amplitude

is elevated, experiencing 6.66 m during mean high-water spring (MHWS) and 0.78 m during mean low water spring (MLWS) with MSL of 3.88 m. Commensurate with the increasing tidal amplitude, vast intertidal expanse is present in and around the port environment. Thus, the occurrence of mudflats on the intertidal zone enables mangrove formation to an extensive area. Contrary to the southern coast of Gulf of Kachchh, the coral formations, seaweed and seagrass beds are absent in the northern coast due to high turbulence induced suspended sediment load in the water column, a factor again induced due to the conical Gulf geomorphology and surging tides towards its inner end.

1.1. Rationale of the present study

The ongoing developmental activities at Deendayal Port Authority has been intended for the following.

(i) The development of the 3 remaining integrated facilities (Stage 1) within the existing Port at Kandla which includes development of a container terminal at Tuna off Tekra on BOT base T shape jetty, construction of port craft jetty and shifting of SNA section of Deendayal port and railway line from NH-8A to Tuna port.

(ii) EC & CRZ clearance granted by the MoEF &CC, GoI dated 18/2/2020 Dev. Remaining 3 integrated facilities (Stage I) within the existing Kandla port – specific condition no. xxiii.

(iii) EC & CRZ clearance granted by the MoEF &CC, GoI dated 19/2/2020 Dev. integrated facilities (Stage II-5 (1) Setting of oil jetty No7 (2) Setting up barrage jetty at Jafar wadi (3) Setting up barrage port at Veera (4) Administrative office building at Tuna Tekra (5) Road connecting from Veera barrage jetty to Tuna gate by M/s DPA -specific condition no. xv.

(iv) EC & CRZ clearance granted by the MoEF &CC, GoI dated 20/11/20 – expansion of port by creation of water front facilities (Oil jetty 8,9,10 and 11) and development of land area 554 acres for associated facilities for storage at old Kandla, Gandhidham, Kachchh by Ms. PA Para VIII Marine Ecology, specific condition iv.

(v)Development of 7 integrated facilities (Stage I) within the existing Kandala port CRZ clearance MoEFcc , GOI dated 19/12/2016-Specific condition (ii),(iii) and (iv) the project proponent ensure that, no damage to the mangrove patch without

disturbing creek water circulation ,there is no blocking of creek or rivers of project area and shoreline also not damaged and it periodically monitored .

(vi) EC& CRZ clearance granted by MoEF &CC , GOI dated 1/1/2024 augmentation of liquid cargo handling facility specific condition no XXV.

As per the environmental clearance requirements to these developmental initiatives, by MoEF & CC, among other conditions, has specified to conduct the continuous monitoring of the coastal environment on various aspects covering all the seasons. The regular monitoring shall include physico-chemical parameters coupled with biological indices such as mangroves, seagrasses, macrophytes and plankton on a periodic basis during the construction and operation phase of the project. Besides, the monitoring study also includes an assessment of Mudflats, Fisheries, and Intertidal fauna including the macrobenthos as components of the management plan. The regular marine ecology monitoring includes Micro, Macro and Mega floral and faunal components of marine biodiversity of the major intertidal ecosystems, the water and sediment characteristics. In accord with MoEF&CC directive, DPA has consigned the project on 'Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme" to Gujarat Institute of Desert Ecology (GUIDE), Bhuj during May, 2021. Further, Deendayal Port authorities has entrusted Gujarat Institute of Desert Ecology (GUIDE) to continue the study for another three years, i.e., 2021 – 2024 and further extended to another 3 years i.e from May 2024 to May 2027 with specific condition XXV for augmentation of liquid cargo handling facility . The study covers all the seasons as specified by specific condition of the Ministry of Environment, Forest and Climate Change (MoEF&CC). The present study is designed considering the scope of work given in the EC conditions

1.2 Scope of work

The scope of the present investigation includes physico-chemical and marine biological components as mentioned in the specific conditions of MoEF&CC, EC & CRZ clearance dated 19.12.2016,18.2.2020,19.2.2022 and 20.11.2020 & 1.1.2024 with specific conditions xviii, xxiii, xv, iv and xxv respectively. A detailed holistic approach to different components of marine physico-chemical parameters of water and sediment and marine biodiversity within the Deendayal Port area will be carried out. Based on the results obtained during the project period, a detailed management plan will be drawn at the end of the project period. The biological and physico-chemical variables will be investigated

during the present study on a seasonal basis i.e., monsoon, post-monsoon and pre-monsoon as the period May 2024 to May 2025 as follows:

- Physico-chemical characteristics of water and sediment will be analysed.
- Detailed assessment of mangrove vegetation structure including density, diversity, height, canopy and other vegetation characteristics.
- GIS and RS studies to assess different ecologically sensitive land use and land cover categories within the Port area such as the extent of dense and sparse mangroves, mudflats, creek systems and other land cover categories within the port limits.
- To study the intertidal faunal composition, distribution, diversity, density and other characteristics, other mega faunal components such as mammals, reptiles and amphibians.
- To investigate the species composition, distribution, diversity, density of sub-tidal benthic fauna.
- To estimate the primary productivity of the selected sampling sites located in around DPA area.
- ToInvestigate the species composition, distribution, density and diversity of phytoplankton and zooplankton.
- To study the distribution of halophytes, sea grasses, seaweeds and other coastal flora, their occurrence, distribution, abundance and diversity.
- To study the Avifaunal density, diversity, composition, habitat, threatened and endangered species and characters.
- Fishery Resources - Common fishes available, composition, diversity, Catch Per Unit Effort (CPUE) and other socio-economic information.

This study in short attempts the following, to i) developing a strong long-term monitoring of the port marine environment from the biological perspective which could be used to monitor changes in the future, and ii) formulating a management plan based on the baseline data in order to ensure long-term ecological health of the port environment. A better understanding of the marine ecology of the port and its processes has been attempted in this study which will assist in better management and conservation decisions to promote marine environmental health within the port limits.

1.2.1. Study Area

The coastal belt in and around Deendayal Port Authority jurisdiction is characterized by a network of creek systems and mudflats which are covered by sparse halophytic vegetation like scrubby to dense mangroves, creeks and salt-encrusted landmass which form the major land components (Table1) .The surrounding environment in 10 km radius from the port includes built-up areas, salt pans, human habitations and port related structures on the west and north creek system, mangrove formations and mudflats in the east and south (Fig1). The nearest major habitation is Gandhidham town located about 12 km away on the western part with population of 2,48,705 (as per 2011 census).

Table 1 . Sampling locations of study area (2024-2025)

Locations	GPS coordination	
	Latitude	Longitude
S-1	22.9410	70.1358
S-2	22.9616	70.1244
S-3	22.9876	70.2345
S-4	23.0285	70.2331
S-5	23.0804	70.2245
S-6	23 9'19.99	7024'1.47
S-7	22.9771	70.2125
S-8	23.0378	70.4070
S-9	22.9960	70.3932
S-10	23.1007	70.2961
S-11	23.1608	70.4948
S-12	22.9446	70.1062
S-13	23° 6'58.69"	70°21'8.77"
S-14	22.89590	70.07450
S-15	23.0654	70.2172

2.Sampling of water and sediment samples

Sampling was carried out for the coastal water (surface) and sediment to determine physical and chemical characteristics from the prefixed sampling sites. The biological parameters (benthic and pelagic fauna, flora and productivity) were also estimated (Table.2). The water samples were collected from each pre-designated site in pre-clean polyethylene bottles. Prior to sampling, the bottles were rinsed with sample water to be collected and stored in an ice box for

transportation to the laboratory and refrigerated at 4°C till further analysis. The analysis of the water quality parameters was carried out by following standard methods (APHA, 2017). All extracting reagents were prepared using metal-free, AnalaR grade chemicals (Qualigens Fine Chemicals Division of Glaxo SmithKline Pharmaceuticals Limited, Mumbai) and double distilled water prepared from quartz double distillation unit.

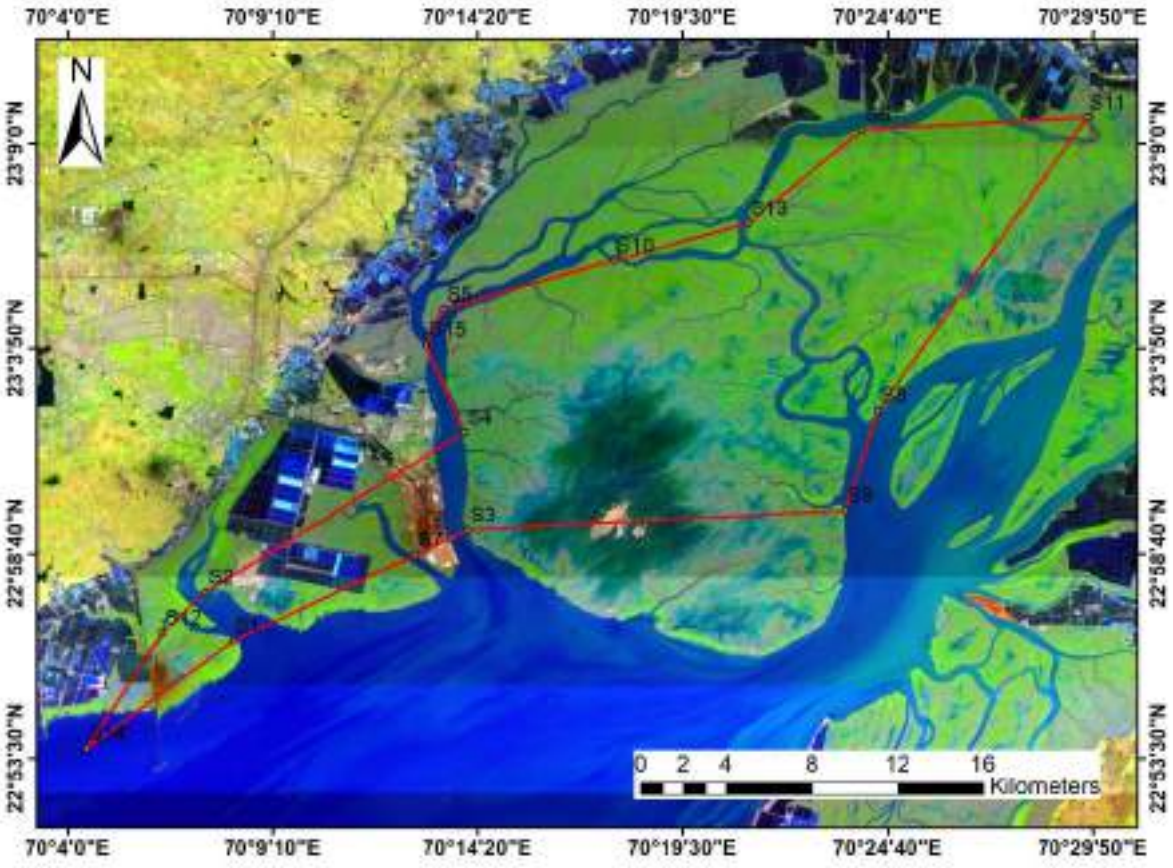


Figure 1. Sampling locations of Study area

2, Land use Land Cover Changes

In order to understand the spatial and temporal changes in the vicinity of the Deendayal port jurisdiction area, Remote Sensing and GIS technique has been employed. Land cover classification was carried out using digital satellite imageries. Images for the Deendayal Port area were acquired for the period of April 2017, December 2019 and March 2020, November 2020, April 2021, March 2022 and March 2023 were used for the study. These were brought to UTM projection with spheroid and datum named WGS 84 in UTM zone 42 north.

Table 2 Satellite Imagery Used for Land Use Land Cover Map

Image use	Satellite name	Sensor	Spatial Resolution	Date acquired
2017	IRS-R2A	LISS IV	5.8m	26 April- 2017
2019	IRS-R2A	LISS IV	5.8m	24-DEC-2019
2020	IRS-R2A	LISS IV	5.8m	29-March-2020
2020	IRS-R2	LISS IV	5.8m	17-Nov-2020
2021	IRS-R2	LISS IV	5.8m	10-APR-2021
2022	IRS-R2	LISS IV	5.8m	12-March-2022
2023	IRS-R2	LISS IV	5.8m	31-March-2023

2.1 Methodology

Training samples were collected from these imageries. Selecting training samples from these cloud-free mosaics was straightforward due to the very distinctive signature of mangrove area. High contrast with open water, saltpan and mudflat helped in selecting the training data successfully. Same training samples with slight modifications in each imageries mosaic (addition and removal of few training samples) were used for the classification of all different date images. Six major classes viz., mangrove, water, mudflat, other vegetation, salt pan and port were delineated. For the tonal variation and pixel values in the imageries, NDVI (Normalised Differential Vegetative Index) and a supervised Maximum Likelihood Classification (MLC) methods were used for the classification. ERDAS Imagine 9.3 was used for satellite image processing, classification and data transformation whereas ARC GIS 10.3 was used for the map formation. Forgraphs and databases processing, MS WORD and MS EXCEL were used.Ground truth study comprises data collection of ground features along with the respectivegeographical positions in

terms of latitudes and longitudes with Garmin e-Trex Vista GPS. Thus, the data were interpreted using all the collected information.

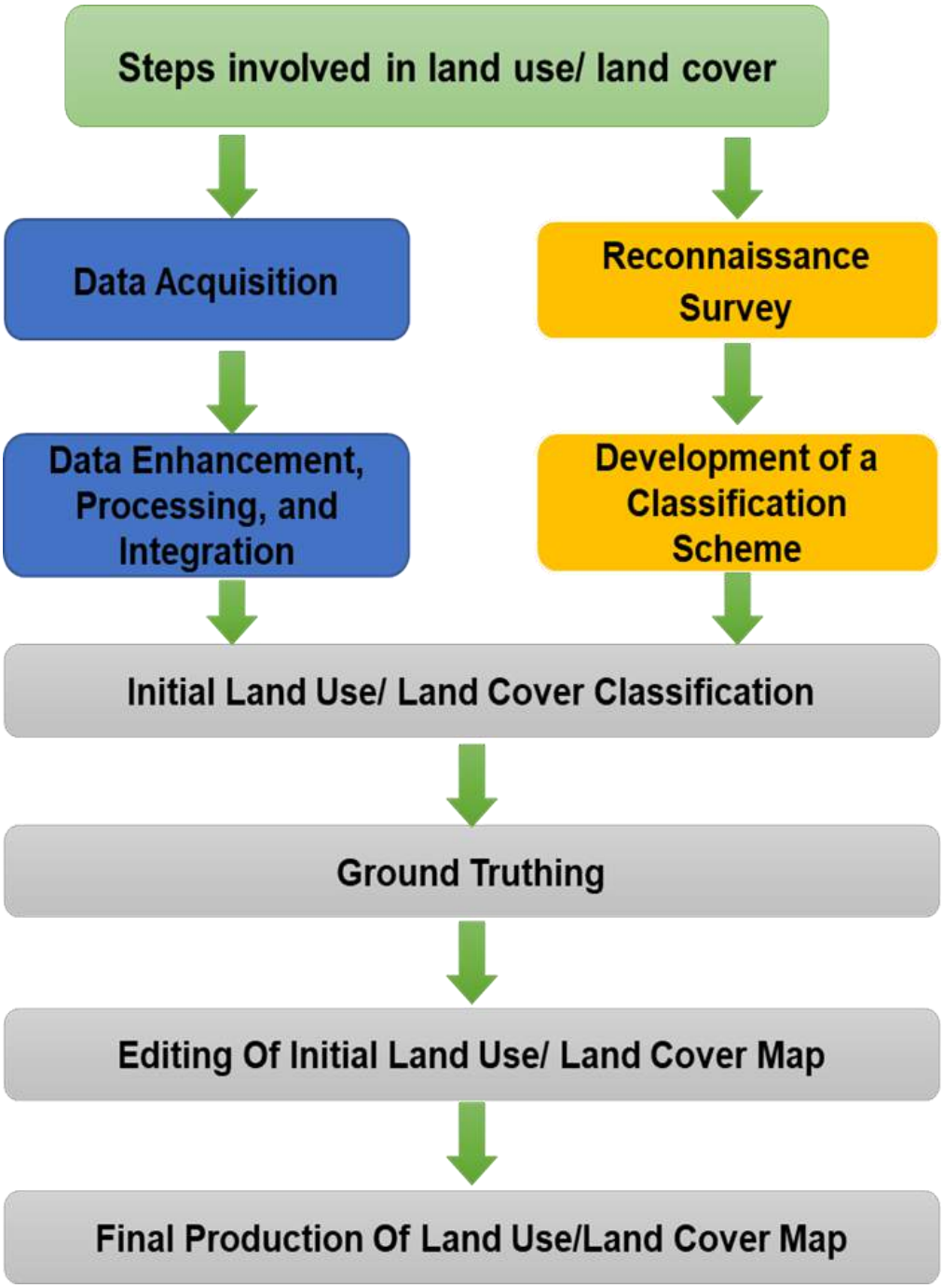


Figure 2. Methodology for land use Land cover

2.2.1Land use Land Cover

Classified imageries are presented in Fig 3 to Fig 4 and detailed presented in table 2 and 3.

Figure 3. Land use/ Land cover classification in DPA area- April-2017

Figure 4. Land use/ land cover classification in DPA area December-2019

Table 3. Land use /Land cover statistics in the DPA area - April-2017

Class Name	Area (ha)	Percentage
Mangrove (Dense + Sparse)	19319.71	19.32
Mudflat	31293.43	31.3
Other veg	12438.8	12.44
Port Area	1243.67	1.24
Salt pan	15016.1	15.02
Water	20674.3	20.68
Total	**99986.01**	**100**

Table 4. Land use /Land cover statistics in the DPA area - December-2019

Class Name	Area (ha)	Percentage
Mangrove	23060.04	23.06
Mudflat	31179.87	31.18
Other vegetation	12333.21	12.33
Water	16953.68	16.96
Port area	1346.21	1.35
Salt pan	15113	15.12
Total	**99986.01**	**100**

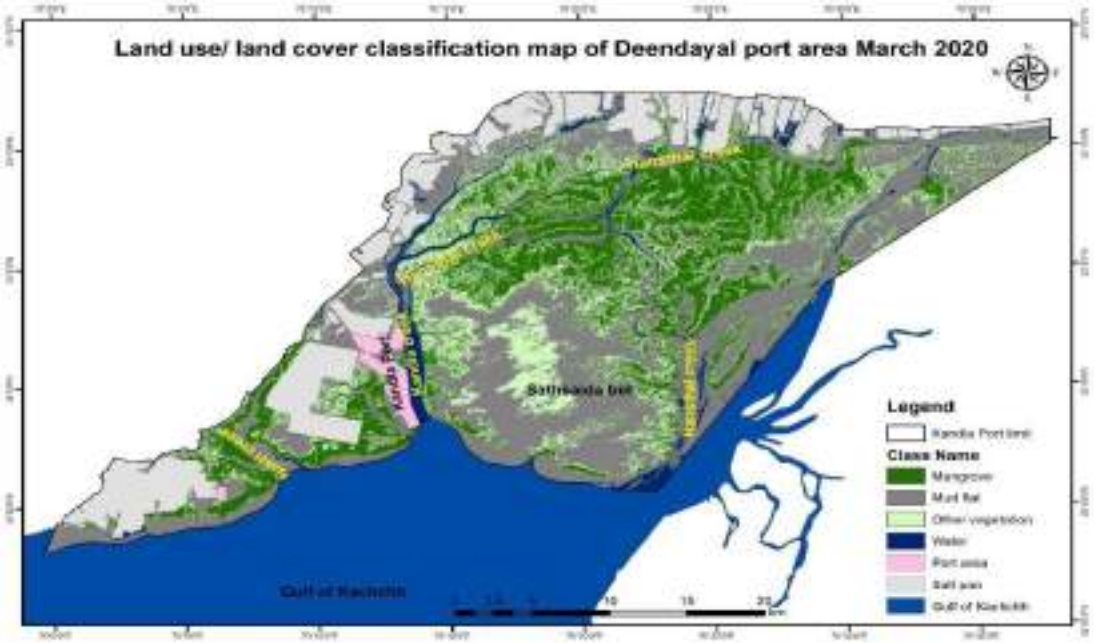


Figure 5. Land use/ land cover classification in DPA area March-2020

Table 5. Land use /land cover statistics in the DPA area- March-2020

Class name	Area (ha)	Percentage
Mangrove	23168.4	23.17
Mudflat	40714.6	40.72
Other vegetation	15991.69	15.99
Port area	1346.21	1.35
Salt pan	15054.5	15.06
Water	3710.61	3.71
Total	**99986.01**	**100**

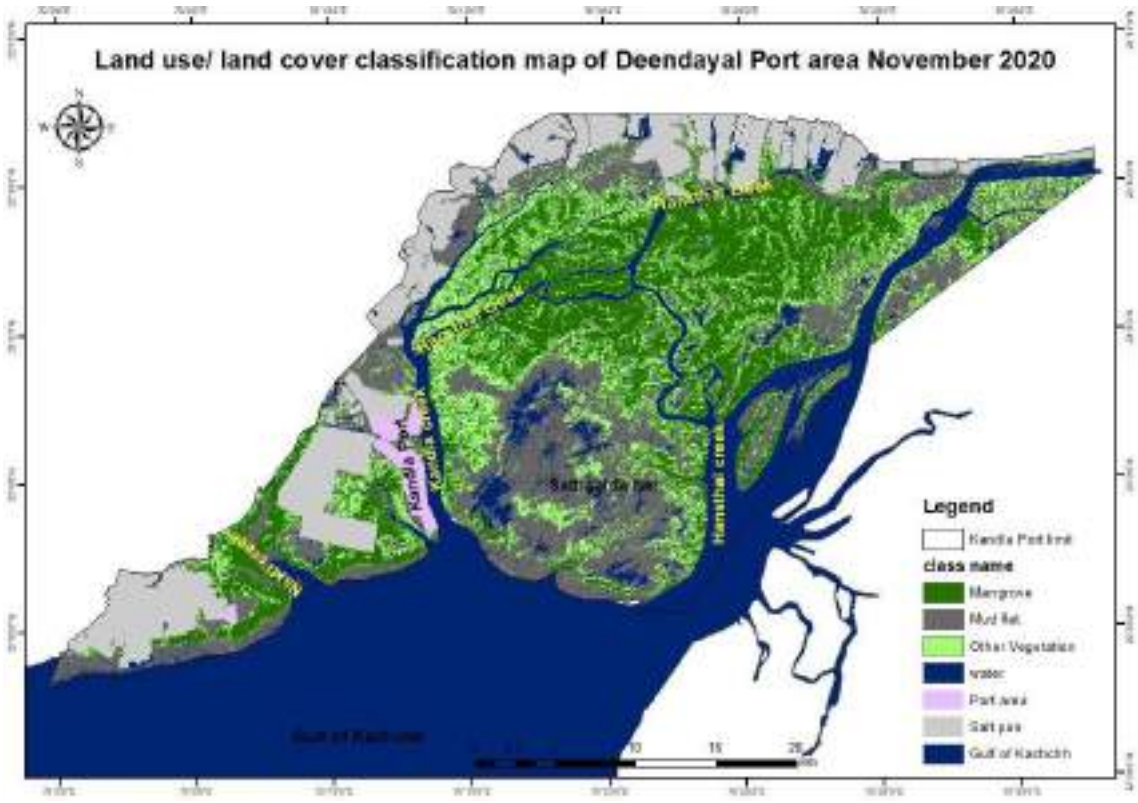


Figure 6. Land use/ land cover classification in Deendayal port area November 2020

Table 6. Land use /land cover statistics in the DPA area- November2020

Class	Area (ha)	Percentage
Mangrove	23856.8	23.86
Mudflat	28764.6	28.77
Other Vegetation	16346.1	16.35
Port area	1346.21	1.35
Salt pan	15193.5	15.2
water	14478.8	14.48
Total	99986.01	100

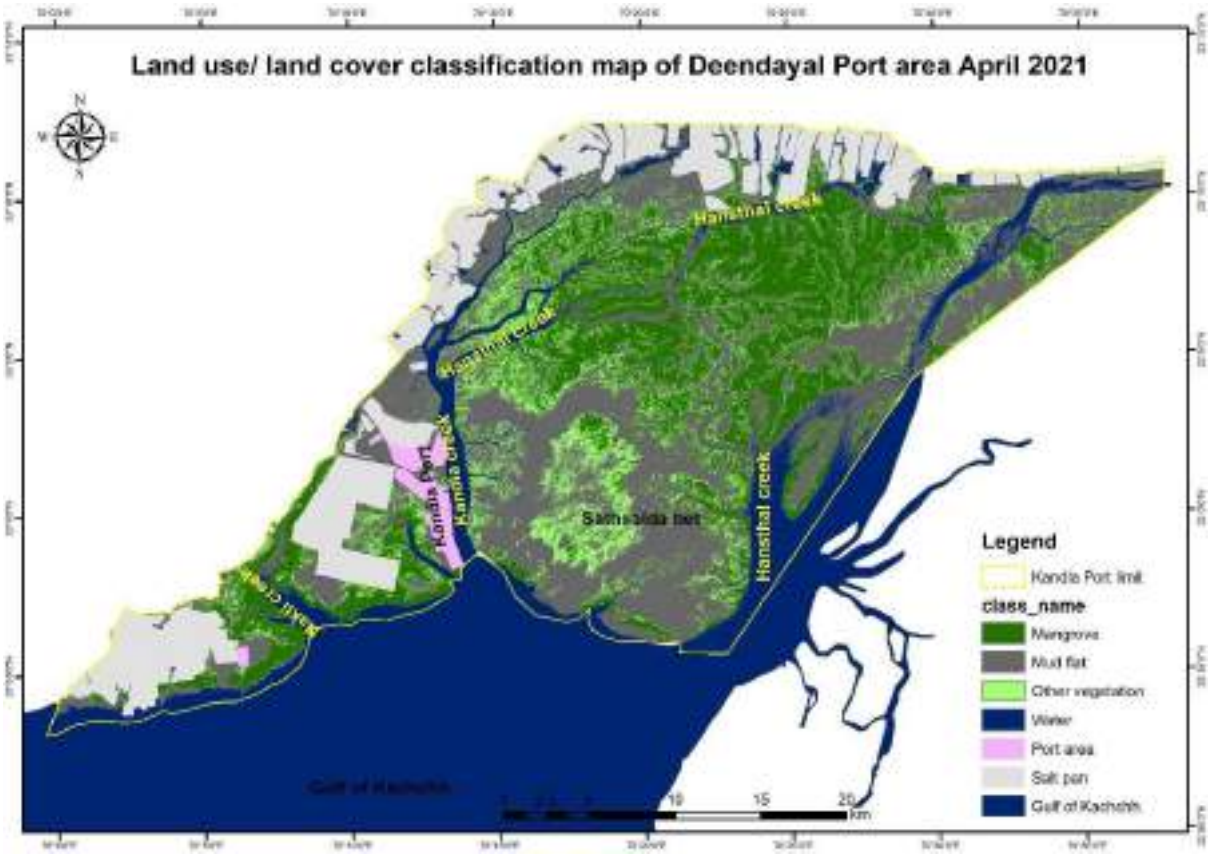


Figure 7. Land use/ land cover classification in Deendayal port area April-2021

Table 7. Land use /land cover statistics in the DPA area April-2021

class name	Area (ha)	Percentage
Mangrove	23967.4	23.97
Mudflat	36909.3	36.91
Other vegetation	11230.4	11.23
Port area	1346.21	1.35
Salt pan	15236.6	15.24
Water	11296.1	11.3
total	**99986.01**	**100**

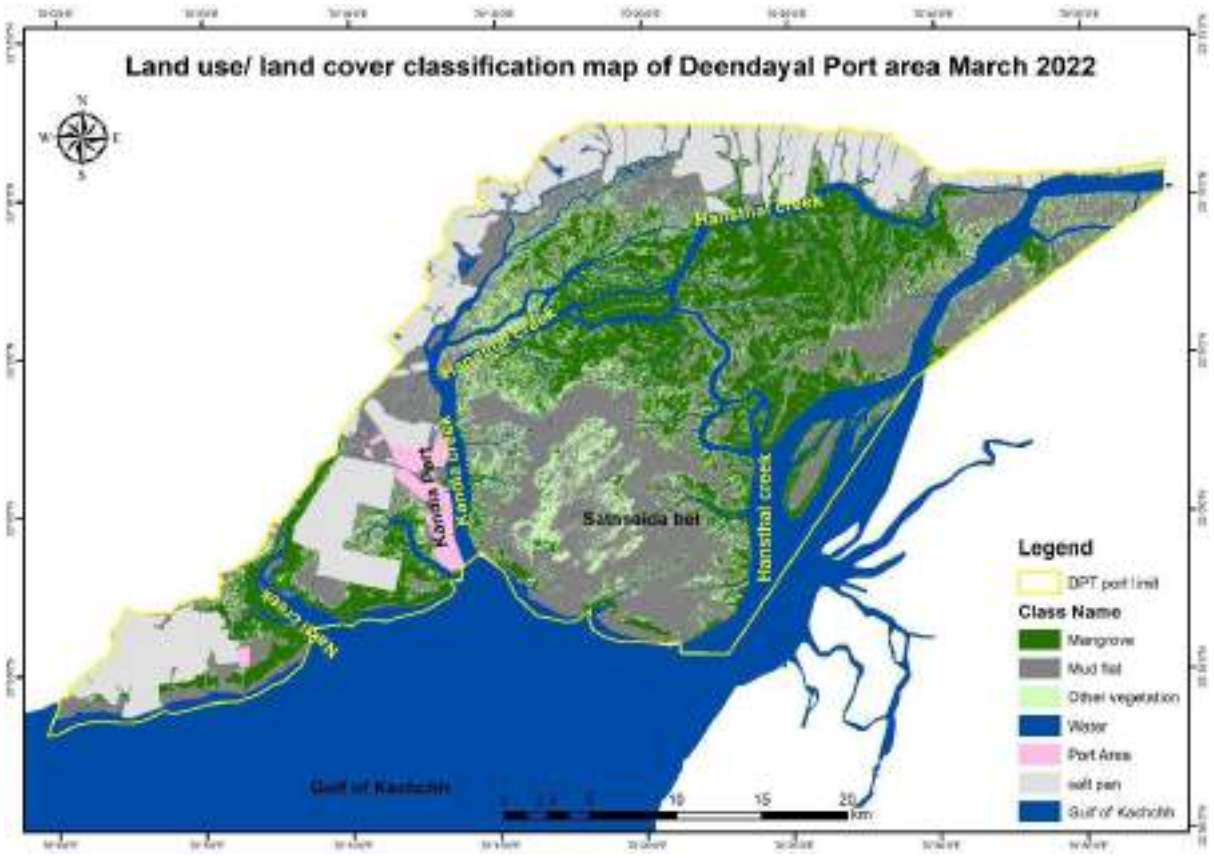


Figure 8.Land use/ land cover classification in Deendayal port area March-2022

Table 8. Land use /land cover statistics in the DPA area March-2022

class name	Area (ha)	Percentage
Mangrove	24328.7	24.33
Mudflat	31089.06	31.09
Other vegetation	11561.2	11.56
Port Area	1436.75	1.44
salt pan	15545.7	15.55
Water	16024.6	16.03
Total	**99986.01**	**100**

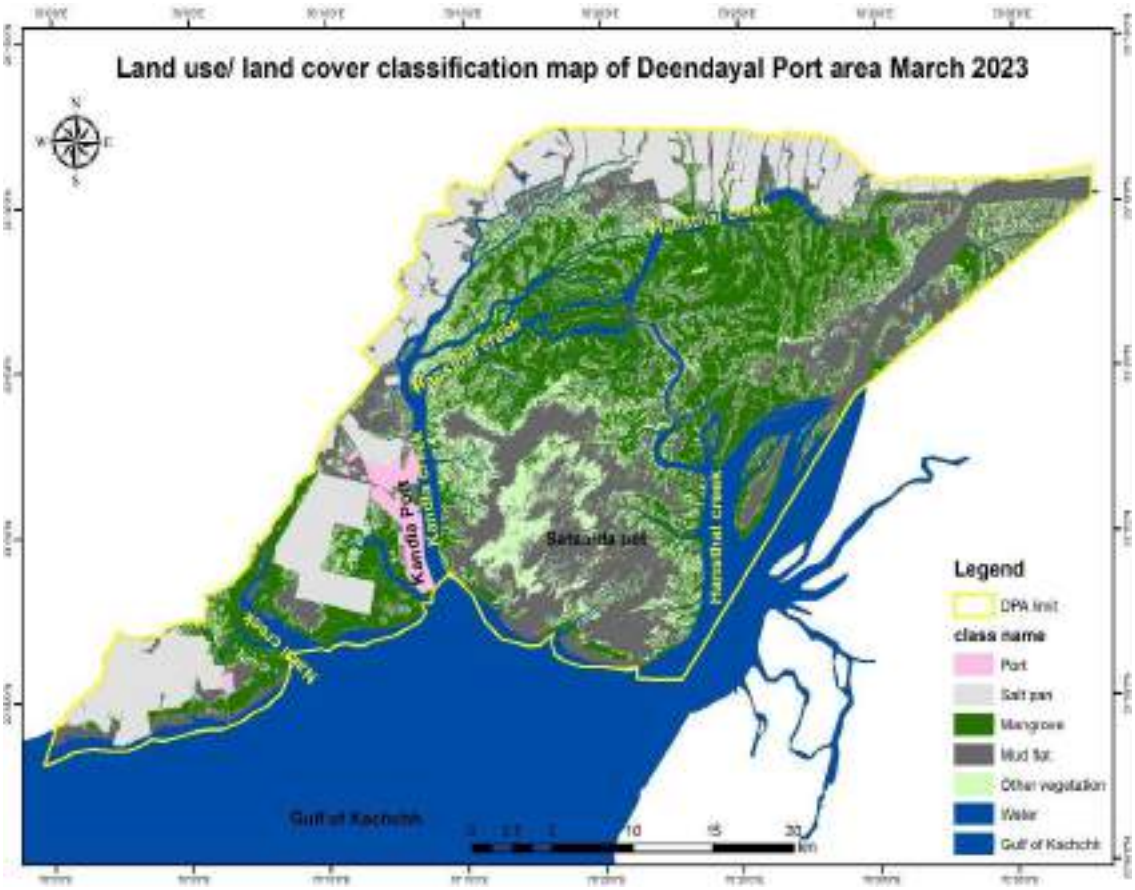


Figure 9. Land use/ land cover classification in Deendayal port area March-2023

Table 9. Land use /land cover statistics in the DPT area for March-2023

class name	Area (ha)	Percentage
Mangrove	26520.56	26.52
Mud flat	27547.90	27.55
Other vegetation	15969.90	15.97
Port	1436.75	1.44
Salt pan	16094.80	16.10
Water	12416.10	12.42
Total	**99986.01**	**100.00**

2.2.2. Comparative Analysis of Land use Land Cover Study

From April 2017 to March 2023 the overall mangrove area increased from 19319 ha to 26520.5 ha, i.e. 7 % of the total area of DPA. Mangrove area is replacing on the mostly on mudflat, hence there is a decreasing trend of the mudflat is clearly seen. Since this area comes under the influence of the tidal time mudflat area comes high value in that case water area decrease. But overall trends show mudflat is replaced by mangroves. (Fig 3.9). Good monsoon and favorable environment have positively impacted the mangroves to flourish. The below graph shows clearly, year on year mangrove area in DPA vicinity is increasing, currently, around 26.5% of the total area of DPT is covered by mangroves.

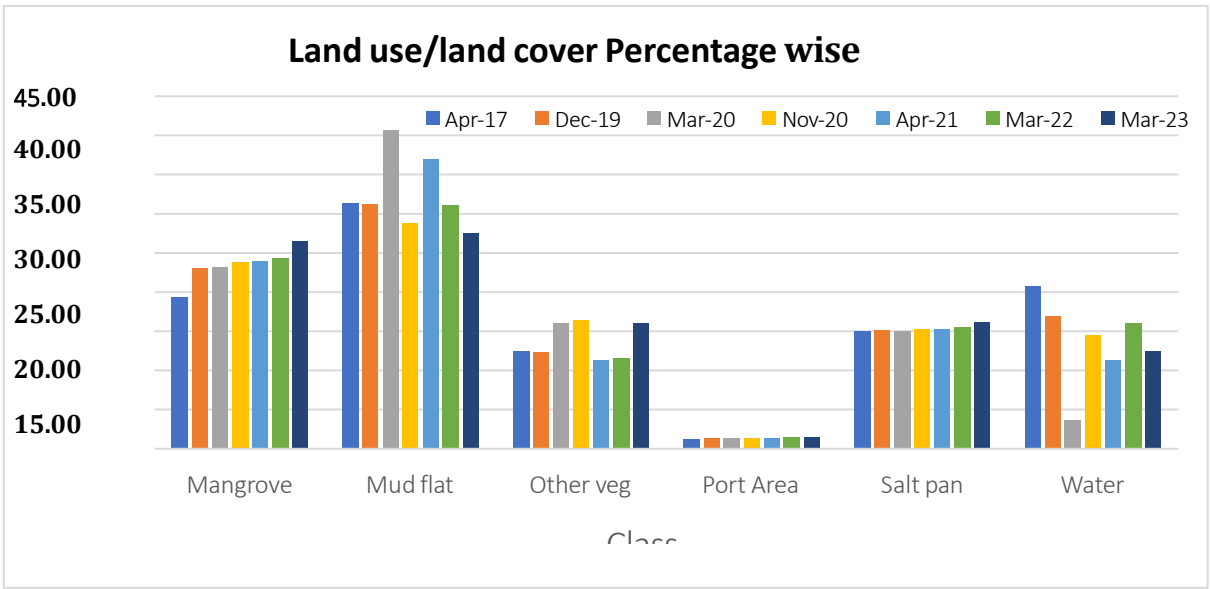
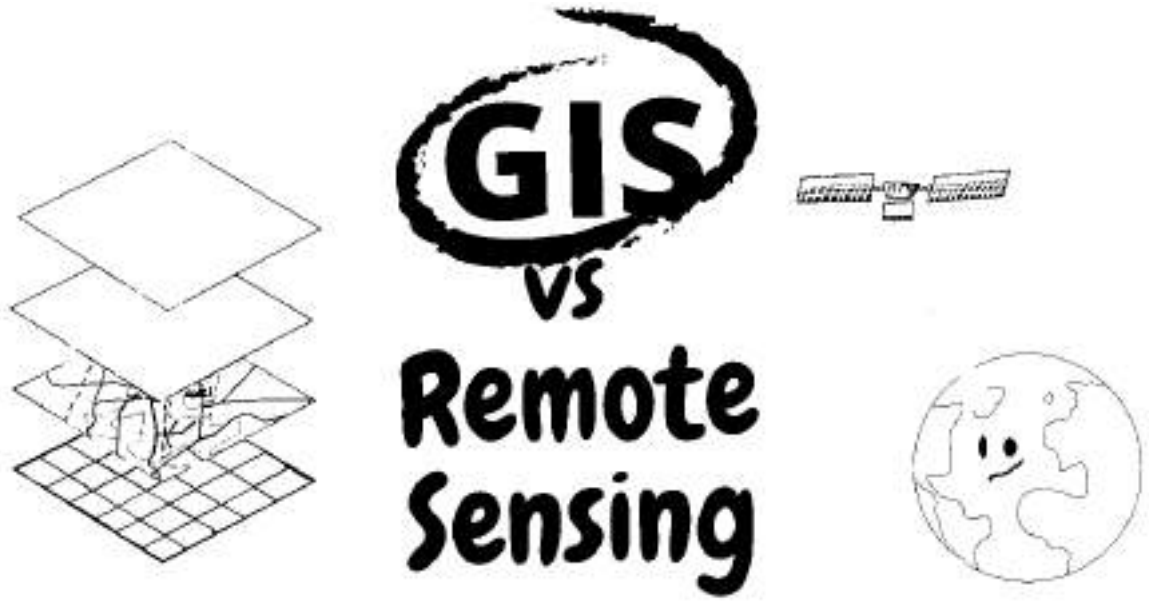


Figure 10. LU/LC Percentage area for the period 2017 to 2023 in Deendayal Port Authority

Table 10. Land use /land cover Percentage wise in the vicinity of DPA area for the study period 2017-2023

Month-Year	Apr-17	Dec-19	Mar-20	Nov-20	Apr-21	Mar-22	Mar-23
Class Name	Area (ha)						
Mangrove	19.32	23.06	23.17	23.86	23.97	24.33	26.52
Mudflat	31.30	31.18	40.72	28.77	36.91	31.09	27.55
Other veg	12.44	12.33	15.99	16.35	11.23	11.56	15.97
Port Area	1.24	1.35	1.35	1.35	1.35	1.44	1.44
Salt pan	15.02	15.12	15.06	15.20	15.24	15.55	16.10
Water	20.68	16.96	3.71	14.48	11.30	16.03	12.42
Total	100	100	100	100	100	100	100



3. Methodology

3.1.Physico-chemical Parameters, Water and Sediment

A port is a location on a coast or shore containing one or more harbors where ships can dock and transfer people or cargo to or from land. Port locations are selected to optimize access to land and navigable water, for commercial demand, and for shelter from wind and waves. Harbors can be natural or artificial. An artificial harbor has deliberately constructed breakwaters, sea walls, or jetties, or otherwise, they could have been constructed by dredging, and these require maintenance by further periodic dredging.Ports are economic instruments for trade and a vital component in the nation's economy. Nevertheless, port activities such as land reclamation, dredging and large-scale construction and its continuous expansion negatively affect the marine ecosystems in its vicinity.

In a port environment, activities like dredging, continuous movement of vessels and humans create major impacts at the marine/coastal environment and the living resources. This will have several impacts on the coastal environmental health which can be reflected by the nature of the physico-chemical characteristics of water which in turn indicates in its productivity. The change in productivity pattern of the marine environment is highly influenced by the flow of nutrients which generally originates from natural and anthropogenic sources. This change in quality of marine water, impacts the composition and availability of aquatic organisms directly and also affects the natural process in the marine ecosystem biological component, coral reefs and seagrass habitats etc. Similar to water, marine sediments also receive pollutants / such as heavy metals, petroleum hydrocarbons, polyaromatic hydrocarbons, polychlorinated biphenyls etc as contaminants from various activities, both off shore and on shore near ports and harbours. Hence assessing the water and sediment characteristics is imperative to understand the environmental changes and to suggest scientific interventions to restore the ecosystem integrity

3.1.1. Sampling Parameters & Water sample collection

Sampling was carried out for the coastal water (surface) and sediment for the determination of physical and chemical characteristics from the prefixed sampling sites. The biological parameters (benthic and pelagic fauna, flora and productivity) were also estimated (Table 11).

Table 11: Physico-chemical and biological parameters analysed

Parameters	
Water	**Mangrove & Other Flora**
pH	**Mangrove**
Temperature	Vegetation structure, density
Salinity (ppt)	Diversity
Dissolved oxygen	Height
Total Suspended Solids (TSS)	Canopy and other vegetation characteristics
Total Dissolved solids (TDS	**Halophytes:**
Turbidity	Percentage of distribution and cover
Nutrients	Diversity
Nitrate (NO_3)	**Seagrass and Seaweed**
Nitrite (NO_2)	Occurrence, distribution, and diversity
Phosphate	**Intertidal fauna**
Silicate	Composition, distribution, diversity, density and other characteristics
Petroleum Hydrocarbon (PHs)	**Mammals**
Sediment	**Avifauna**
Texture	Density, diversity, composition, habitat,
Bulk density	Threatened and endangered species and characters
Total organic carbon (TOC)	
Biological Parameters	
Phytoplankton- Genera, abundance, diversity and biomass	
Productivity-Chlorophyll a	
Zooplankton – Species, abundance, diversity	
Macrobenthos - genera, abundance, diversity	
Fishery Resources	
Common fishes available	
composition, diversity	
Catch Per Unit Effort (CPUE)	

The water samples were collected from each pre-designated sites in pre-cleaned polyethylene bottles. Prior to sampling, the bottles were rinsed with sample water to be collected and stored in an ice box for transportation to laboratory and refrigerated at 4°C till further analysis. The analysis of the water quality parameters was carried out by following standard methods (APHA, 2017). All extracting reagents were prepared using metal-free, AnalaR grade chemicals (Qualigens Fine Chemicals Division of Glaxo SmithKline Pharmaceuticals Limited, Mumbai) and double distilled water prepared from quartz double distillation assembly. There is one water sample will be collect from each designated sampling locations and period of survey will be carried out June to September as Monsoon, October to January will be designated as Post-monsoon and February to May will be designated as Pre-monsoon.

3.1.2.pH and Temperature

A Thermo fisher pH / EC / Temperature meter was used for pH and temperature measurements. The instrument was calibrated with standard buffers just before use.

3.1.3.Salinity

A suitable volume of the sample was titrated against silver nitrate (20 g/l) with Potassium chromate as an indicator. The chlorinity was estimated, and from that, salinity values were derived using a formula (Strickland and Parsons,1972).

3.1.4.Total Suspended Solids (TSS)

About 100 ml of the water sample was filtered through pre-weighed filter paper and placed in the Hot Air Oven at a specified temperature as per the protocol for 1 hour. The filter paper was allowed to cool in a desiccator to obtain a constant weight by repeating the drying and desiccation steps.

3.1.5. Total Dissolved Solids (TDS)

The water samples were subjected for gravimetric procedure for confirmation of the readings obtained from the hand -held meter. About 100 ml of the water sample was taken in a beaker and filtered, which was then dried totally in a Hot Air Oven (105°C). The TDS values were calculated using the difference in the initial and final weight of the container.

3.1.6.Turbidity

The sample tube (Nephelometric cuvette) was filled with distilled water and placed in the sample holder. The lid of the sample compartment was closed. By adjusting the' SET ZERO' knob, the meter reading was adjusted to read zero. The distilled water was removed, the 40 NTU standard solutions were filled in the tube, and the meter reading was set to read 100. Other standards were also run. The turbidity of the marine water sample was then found by filling the sample tube with the sample, and the reading was noted.

3.1.7. Dissolved Oxygen (DO)

The amount of dissolved oxygen (DO) was determined by Winkler's method (Strickland and Parsons,1972).

3.1.8.Phosphate

Acidified Molybdate reagent was added to the sample to yield a phosphomolybdate complex that is reduced with Ascorbic acid to a highly coloured blue compound, which is measured at the wavelength of 690 nm in a Spectrophotometer (Shimadzu UV 5040). The Phosphorus compounds in the sample were oxidized to phosphate with alkaline Potassium per sulphate at high temperature and pressure. The resulting phosphate was analyzed and described as total phosphorous (APHA,2017).

3.1.9. Silicate

The determination of dissolved silicon compounds in natural waters is based on the formation of a yellow silicomolybdic acid when an acid sample is treated with a molybdate solution. It is Spectrophotometrically measured by absorbance (810 nm for maximum absorbance and 660 for about 40% by adopting method of Grasshoff et.al. (1999).

3.1.10.Nitrite

Nitrite in the water sample was allowed to react with Sulphanilamide in acid solution. The resulting diazo compound was reacted with N-1-Naphthyl ethylenediamine dihydrochloride to form a highly coloured azo-dye. The light absorbance was measured at the wavelength of 543 nm in Spectrophotometer (Shimadzu UV 5040).

3.1.11.Nitrate

The Nitrate content was determined as nitrite (as mentioned above) after its reduction by passing the sample through a column packed with amalgamated Cadmium.

3.1.12.Petroleum Hydrocarbon (PHs)

The water sample (1liter) was extracted with Hexane and the organic layer was separated, dried over anhydrous sulphate and reduced to 10 ml at 30°C under low pressure. Fluorescence of the extract was measured at 360 nm (excitation at 310 nm) with Saudi Arabian crude residue as a standard. The residue was obtained by evaporating lighter fractions of the crude oil at 120°C.

3.2 Sediment Characteristic (Sediment sampling)

Sediment samples were collected from the prefixed stations by using a Van Veen grab having a mouth area of 0.04m^2 or by a non-metallic plastic spatula. Sediment analysis was carried out by using standard methodologies. In each location (grid), sediment samples were collected from three different spots and pooled together to make a composite sample, representative of a particular site. The collected samples were air dried and used for further analysis.

3.2.1.Sediment Texture

For texture analysis, specified unit of sediment sample was passed through sieves of different mesh size as per Unified Soil Classification System (USCS). Cumulative weight of the fraction retained in each sieve was calculated starting from the largest sieve size and adding subsequent sediment weights from the smaller size sieves (USDA,1951). The percentage of the various fractions was calculated from the weight retained and the total weight of the sample. The cumulative percentage was calculated by sequentially subtracting percent retained from the 100%.

3.2.2.Total Organic carbon

Percentage of organic carbon in the dry sediment was determined by oxidizing the organic matter in the sample by Chromic acid and estimating the excess Chromic acid by titrating against Ferrous ammonium sulphate with Ferroin as an indicator (Walkley and Black, 1934).

3.3. Biological Characteristics of water and Sediment

3.1.1.Primary productivity

Phytoplankton possess the plant pigment chlorophyll 'a' which is responsible for synthesizing the energy for metabolic activities through the process of photosynthesis in which CO_2 is used and O_2 is released. It is an essential component to understand the consequences of pollutants on the photosynthetic efficiency of phytoplankton in the system. To estimate this, a known volume of water (500 ml) was filtered through a 0.45 µm Millipore Glass filter paper and the pigments retained on the filter paper were extracted in 90% Acetone. For the estimation of chlorophyll 'a' and pheophytin pigments the fluorescence of the Acetone extract was measured using Fluorometer before and after treatment with dilute acid (0.1N HCL) (Strickland and Parsons,1972).

3.1.2.Phytoplankton

Phytoplankton samples were collected from the prefixed 15 sampling sites from the coastal water in and around DPA location using standard plankton net with a mesh size of 25µm and a mouth area of 0.1256 m^2 (20 cm radius). The net fitted with a flow meter (Hydrobios) was towed from a motorized boat moving at a speed of 2 nautical miles/hr. The Plankton adhering to the net was concentrated in the net bucket by splashing seawater transferred to a pre-cleaned and rinsed container and preserved with 5% neutralized formaldehyde and appropriately labelled indicating the details of the collection, and stored for further analysis. The Quantitative analysis of phytoplankton (cell count) was carried out using a Sedgewick-Rafter counting chamber. The density (No/l) was calculated using the formula: N=n ×v/V (Where, N is the total No/liter, n is the average number of cells in 1 ml, v is the volume of concentrate; V is the total volume of water filtered. The identification was done by following the standard literature of Desikachary, (1987), Santhanam *et.al*. (2019) and Kamboj *et.al*. (2018).

3.1.3.Zooplankton

Zooplankton samples were collected using a standard zooplankton net made of bolting silk having 50µm with mouth area of 0.25 m^2 fitted with a flow meter. The net was towed from a boat for 5 minutes with a constant boat speed of 2 nautical miles/hr. The initial and final reading in the flow meter was noted down and the plankton concentrate collected in the bucket was transferred to appropriately labelled container and preserved with 5% neutralized formaldehyde. One ml of the zooplankton concentrate was added to a Sedgwick counting chamber and observed under a compound microscope and

identified by following standard literature. The group/taxa were identified using standard identification keys and their number was recorded. Random cells in the counting chamber were taken for consideration and the number of zooplankton was noted down along with their binomial name. This process was repeated for five times with 1 ml sample and the average value was considered for the final calculation. For greater accuracy, the final density values were counter-checked and compared with the data collected by the settlement method.

3.1.4.Intertidal Fauna

The Intertidal faunal assemblages were studied for their density, abundance and frequency of occurrence during Pre-monsoon 2025 at the pre-fixed 15 sampling locations within the DPA jurisdiction. Sample collection and assessment of intertidal communities were done in the intertidal zone during the low tide period. At each site, 1 x1m^2quadrates were placed randomly and all visible macrofaunal organisms encountered inside the quadrate were identified, counted and recorded. At each site, along the transects which run perpendicular to the waterfront, three to six replicate quadrate samples were assessed for the variability in macro-faunal population structure and the density was averaged for the entire intertidal belt. Organisms, which could not be identified in the field, were preserved in 5% formaldehyde, brought to the laboratory and identified using standard identification keys (Abott, 1954; Vine, 1986; Rao, 2003; 2017; Psomadakis *et al.,* 2015; Naderloo 2017; Ravinesh *et al.* 2021; Edward *et al.,* 2022). Average data at each site were used to calculate the mean density (No/m^2).

3.1.5.Sub tidal macro benthic Fauna

The sampling methods and procedures were designed in such a way to obtain specimens in the best possible condition as to maximize the usefulness of the data obtained. For studying the benthic organisms, triplicate samples were collected at each station using Van Veen grab, which covered an area of 0.04m^2. The wet sediment was passed through a sieve of mesh size 0.5 mm for segregating the organisms. The organisms retained in the sieve were fixed in 5-7% formalin and stained further with Rose Bengal dye for ease of spotting at the time of sorting. The number of organisms in each grab sample was expressed as No. /10cm^2. All the species were sorted, enumerated and identified by following the available literature. The works of Day (1967), Hartman (1968), Rouse and Pleijel (2001), Robin *et al*., (2003), Amr (2021), were referred for polychaetes; Crane (1975), Holthuis (1993), Naderloo (2017). Xavier *et al*., (2020) for crustaceans; Subba

Rao (2017), Ravinesh *et al*. (2021) and Edward *et al*, (2022) for molluscs. Statistical analyses such as diversity indices and Univariate measures such as Shannon-Wiener diversity index (H'), Margalef's species richness (d), Simpson's dominance (D) were determined using Paleontological Statistics Software Package for Education and Data (PAST) version 3.2.1 (Hammer et al., 2001).

Plate 1: Estimation of intertidal fauna by the quadrate method

Plate 2a: Collection of Plankton

2 b. Collection macrobenthos in subtidal habitat

3.4. Mudflats

Mudflats are ecologically and socio-economically vital ecosystems that bring benefits to human populations around the globe. These soft-sediment intertidal habitats, with >10% silt and clay (Dyer, 1979), sustain global fisheries through the establishment of food and habitat (including important nursery habitats), support resident and migratory populations of birds, provide coastal defences, and have aesthetic value. Mudflats are intimately linked by physical processes and dependent on coastal habitats, and they commonly appear in the natural sequence of habitats between subtidal channels and vegetated salt marshes. In some coastal areas, which may be several kilometres wide and commonly form the largest part of the intertidal area. Mudflats are characterized by high biological productivity and abundance of organisms but low in species diversity with few rare species. The mudflat biota reflects the prevailing physical conditions of the region. Intertidal mudflats can be separated into three distinct zones such as the lower tidal, middle and upper mudflats. The lower mudflats lie between mean low water neap and mean low water spring tide levels, and are often subjected to strong tidal currents. The middle mudflats are located between mean low water neaps and mean high water springs. The upper mudflats lie between the mean high-water neap and mean high water springs. The upper mudflats are the least inundated part and are only submerged at high water by spring tides (Klein, 1985). Salt marsh vegetation may colonize as far seaward as mean high water neaps. Mudflats will often continue below the level of low water spring tides and form sub-tidal mudflats (McCann, 1980). The upper parts of mudflats are generally characterized by coarse clays, the middle parts by silts, and the lower region by sandy mud (Dyer *et al*., 2000). The intertidal mudflats are prominent sub-environments that occurred on the margin of the estuaries and low relief sheltered coastal environments. The fine-grained sediments of intertidal mudflats (70%-90%) are derived from terrestrial and marine regions (Lesuerd *et.al*.,2003). Estuarine mudflats are potential sites for deposition of organic matter derived from terrigenous, marine, atmospheric and anthropogenic sources and are mainly associated with fine grained particles (Wang *et.al*., 2006).

Plate 3. Sediment sample collection at mangrove and mudflat areas

Sampling locations

The Sediment samples were collected from 15 sampling locations by using sediment corer. From each site triplicate samples were collected from up to 100 cm depth with four intervals (0-25cm, 25-50cm, 50-75cm & 75-100cm) and made into composite sample for analysis. The samples were packed in zip lock bags, stored in icebox and shifted to the laboratory for subsequent analysis.

Total Organic Carbon

The organic carbon content of the mudflat sediment was estimated to assess the biological productivity of the sediment. Soil Organic Carbon (SOC) was estimated following the method of Walkley and Black (1934). In this method, organic matter (humus) in the soil gets oxidized by Chromic acid (Potassium dichromate plus concentrated H2SO4) by utilizing the heat evolved with the addition of H_2SO4. The unreacted dichromate is determined by back titration with Ferrous ammonium sulphate (redox titration). Organic carbon was determined by following the below given formula:

$$\text{Oxidizable organic carbon (\%)} = \frac{10\ (B\ -\ T)}{B} \times\ 0.003\ \times\ \frac{100}{\text{wt. of soil}}$$

Where B = volume (mL) of Ferrous ammonium sulfate required for blank titration.T = volume of Ferrous ammonium sulfate needed for soil sample. Wt. =weight of soil (g).

Estimation of Bulk Density (BD)

The soil under field condition exists as a three-phase system viz. solid (soil particles), liquid (water) and gas (mostly air). The soil organic matter contained in a unit volume of the soil sample is called its bulk density. The amount of bulk density depends on the texture, structure and organic matter status of the soil. High organic matter content lowers the bulk density, whereas compaction increases the bulk density. To determine the bulk density of the sediment samples collected during the present study, the oven-dry weight of a known sediment volume was considered, and mass per unit volume was calculated (Maiti, 2012).

3.5. Mangrove assessment

Mangroves are widely distributed on the Deendayal Port Authority jurisdiction area along the Kandla coast. The 15 sites were selected at the different creeks belong to Deendayal Port Authority jurisdiction to represent the mangroves status in Kandla. The mangrove

stations in this study were named Tuna, Jangi, Kandla, Phan and Navlakhi based on the closeness of the location to the respective creek system. The Point Centered Quadrate Method (PCQM) was used for the collection of data of the mangrove vegetation structure. The data included, measurements of density of plants, height variations, canopy and basal girth of mangrove trees as per the method of Cintron and Novelli (1984). For this method, a transect of a maximum of 200 m was applied mostly perpendicular or occasionally parallel to the creek. The sampling points were considered at an interval of every 10 m and the vegetation structure of the that area were recorded. As the orientation of the transect line was already fixed, it was easy for movements within the station area for data recording. The distance between trees from the centre of the sampling point to the nearest 4 trees of four different directions, height of trees from the ground level, canopy length and canopy width were measured to determine the canopy cover in this study. The equipments utilized in the field were handy, and easy to use such as ranging rods, pipes and for measurement of girth at root collar above the ground (GRC), a measuring tape was used. The plants with a height <50 cm was considered as regeneration class and >50 cm but <100 cm was considered as recruitment class. Along the transects, sub-plots of 1×1 m^2 for regeneration and 2×2 m^2 were laid randomly for recruitment class of the mangrove sites.

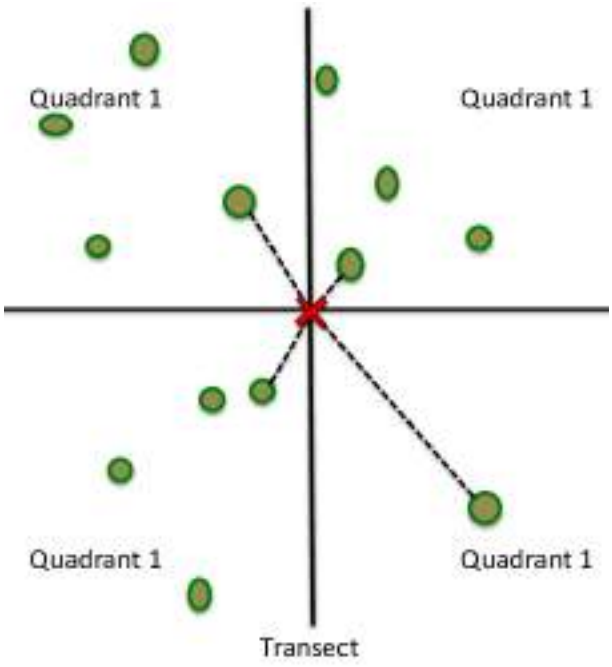


Figure 11 . Point Centred Quadrate Method

Plate 4: Assessment of mangrove density, height, canopy cover and girth

3.6. Halophytes

To quantify and document the halophytes at Deendayal Port Authority region, quadrate method was followed. At each sampling location quadrates of various sizes have been laid during every seasonal sampling. For recording the plant density at each transect, a quadrate 1 x 1m^2 has been laid within the site each tree quadrates were used randomly (Mishra,1968; Bonham, 1989). Four quadrates each for shrubs and herbs were laid in each tree quadrate to assess the halophytes and the percentage cover in the study area. To enrich the species inventory, areas falling outside the quadrates were also explored and the observed species were recorded and photographed and identified using standard keys. Specimens of the various species were collected to know more information on habitat and for the preparation of herbarium.

Plate 5: Assessment and percentage cover of halophyte

3.7. Marine Fishery

Fishery resources and the diversity were assessed from the selected sampling sites. Finfish and shellfish samples were collected using a gill net with a 10 mm mesh size. The net was operated onto the water from a canoe or by a person standing in waist deep water during the high tide using a cast net (Plate 6). For effective sampling, points were fixed at distances within the offshore sites for deploying fishing nets to calculate the Catch per Unit effort estimated per hour. The collected specimens were segregated into groups, weighed and preserved in 10% neutralized formalin solution. Finfishes were identified following Fischer and Bianchi (1984), Masuda *et al*. (1984), de Bruin et al. (1995) and Mohsin and Ambiak (1996). Relevant secondary information pertaining to fishery resources of Deendayal Port creek systems were gathered through technical reports, the District Fisheries department, Government gazette and other research publications.

Plate 6: Fisheries Information from DPA environment

3.8. Avifauna

The Avifauna population was determined along DPA mangrove stands for which the area was demarcated into fifteen major stations. In each station, creeks of varying lengths from 2 to 5 km are available. These creeks were surveyed by using boat and adopting "line transect" method. A total of fifteen boat transect (one in each site) survey was conducted in the Monsoon, Post -Monsoon and Pre-monsoon season (May 2024- May 2025. Survey was done in terrestrial habitats like mangrove plantations adjoining the mudflats, waste land, and aquatic habitats, like creek area, rivers and wetland.

Boat Surveys

Mangrove bird diversity was calculated by using Boat Survey method. Birds were observed from an observation post on board the boat which has given the greatest angle of clear view. Birds within a 100 meter transect on one side of the boat were counted in 10-minute blocks of time (Briggs *et al.* 1985; van Franeker, 1994). Detection of birds was done with a binocular (10 x 40) and counts were made: (1) continuously of all stationary birds (swimming, sitting on mangrove, or actively feeding) within the transect limits and (2) in a snap-shot fashion for all flying birds within the transect limits. The speed of the boat determines the forward limit of the snapshot area within a range of 100 meters. Longer or shorter forward distances were avoided by adapting the frequency of the snapshot counts. Birds that following and circling the boat were omitted from both snapshot and continuous counts. If birds arrive and then follow the boat, they were included in the count only if their first sighting falls within a normal snapshot or continuous count of the transect area. For each bird observation species, number of individuals and activity at the time of sighting, were recorded. Species richness and diversity index were calculated for different mangrove patches (i.e. fifteen station) of the study station in the Deendayal port Authority.Data collected in- situ and through laboratory analysis of samples were subjected to descriptive statistical analysis (PAST and Primer 7.0) for the mean, range and distribution of different variables from the selected 15 study stations.

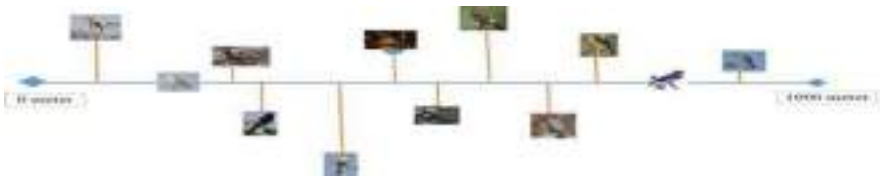


Figure .12 Line transect method for Avifauna survey

3.9 Data analysis

Data collected in situ and through laboratory analysis of samples were subjected to descriptive statistical analysis (PAST) for the mean, range and distribution of different variables from the selected 15 study stations.

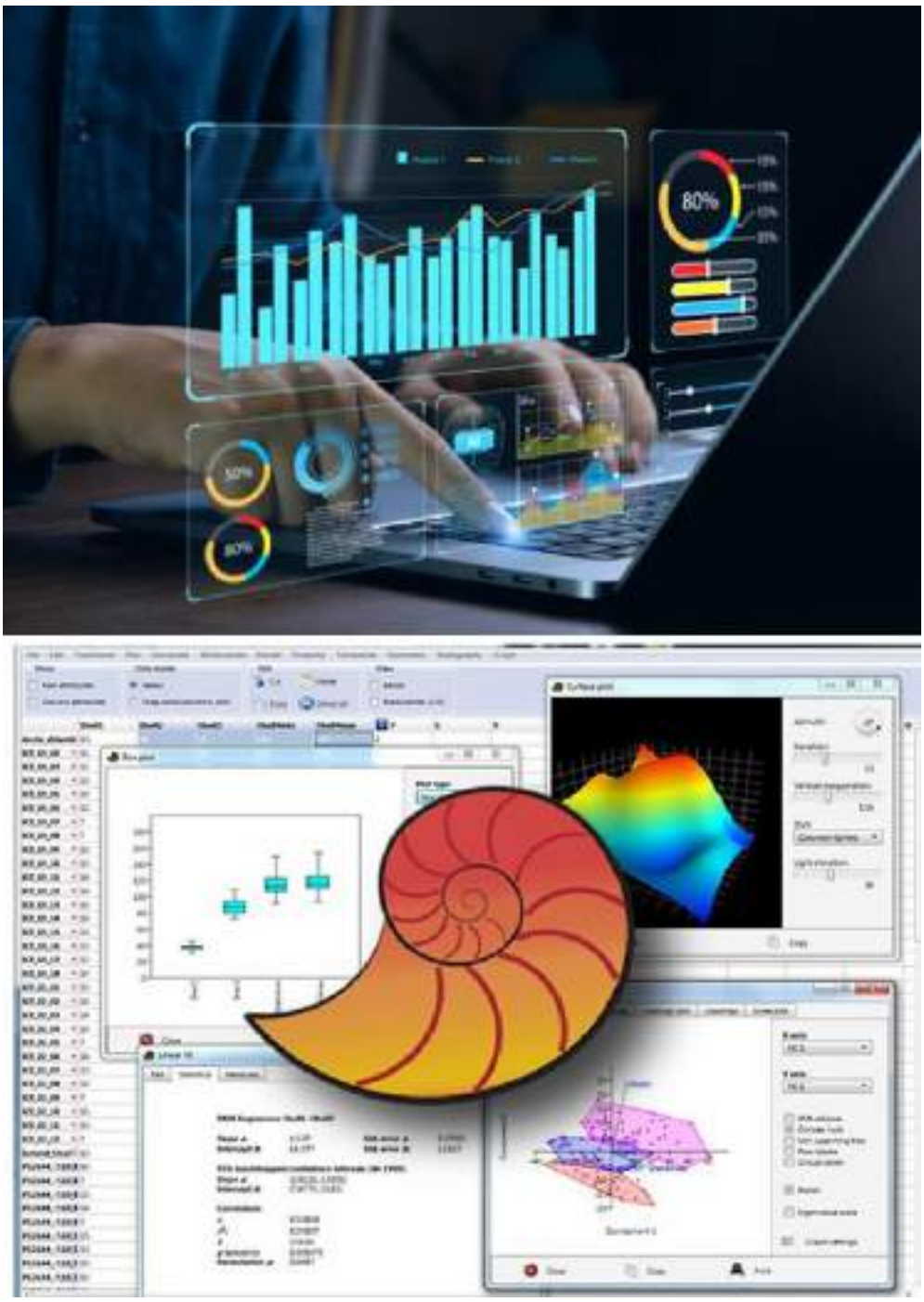


Plate 7 Statistical Data analysis methods

4.Results

4.1. Physico-Chemical Characteristics of water and Sediment

4.1.1.Water quality assessment

The data on the mean water quality parameters measured at the time of sampling of the biological components from the 15 study sites are presented in Table12.

Table-12 Physico-chemical characteristics of the DPA Jurisdiction From May 2024- May 2025

Parameter		Monsoon 2024	Post Monsoon 2024-25	Pre Monsoon 2025
Temperature (°C)	max	30	27	29
	min	23	12	25
pH	max	8.1	8.5	8.3
	min	7.7	7.3	7.8
Salinity	max	42	42	41
	min	34	32	32
Dissolved oxygen (mg/L)	max	8.2	7.7	5.3
	min	2.9	3.9	3.2
Total Suspended Solids (TSS) (mg/L	max	729	579	722
	min	205	222	253
Total Dissolved solids (TDS) (mg/L)	max	139862	95571	41300
	min	26876	9829	3035
Turbidity (NTU)	max	160	133	489
	min	20	38	61.4
Nitrate (NO3) (mg/L)	max	0.003	0.140	0.019
	min	0.001	0.020	0.009
Nitrite (NO2) (mg/L)	max	0.173	0.003	0.128
	min	0.001	0.001	0.003
Total Phosphorus (mg/L)	max	73.24	65.90	27.12
	min	36.18	30.60	3.16
Total silicate	max	0.058	0.07	4.48
	min	0.012	0.01	1.02
PHs (µg/L)	max	10.10	70.80	8.32
	min	1.20	2.50	0.19
Chlorophyll a (mg/L)	max	0.89	0.65	2.98
	min	0.04	0.04	0.12

Temperature (°C)

The values for the Temperature obtained from 15 different sampling station for all the three seasons (Monsoon, post monsoon and pre monsoon) have been represented in Figure 13. During monsoon, the value ranged from 23°C to 30°C while in post monsoon observation, the value ranged from 12°C to 27°C. However, in pre monsoon the values were noted in the range of 25°C to 29°C. During monsoon, the highest temperature was noted at station S-7 while the lowest temperature was noted at S-6 and S-15. In post-monsoon maximum temperature was recorded at S-2 and S-4 and lowest at S-15 while in pre-monsoon highest temperature exhibited at S-2 & S-8 and lowest temperature observed at S-10.

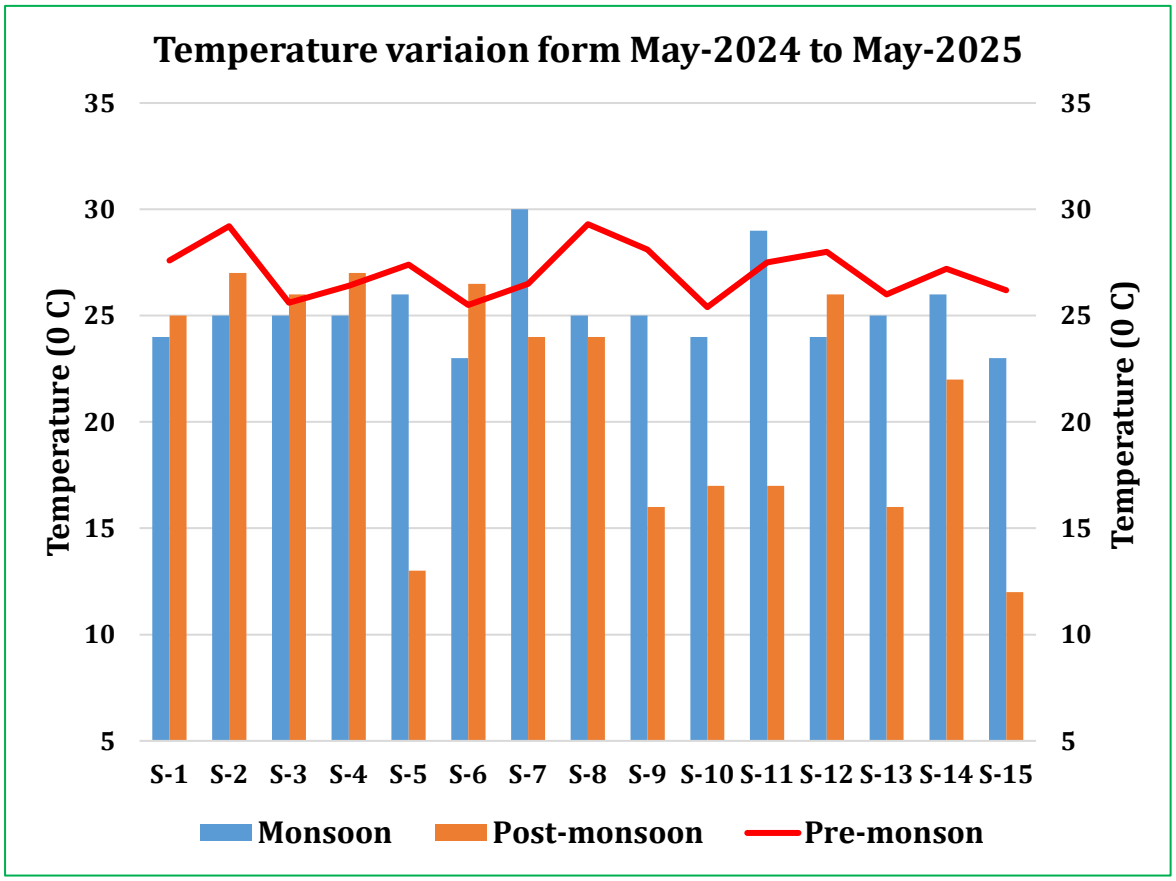


Figure 13. Temperature variation in DPA study sites during 2024-2025

The average temperature in Deendayal port authority jurisdiction varied from 21° C to 27°C in 3 seasons throughout the year.

pH

The pH obtained from 15 different sampling station for all the three seasons (Monsoon, post monsoon and pre monsoon) have been represented in Figure 12. During monsoon, the value ranged from 7.7 to 8.1 while in post monsoon observation, the value ranged from 7.3 to 8.5. However, in pre monsoon the values were noted in the range of 7.8 to 8.3. During monsoon, the highest pH was noted at station S-1, S-3, S-6, S-7, S-13, & S-14 while the lowest pH was noted at S-8 & S-11. On an average, the pH ranged between 7.3 to 8.5 throughout the year inclusive of all the three seasons.

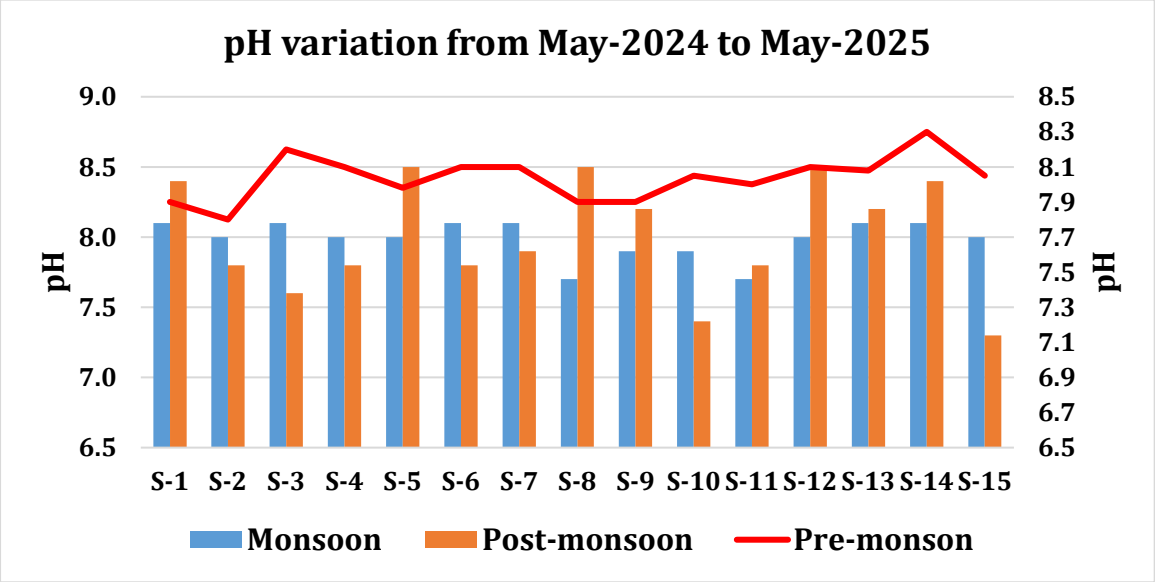


Figure 14. pH variation May 2024 to May 2025 in Deendayal Port Authority

Salinity (ppt)

The salinity obtained from 15 different sampling station for all the three seasons (Monsoon, post monsoon and pre monsoon) have been represented in Figure 15. During monsoon, the salinity ranged from 34 ppt to 42 ppt while in post monsoon observation, the value ranged from 32 ppt to 42 ppt. However, in pre monsoon the values were noted in the range of 32 ppt to 41 ppt. During pre-monsoon, the highest salinity was noted at stations S-10 & S-11 while the lowest salinity was recorded at S-5. It was observed that maximum salinity was recorded in pre-monsoon and post-monsoon seasons while the lowest was recorded during monsoon. The average salinity throughout the year in Deendayal port authority jurisdiction varied from 32 ppt to 42 ppt during 3 seasons.

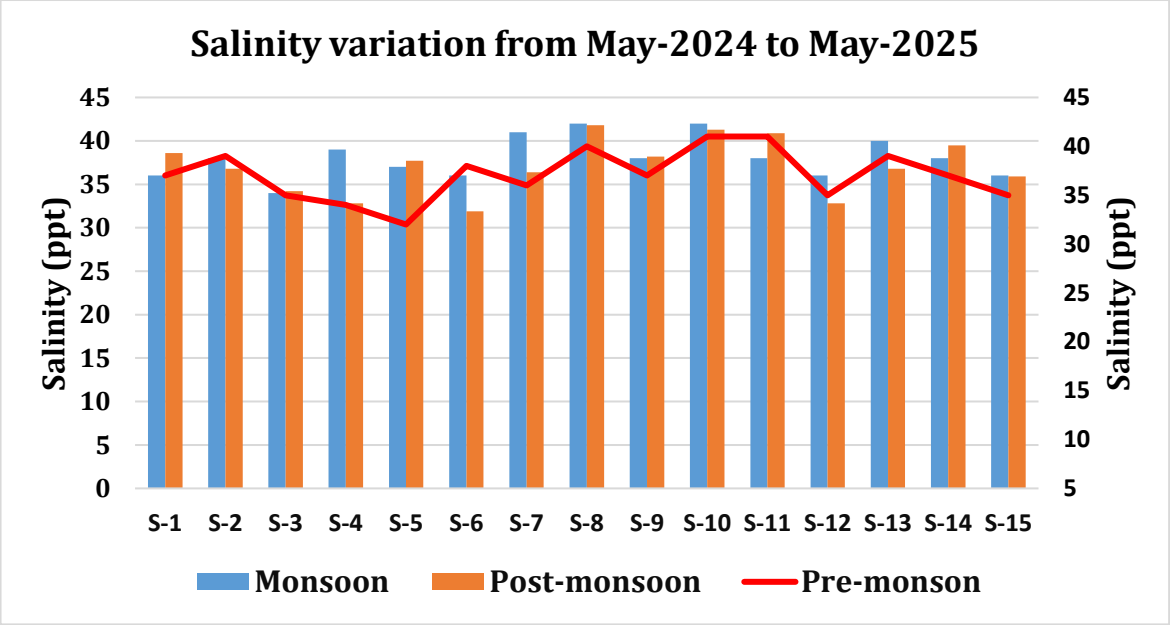


Figure 15. Seasonal variation of salinity during 2024-2025 at DPA

Dissolved oxygen (DO)

The maximum Dissolved Oxygen concentration of the sampling stations for three seasons varied from 5.3 mg/L to 8.2 mg/L with average of 4.1 mg/L to 5.8 mg/L from May 2024 to May 2025. The minimum DO values varied from 2.9 mg/L to 3.9 mg/L. The seasonal variation of water DO among stations is presented in Figure 16.

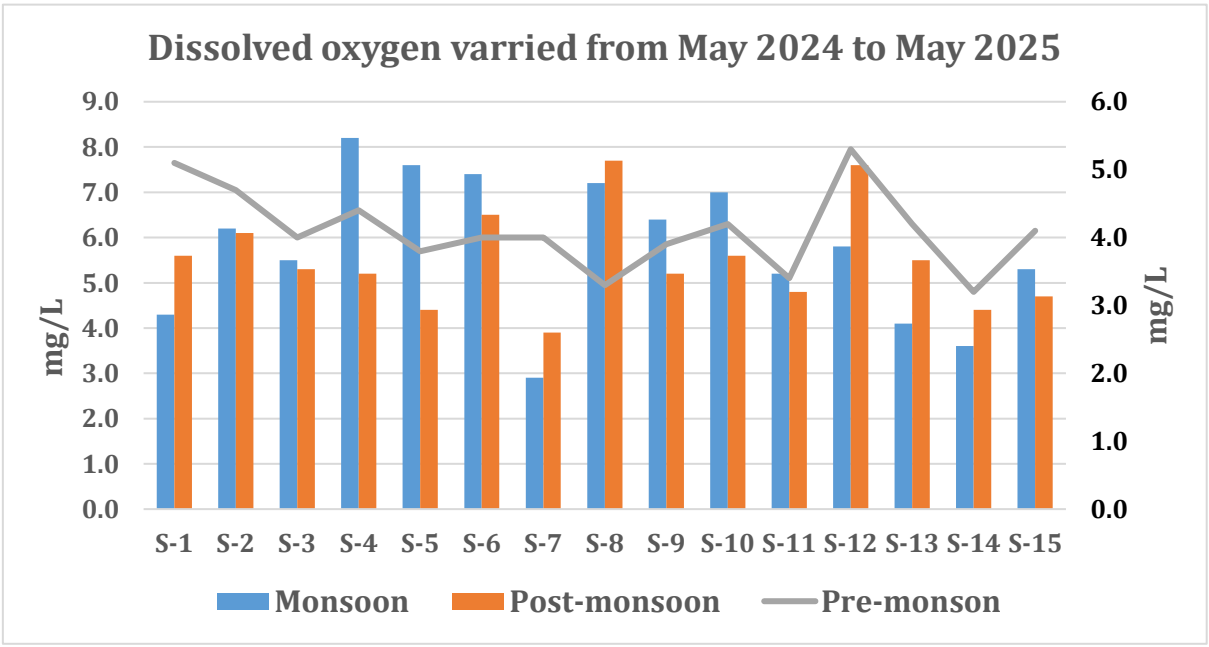


Figure 16. Seasonal variation Dissolved Oxygen from May 2024 to May 2025

During monsoon, the highest DO concentration was observed at station S-4 (8.2 mg/L), and the Lowest dissolved oxygen concentration was observed at S-7 (2.9 mg/L). In post-monsoon, the highest dissolved oxygen was observed at S-8 (7.7 mg/L) and the lowest value at S-7 (3.9 mg/L). During Pre-monsoon, the highest and lowest DO values were observed at stations S-12 (5.3 mg/L) and S-14 (3.2 mg/L) respectively.

Total Suspended Solids (TSS)

The values for the Total Suspended Solids (TSS) obtained from 15 different sampling sites for all the three seasons (Monsoon, post monsoon and pre monsoon) have been represented in Figure 15. During monsoon, the value ranged from 205 mg/L to 729 mg/L, while in post monsoon observation, the value ranged from 222 mg/L to 579 mg/L. However, in pre monsoon the values were noted in the range of 253 mg/L to 722 mg/L. During monsoon, the highest TSS was noted at site S-6 while the lowest TSS value was noted at S-13. The maximum TSS was obtained at S-15 and lowest at S-4 during post monsoon while site S-5 exhibited the highest TSS value and S-12 exhibited the lowest value during the pre-monsoon season (Figure 17).

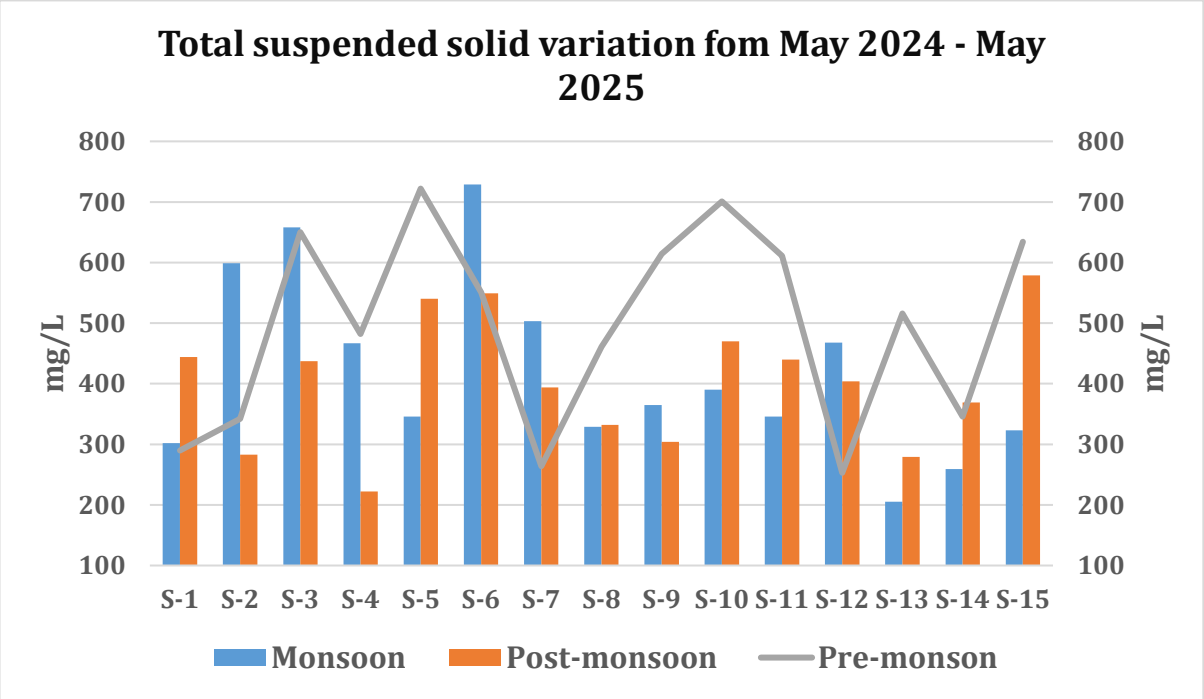


Figure 17 Seasonal variation of TSS during May 2024-May 2025

Total Dissolved solids (TDS)

The values for the Total Dissolved Solids (TDS) obtained from 15 different sampling sites for all the three seasons (Monsoon, post monsoon and pre monsoon) have been represented in Figure 18. During monsoon, the value ranged from 26876 mg/L to 139862 mg/L, while in the post monsoon observation, the value ranged from 9829 mg/L to 95571 mg/L. However, in pre monsoon the values were noted in the range of 3035 mg/L to 41300 mg/L. During monsoon, the highest TDS was noted at site S-10 while the lowest TDS value was noted at S-12. The maximum TDS was obtained at S-14 and the lowest was recorded at S-2 during post monsoon while site S-6 exhibited the maximum TDS value and S-12 showed the lowest value during the pre-monsoon season.

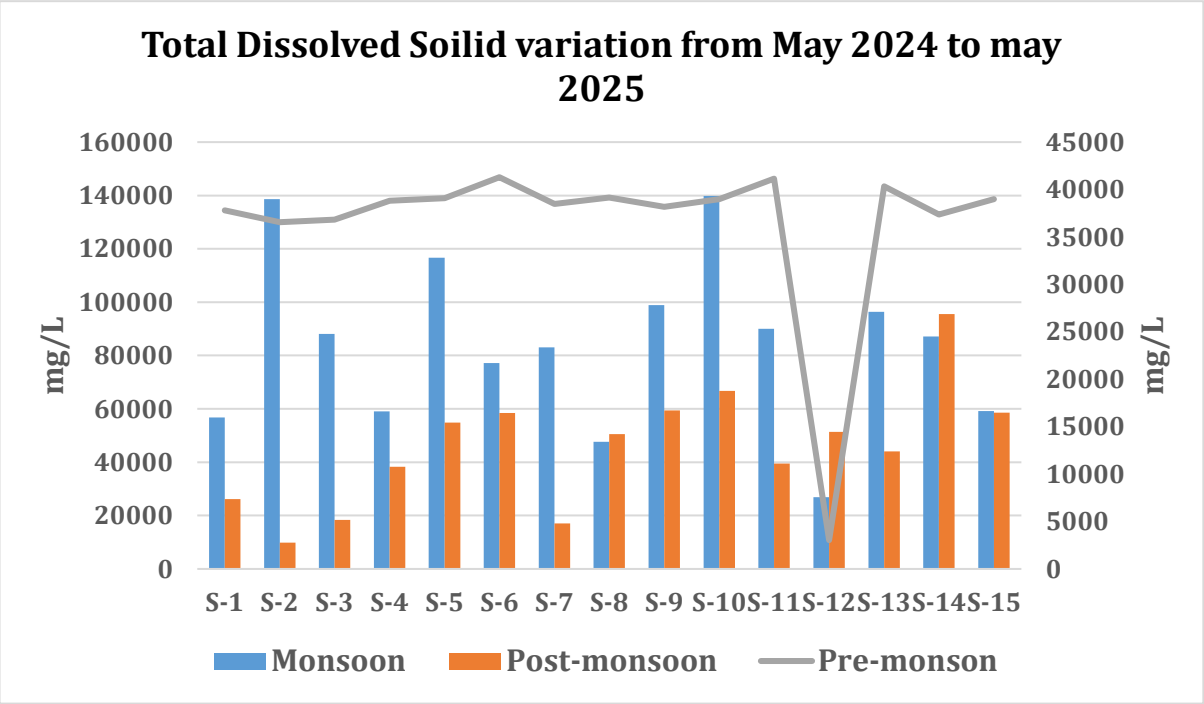


Figure 18 Total Dissolved Solids (TSS) from May 2024 to May 2025

Turbidity

The Turbidity of the sampling stations varied season wise from 20 NTU to 489 NTU for the period May 2024 to May 2025. The seasonal variation of water turbidity among the stations is presented in Figure 19.

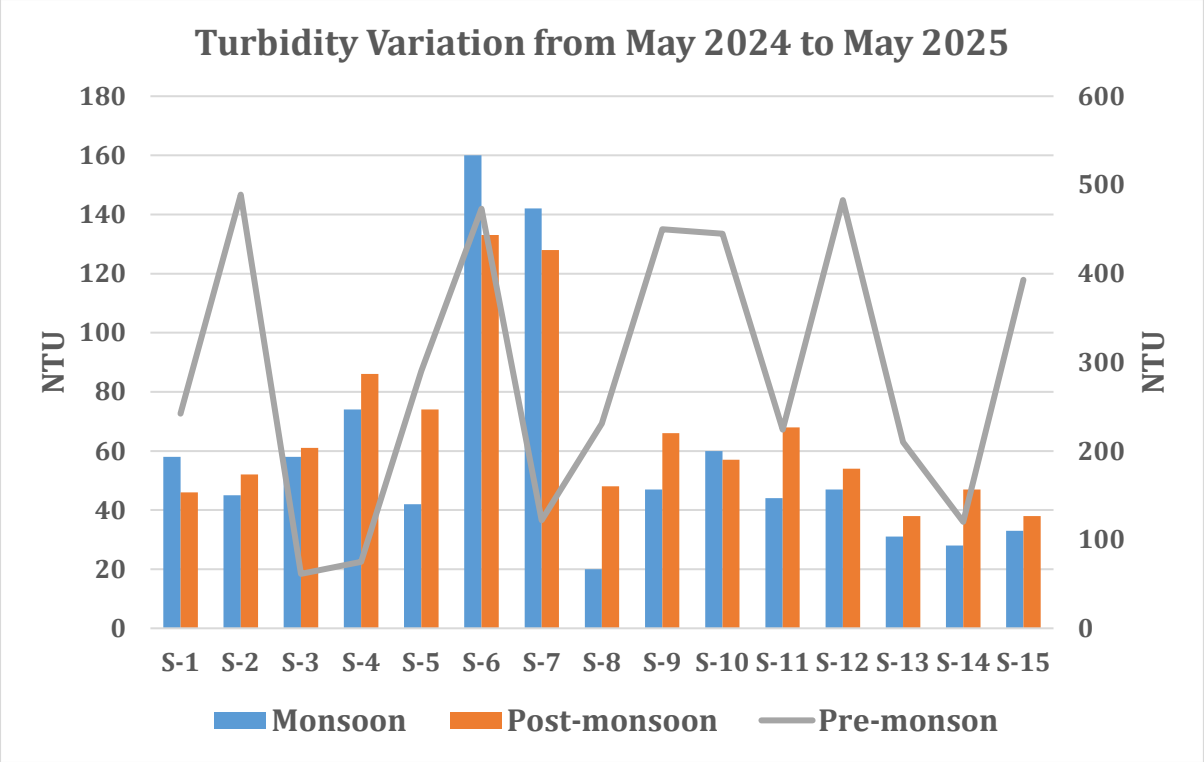


Figure 19 Seasonal variation during Turbidity from May 2024 to May 2025

During monsoon, the highest Turbidity was observed at S-6 (160 NTU) and the lowest was at S-8 (20 NTU). In post-monsoon, the highest Turbidity was observed at station S-6 (133 NTU) and the lowest was at stations S-13 & S-15 (38 NTU). Similarly in Pre-monsoon, the highest and lowest turbidity was observed at S-2 (489 NTU) and S-3 (61.4 NTU) respectively

Nitrate

The amount of Nitrate in the water sample is relatively low throughout the study period. The maximum Nitrate value for the three seasons was 0.140 mg/L from May 2024 to May 2025. This was noted at S-3 during post-monsoon study. The minimum Nitrate values noted during post monsoon were 0.020 mg/L and 0.009 mg/L (during pre-monsoon), both at site S-6. The seasonal variation of Nitrate content in water samples for all the stations is presented in figure 20. During monsoon, the highest Nitrate value observed was 0.003 mg/L at stations S-1, S-6, S-9, S-10 and S-15 whereas the lowest Nitrate value was 0.001 mg/L at station S-7. During post-monsoon study, the values increased and highest Nitrate was observed at S-3 (0.140 mg/L) and lowest at S-6 (0.020 mg/L).

Similarly in Pre-monsoon the highest (0.019 mg/L) and the lowest (0.009 mg/L) were reported S-11 & S-6 respectively.

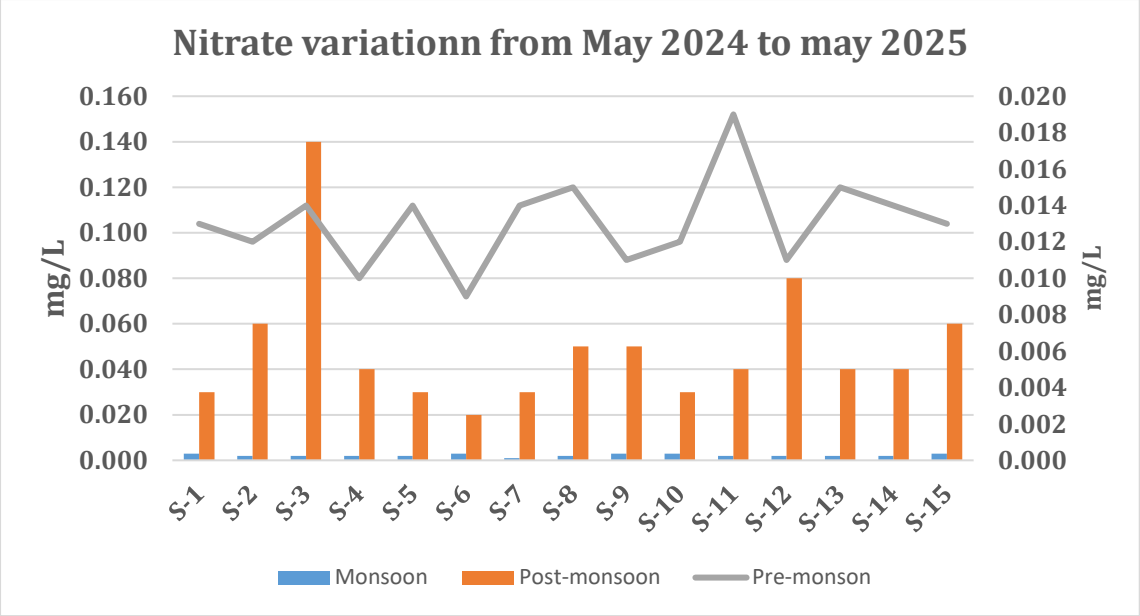


Figure 20. Seasonal variation of Nitrate concentration during May 2024 to May 2025

Nitrite

The amount of Nitrite in the water sample is relatively high compared to the nitrate content throughout the study period. The maximum Nitrite value for the three seasons was 0.173 mg/L from May 2024 to May 2025. This was noted at S-9 during monsoon study. The minimum Nitrite value noted during the study was 0.001 mg/L. The seasonal variation of Nitrite concentration is presented in Figure 21. During monsoon, the highest nitrite concentration was noted at S-9 (0.173 mg/L) and the lowest was recorded at S-14 (0.001 mg/L). In post-monsoon, the maximum value was found at S-1, S-6, S-8, S-12 and S-14 (0.003 mg/L) and lowest nitrite was observed at S-3, S-5, S-10 and S-15 (0.001mg/L). Similarly in Pre-monsoon, the highest nitrite content was (0.128 mg/L) and the lowest content (0.003 mg/L) was observed at S-1 and S-15 respectively.

Total Phosphorous

The total phosphate content at S-4 was highest during the pre-monsoon season during the study period. Seasonal observation revealed that the phosphate values were in the range of 3.16 mg/L to 73.24 mg/L. The seasonal variation for the total phosphorous among stations is presented in Figure 22.

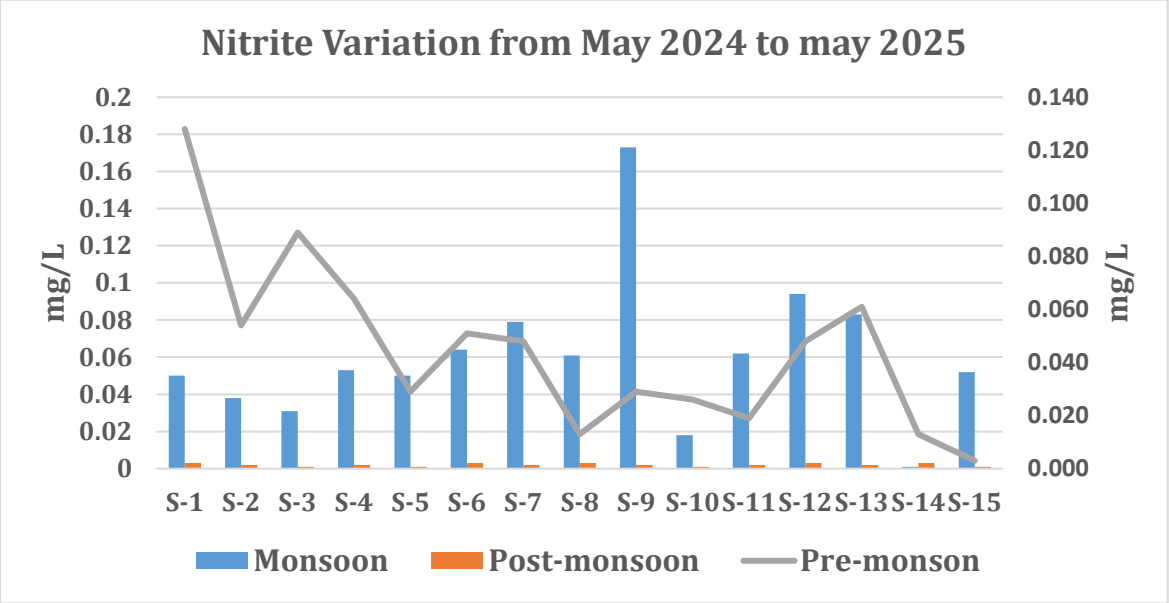


Figure 21. Nitrite concentration during May 2024 to May 2025

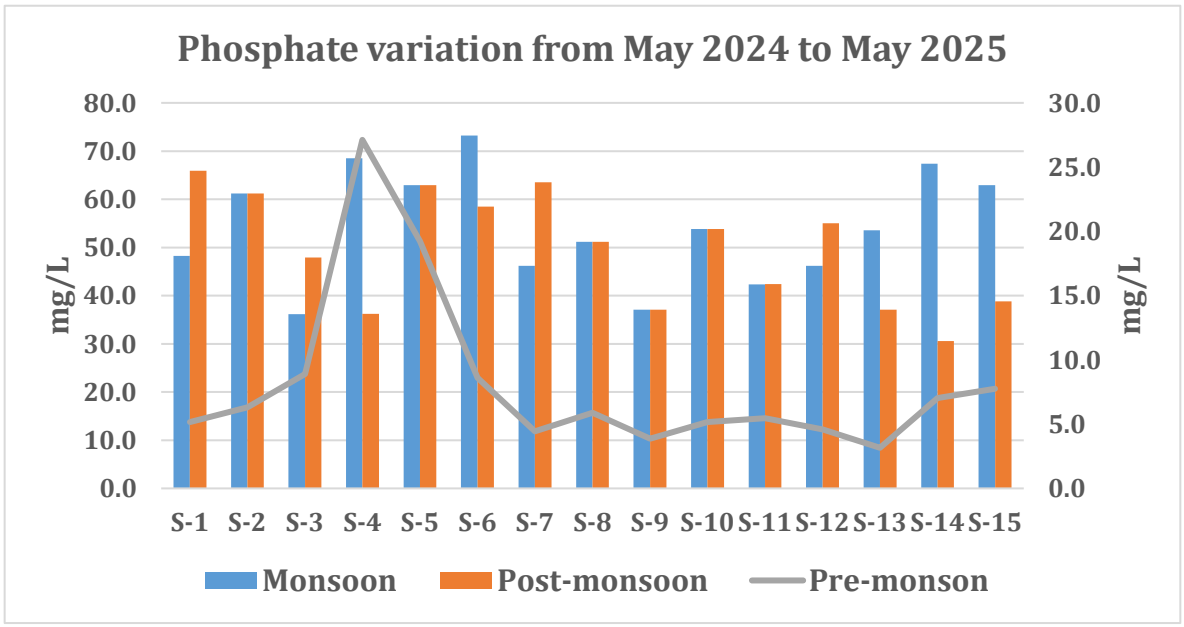


Figure 22 Seasonal variation Total Phosphorou sMay 2024 to May 2025

During Monsoon, the maximum value noted was 73.24 mg/L at (S-6) and the lowest was 36.18 mg/L at (S-3). In post-monsoon, the highest value was 65.90 mg/L at S-1 and 30.60 mg/L at S-14. In Pre-monsoon, the highest and the lowest values observed were 27.12 mg/L and 3.16 mg/L at S-4 and S-13 respectively.

Silicate

The total Silicate content at S-12 was highest during the Pre- monsoon during the study period. Seasonal observation revealed that the silicate values were in the range of 0.012 mg/L to 4.48 mg/L. The seasonal variation for the total silicates among stations is presented in Figure 23. During Monsoon, the maximum value noted was 0.058 mg/L at (S-15) and the lowest was 0.012 mg/L at (S-14). In post-monsoon, the highest and lowest value was 0.07 mg/L at S-15 and 30.01 mg/L at S-10. In Pre-monsoon, the highest and the lowest values observed were 4.48 mg/L and 1.02 mg/L at S-12 and S-13 respectively.

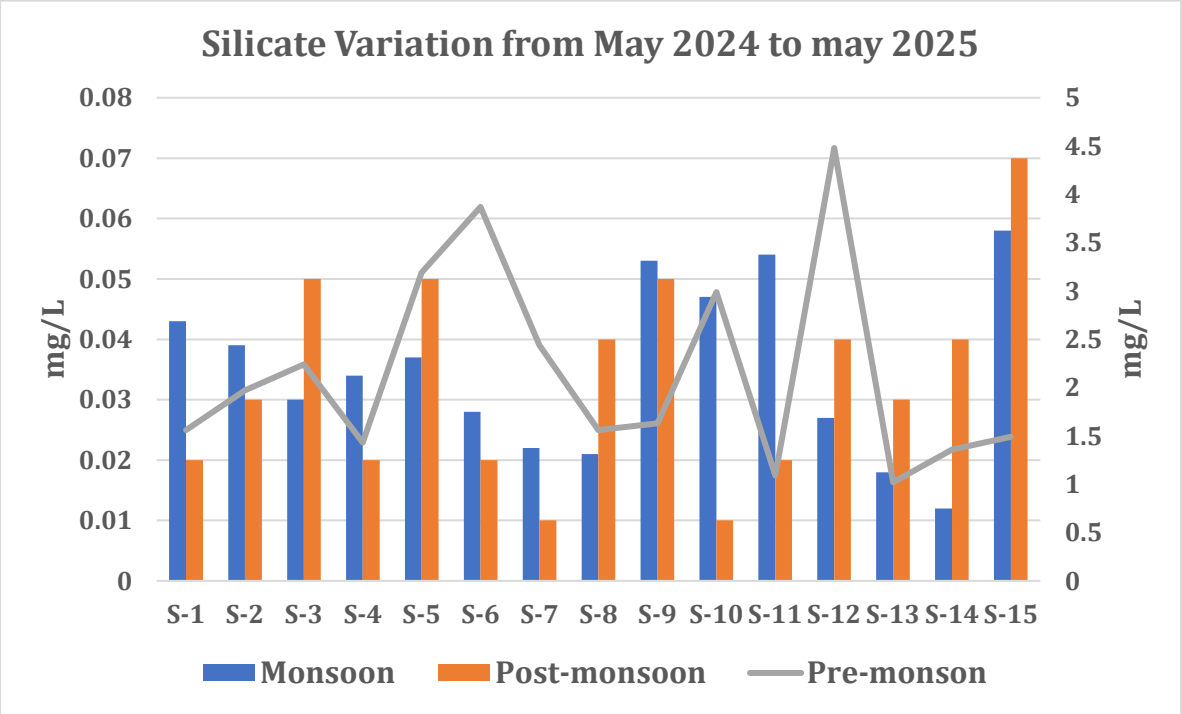


Figure 23. Seasonal variation of Silicate May 2024 to May 2025

4.1.2. Petroleum Hydrocarbon (PHs)

Petroleum Hydrocarbons (PHs) are widely recognized as the most extensively utilized fossil fuels in commercial applications (Kuppusamy et al., 2020). PHs serve as crucial raw materials across various industries and function as primary sources of energy (Varjani, 2017). However, their pervasive use has led to their identification as a major concern in terms of environmental contamination, posing significant threats to ecosystems due to their inherent stability and resilience. The category of PHs encompasses diverse components, including Polycyclic aromatic hydrocarbons (PAHs), alkanes, paraffin, cycloalkanes, organic pollutants, and non-hydrocarbon elements such as phenol, sulfur

compounds, thiol, metalloporphyrin, heterocyclic nitrogen, naphthenic acid and asphaltene. The presence of PHs significantly impacts marine organisms, with bioaccumulation of harmful PHs in the aquatic food chain persisting for extended periods. This, in consequence, affects primary producers, primary consumers, and secondary consumers. Notably, approximately 90% of PH discharges are attributed to anthropogenic activities, particularly oil spills, occurring in both terrestrial and marine environments. Reports indicate an alarming annual discharge of around 8.8 million metric tonnes of oil into aquatic environments (Periathamby and Dadrasnia, 2013).

The PHs values were comparatively high at S-7 and S-8 during post-monsoon than the other seasons. The values for Petroleum Hydrocarbons (PHs) for the three-season varied from 0.19 µg/L to 70.80 µg/L (Figure 24). The PHs concentration in general, is at low level during monsoon and pre-monsoon. During monsoon, the highest PHs were observed at S-4 (10.10 µg/L) and lowest PHs were observed along S-5 (1.20 µg/L). Similarly in Pre-monsoon, the maximum PH content was recorded (8.3 µg/L) at S-4 and the minimum was (0.19 µg/L) at S-13. In post-monsoon, the highest PH value was observed at S-7 (70.80 µg/L) and the lowest PH was observed S-6 (2.50 µg/L).

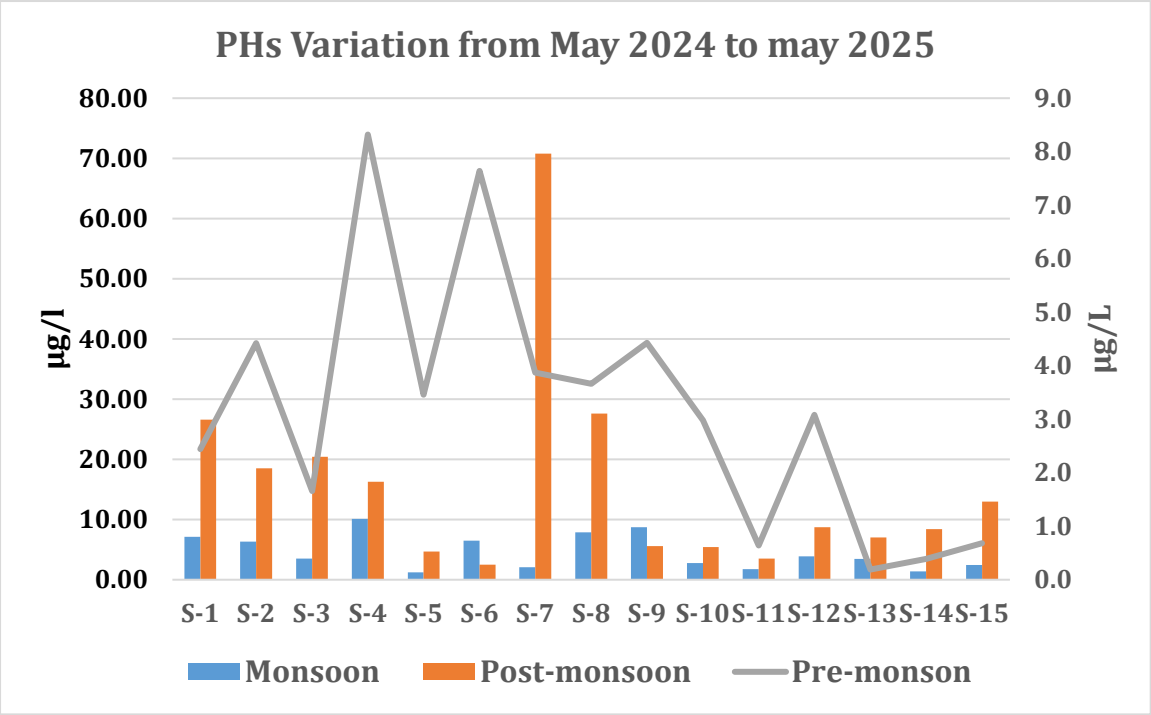


Figure 24 Seasonal Petroleum Hydrocarbon from May 2024 to May 2025

4.1.3 Sediment

Sediment texture

The sediment texture of DPA environment and its premises is presented in figure 25. The textural content mostly include sand , silt and clay. The percentage composition varieds from season to season. Through out the study period from May 2024 to may 2025 ,average sand percentage is during monsoon is more followed by pre-monsoon and Post-monsoon. The clay percentage occupies 2nd percentage composition and the average percentage is more in post and Pre-monsoon followed by monsoon. Average percentage of clay more in post-monsoon followed by pre-monsoon and monsoon.

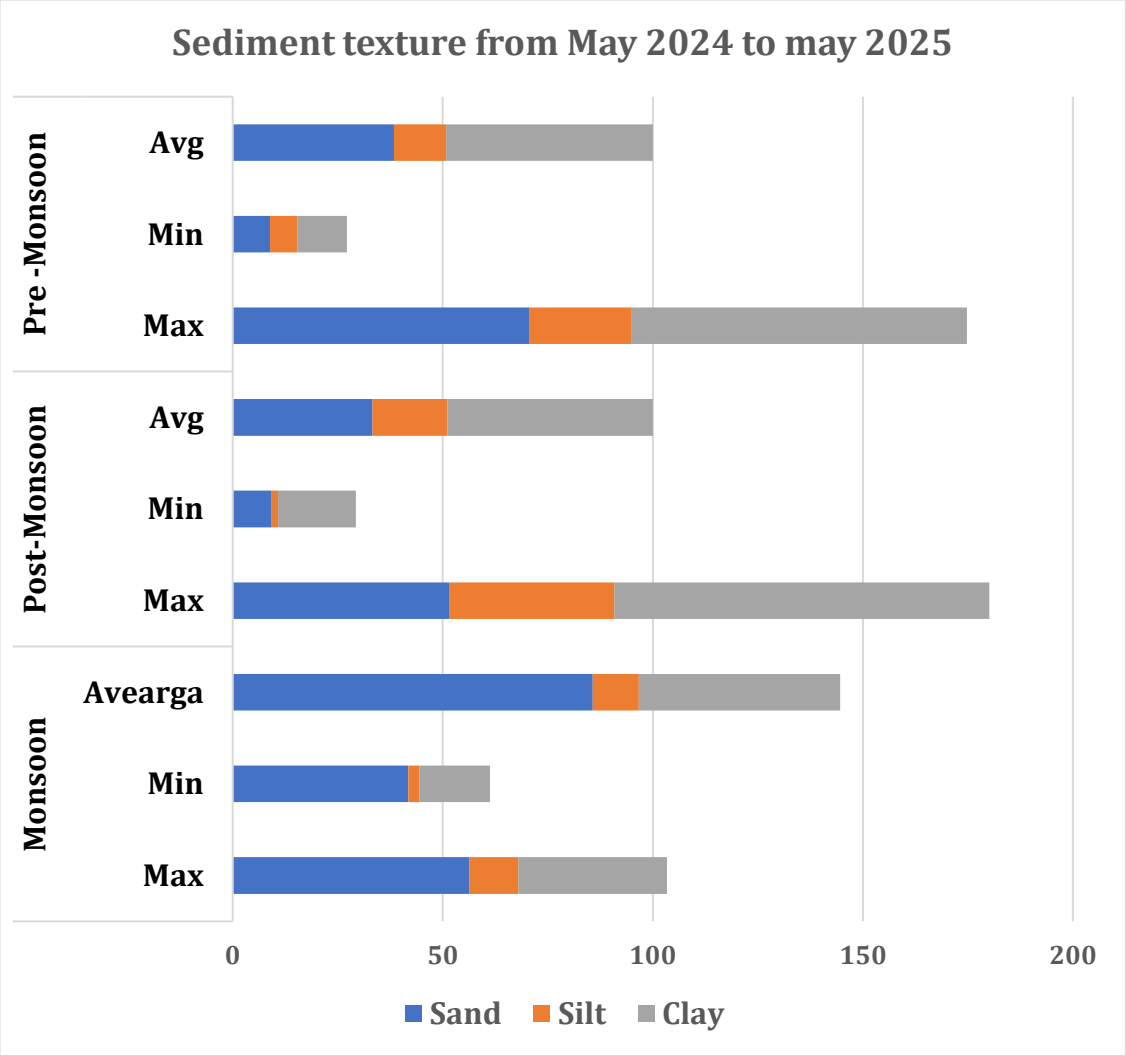


Figure 25. Soil textural chaacteristic from May 2024 to May 2025

4.1.4. Sediment total Organic Carbon (TOC)

The data on the total organic carbon of the sediment samples are presented (Figure 26). Among the station of DPA port area the maximum sediment carbon ranges from 1.2% to 3.2% and the minimum sediment carbon range was 0.5% to 2.4%. Station wise the highest sediment carbon was recorded at station S-12 during post-monsoon (3.2%), whereas lowest sediment carbon was recorded in station S-8 and S-9 during pre-monsoon (0.5%).

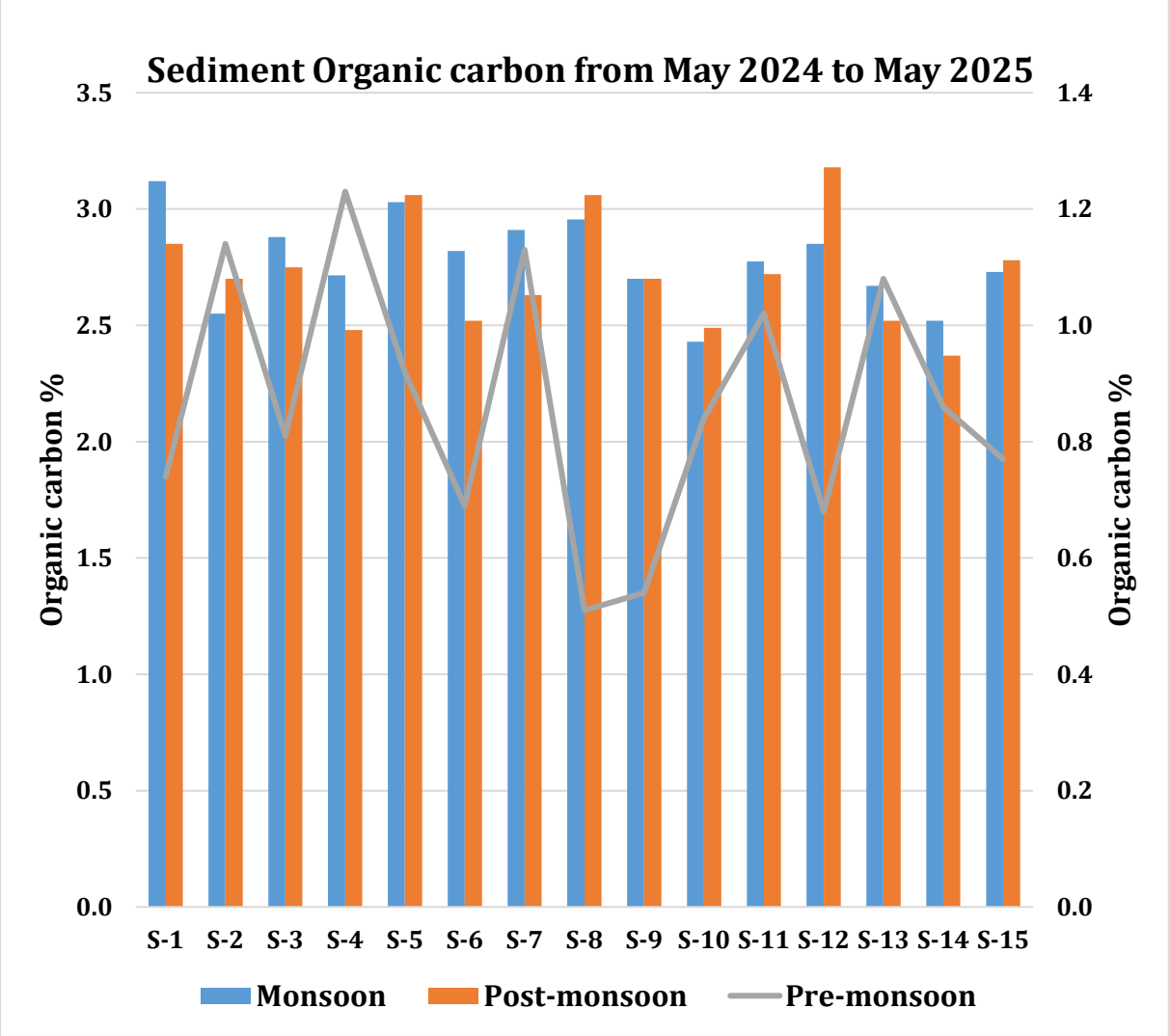


Figure 26. Sediment Organic carbon from May 2024 to May 2025

4.2. Biological characteristics water and Sediment

4.2.1. Primary productivity

Chlorophyll 'a' the photosynthetic pigment which can be used as a proxy for phytoplankton productivity and thus is an essential water quality parameter. Generally, the primary production of the water column is assessed from Chlorophyll 'a' concentration. It is well known that half of the global primary production being arbitrated by the activity of microscopic phytoplankton. . For the period of May 2024 to May 2025, the maximum Chlorophyll 'a' ranged from 0.0 mg/L to 2.98 mg/L inclusive of all the three seasons. The Chlorophyll 'a' value ranged from 0.12 mg/L to 2.98 mg/L during pre-monsoon while during monsoon, the range was recorded between 0.0 mg/L to 0.89 mg/L and during post monsoon, the range was found to be 0.04 mg/L to 0.65 mg/L. The seasonal variation of Chlorophyll 'a' among 15 stations is presented in Figure 27.

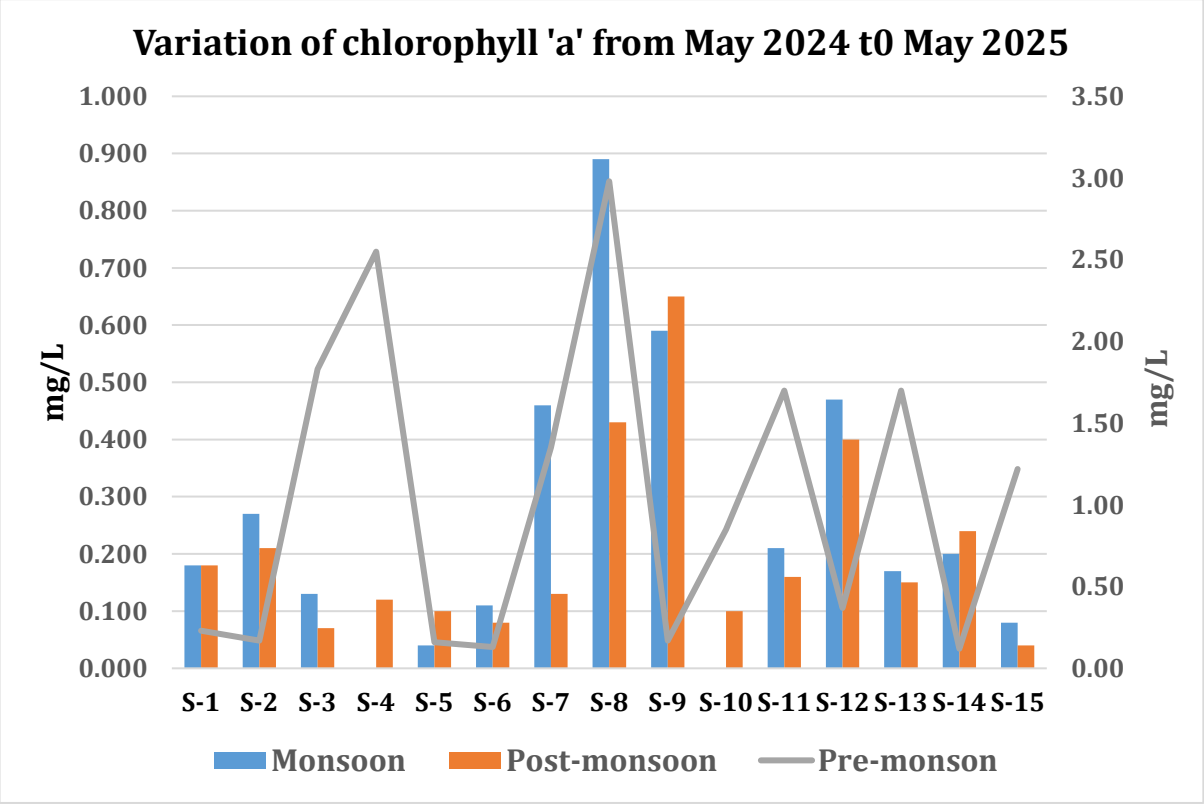


Figure 27. Concentration of Chlorophyl 'a' from May 2024 to May 2025

4.2.2. Phytoplankton

Phytoplankton are a key component of the ocean and freshwater ecosystems and provide many ecosystem services including oxygenation through photosynthesis which is estimated to be about half of the Earth's oxygen. Thus, they are important component of the functioning of ecosystems and climate regulation (Jacqueline et al.,2018). The carbon assimilation during photosynthesis by the phytoplankton enables the transfer of atmospheric carbon dioxide into the biomass which is stored in the cells and later pass on to the food chains and being cycled through the food webs. These microscopic producer community has been influenced by the negative impact from human developments and activities, and hence the service provision afforded by them should be accounted for in marine management processes (Jacqueline et al.,2018). Phytoplankton growth depends on the availability of carbon dioxide, sunlight, and nutrients. Phytoplankton, like land plants, require nutrients such as nitrate, phosphate, silicate, and calcium at various levels depending on the species. Some phytoplankton can fix nitrogen and can grow in areas where nitrate concentrations are low. They also require trace amounts of iron which limits phytoplankton growth in large areas of the ocean because iron concentrations are very low. Other factors influence phytoplankton growth rates, including water temperature and salinity, water depth, wind, and what kinds of predators are grazing on them (Lindsey and Scott,2010).

The numerous species of phytoplankton are the primary producers form the basis of marine food-webs, supporting production of higher trophic levels (a provisioning ES), and act as a sink of carbon dioxide. The spatial distributions of phytoplankton and rates of primary productivity are generally subject to bottom-up control, due to the tight coupling between light, temperature and nutrients. understanding of the spatial and temporal variability in phytoplankton parameters are accounted in marine management as these are correlated with physical and chemical factors of the water. The diatoms form the bulk of phytoplankton and the dinoflagellates are scarce. The phyto-plankton in the Gulf of Kachchh shows a primary peak in September and secondary peaks in January or June are instances of local blooms of more than one genus and species of diatoms.

Generic Status

The phytoplankton genera for the period May 2024 to May 2025 varied from 8 to 29 number with average variation of 16-23 number. Highest genera was reported during post-monsoon followed by monsoon and pre monsoon(Figure 28).

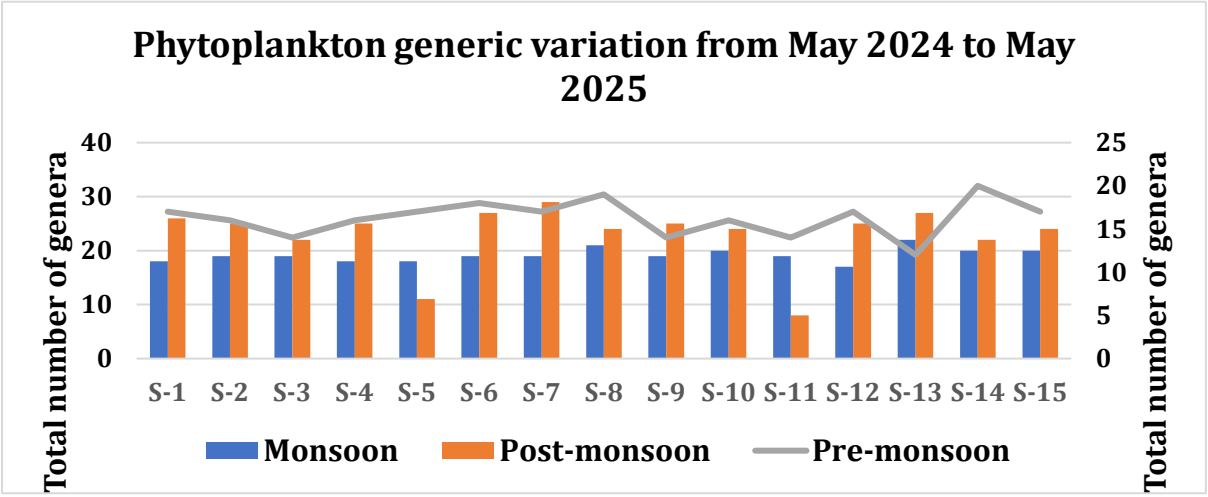


Figure 28. Seasonal variation of Phytoplankton genera from May-2024 to May2025

Percentage composition of phytoplankton

The percentage composition of different phytoplankton varied from 0.9% to 65.1% with average variation of 0.6% to 59.7% for the period May 2024 to May 2025. Four groups such as Pennales, Centrales, Dinophyceae , Cyanophyceae has been encounter during entire study period dominate by Pennales followed by Centrales and group Cyanophyceae represent less percentage of composition (Fig.29).

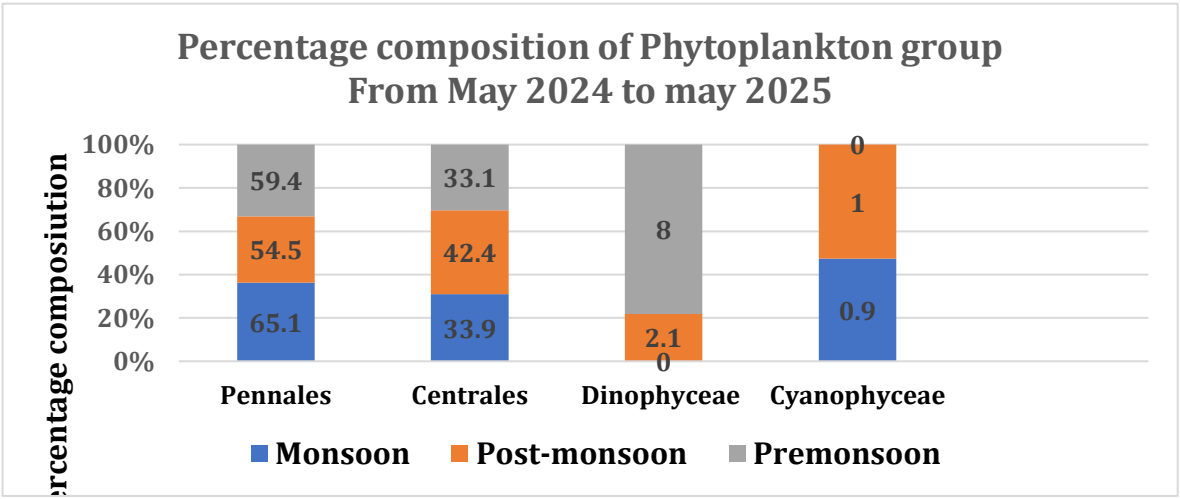


Figure 29 Percentage composition of different phytoplankton groupfrom May 2024 to May 2025

Percentage of occurrence

The percentage occurrence of phytoplankton for the period May 2024 to may 2025 was 13 to 100% . Highest percentage of occurrence was observed monsoon followed by post-monsoon and pre-monsoon. During monsoon 15 genera such as *Cheatoceros, Coscinodiscus, Dictylum, Eucampia, GyrosigmaMelosira, Navicula, Nitzschia, Odontella, Pleurosigma, Pseudonitzschia, Rhizosolenia, Synedra, Thalassionema, Thalassiothrix* represent 100% of occurrence. But in Post-monsoon and pre monsoon represent less number i.e 8 and 5 number of genera represent 100% of occurrence (Fig.30).

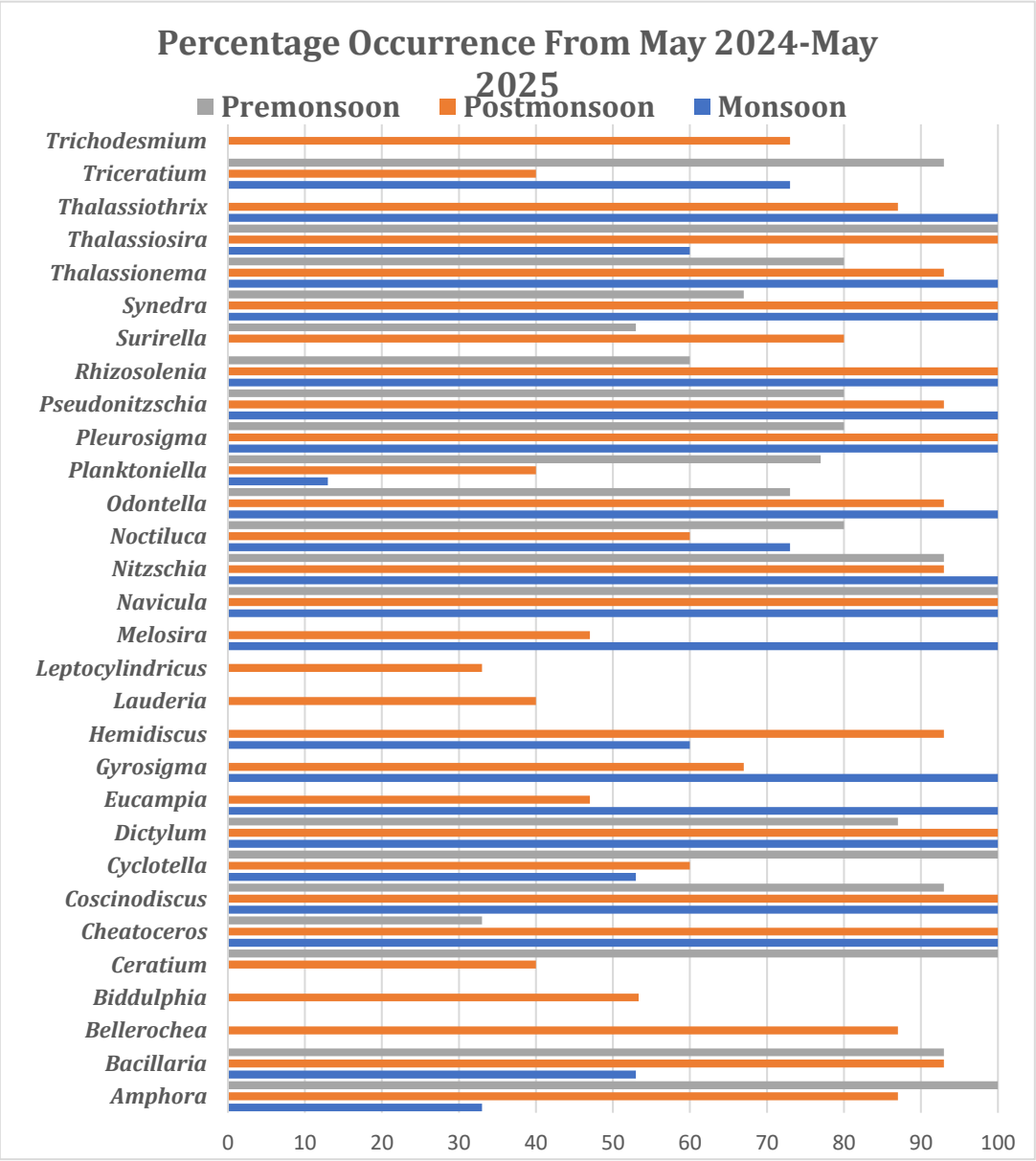


Figure 30. Percentage occurrence of phytoplankton genera from May 2024to May 2025

Phytoplankton density

The density of different phytoplankton group varied from 4000 No/L to 24320 No/L with average variation of 7,627 No/L to 24, 320. Highest phytoplankton density was observed in post-monsoon followed by Pre-monsoon and Monsoon (Fig 31).

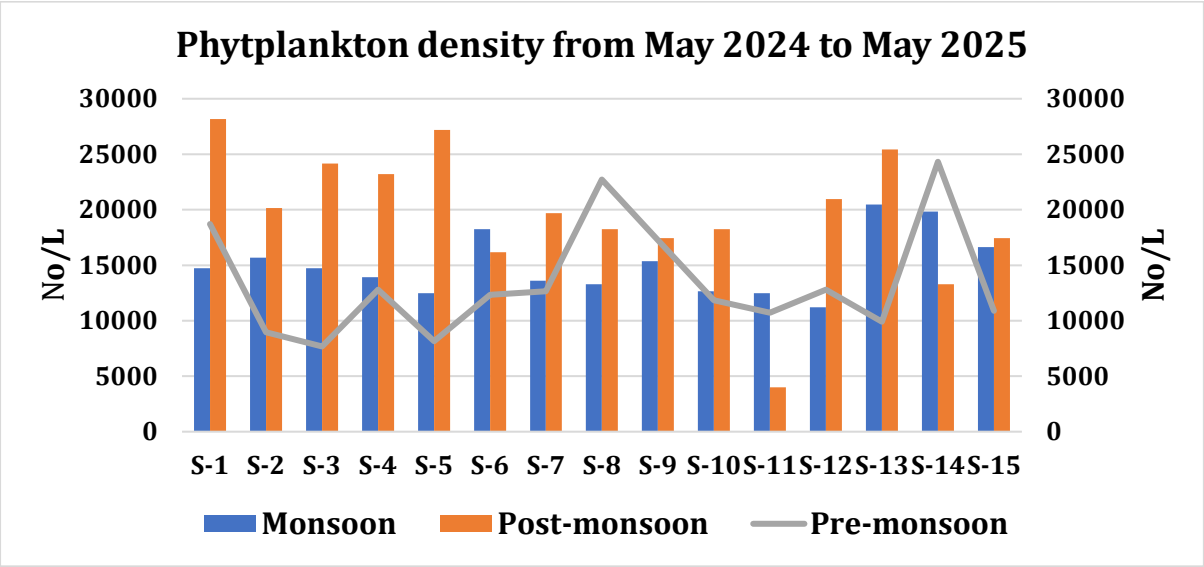
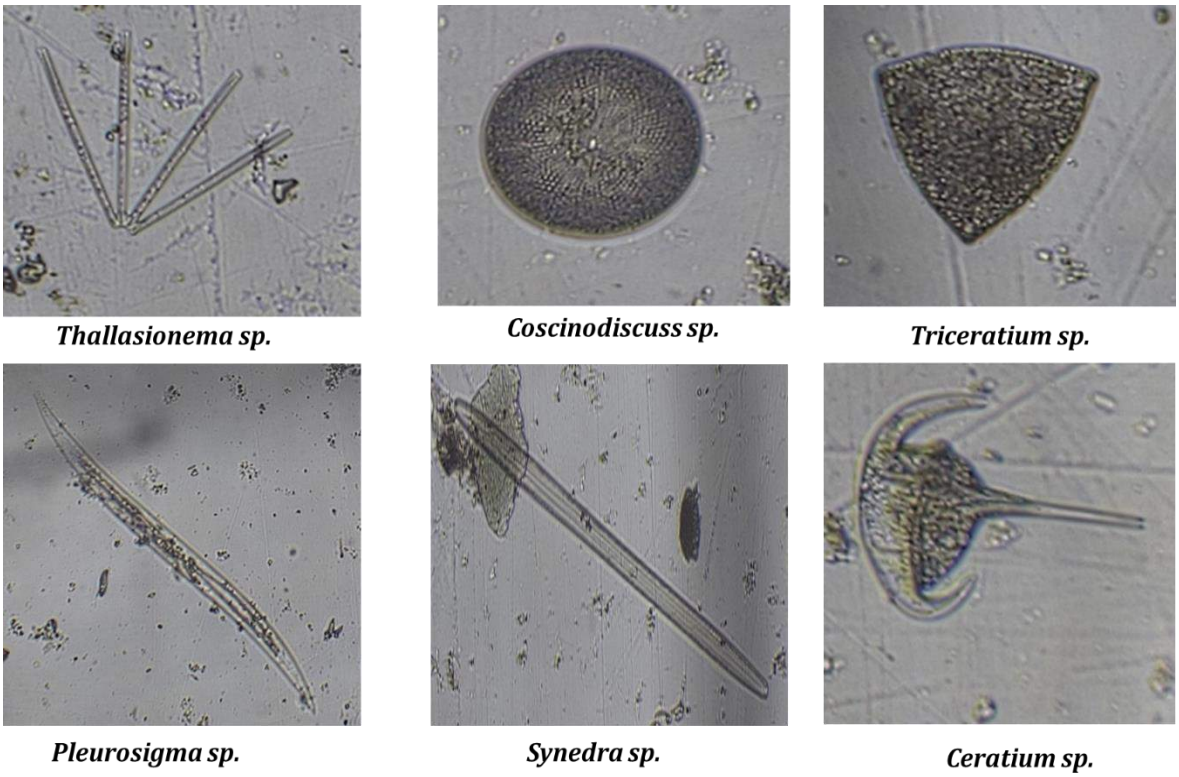


Figure 31. Seasonal variation Phytoplankton density during May 2024 to May 2025



Thallasionema sp. *Coscinodiscuss sp.* *Triceratium sp.*

Pleurosigma sp. *Synedra sp.* *Ceratium sp.*

Plate 8: Phytoplankton of Deendayal Port Authority

4.2.3. Zooplankton

These are the primary consumers that depends on phytoplankton for their feeding and constitute a second trophic level in food chain of marine ecosystem. The size of the zooplankton members varies greatly from microscopic to macroscopic occupying different depths in the pelagic realm. They constitute the primary food for several higher trophic level organisms which includes fishes, crustaceans and mollusks. Zooplankton provides the required amount of protein to the cultured fishes and crustaceans (Koli and Mule, 2012) as well. The zooplankton species quickly respond to the environmental changes and thus are used as bio-indicators for the assessment of aquatic environments (Sharma et al., 2007). Thus, zooplankton are of great ecological significance as they play important role of transferring organic matter from primary producer to secondary consumers like fishes (Kehayias et al., 2013). Zooplankton in the Gulf of Kachchhis dominated by copepods (Saravanakumar et al.,2017) while the microzooplankton is represented by Cilio-phora and Forminifera (Patel et al., 2017). Ramaiah (1997) stated that studies on zooplankton communities, especially copepods are of key importance in assessing the health of coastal ecosystems. The distribution of living organism is controlled by the variation in salinity of water and its variation caused by dilution and evaporation is most likely to influence the fauna in the coastal ecosystem (Sridhar et al. 2006). The density of zooplankton was found to be high during Post-monsoon and premosoon period, bimodal distribution, the primary peak occurring either in October or April and the secondary peak in March or December (Bhaskaran and Gopalakrishnan,2011). Similarly, there occurs gradual increase in number of organisms towards the offshore area with concomitant increase in diversity. The larval forms of echinoderms, cephalopods and brachiopods are usually confined to the offshore (Govindan et al.,1980).

Phylum and group status

The status of phylum and group of Zooplankton for the period 2024 to 2025 showed highest phylum and group during post-monsoon followed by pre-monsoon (Fig,32)

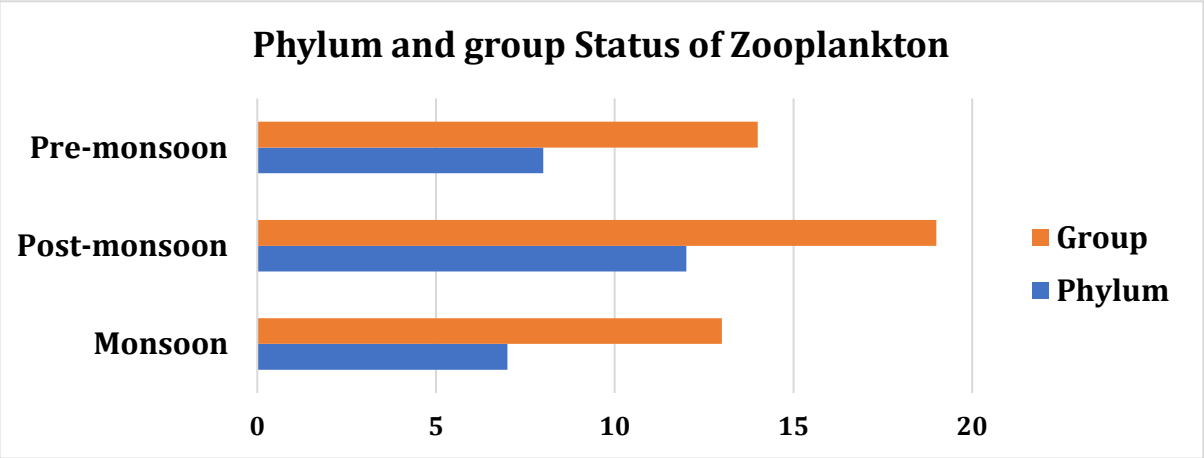


Figure 32. Status of Zooplanktonn and group and phylum from May 204 to May 2025

Generic Status

The generic status of Zooplankton from May 2024 to May 2025 varied from 13 to 37 in number with average variation of 16 to 32 in number. Highest number of genera was observed during Post- Monsoon followed by pre-monsoon and Monsoon (Fig.33)

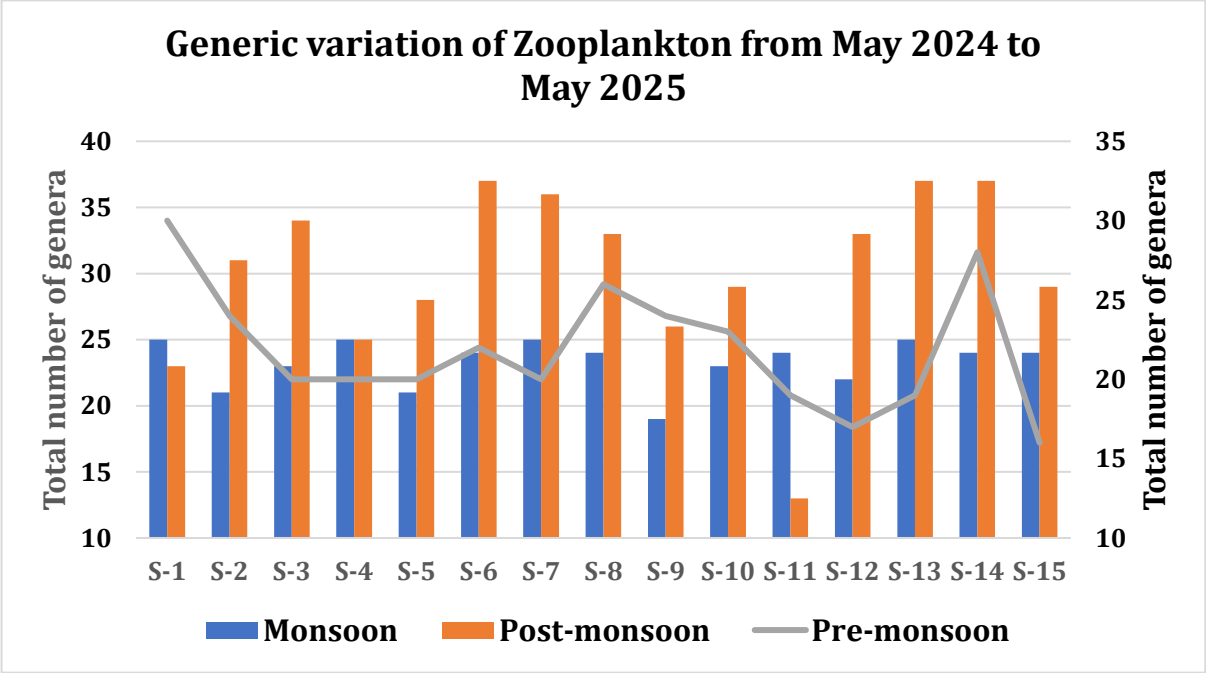


Figure 33. Generic Status of Zooplankton From May 2024 to May 2025

Percentage composition

The average maximum percentage composition of different zooplankton group varried from 26% to 31% with average variation of 29 %. Highest percentage of composition was contributed by *Copepoda-Calanoida* followed by Malacostraca and Tintinnida. Highest percentage of composition was observed in Post-monsoon and least percentage composition was observed in pre-monsoon (Fig.34).

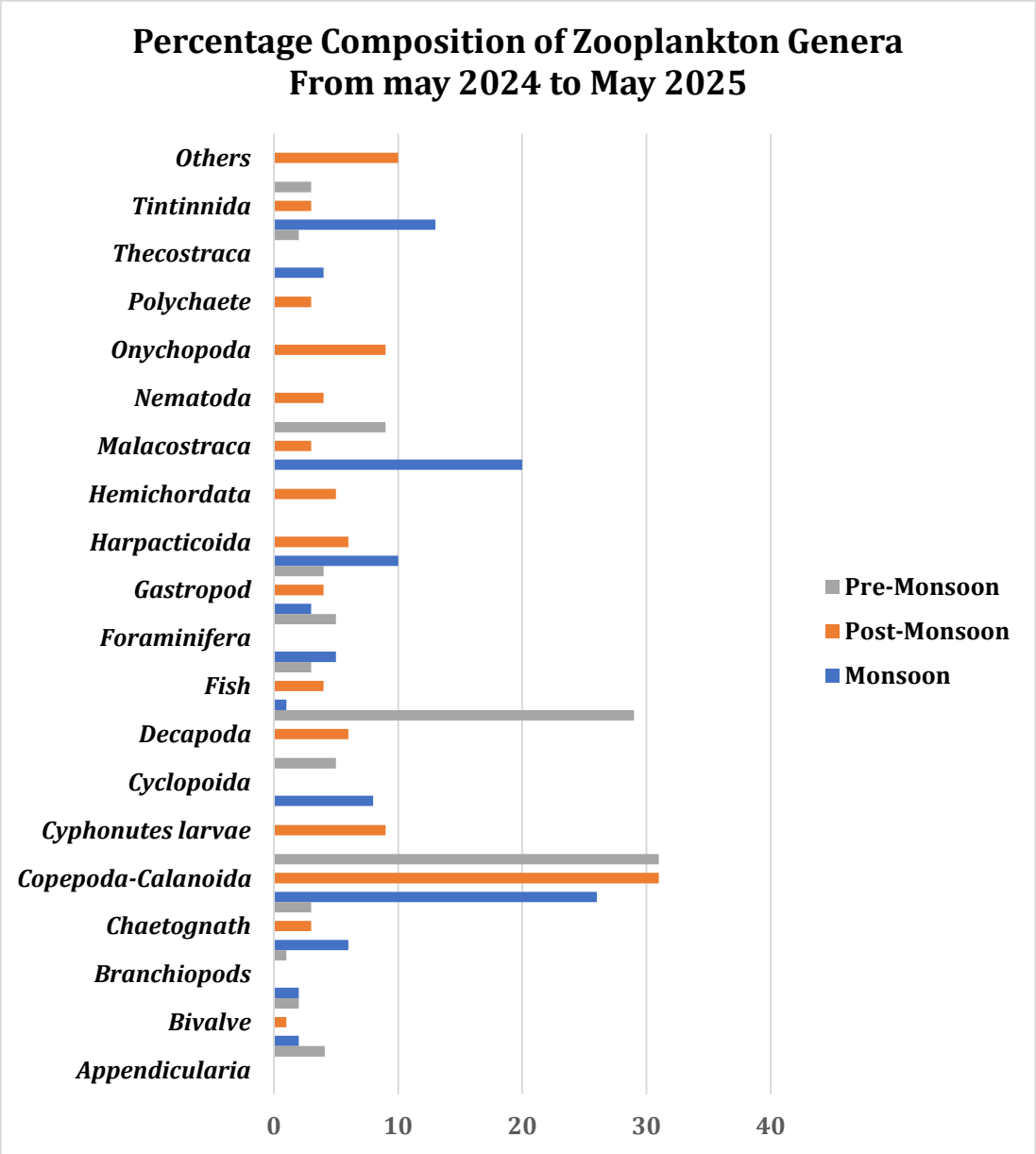


Figure 34. % Composition of Zooplankton Genera at DPA from May 2024 to May 2025

Percentage occurrence of zooplankton

The percentage occurrence of zooplankton from May 2024 to May 2025 was 7 to 100%. Highest percentage of occurrence was observed during monsoon i.e 12 genera such as Acartia, Acrocalanus, Bivalve larvae, Brachyuran larvae, Calanus, Cirripede nauplius, Codonellopsis, Eucalanus, Gastropod larvae,Globigerina, Microsetella, Tintinnopsis occurred 100% of occurrence. Similarly in Post monsoon 7 genera was found 100% of occurrence and during pre-monsoon. In Pre-monsoon least number of genera found 100% of occurrence where the genera Lucifer only found to be 100% of occurrence (Fig 35).

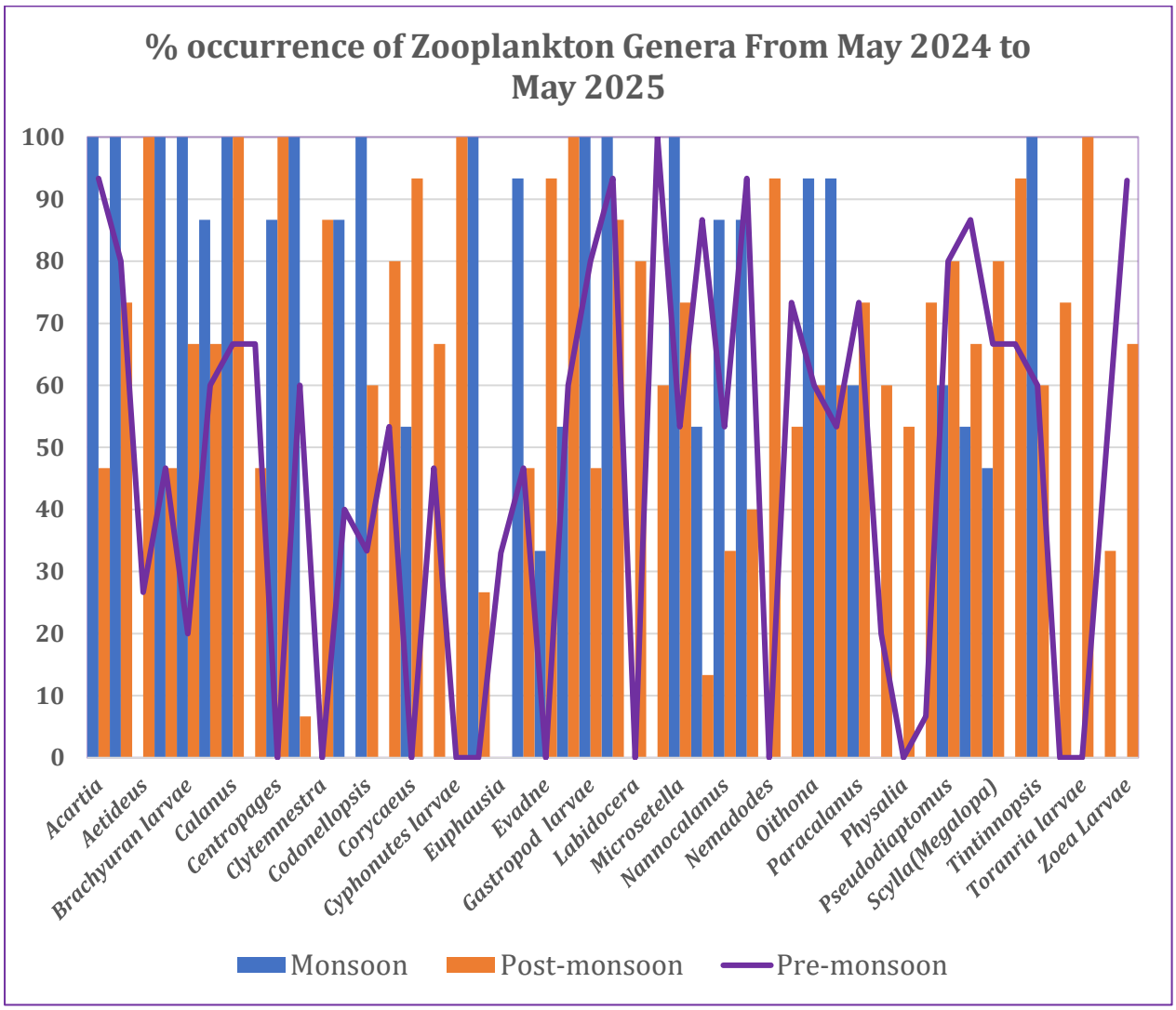


Figure 35. % Occurrence of Zooplankton Genera at DPA from May 2024 to May 2025

Density of zooplankton

The density of zooplankton from May 2024 to May 2025was 8,000 No/L to 20,000 No/L with average variation of 7,653 No/L to 17,660 No/ L. Highest Zooplankton density was observed in Post-mon soon followed by pre-monsoon and Monsoon (Fig.36).

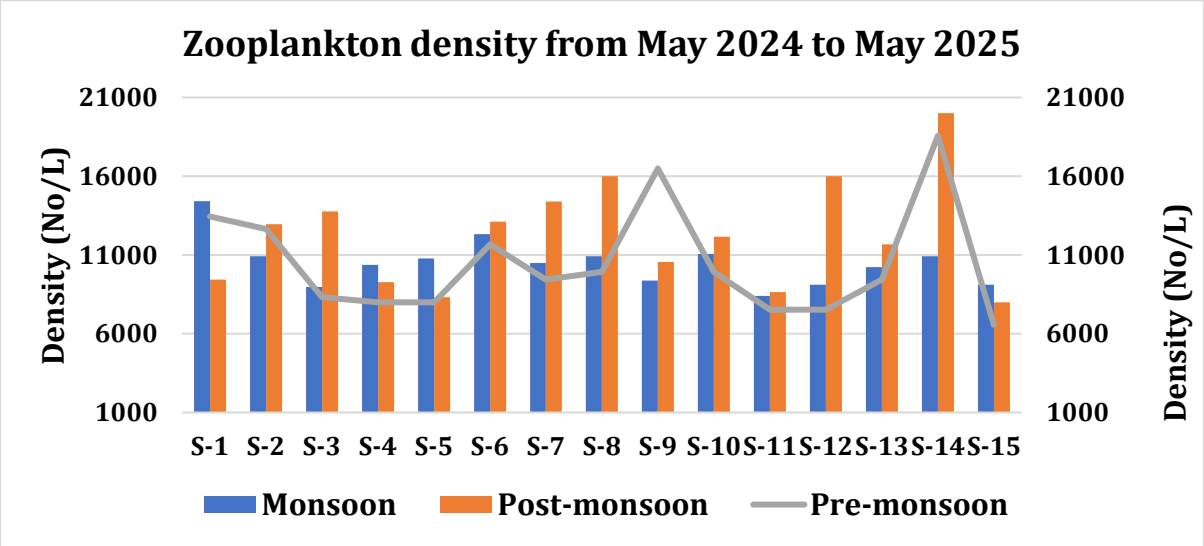


Figure 36. Density of Zooplankton in DPA form May 2024 to May 2025

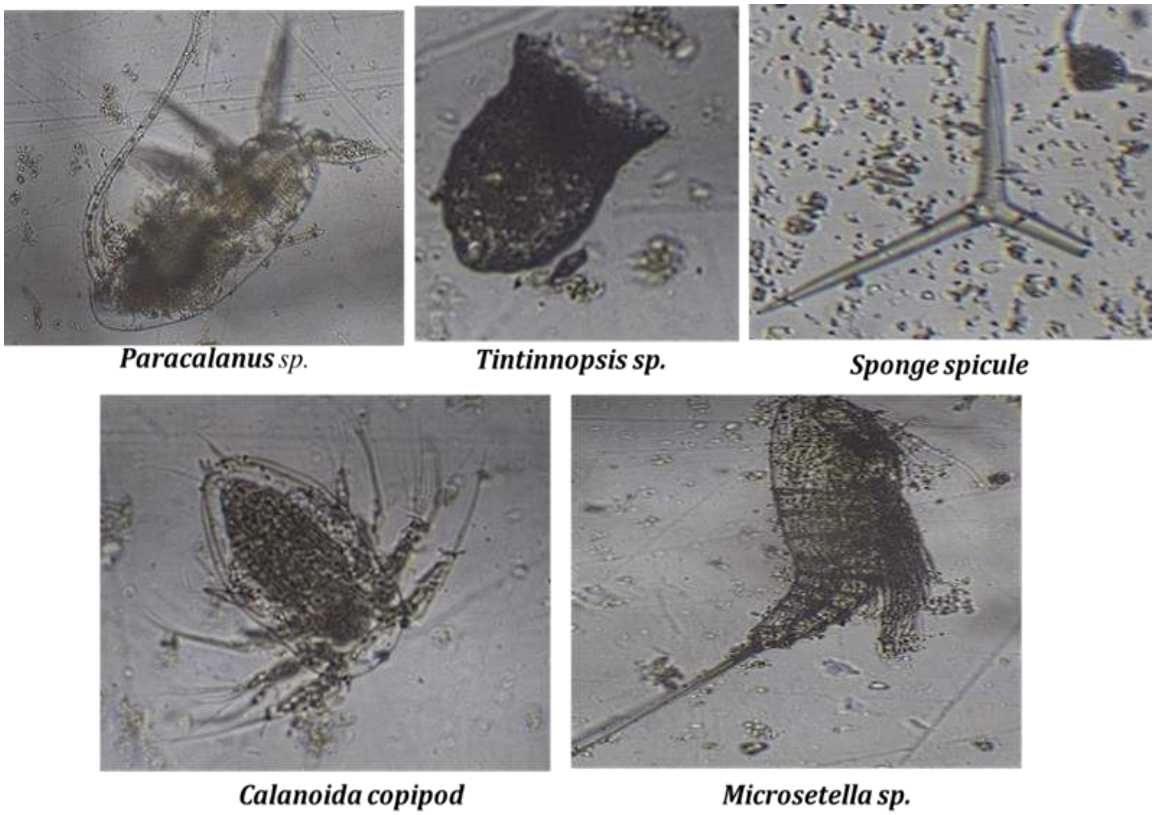


Plate 9: Zooplankton of Deendayal Port Authority

4.2.4 Intertidal Fauna

The intertidal zone, the interface between terrestrial and marine environments, represents one of the most dynamic and ecologically multifaceted ecosystems. Globally, the increasing utilization of the littoral zone for several developmental projects and human activities have contributed increasing level of habitat transformation and consequently degradation of this fragile ecosystem. Such degradation is manifested in the rapid loss of biodiversity, which poses a significant threat to the ecosystem's products and services (Liang et al., 2024).

The intertidal zone is often referred as the littoral zone is the area where the land is submerged temporarily due to the tidal water inundation, and where the benthic region of the ocean begins and below this zone is the sublittoral (shelf) zone, extending from the low tide mark to the shelf break, is permanently submerged. The Intertidal zone can include rocky ledges, sandy beaches, mudflats, salt marshes, and mangrove swamps and the benthic region has a variety of physical conditions, including depth, light penetration, and pressure. The intertidal zone is a marine habitat that experiences extreme and rapidly changing environmental conditions such as water Temperature, salinity, tidal amplitude, turbidity, along with substratum composition and organic matter and carbon content and the vegetation characteristics which are very much correlated with the fauna population density and distribution along the intertidal zone.

Faunal composition of intertidal macrobenthos

The survey of the intertidal Fauna of DPA Kandla area recorded the presence of 4 phyla (Arthropoda, Chordata, Mollusca). The faunal diversity was the highest for phylum Mollusca followed by Arthropoda and Chordata respectively (Fig.37).

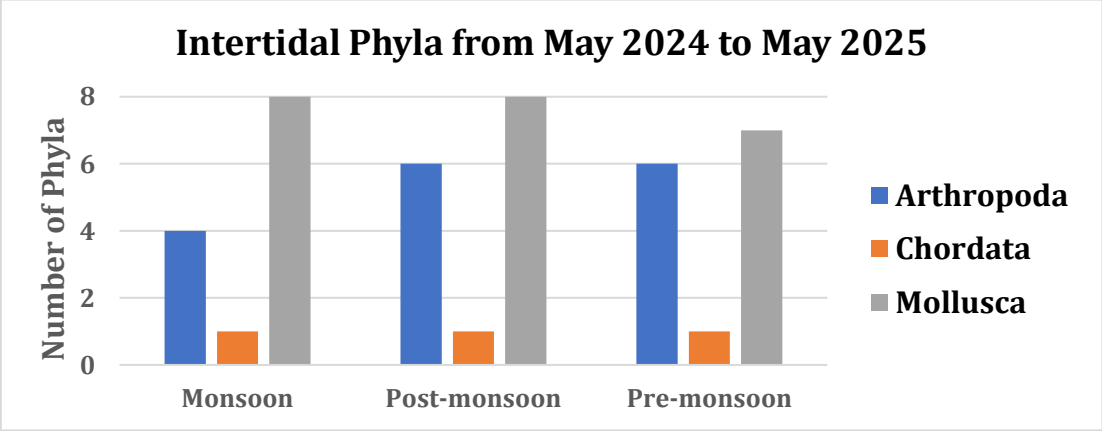


Figure 37. Intertidal faunal diversity in DPA from may 2024 to May 2025

Generic status

The generic status of intertidal fauna from May 2024 to May 2025 varied from 4 to 11 number with average variation of 4 to 10. Highest number of genera was observed during pre-monsoon followed by Post-monsoon and Monsoon (Fig.38)

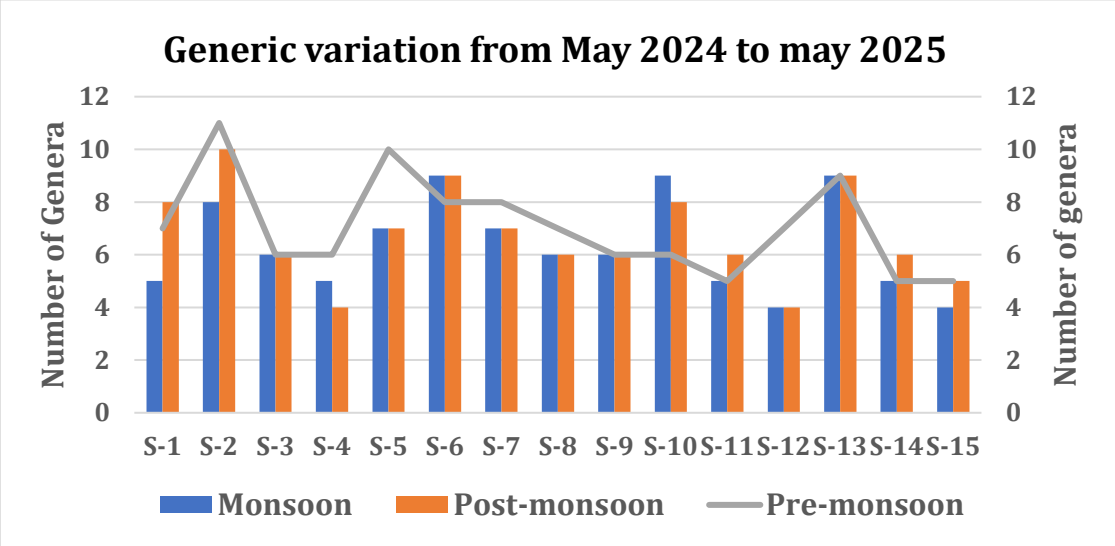


Figure 38. Generic Status of Intertidal Fauna in DPA from May 2024 to May 2025

Percentage composition of Intertidal Fauna

The percentage composition of Intertidal ranged from 0.2% to 245vwith average variation of 0.6% to 22% from May 2024 to May 2025.Highest organism contribute in pre-monsoon followed by followed by Monsoon and Post-Monsoon (Fig.39) .The organism such as *Austruca iranica*, *Austruca sindensis*, and *Austruca variegata* contribute highest percentage of composition.

Density variation of intertidal fauna

The density of Intertidal organism among different station was varied from 17No/m^2 to 133 No/m^2 with overall variation in 3 season was 18 No/m^2 to 97No/m^2 (fig 40). Monsoon contribute highest density of organism followed by Pre- and Post-Monsoon.

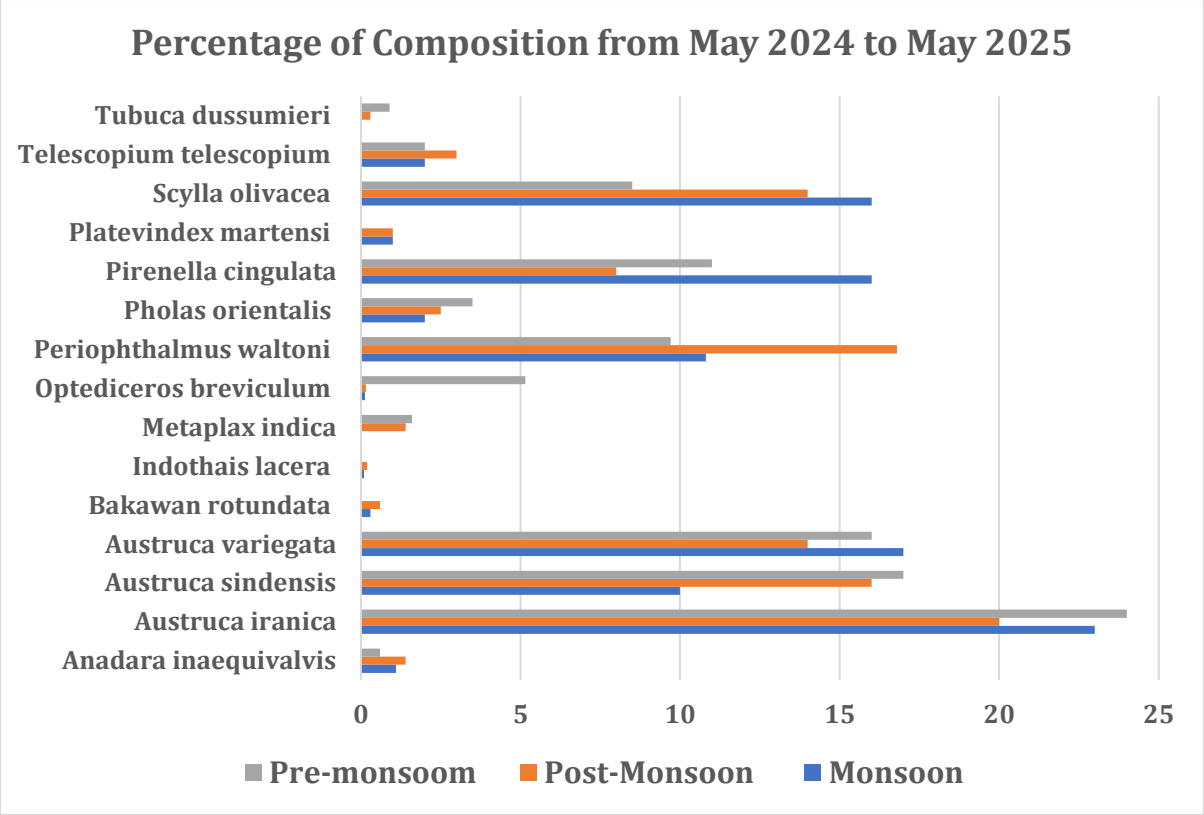


Figure 39.Percentage composition of Intertidal Fauna in DPA

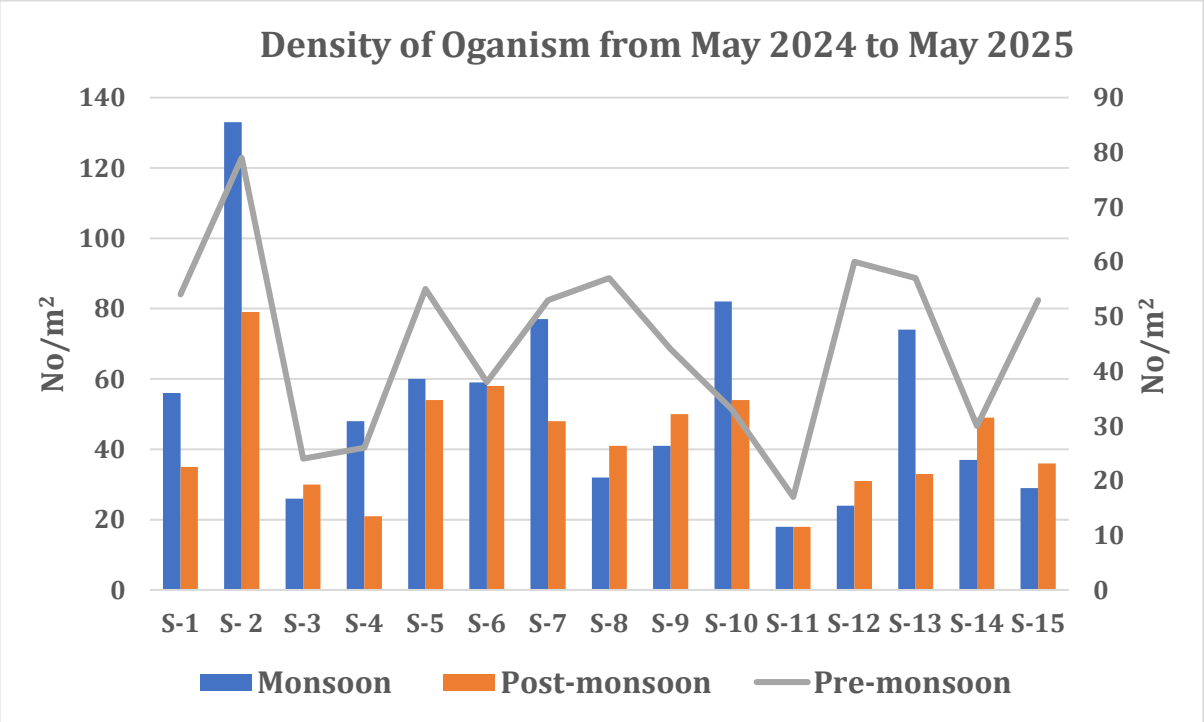


Figure 40. Density of Intertidal Fauna in DPA

4.2.5. Subtidal Fauna (Macrobenthos)

Subtidal ecosystems are permanently submerged due to tidal influence, whereas intertidal ecosystems are found between the high tide and low tide, experiencing fluctuating influences of land and sea. Macrobenthos are an important component of estuarine and marine ecosystems. Benthic fauna is an important component of marine ecosystems, providing key services including secondary production and remineralization. Being sedentary or having only limited mobility, benthic communities are particularly vulnerable to variations in environmental and ecological factors. As a result, they exhibit distinct spatial and temporal distribution patterns on small and large scales. Coastal areas are naturally highly dynamic, with several distinct habitat types coexisting nearby (e.g., estuaries and intertidal habitats) and supporting high biodiversity (Cowie and Woulds,2011). The abiotic factors structuring benthic communities include salinity, temperature, sediment characteristics, and oxygen availability, however, their relative importance varies among the different habitats. On a fine scale, biotic factors such as competition for food and space, predation, reproductive strategies, and life-history traits influence the distribution and abundance of individual species, in turn determining community structure. Moreover, coastal habitats are also the most impacted by anthropogenic pressures, from climate change-related warming and acidification to habitat degradation and pollution. Benthic fauna, through their diverse feeding modes and lifestyles, not only are affected by conditions in the sediment environment, but also actively influence sediment textural and geochemical properties, the flow regime of bottom waters, and, through exchange of particles and solutes between water and sediments, also regulate properties in overlying waters (Meysman et al., 2006)

All marine sediments are anoxic below a certain depth from the sediment surface and, consequently, sulphidic sediments have a worldwide distribution. Organic sediment enrichment occurs through vertical and advective accumulation of organic carbon from the decomposition of the organic matter. On bottoms where accumulation of organic matter happens and leading to the reduction of oxygen at low concentration. The oxygen deficiency may very well be the most widespread anthropogenically induced deleterious effect in me marine environment that causes localized mortality of benthic macrofauna.

Distribution and composition of subtidal macrobenthos

The number of macro benthic fauna of the various groups from the DPA port environment includes Annelida, Arthropoda, Mollusca and Nematoda. The number of various fauna from May 2024 to May 2025 raged from 1 to 11 with maximum contribution was during Post and pre-monsoon (Fig.41).

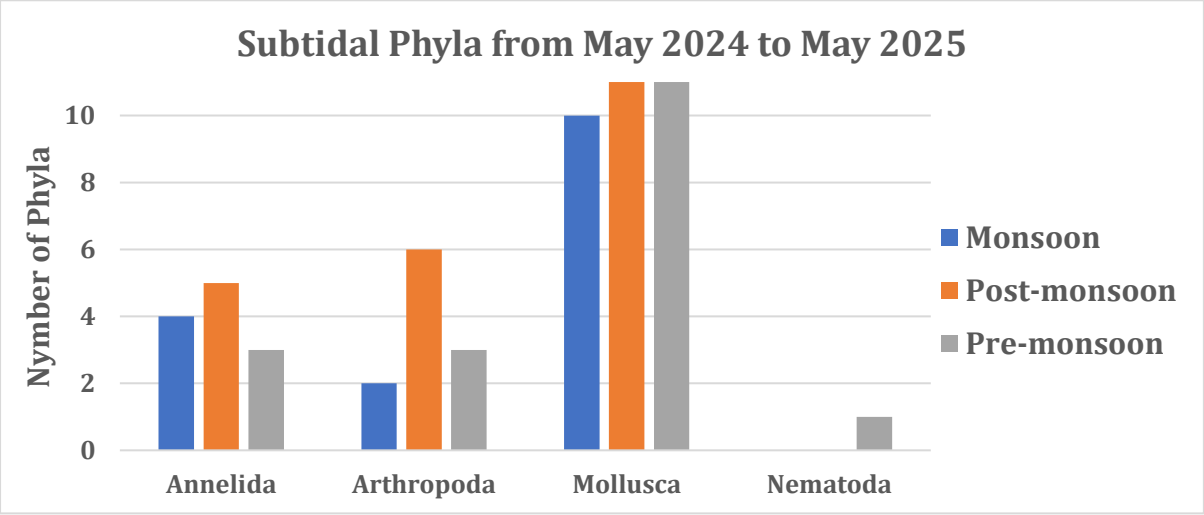


Figure 41. Distribution of Subtidal macrobenthos in DPA

Generic Status

The generic status of subtidal macrobenthos varied from 1 to 12 number with average variation of 2 to 10 number. Highest number of genera contributed during monsoon followed by pre-monsoon and Pre-monsoon (Fig.42).

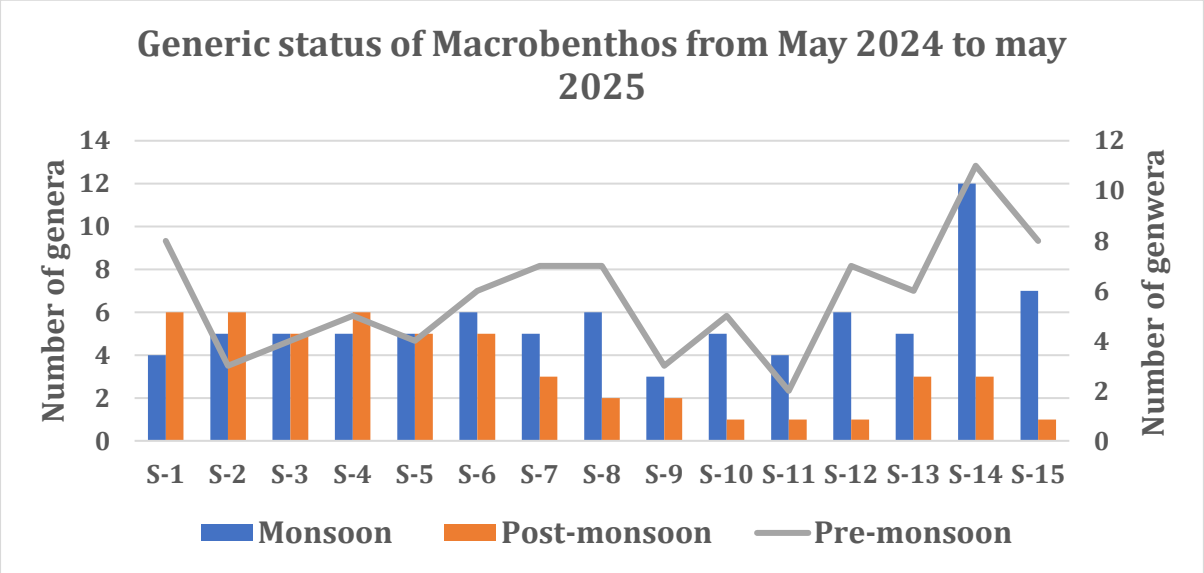


Figure 42. Generic status of Macrobenthos in DPA

Density of subtidal benthos

The average density and population of subtidal macrobenthos from May 2024 to May 2025 varied from 307 N0/m^2 to 507 No./m ^{2} and 12 to 20 in number (Fig.43)

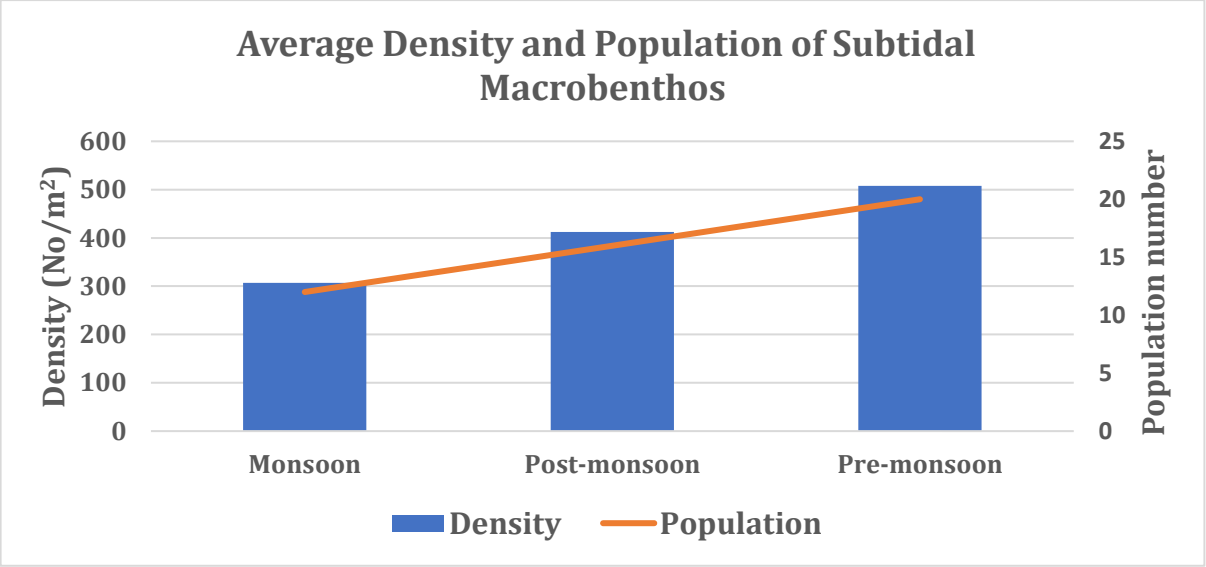


Figure 43 . Average Density of Subtidal macrobenthos in DPA

In station wise density of subtidal macrobenthos varied from 25 no/m^2 to 1150 no /m^2 with average variation of 100 no/m^2 to 754 no/m^2 . Highest dinsith was observed in Pre-monsoon and lowest was observed during post-monsoon (fig 44).

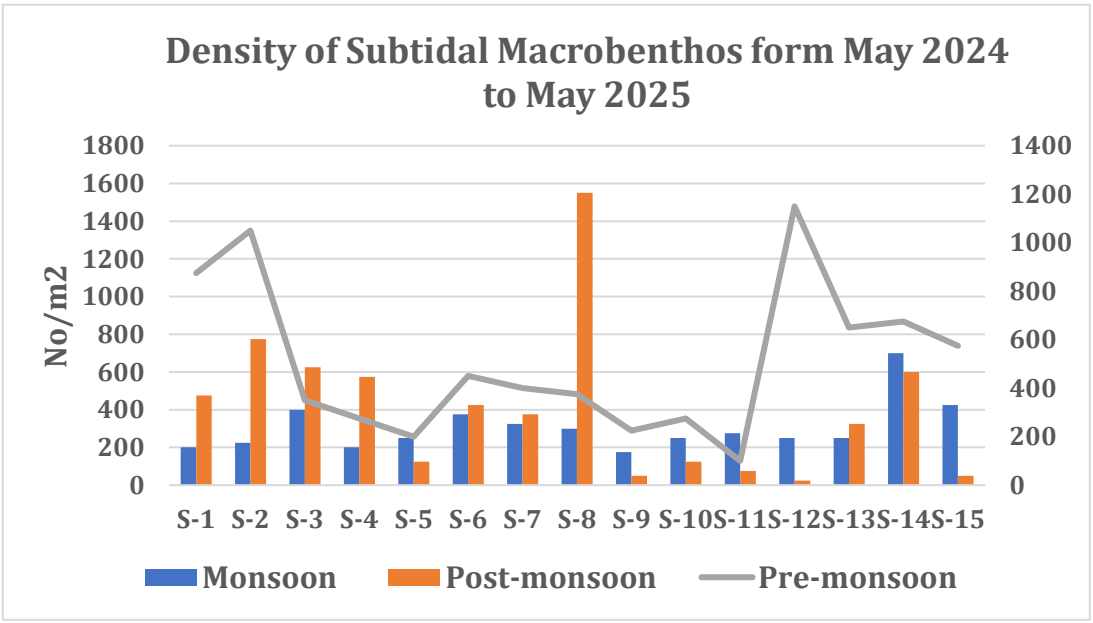


Figure 44 . Density of Subtidal Macrobenthos in DPA along different station

Percentage composition of Subtidal macrobenthos

The percentage composition of subtidal macrofauna varied from 0.4% to 31.8% with average variation of 1% to 26%.Highest percentage was contribution in Pre-monsoon ,followed by Post-monsoon and Monsoon (Fig 45).

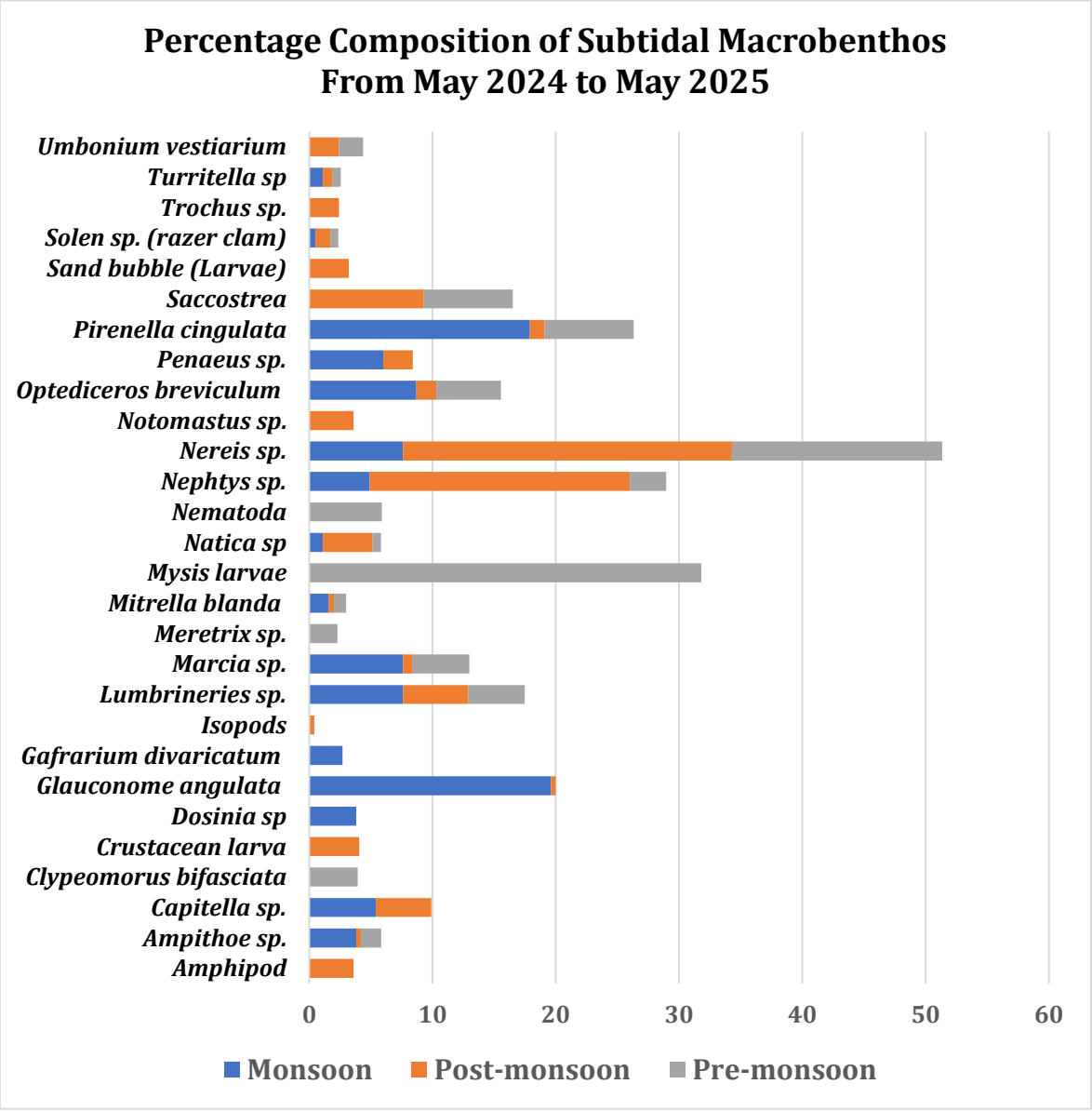


Figure 45. Percentage composition of Subtidal Macrobenthos in DPA

During the study period from May 2024 to May 2025 species such as *Mysis larvae*, *Nereis sp*, *Glauconome angulata* and *Pirenella cingulata* was dominated .

4.3. Mudflats

Mudflats and mangroves establish a major ecosystem of the DPA coastal region and the significance of ecosystem services rendered by mudflat is endorsed in Coastal Regulation Zone (CRZ, 2011) as it accords special status to highly productive zone. Mudflat has an assemblage of plant-animal-geomorphological entities. DPA has been surrounded by two major ecosystems such as mangroves and mudflats which support a number of ecosystem services like nursery grounds for fish and shellfishes and breeding/feeding grounds for the birds (Spencer and Harvey, 2012). The TOC concentration is a direct indicator of mudflat productivity and blue carbon sequestration

4.3.1. Bulk density of the sediment

The sediment bulk density varied from 1.10 gm/cm^3 to 1.89 gm/cm3 with overall average variation of 1.21 gm/cm^3 to 1.68 gm/cm^3 (Fig.46). Highest bulk density was observed in Pre-monsoon followed by post-monsoon and post-monsoon. Among the station highest BD was observed in Pre-monsoon at S-14 (1.89 gm/cm^3) and lowest was observed at S-10 in Pre-monsoon (S-10).

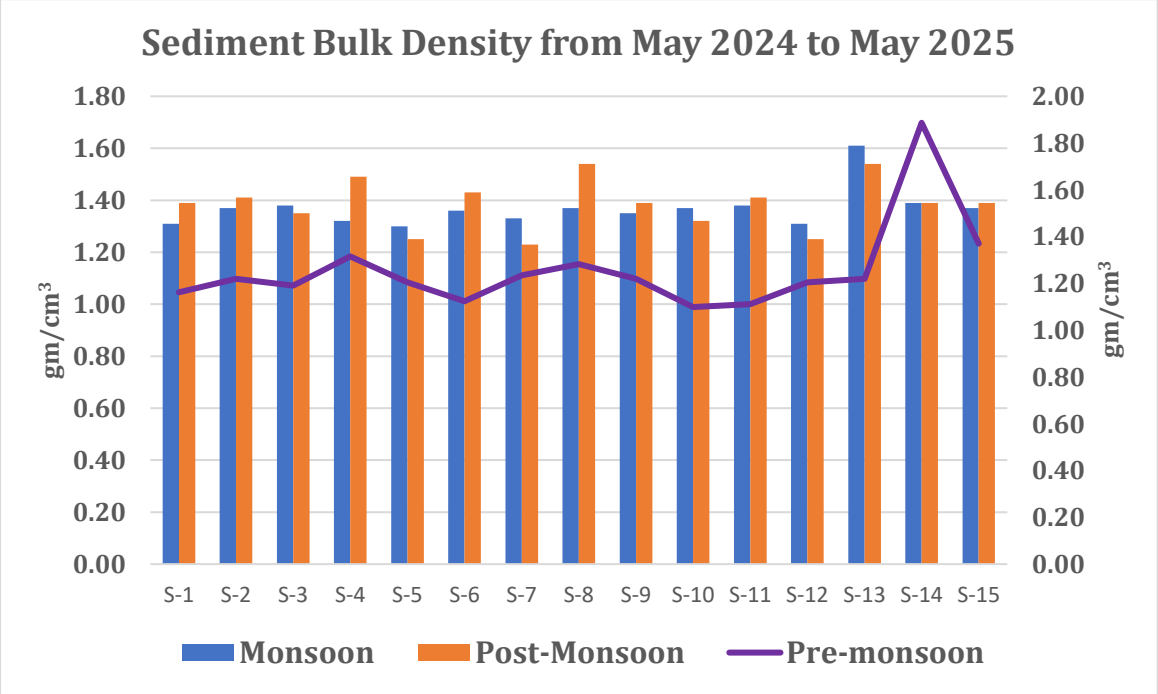


Figure 46. Seasonal variation of Sediment Bulk Density in DPA

4.3.2.Total Organic Carbon (TOC)

The sediment organic carbon of DPA varied from may 2024 to May 2025 was 0.5% to 3.2 % with average variation of 1.8% to 2.5%. Through out season the highest percentage of organic carbon was observed in post-monsoon followed by monsoon and pre-monsoon. Similarly lowest percentage of organic carbon was observed in pre-monsoon followed by equally percentage in monsoon and post-monsoon.

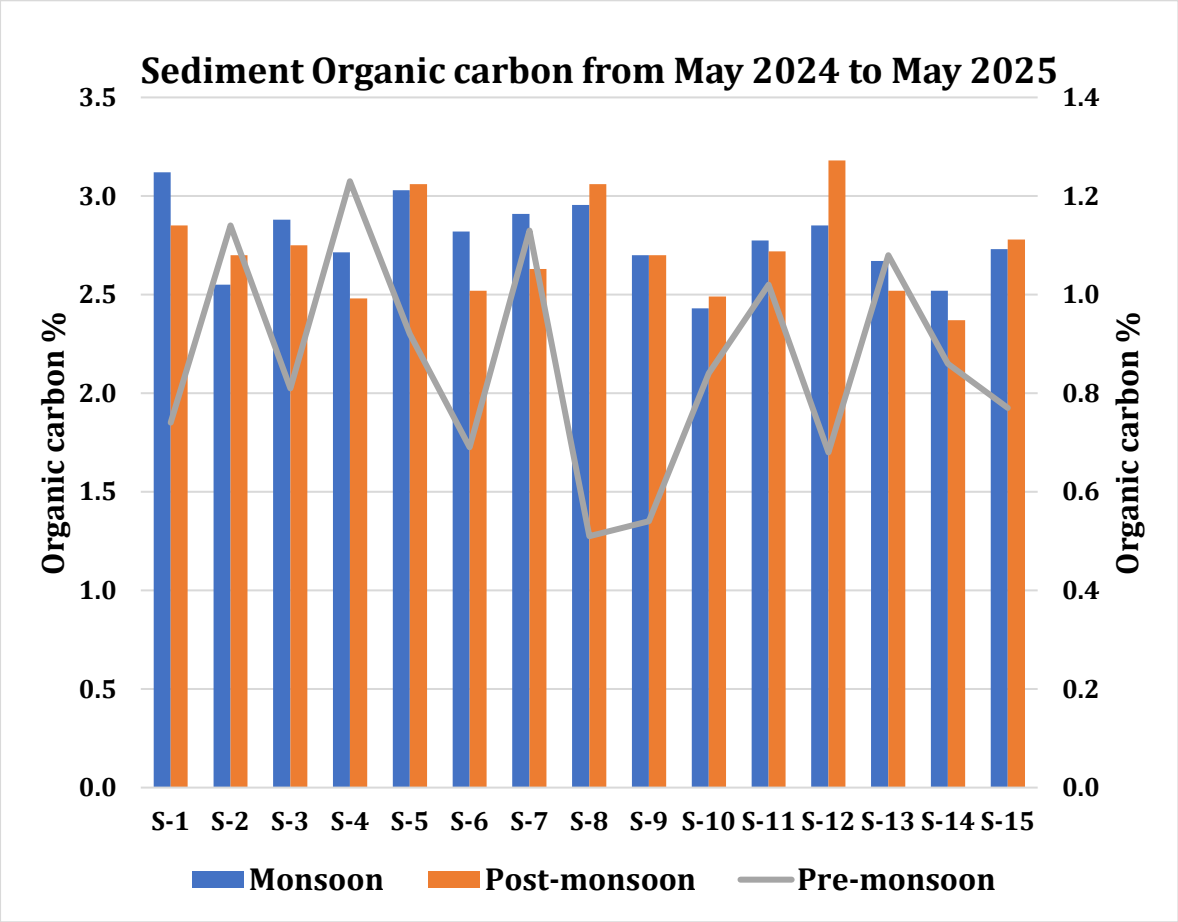


Figure 47. Seasonal variation Sediment Organic carbon in DPA

Among the station highest organic carbon percentage was contributed by S-12 during post monsoon and lowest percentage of organic carbon was observed during pre-monsoon at S-8.

4.4. Mangroves

Gujarat state has the longest coastline of India, with one of the rich coastal areas in terms of biodiversity, and major part of it is covered by mangroves. The mangrove cover in Gujarat ranks as the second largest in India, following the Sundarbans in West Bengal. Mangroves in Gujarat are distributed across four main regions: Kachchh, the Gulf of Kachchh, Saurashtra, and the Gulf of Khambhat including south Gujarat. Among these, Kachchh and the Gulf of Kachchh shows the major contribution of mangrove cover in Gujarat. Around 15 species of mangroves have been recorded across Gujarat's 13 coastal districts, though this number is subject to ongoing debate. However, Avicennia marina is the only species predominates in all the 13 coastal districts of Gujarat.

This unique ecosystem thrives in waterlogged, oxygen-deprived mud, typical of tropical and subtropical zones. The Kachchh coast is characterized by diverse habitats, including vast mudflats and small sandy beaches, shaped by extreme salinity, temperature variations, and tidal influences. These challenging conditions encourage mangrove species to adapt and flourish. Mangroves naturally enrich soil fertility by decomposing leaf litter and root systems, improving surrounding sediments. These ecosystems support a rich variety of flora and fauna, serving as essential breeding, nursery, and feeding sites for numerous marine and terrestrial species.

Despite their ecological significance, mangroves face persistent threats from human activities, such as deforestation, pollution, and climate change. Conservation strategies have been introduced to protect these invaluable ecosystems. The Gujarat Institute of Desert Ecology (GUIDE) has extensively studied and documented these ecosystems, providing insights into their vegetation, species diversity, ecological importance, and conservation status. Mangroves serve as critical habitats for marine and terrestrial wildlife, contribute to coastal protection, preserve biodiversity, and support local communities. The ongoing focus on research and preservation highlights the need for sustainable management practices to ensure their long-term survival. During the study period May 2024 to May 2024 4 species of mangrove such as *Avicenna marina* , *Aegiceras corniculatum* , *Ceriops tagal* and *Rhizophora mucronate* was observed (Plate 10).

4.4.1.Tree Density

Across three seasons of the study, monsoon 2024, post-monsoon 2024, and pre-monsoon 2025, a total of 15 mangrove sites in and around the Deendayal Port Authority (DPA) were assessed. During the monsoon 2024, the overall average tree density recorded was 2,189 trees/ha, with Tuna Creek exhibiting the highest mean density (2,535 trees/ha) and S-6 having the highest individual density (3,673 trees/ha). During post-monsoon 2024, the overall tree density recorded as 1,986 trees/ha, with Kharo Creek leading at 2,788 trees/ha and S-6 remaining the densest (3,156 trees/ha). During pre-monsoon 2025, the overall tree density recorded was 1,907 trees/ha and S-6 continued to show the highest density (3,113 trees/ha), however, major portion of S-11 was observed to go through extensive conversion into salt pans resulting the lowest density for the whole study period (872 trees/ha). The ongoing degradation highlights the pressing need for conservation measures to mitigate the impact of anthropogenic disturbances and preserve the ecological integrity of these mangrove ecosystems.

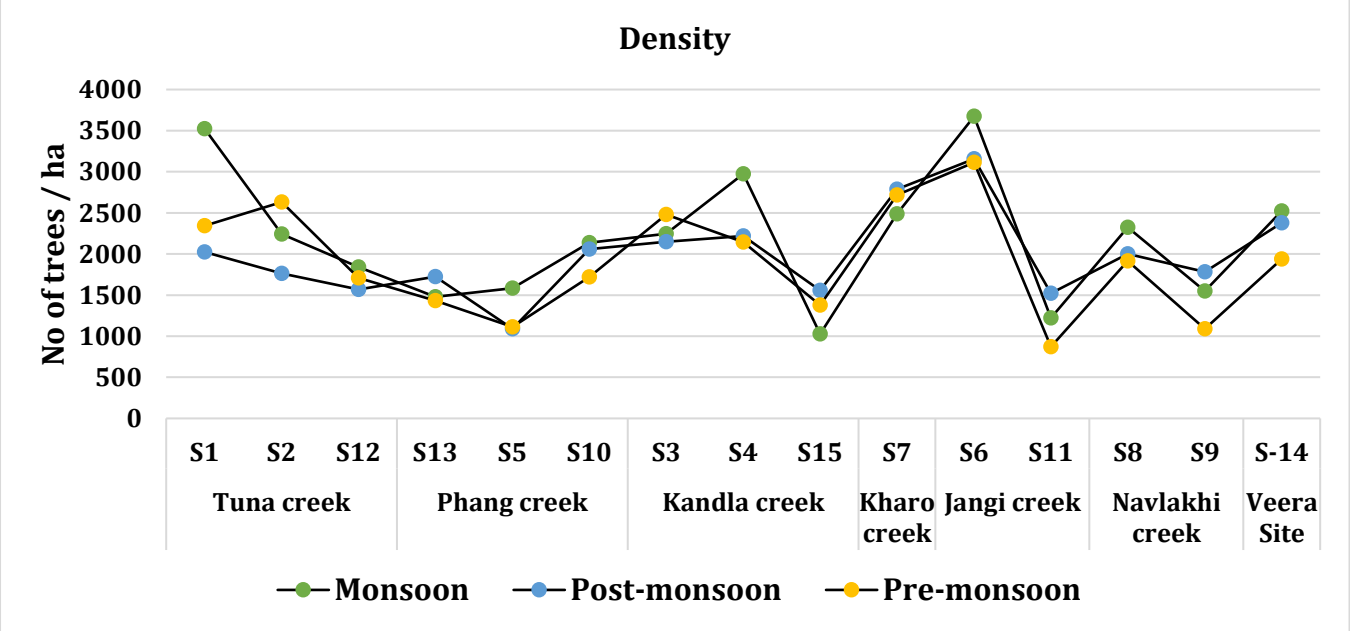


Figure 48. Average tree density during the three seasons study in 2024-2025

4.4.2.Tree Height

The study on mangrove tree height in the DPA Kandla region during 2024-25 revealed seasonal variations in growth. During the monsoon, of 2024, the overall average height of mangrove tree was recorded as 1.8 meters. The highest average was recorded at Veera coast (2 meters), followed by Tuna and Phang creeks (1.8 meters). Site-specific data showed the tallest trees at S-10 in Phang Creek (2.4 meters) and S-12 in Tuna Creek (2.3 meters). The height varied between 1.3 and 2.4 meters across the different locations. However, during the post-monsoon of 2024, the average height was recorded as 1.7 meters. Navlakhi Creek had the tallest mangroves reaching 3 meters while the overall average height was 2.2m. At S-10 in Phang Creek the average height of trees was 2.3 meters. The height of the plants recorded during this season ranged from 1.1 to 3 meters considering all the study stations. During the pre-monsoon of 2025, the average height was 1.6 meters, with Phang Creek recording the highest at 1.7 meters. Site-specific observations showed that S-10 in Phang Creek (2.2 meters) and S-2 in Tuna Creek (2.1 meters) were the maximum height of the plants. The height varied between 1 and 2.8 meters. Mangrove height is a key indicator of the health plants and the ecosystem. The taller trees provide greater protection against storm surges and coastal erosion.

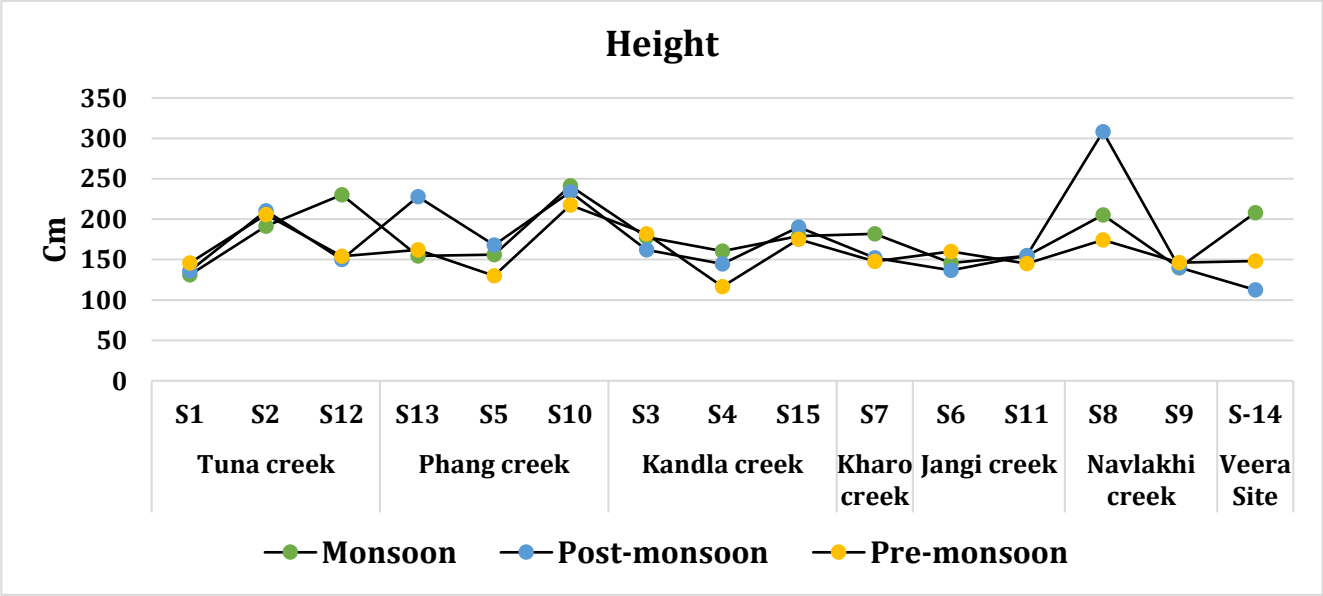


Figure 49. Average tree height during the three seasons study in 2024-2025

4.4.3.Canopy Crown Cover

During the monsoon, the average canopy cover across the mangrove study sites was 3.8 m^2. The highest average canopy cover was recorded at Navlakhi Creek (5.2 m^2), followed by Phang Creek (4.5 m^2). In station wise study, the highest canopy cover was recorded at S-10 (Phang Creek) and S-15 at Kandla Creek, while, S-1 at Tuna Creek, and S-4 at Kandla Creek showed comparatively lower average canopy cover. The post-monsoon survey of 2024 recorded an average canopy cover of 3.45 m^2. In this season the highest canopy cover was recorded at Navlakhi Creek (5.5 m^2), followed by Tuna Creek (3.8 m^2). In station wise observation, stations S-6 at Janghi Creek and S-4 at Kandla Creek recorded relatively lower canopy covers. During the pre-monsoon in 2025, average canopy cover was recorded as 2.25 m^2 across the mangrove study sites. The stations S-10 (4.9 m^2) at Phang Creek and S-15 (3.1 m^2) at Kandla Creek showed higher average canopy covers compared to other stations. However, stations S-4 (0.8 m^2) at Kandla Creek and S-7 (1.7 m^2) at Khari Creek recorded lower canopy covers. Such variations in canopy cover demonstrate how the local environmental factors shape the growth and progression of mangroves.

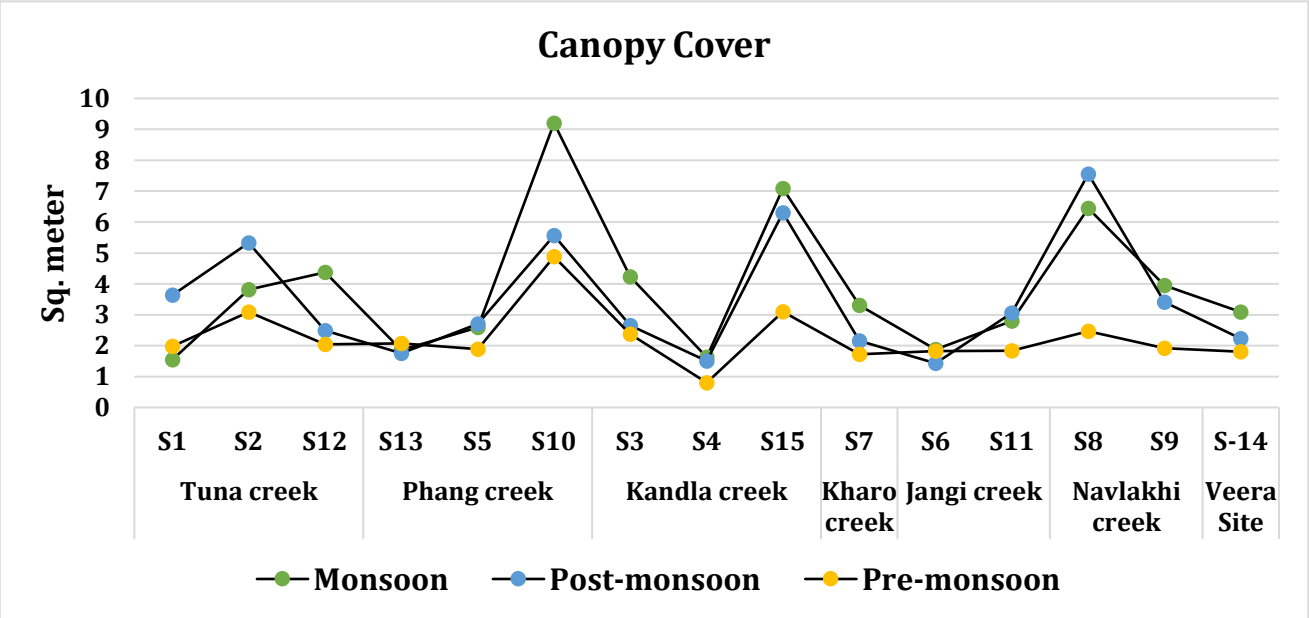


Figure 50. Average tree canopy during the three-season study during 2024-25

4.4.4.Basal Area (Girth)

During the monsoon of 2024, the average basal girth of the mangroves at the DPA sampling sites was reported to be 13 cm. The highest average basal girth was recorded at S-10 (22 cm) and S-8 (18 cm), located in Phang Creek and Navlakhi Creek respectively. The lowest average basal girth was reported at S-6 and S-9 (8 cm) in Janghi Creek and Navlakhi Creek, respectively. During the post-monsoon of 2024, the average basal girth recorded was 12 cm for all the sites while the highest average basal girth was 22cm observed at site S-10 in Phang Creek, followed by S-8 (20 cm) in Navlakhi Creek. In contrast, the lowest average basal girth 8 cm was noted at S-6 and S-14, situated in Janghi Creek and the Veera site respectively. During pre-monsoon of 2025, the average basal girth was recorded as 11 cm and the highest average basal girth were at S-10 (17 cm) in Phang Creek, followed by site S-15 (14 cm) in Kandla Creek. However, the lowest average basal girth was noted at site S-4 and site S-1, both measuring 8 cm, situated in Kandla Creek and Tuna Creek, respectively. Across the DPA Kandla region, Avicennia marina is the dominant species, recognized for its unique multiple-stem growth habit.

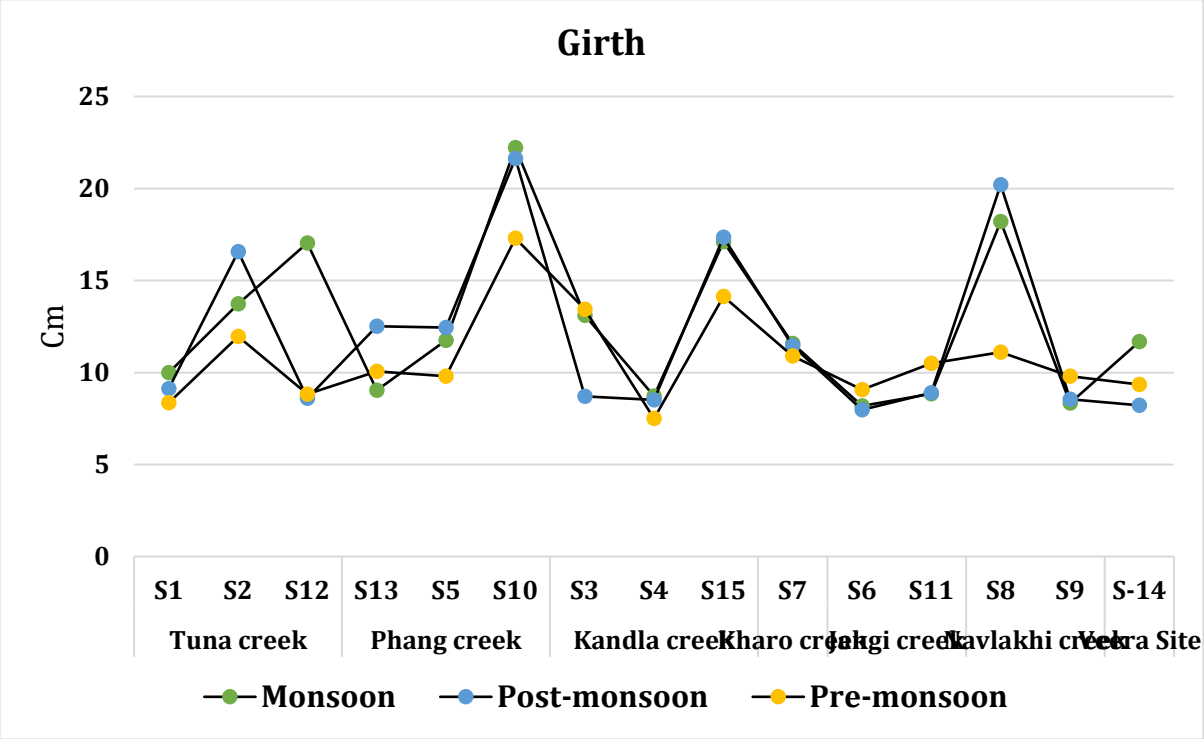


Figure 51. Average tree basal girth during three-season study during 2024-2025

4.4.5.Regeneration and Recruitment Class

During monsoon of 2024, the overall average regeneration class density was recorded as 29,692 plants/ha and the overall average recruitment class density was 5,308 plants/ha. In site-wise observations, the highest average regeneration class density was 73,000 plants/ha at S-8 which is followed by S-9 (52,000 plants/ha) both located along the Navlakhi creek area. For the recruitment class, the maximum plant density (average) was 11,750 plants/ha at S-7 located in the Kharo creek during this survey.

During the post-monsoon survey of 2024, the average density of the regeneration class was recorded as 24,467 plants/ha, while the average density of the recruitment class was noted as 4,785 plants/ha. The site-specific observations revealed that the highest average regeneration class density was at S-12, with 57,100 plants /ha, followed by S-1, which recorded 38,000 plants/ha, both situated in the Tuna Creek area. For the recruitment class, the maximum average density recorded was 10,725 plants per hectare at site S-12 in the Tuna Creek during the survey.

During the pre-monsoon survey of 2025, the average density of the regeneration class was observed at 23,100 plants /ha, while the average density of the recruitment class was3,819 plants/ha. In the station-specific observations the highest average regeneration class density was 46,000 plants/ha at S-11, followed by 36,700 plants/ha at S-3, situated in the Janghi Creek and Kandla Creek area respectively. For the recruitment class, the maximum average density recorded was 7,250 plants/ha at S-8 in the Navlakhi Creek during the survey.

The younger mangroves in these areas promise the future establishment of fully mature trees. These younger class mangroves play a vital role in stabilizing soil and capturing sediments, thereby preventing coastal erosion and maintaining the quality of nearby water systems

a.*Avicenna marina* b. *Aegiceras corniculatum* c. *Ceriops tagal* d.*Rhizophora mucronata*

Plate 10. Mangrove Species of DPA Port Authority

4.5. Halophytes

The halophytes are the plants that are adapted to live in coastal estuaries and salt marshes. It is common in arid and desert milieu which often have substantial salt accumulation. Technically these are the plants which have tolerance to moderate to high salt concentration in its growth substrate. Halophytes, that survive and reproduce in environments where the salt concentration is around 200 mM NaCl or more, constitute about 1% of the world's flora. (Timothy and Colmer, 2008). Halophytes are classified based on their growth conditions as obligate halophytes, facultative halophytes, and habitat-indifferent halophytes.

Percentage of Cover

In entire study period from May 2024 to May 2025 , highest percentage of cover contribute by the halophyte *Salicornia brachiate* (96% -100%) followed by *Sesuvium portulacastrum* (35-50%) , *Salvadora persica* (4% -60%) and *Aeluropus lagopoides* (7%-40%) in monsoon,Post-monsoon and Pre-monsoon. (Plate 11)

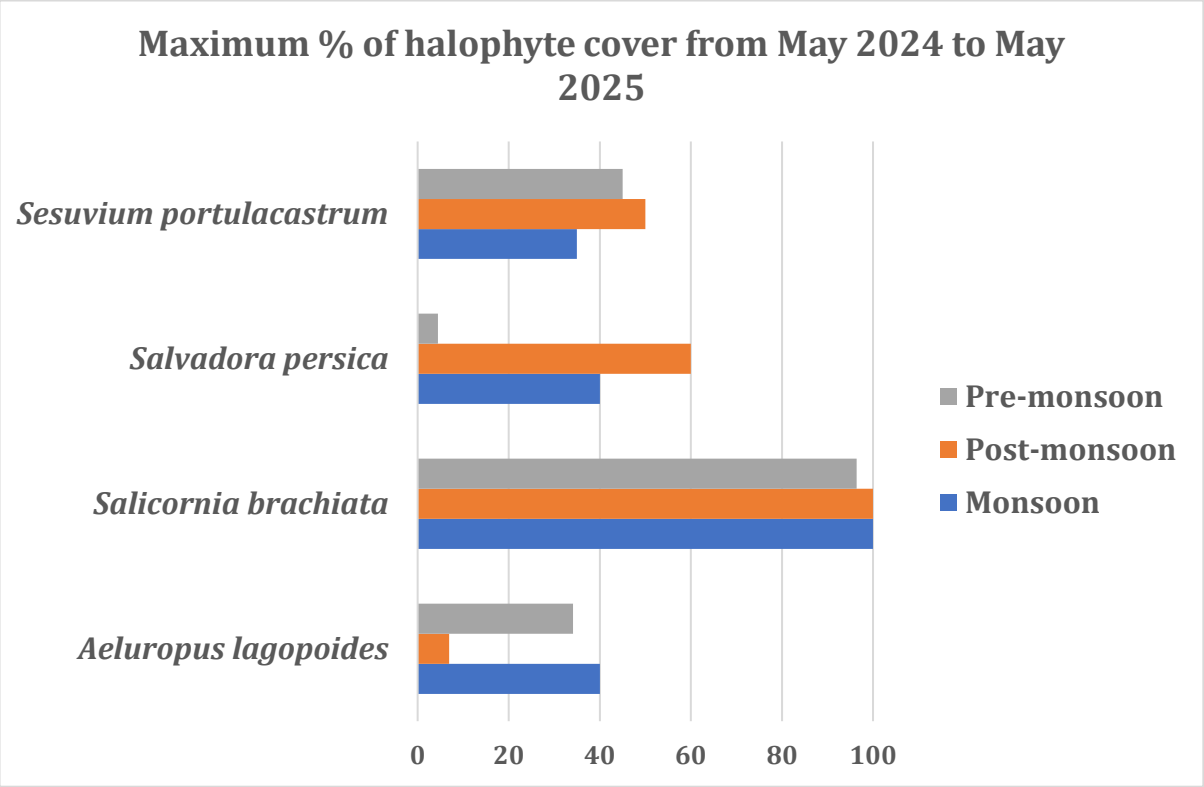
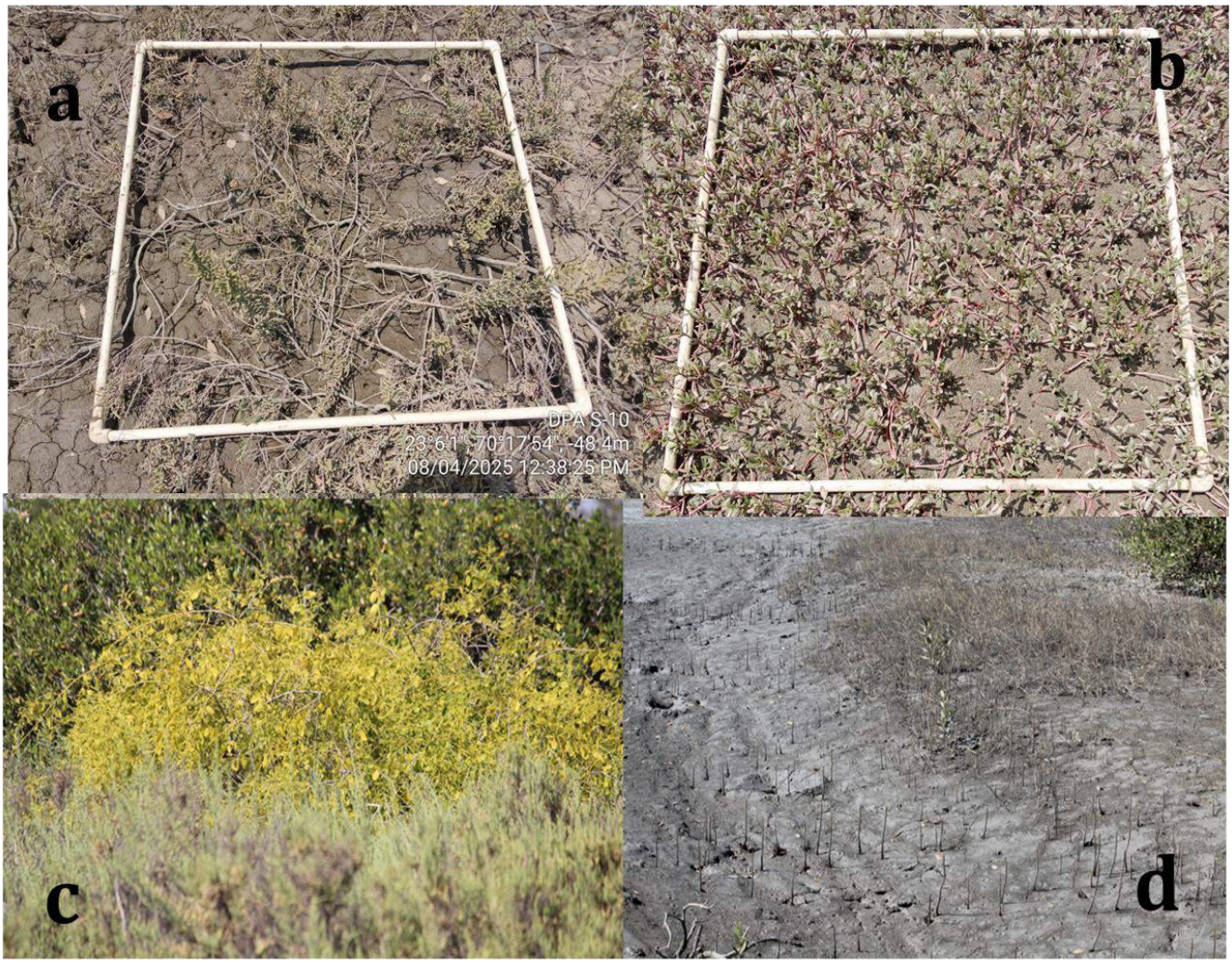


Figure 52. Maximum % cover of Halophytes in DPA and it periphery environment



a. Salicornia brachiata b. Aeluropus lagopoides c. Salvadora persica

d. Sesuvium portulacastrum

Plate 11: Halophyte species recorded along Deendayal Port Authority

4.6. Seaweeds &Seagrass

Both the seagrass and seaweed not observed entire study period from may 2024 to may 2025.

4.7.Marine fisheries

The Ichthyofauna diversity of the Gulf of Kachchh includes a total of 20 orders, 47 families and 96 species (Katira & Kardani 2017). Along the Sikka coast of Jamnagar where 112 ichthyofauna species belonging to 50 families, 12 orders, and 84 genera has been reported. Similarly, the localitynear the Marine National Park, in Jamnagar, Gulf of Kachchh reported 109 ichthyofauna species belonging to 58 families, 19 orders, and 93 genera (Brahmane et al. 2014). Apart from this, a recent study conducted by Sidat et al., (2021) reported 96 species which include 20 order and 47 families. During the field observation from May 2024-2025 , 0.5 kg to 5 kg of fish was catched in 1 km distance with 10 minutes and *Mugil cephalus* is only dominant species which is available in all the season (Plate12).

Plate 12 . Marine fisheries along DPA Jurisdiction

4.8.Reptiles

The saw-scaled viper *Echis carinatus sochureki* normally encountered during mangrove survey Monsoon and Post-monsoon at S-10 location

4.9.Marine mammals

Marine mammals was not observed in entire study period

4.10.Avifauna

Globally, avifauna has the highest level of diversity. Indian subcontinent comprehends around 1340 species of birds which contribute more than 15% of the world's bird species (Ali and Ripley 1987, Manakadan and Pittie 2001, Cox 2010, Grimmett et al. 2011). Thus, understanding the diversity and structure of bird communities to describe the importance of regional or local landscapes for avian conservation and assessment of avian diversity has become an important tool in biodiversity conservation (Safiq et al. 1997). The baseline data on diversity, distribution and species composition plays a significant role for identifying priority areas and formulating the species-specific conservation plan (Peterson et al. 2000, Colin 2000) and evaluate the habitat quality (Chettri et al. 2005, Manjunath and Joshi 2012). Mangrove forest is an important habitat for many bird species and provide high quality habitat for birds because they contain relatively safe nesting and roosting sites, and abundant prey (Nisbet, 1968; van Balen, 1989). Mangrove habitats harbor much of the world's tropical biodiversity and 50% of the world's mangrove forests have been lost as a result of clearing and alteration of coastlines (Duke, 1992). With continuing degradation and destruction of mangroves, there is a critical need to understand the biodiversity of the mangrove ecosystems (Vannucci, 2002). Mangrove vegetation provide a complaint niche for the myriad resident as well as passage migrant aquatic birds, which utilize the system in varying degree from feeding, roosting and breeding (Oswin, 2002).

While, numerous bird species use their foraging ecology to sustain a trophic level, making birds another key animal group in an ecosystem. Scavenging carcasses, eliminating vermin and insect pests, cycling nutrients, dispersing seeds, pollination, and pest control are some of these services. As scavengers and possible pollinators, they have a functional role in the ecosystem and are appropriately referred to as bio-indicators (Bruford 2002, Gregory *et al.* 2003, Parmar *et al.* 2016, Maznikova *et al.* 2024).

Status, Diversity and Distribution of avifauna in different station

The status and diversity of avifauna was studied in coastal areas of Deendayal Port Authority, Kandla, India for the 2024-25. The entire survey was comprehensively carried out by boat survey and walking along the fixed sampling station, for documentation of avifauna. A total of 64 species (34 species terrestrial and 30 aquatic bird) representing 11 order, 26 families and 46 genera were recorded during the study period (Annexture 1, Plate 13). Scolopacidae (nine species) were the most dominant family in terms of species richness followed by Ardeidae and Laridae (eight species), whereas Columbidae and Accipitridae (five species), whereas others represent less species (Fig.53).

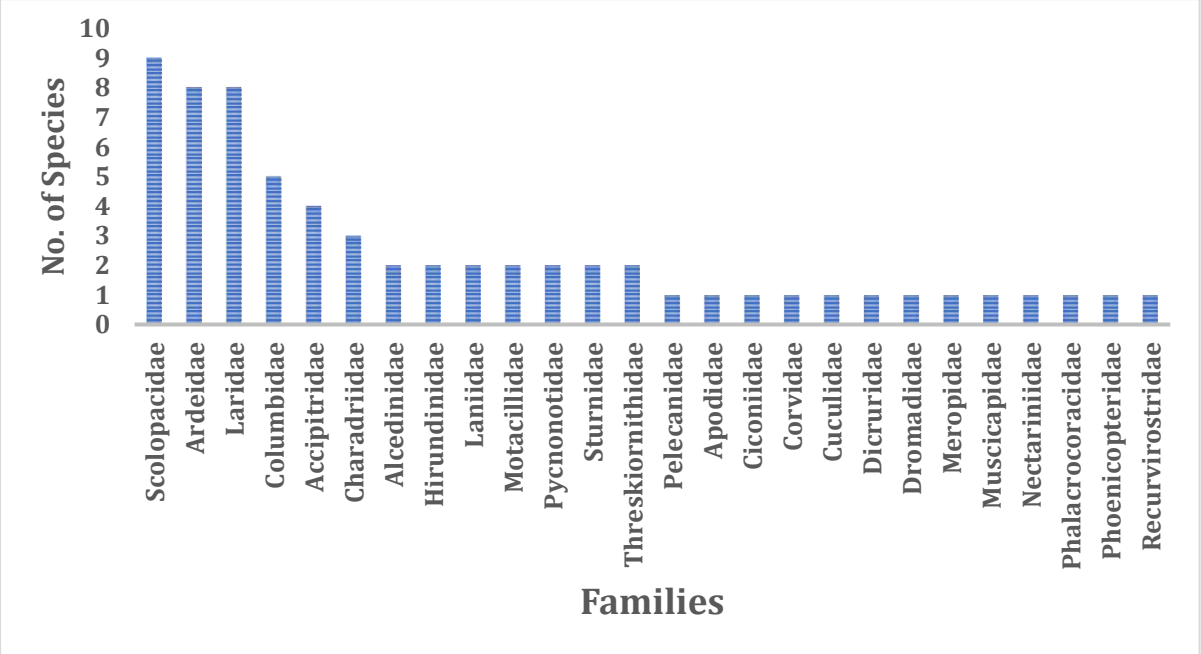


Figure 53. Distribution of families and species at the DPA , Kandla, India

Among the survey station, site 12 (55 species) were the most dominant with 41 genera and 24 families species richness followed by site 13 (53 species), sites 1, 2 and 7 have (47 species) and site 3 have 46 species and other sites have less species composition (Fig.54). The Shannon–Wiener diversity indices shows that site 13 (H=3.756), followed by site 12 (H=3.707), site 7 (H=3.642) and site 5 (H= 3.622), whereas others represent less diversity (Table 13). Based on the movement pattern 42 species (66%) of birds were residence, 18 (28%) are migratory and four (6%) species are regional migratory (Fig. 55).

Table 13. Site wise diversity indices recorded from DPA during 2024-25.

Sites	Taxa	Individuals	Simpson_1-D	Shannon_H	Evenness e^H/S	Margalef	Equitability_J
S-1	47	191	0.966	3.559	0.748	8.758	0.925
S-2	47	212	0.969	3.62	0.794	8.588	0.940
S-3	46	520	0.964	3.575	0.776	7.196	0.934
S-4	42	527	0.969	3.607	0.878	6.542	0.965
S-5	45	499	0.967	3.622	0.832	7.082	0.952
S-6	35	309	0.962	3.405	0.861	5.93	0.958
S-7	47	281	0.968	3.642	0.812	8.158	0.946
S-8	34	288	0.965	3.433	0.911	5.827	0.974
S-9	34	275	0.964	3.405	0.886	5.875	0.966
S-10	36	403	0.963	3.427	0.855	5.834	0.956
S-11	25	241	0.947	3.045	0.841	4.376	0.946
S-12	55	385	0.969	3.707	0.741	9.071	0.925
S-13	53	644	0.972	3.756	0.807	8.04	0.946
S-14	30	199	0.958	3.258	0.867	5.479	0.958
S-15	37	287	0.966	3.488	0.885	6.361	0.966

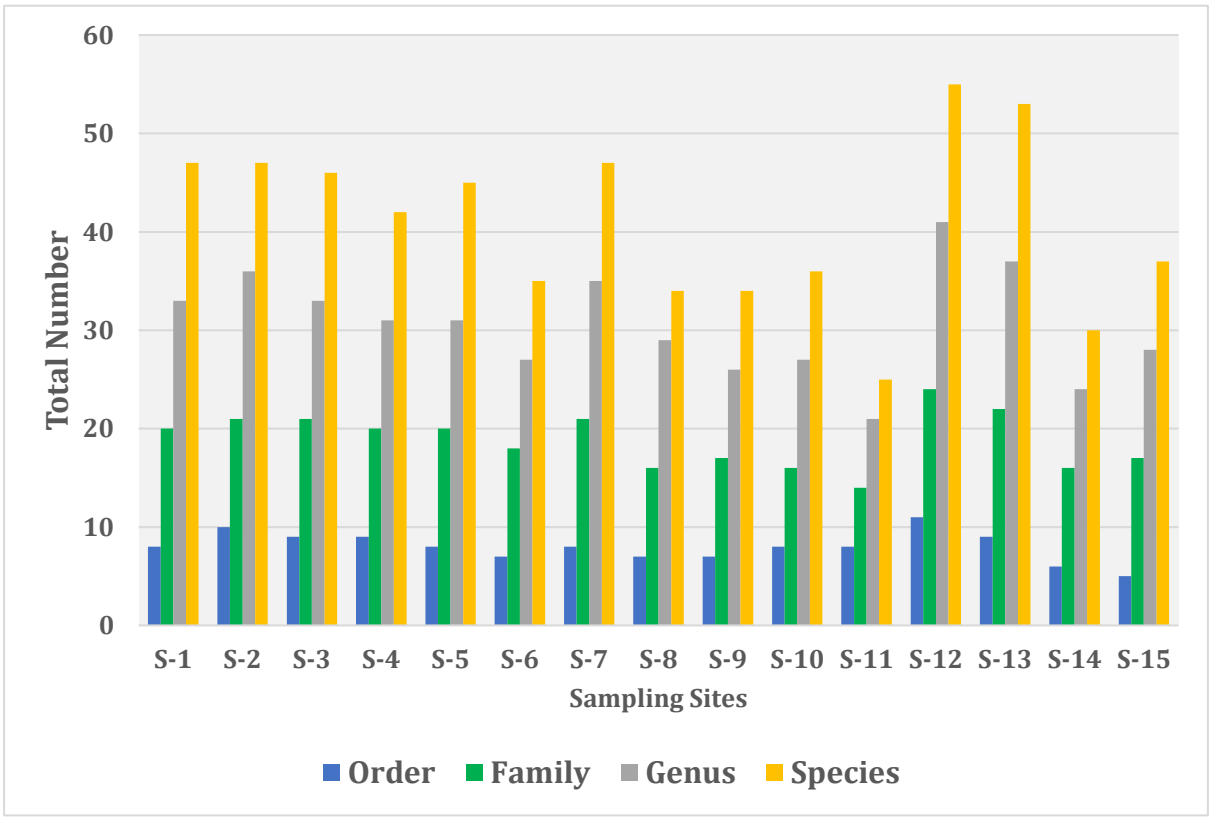


Figure 54. Station wise distribution of Avifauna from May 2024-May 2025 at DPA

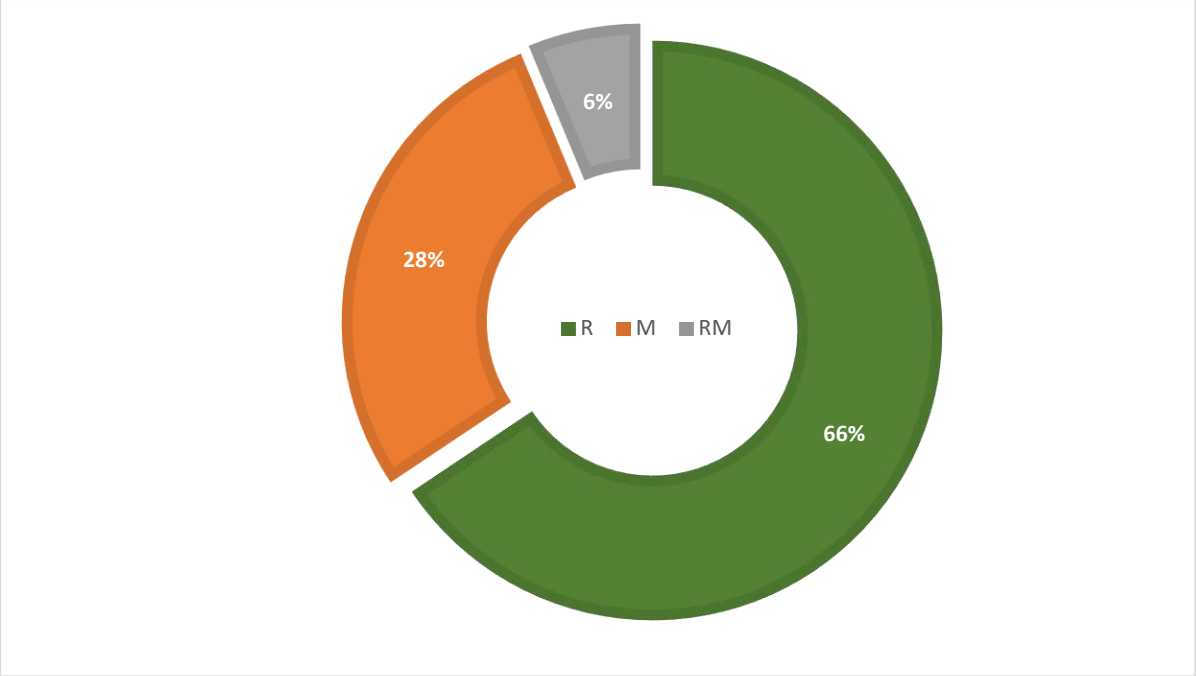


Figure 55. Behavioural status of avifauna from the DPA

Considering the abundance of the species during the study period, 34 taxa (53%) were recorded from terrestrial, 30 species (47%) from aquatic habitat. During the seasonal survey we have noted that, post monsoon season is most productive for avifauna in study area (Table.14)

Table.14. Season wise species recorded from study area

Sites	Monsoon	Post Monsoon	Pre-Monsoon	Overall
S-1	44	14	13	47
S-2	40	21	14	47
S-3	43	44	46	46
S-4	42	42	40	42
S-5	45	45	44	45
S-6	35	35	34	35
S-7	41	22	21	47
S-8	33	34	33	34
S-9	34	34	34	34
S-10	35	36	36	36
S-11	23	23	25	25
S-12	45	37	31	55
S-13	53	53	51	53
S-14	29	29	20	30
S-15	37	37	37	37
Total	**53**	**64**	**60**	**64**

Plate 13. Common and migratory birds from the Deendayal Port Authority, Kandla. (A) Western Reef Heron (*Egretta gularis*) (B) Black-headed Gull (*Chroicocephalus ridibundus*) (C) Eurasian curlew (*Numenius arquata*) (D) Grey Heron (*Ardea cinerea*) (E) Greater Flamigo (*Phoenicopterus roseus*) (F) Black-winged Stilt (*Himantopus himantopus*)

Based on the feeding guilds of recorded birds, it was found that carnivore, 20 species (31.35%) were insectivore, 17 species (26.56%) were piscivore were 14 species (21.88%) and 6 species of omnivores and others represents less (Fig 56).

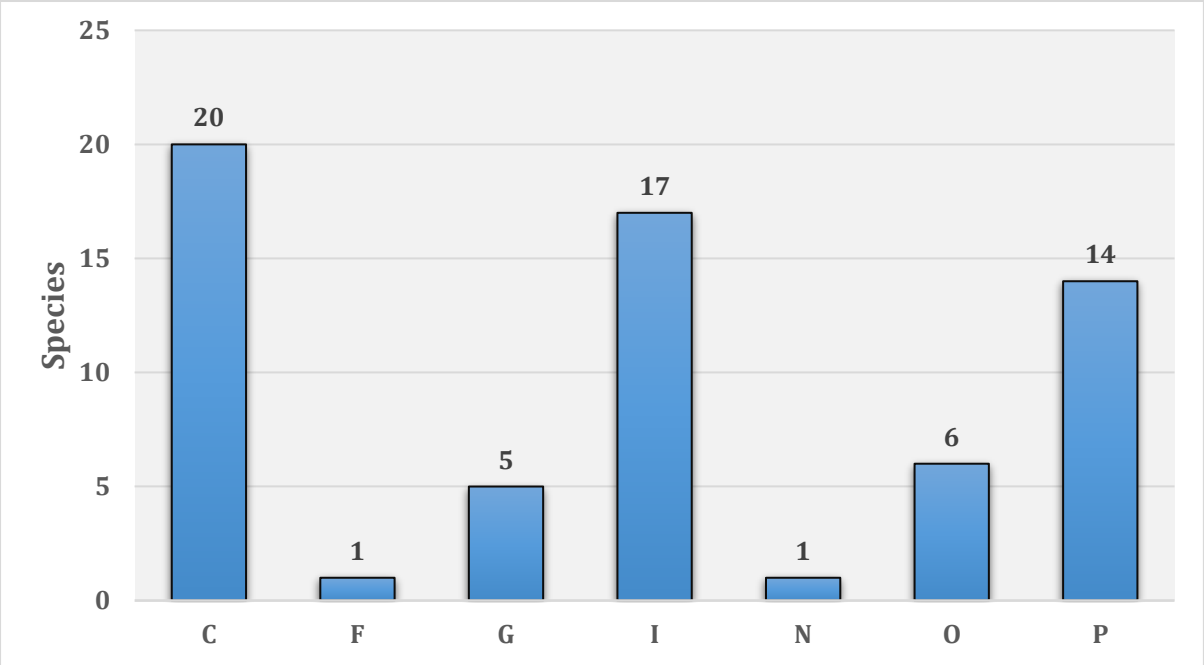


Figure 56. Status of foraging guild of avifauna recorded from Deendayal Port Authority, Kandla, India (C- Carnivore, F- Frugivore, G- Granivore, I- Insectivore, N- Nectarivore, O- Omnivore, P- Piscivore).

Among 64 species, only five species *viz.* Painted Stork *Mycteria leucocephala* (Pennant, 1769), Black-headed Ibis *Threskiornis melanocephalus* (Latham, 1790), Glossy Ibis *Plegadis falcinellus* (Linnaeus, 1766), Black-tailed Godwit *Limosa limosa* (Linnaeus, 1758) and Eurasian curlew *Numenius arquata* (Linnaeus, 1758) are under the Near Threatened (NT), whereas, River Tern *Sterna aurantia* (Gray, JE, 1831) is under vulnerable (VU) categories of IUCN Red List of Threatened Species. Moreover, four species (6.25%) River Tern *Sterna aurantia* (Gray, JE, 1831), Common Greenshank *Tringa nebularia* (Gunnerus, 1767), Black Kite *Milvus migrans* (Boddaert, 1783), Gull-billed Tern *Gelochelidon nilotica* (Gmelin, JF, 1789) and Shikra *Tachyspiza badia* (Gmelin, JF, 1788) were under the Schedule I, and species (90.63%) were under Schedule II categories of Wild Life (Protection) Act, 1972 (Fig 57) and the species rarefaction curve presented in figure 58.

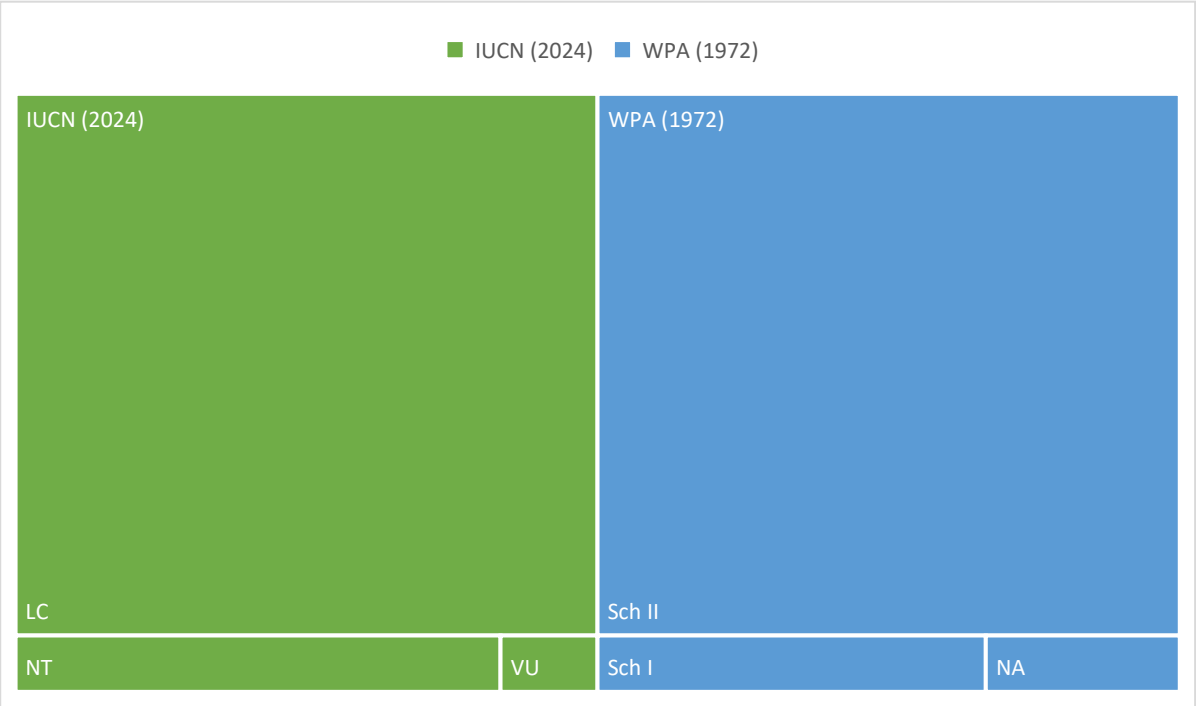


Figure 57. Status of threatened species recorded from Deendayal Port Authority, Kandla, India (Sch=Schedule, LC=Least Concerned, VU= Vulnerable, NT= Near Threatened).

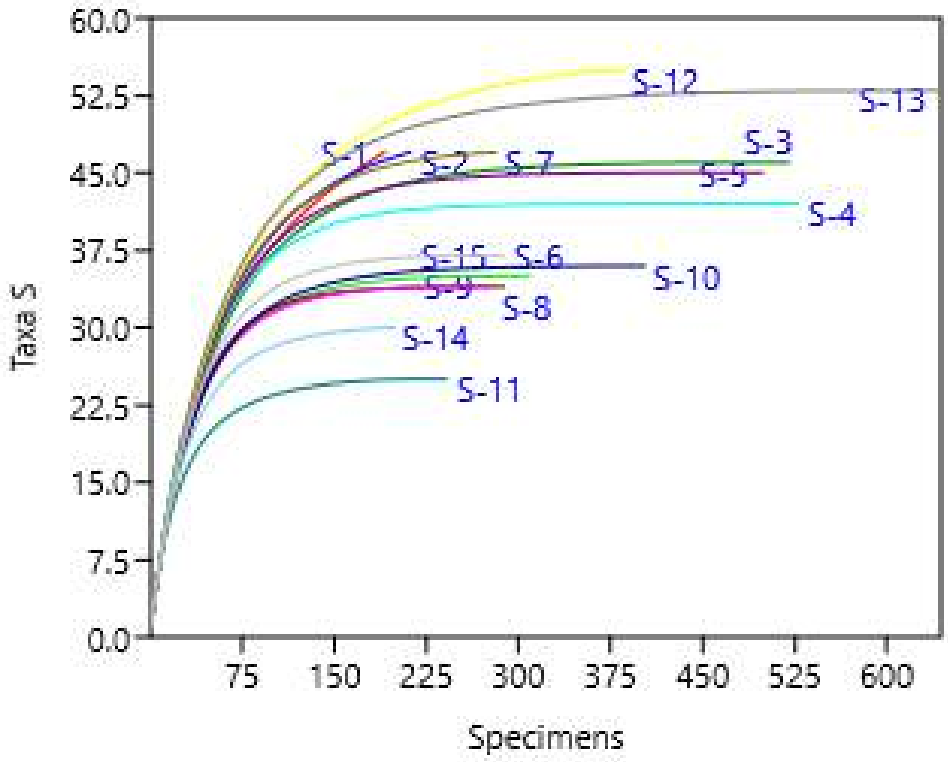


Figure 58. Species rarefaction curves of different sampling sites in study area.

5. Discussion

5.1.Physico-chemical status of Deendayal Port Authority Environment

Water quality of coastal water reveals the state of the overall environment. The quality of water determines the biological and other resources in the marine environment. However, water quality parameters in marine environment vary to a great extent, influenced by the climate,water currents and movements, input of pollutants in the form of effluent and sewage out fall and so on. The geophysical and geo-chemical factors such as shape and size of the coastal areas, prevailing currents, temperature, salinity, tidal impacts, directions of prevailing winds and influx of fresh water also influence the quality of water in the nearshore marine environment. The creeks and the intertidal zones are well known for the biodiversity and their role in the ecological services arewell documented. mangroves are now recognized as one of the most effective nature based solutions for climate change adaption and to reduce disaster risk (Sunkur, 2023). To assess the health of mangrove forest is inevitable in the monitoring programme in which extensive field survey is carried out to select the representative sites for data collection. The plant growth characteristics indicates the status of the mangrove cover for which the height,canopy dimension, Girth, as well as the number of different age groups of plants are considered. The DPA port and the influencing environment are surrounded by the mangroves and tidal flat with marshes are potential carbon stocks which are conserved and restored. Yet,the various human interventions due to the port related activities tendto impair the water and sediment quality which in turn affect the biological productivity. In this regard some of the most influencing physical and chemical water and sediment are considered for the seasonal study from the 15 selected sites. The plankton and benthic fauna diversity, Chlorophyll 'a' are also recognized as indicators of the health status of the environment (Adams,2002). The rate of variations in the different stress indicators in the water are followed in the monitoring process to evaluate the impacts that are likely to occur both in the near future as well as in the long term at the present rate of occurrence.

Temperature and pH

Water temperature in DPA port area generally varies in the range 12°C to 30.°C. However, the present study shows a increased range of water temperature in Kandla DPA port in previous year of 2023-2024. Water temperature Port region varies during monsoon, ranged from 23°C to 30°c to while in post monsoon observation, the value ranged from

12°c to 27°c to . However, in pre monsoon the values were noted in the range of 25°c to 29°C.The monsoon water temperature has been recorded as high (30°C). There is no vertical variation in temperature of marine water in Kandla Port area due to lack of thermal stratification in Creek (NIO,1998). This is because of the strong currents, high tidal impact and low depth of the harbour areas. The currents influence vertical mixing and restrict the stratification of water layer in the harbour area. High temperature during pre- monsoon attributed to high rate of evaporation and less rain fall.

pH

The pH of seawater of DPA Port area varied in the range of 7.3 to 8.5. Generally, the pH of seawater is controlled by Carbonate and biocarbonate system and falls in the narrow range of (0.2-0.3). pH was alkaline during summer and showed downward pattern up to monsoon and remained alkaline during postmonsoon, (Vajravelu et.al 2018). Changes in pH will depend on the factor like the removal of CO2 by photosynthesis through bicarbonate degradation, fresh water influx, reduction in salinity and temperature and decomposition of organic matter (Rajasegar et al., 2002).

Salinity

As temperature influences the salinity of marine water in the tropics, water in DPA region has higher salinity in the range of 36ppt 47ppt during 2023-2024 but at present the salinity ranged 32ppt to 42 ppt which is quite lower in previous year . Highest salinity observed during monsoon and Post-monsoon (42ppt) at station S-8. The higher salinity towards open sea regions around S-8 due fresh ingress of seawater in gulf region and localized effects of seepage of high saline (brine) water from salt marshes and saltpans of salt industries (Zingde& Anand ,1996). Hundreds of salt industries in and around Kandla Port use seawater with salinity in the range of 35 to 50 ppt. They release 'bittern' remains of salt after manufacturing, which has salinity as high as 250 ppt in Kandla Creek, thereby increasing the salinity in isolated regions of port areas (Chhaya, & Chhaya, 1997). Lack of fresh water from catchments coupled with higher evaporation is the cause of higher salinity in Kandla Port area. In the Little Gulf of Kuchchh water salinity has been recorded as high as 50 ppt (NIO,1998).

Dissolved oxygen

DO is consumed in marine ecosystem by the respiration and decaying organic matter in the water column. Loads of high organic matters may deplete the DO to its minimum level, which can be detrimental for the aquatic life. A severe depletion of DO may lead to 'Eutrophication' in an aquatic system. However, no such event has been reported in Kandla port region so far. DO in marine water of DPA region has been found in the range of 2.9 mg/l to 8.2 mg/l for in 3 seasons May 2024 to May 2025. The current range of dissolved oxygen in the marine water of Kandla Port region conforms to the designated best use for Salt pans, Shell fishing, Mariculture and Ecologically Sensitive Zone. For ecologically sensitive zone not less than 3.5mg/l at any time in a year (or 5.0 mg/l at 60 percent saturation level) of DO is essential for the protection of aquatic life. But in presentation observation less content of do in monsoon at S-7 might be due certain nutrient load from mangrove environment.

Total Suspended Solids

Suspended solids in Deendayal port area varied in the range 205 mg/l to 729 mg/l. Generally, the suspended solids in the Deendayal region are high and vary to a great extent from the inner port region to the out harbour region and further towards outer Gulf..The higher value of suspended solids and their variations across the stations in the inner Gulf including Kandla Port regions results from the dispersion of sediment loads due to strong currents and tidal influence Zingde& Anand (1996).

Turbidity

The Kandla Port areas fall under inner Gulf of Kuchch, there is a high turbulence in the· Creek, due to strong an ocean currents and tidal influence. Therefore, the turbidity of tropical seas is higher than other tropical and subtropical seas. The marine water turbidity is expressed in Nephelo Turbidity Unit (NTU). Water turbidity in DPA Port region has been recorded in the range of 16 NTU to 489 NTU. 2023-2024 at present 2024-2025 the turbidity 20 NTU to 489 NTU. Generally, water turbidity is high due to high organic load of mud and silt. (Omprakash, 1997) Higher turbidity of marine water at the DPA Port regions may also be associated with the washed sediment from mangrove environment and partially dredging activities, which is done on a regular basis along the Kandla Creek.

Nutrients

Nutrients in marine water such as Nitrate and Nitrite ,Phosphate and silicate are very crucial for the marine life. Their increase in concentration enhances the primary productivity in marine water. Nonetheless, excessive concentration sometimes can be detrimental to the aquatic life especially in creeks, estuaries and bays where there is a restricted water exchange. These increased nutrients lead to an excessive growth of algae resulting in eutrophication in some extreme cases (NIO,1998). During the period of May 2024 to May 2025 covering 3 season with respect to nutrient concentation it was observed that the concentration were with in permissible limit to marine life expect phosphate concentration which is quite higher from 3.16mg/l to 73.24mg/l which might be due to handling of cargo in port area ,input of sewage and industrial effluent to creek environment

Petroleum Hydrocarbon (PHs)

Petroleum hydrocarbons in the water column of Deendayal port area have been found in the range of 0.3 µg/l to 85.8µg/l for the period 2023 and 2024. For the period may 2024 to May 2025 the PHs ranged from 0.19 µg/l to 70.80 µg/l. High range of petroleum hydrocarbon results from the spills and leakage during the handling of crude petroleum products at the Port especially at oil terminals (NIO,2002).

5.2.Biological status of Deendayal Port Authority Environment

Biological resources of a marine area reflect the overall environment of the region in question. The coastal areas especially bays, creeks and estuaries are rich in biota and are habitat of many marine species. Usually, ports are also built in these areas for their geographical advantages. The port and harbour activities in these locations disturb the habitat of many marine biota. However, in the process many habitats are also created for marine biota. The Gulf of Kachchh is an example of such habitat and has been considered to be rich in biodiversity. Kandla port has been built right in the gulf and has been serving this region nearly seventy years.

Chlorophyll ‘a’ Phytoplankton and Zooplankton

In general the basic parameters of marine biota like Chlorophyll ‘a’ and Phytoplankton are observed to be moderate in their values but similar to those prevailing along the coastal

waters of India (NIO,2002). During the period May 2024 to May 2025 the Chlorophyll 'a' concentration 0.04 mg/l to 2.89mg/l which is quite satisfactory for port environment.

The index value of both phytoplankton and Zooplankton of 3 season shows moderate environmental status (Fig.59).

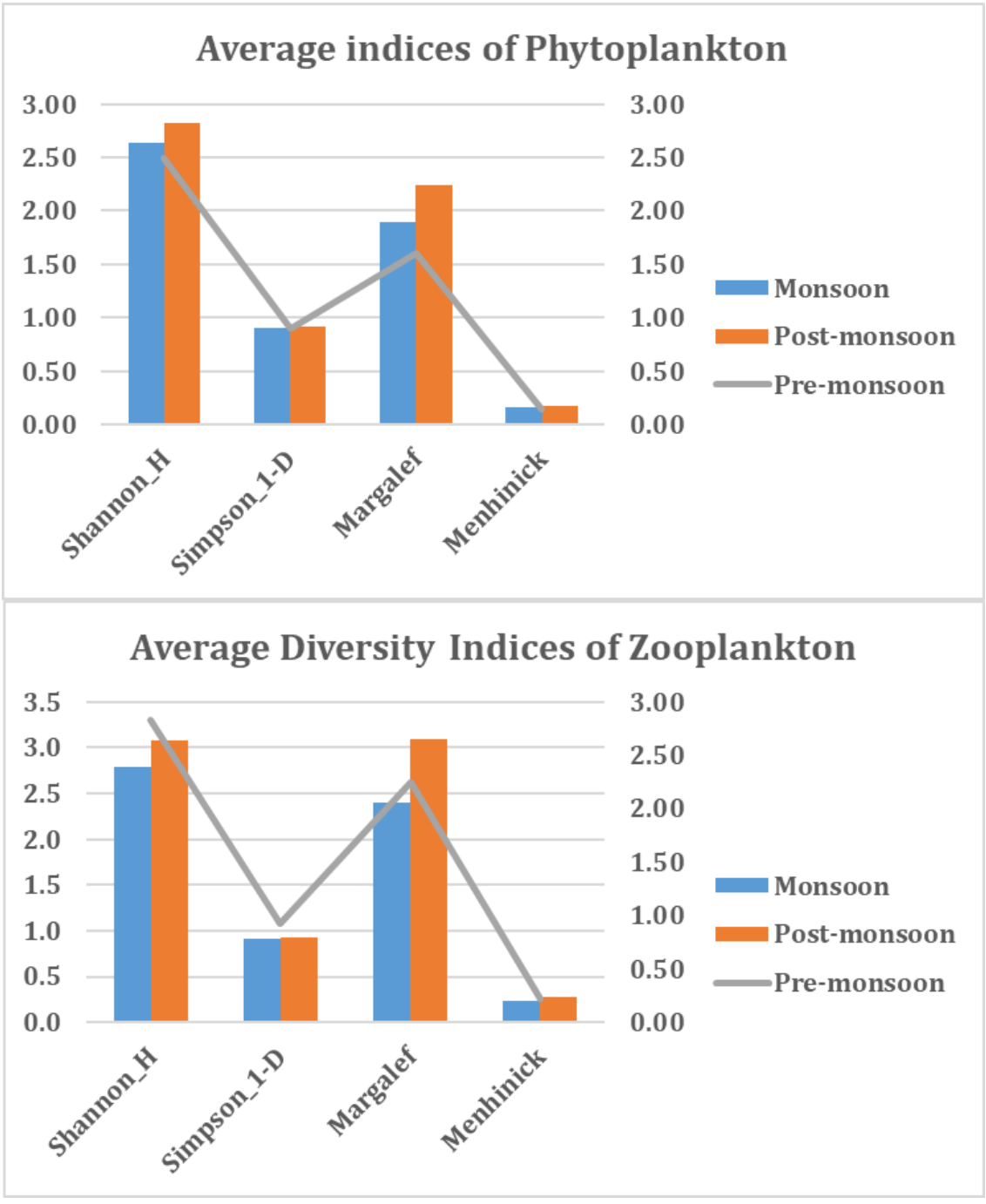


Figure 59 Diversity indices of Phytoplankton and Zooplankton

As per Shannon Wiener's rules the aquatic environment i.e both soil and water classified as very goodwhen H' value is greater than four (>4), whereas the good quality represents the H' value with a range of 4-3, similarly moderate-quality (H' value 3-2), poor quality (H' value 2-1) and very poor-quality H' value significantly less than one (<1). Presently DPA port and its periphery environment has been influenced by contaminants deposited from industries and the cargo movements. Accordingly, species diversity decreases at sites with poor water quality. As deduced from the Shannon diversity index values between 3-4 overall 3 season representing the moderate quality of environmental status dominated by the few genera such as Coscinodiscus sp. and Synedra sp,and copepod sp. A community dominated by relatively few species indicates environmental stress (Plafkin et al., 1989). According to Staub et. al (1970) species diversity index value between 3.0 to 4.5 represents slightly polluted and the lightly polluted environment, the index value characterizes 2.0-3.0, similarly, moderately polluted environment shows index value of 1.0-2.0 and finally, the heavily polluted environment index value is 0.0-1.0. While considering the overall index values it is inferred that the study sites can be included under the category of lightly polluted environment.Natural geographical processes such as strong currents and higher tidal influence have been responsible for the high turbidity and suspended solids which in turn reduce the light penetration thereby reducing the growth of Plankton and primary productivity.

Intertidal Fauna

Macrofaunal communities did not show much spatial and temporal variation in their components at 15 sampling locations. The distribution of intertidal Fauna seems to be entirely governed by the environmental parameters like Physico-chemical and biological characteristics of the ambient milieu. Generally, intertidal Fauna on the Kachchh coast scope a harsher environment with relatively high salinity, wide temperature fluctuations, seasonal fluctuation of different hydrological parameters and a high sedimentation rate. The water suspended solids (SS) were generally found due to the dispersion of fine sediment from the bed and the intertidal mudflats due to tidal movements at the mouth of the Kachchh coast (Kandla).

An earlier study by Saravanakumar et al. (2007) revealed the presence of five intertidal Fauna in the mangrove environments along the Kachchh coast, with a diversity index such as Shannon_H, Simpson_1-D, Margalef and Menhinick ranging from 1.84 to 2.45 in 2023 to 2024 at present from may 2024 to may 2025 it is 0.77 to 1.66. The species composition and diversity indices reported during 2018-2019, 2019-2020, 2020-21, and 2021-2022 2022-2023 and 2023 to 2024 did not vary significantly in the DPA port environment. It was understood that the intertidal fauna community in the Kachchh mangrove had not varied much in terms of its species diversity. An earlier study by Saravanakumar et al. (2007) revealed the presence of five intertidal Fauna in the mangrove environments along the Kachchh, with a diversity index ranging from 1.84 to2.45. During the 2023 to 2024 average Shannon diversity indices varied from 1.51 to 1.6 similarly the Margalef and Simpson indices ranged from 1.43 to 1.5 and 0.7 to 0.73 and similar patter the index value also run parallelly (Fig. 57). According to Magurran (1991), the Shannon diversity index of >3.0 indicates a healthy coastal environment. However, diversity indices around the DPA coastal environment were <2.0, indicating that the lower moderate faunal diversity.In the present observation, the species composition of the benthic macrofauna showed dominance in the Phyla Molluscs, Arthropoda, Annelida, Nematoda, Nemertea and Chordata. Previously, Ansari et al. (1986), Mohammed (1995) and Kumar (2001) recorded the presence of the Molluscs, Arthropoda, Annelida, and Chordata in various parts of Indian coastal waters.

Subtidal Fauna

The Shannon diversity indices ranged from 0.65 to 1.77, similarly Margalef and Simpson indices ranged from 0.75 to 2.18, 0.35 to 0.80 during 2023 -2024 . The results obtained from this study represent and the indices such Shannon_H,Simpson_1-D, Margalef, and Menhinick reflect similar moderate to lower environmental status for the period 2024-2025 (Fig.61). There is a need for an in-depth study of Fauna and their interactions in mangrove ecosystems. Also, practices directed at managing mangrove resources should go hand in hand with conservation strategies.Mahapatro et al. (2011) documented the macrofaunal diversity in Bhitarkanika (Odisha coast) mangroves, and the diversity ranged from 1870 No/m2. Ramakrishna et al. (2011) recorded the population structure and density of macrofaunal from the Andaman and Nicobar Islands and documented diversity from 1015 No/m2 in the. In the Gulf of Katchh, Saravanakumar et al. (2007) documented that from 1999 to 2000.

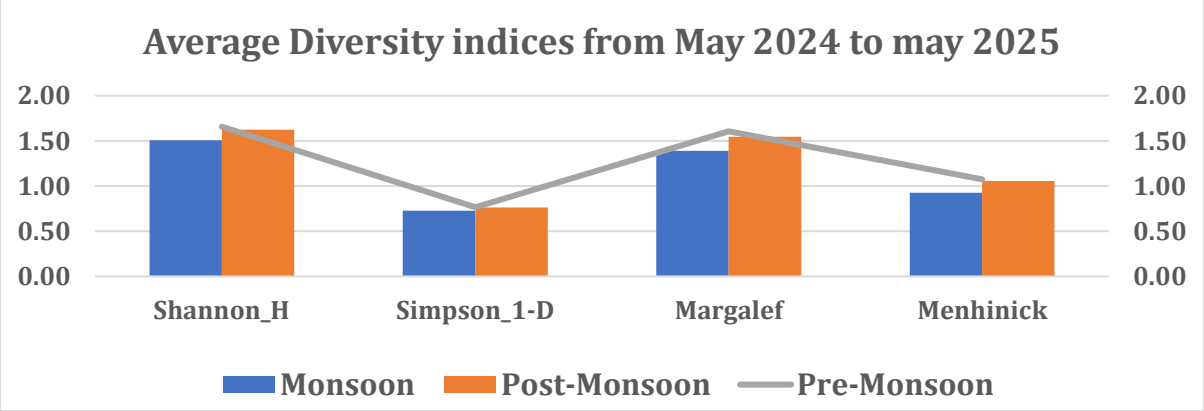


Figure 60. Average diversity indices of intertidal fauna of DPA

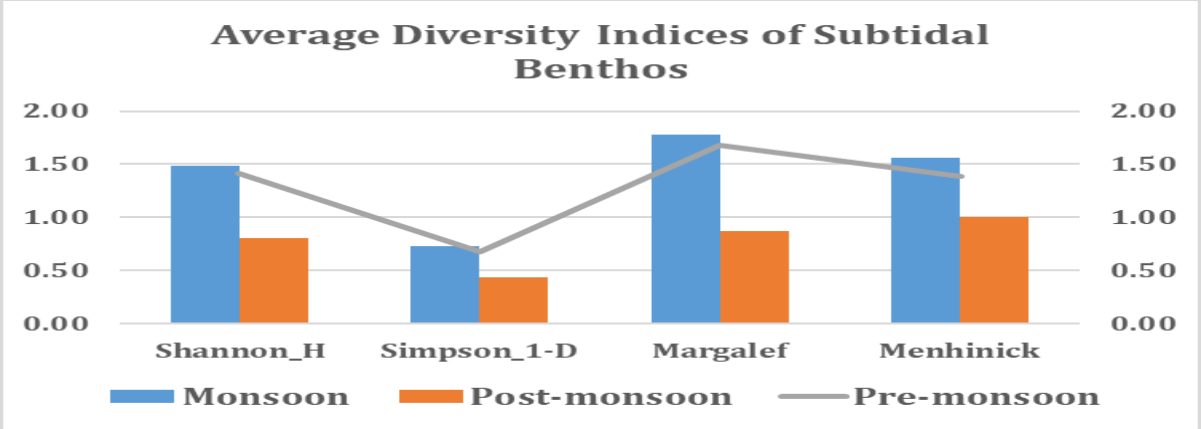


Figure 61 Average diversity indices of Subtidal fauna of DPA

6. Impact identification and Evaluation

The Deendayal Port, Kandla, in Kachchh district is surrounded by a large number of port associated industries and salt pans and salt processing industries. There are a number of minor and creeks that are connected to the Gulf of Kachchh. The DPA has been the prominent industrial and transport facility primarily associated with the inter connected creek environment which influences the open oceanic zone. The adjacent marine zone is well known for the multitude of the biological resources however, the very sensitive ecosystems like coral reefs, sea grass meadows and salt marshes are not found within the 10 km radius of the DPA port Jurisdiction, and the direct impacts are not experienced.

The general consequences of the port associated activities, particularly on the free-floating microscopic animals and plants, the macrofauna inhabiting the sub-tidal and Intertidal habitats and the birds have been well known, in this respect it is imperative to analyze the major impacts and to put forth effective mitigation measures.

Routine dredging Impact

- Dredging and dredge spoil disposal activities for port development and maintenance can induce short and long-term impacts on aquatic systems, namely degradation of marine resources such as fisheries and other aquatic biota.
- Dredging activities often disturb sediments reducing visibility and transparency of water.
- Dredging activities potentially affect not only the site itself, but also the surrounding areas, through a large number of impact factors such as turbidity, sedimentation, resuspension and release of contaminants which can be within the site or to the nearby area on a temporary or over a long period.
- **Impact on Air quality of the Port premises**
- Emissions from burning waste materials and the escaping dust particles due to handling of fine-particulate materials such as fertilizers and minerals causing air pollution in port areas.

Impact on Avifauna

Impact-I Location of the Deendayal port site in the close vicinity of the ecologically sensitive terrestrial ecosystem (migratory route, breeding and nesting sites of avifauna)

may impact the overall biodiversity values due to the project associated activities such as A. Habitat degradation due to pollution

B. Loss of habitat and population of faunal groups

C. Overall impact on biodiversity of the protected area

Evaluation: The Deendayal SEZ project site located in the mid of the Deendayal Port area surrounded by port associated industrial sectors, predominately salt industries. There is no any ecologically sensitive ecosystem (Protected Areas) located within 10 km radius of the project site. Due to the prevailing land use no impact on protected areas was foreseen. Further the study area also not reported any migratory route of major animal groups, nesting and breeding sites of avifauna.

Impact on threatened flora and Fauna – Inter-tidal coastal habitat.

Impact 2: Direct loss of inter-tidal habitat like mangrove and saltpan will impact the threatened floral and faunal species existing within it due to; Loss of inter-tidal habitat (mangrove) and degradation due to project associated activities will overall population status of threatened aquatic avifauna.

Evaluation: As per land use land cover study, the project area dominated by intertidal habitats like, Mangrove, creeks and salt pans. The study area reported total 5261 birds belong to 64 species (Annexure 1). However, this list includes only five species *viz.* Painted Stork *Mycteria leucocephala* (Pennant, 1769), Black-headed Ibis *Threskiornis melanocephalus* (Latham, 1790), Glossy Ibis *Plegadis falcinellus* (Linnaeus, 1766), Black-tailed Godwit *Limosa limosa* (Linnaeus, 1758) and Eurasian curlew *Numenius arquata* (Linnaeus, 1758) are under the Near Threatened (NT), whereas, River Tern *Sterna aurantia* (Gray, JE, 1831) is under vulnerable (VU) categories of IUCN Red List of Threatened Species. Moreover, four species (6.25%) River Tern *Sterna aurantia* (Gray, JE, 1831), Common Greenshank *Tringa nebularia* (Gunnerus, 1767), Black Kite *Milvus migrans* (Boddaert, 1783), Gull-billed Tern *Gelochelidon nilotica* (Gmelin, JF, 1789) and Shikra *Tachyspiza badia* (Gmelin, JF, 1788) were under the Schedule I of Wildlife Protection Act, 1972 (amendment 2022).Since the study area beyond 5 km supports large extent of similar (Inland wetlands and Salt pans) habitat types and supports large number of aquatic birds, the overall impact on few aquatic threatened avifauna reported in the study area would be minimal (Annexure 1). In spite of that, implementing, proper mangrove plantation activity can take care of this minimal impact. Further, no endangered aquatic birds reported in the study area.

7. Mitigation

Adopting mitigation techniques for reducing the carbon concentration in the atmosphere through green belt/plantation, conservation of water and energy in the agriculture and several production sectors have been very much familiar. Various other considerations to control air and water quality in the port and influencing environment have been suggested and implemented in many states. Depending on the physical and chemical characteristics of the dredged material, disposal may be confined, unconfined or treated prior to release in open water, along the shoreline, or on land. Ultimately, EMMP acts as a comprehensive manual for environmental protection, reduction in carbon (GHG) emission and finally it helps in converting major ports into "Green Ports". The ultimate goal of a Green Port Plan program is to achieve long-term environmental, societal and economic benefits through resource conservation, waste reduction and pollution prevention. The Green Port Program unifies the Port's environmental sustainability goals (in many key areas) by way of setting measurable goals and evaluating progress in each area on an annual basis.

Pollution control

The major health impacts of pollution from ports are related to the gaseous and particulate emissions arising from the combustion of petroleum products and coal leading to various respiratory tract diseases, cardiovascular disease, lung cancer and also climate change related issues. Petroleum contamination is a very common problem these days arising from leaking tanks, oil spill, and gas into the surrounding water and soil and takes long time for reclamation by bioagents or physical and chemical treatments. A process called thermal soil remediation helps in the remediation of contaminated soil which can be reclaimed and reused by this method.

The possible soil contamination due to spillage of oil residues, petroleum products, cement, paint, plastics, non -degradable solids etc. are to be handled effectively by scrupulous preventive management guidelines. The laborer and officials should be aware of the extent of damage they can bring on the ecosystem and in turn to human as well through the process of biomagnification through the marine food chain. In this regard any potentially contaminated soils from construction activities must be handled,

transported and disposed off in accordance with the Environmental Management Act (EMA) and its Regulations of Government of India.

Afforestation

The port authority should take up plantation of various kinds according to the space, soil types and water availability. Also, it is utmost necessary to carry out promotion compensatory mangrove and associated vegetation plantation along the shoreline at the suitable tidal level with the common species. The development such green belts surrounding the whole project area will enhance the integrity of the ecosystem and provide ecological and economic services at large on a long and regular basis. The plantation needs to be carried out with higher density of seedlings to realize high survival rates and growth performance considering the past experiences in the coast and the type of natural stands existing along the shores of the creek system as well.

Mangrove plantation

The Green Port Program is an umbrella program designed to achieve the Port's environmental sustainability goals by adopting appropriate afforestation programs to develop large green belt areas at all prospective locations. The afforestation would not only contribute to the aesthetics but also would serve as a 'sink' for the pollutants released from the station and would thereby protect the quality of ecology and environment in and around the projects. Green belt will help in supporting the biological diversity, controls soil moisture, erosion control and coastal protection, increase the rate of ground water recharge and act as carbon sink to reduce climate change. Green cover interventions capture the fugitive, attenuate the noise, subside the particulate matter in the air and reduce the temperature in the surroundings. The mangrove plantation is expected to support the avifauna diversity of the local environment. It is recommended that construction activities to be restricted during the non-migratory season of the birds (November – February) to avoid disturbance to the migratory species as the Kachchh wetlands serve as major wintering grounds, located in the major central Asia fly way. Since the intertidal zone of the creeks comprising the mangroves and salt pan habitats support many benthic fauna including finfishes and shell fishes, aquatic and terrestrial migratory birds, the protection of these productive environments is very much essential for the restoration of the biodiversity and the livelihood of the fishermen. The above

suggested mangrove plantation needs to be monitored for the next five years till it attains maturity and later on evaluation of the ecosystem and economic services rejoiced by the community in view of the evolving climate change related issues. The monitoring of the mangrove and coastal zone should include the study of species composition, population characteristics, growth rate of plants, abundance of the flora and fauna in order to estimate the diversity and health status at every season of the entire environment.

Soil erosion control

Shore line substratum erosion is a major threat to the intertidal habitats in DPA port jurisdiction. Often the rate of erosion is severe in the port environment due to the continuous vessel movement and the churning effect induced hydrological regime and other natural causes. During the present study it was noticed that few creeks stretch in Kandla are susceptible to erosion due to high water currents and tides. The dual purpose of controlling erosion and promoting intertidal biodiversity could be best achieved by installation of artificial reef structures, limestone rocks, laterite, cement and granite as well as bio reefs. Artificial coastal structures are cheap and installation is easy and adaptable and for better results it can be supplemented with the addition of a substrate that will support marine organisms as that of the natural intertidal and sub tidal environment. The structural diversity of the artificial reef will determine the diversity of marine organisms utilizing the created habitat. Artificial reefs once built will last for decades and would enrich marine biodiversity in a short period of time by providing ideal habitat for sessile and free-living benthic organisms and their larvae. Natural materials such as dead shells can be used for building artificial reefs and are environment-friendly. Reef balls are another form of artificial reef increasingly used in western countries to create sustainable marine reef habitat which may be easily attempted at Deendayal port Areas. Both reef balls and artificial reefs being inexpensive and locally available, can be built in different creek systems of the port jurisdiction. Application of coir mats are also suitable to control the shoreline erosion in the mangrove patches and open shore in conjunction with the rocky and cement structures.

Phosphate mitigation

- Optimizing fertilizer and detergent application in the households and industries
- Creating awareness among the stakeholders
- Planting perennial crops or crop rotation to avoid bare fields, which experience higher erosion and phosphate runoff.
- Planting trees and shrubs around fields to absorb excess nutrients.
- Restricting runoff from livestock rearing areas and maintaining treatment systems for sewage
- Bioremediation methods to be adopted for the removal phosphorous in agriculture and waste water.
- The most reliable and most frequently applied removal process is chemical phosphorus precipitation by addition of metal salts. Dissolved phosphorus is converted to solids which are removed from the waste water together with the sludge.
- The decay of the organic material produced by photosynthesis under aerobic conditions again results mainly in mineral phosphorus compounds in the sediments with low availability. Under anaerobic conditions decomposition process results in the release of phosphorus in dissolved and therefore easily accessible form.
- By precipitation with calcium cations manifold reactions are known, which are hard to predict. High phosphorus removal efficiency can be achieved at pH-controlled crystallisation of calcium hydroxyapatite which has a very low solubility product.

8. Conservation and Management Plan

Conservation of biodiversity is considered as the key component for administration of natural assets. Biodiversity is an all-encompassing concept that describes the magnitude of ecological diversity addressing the wide range of life associated with different types ecosystems. Biodiversity conservation is the protection and management of the biotic ad abiotic resources for sustainable development and existence and preservation of the diverse species, Sustainable utilization of species in the ecosystem along with the maintenance of the life-supporting systems are essential for the functioning of the various ecological processes. It is an integral part of any commercial activity and infrastructure development in the marine environment. Emphasis is given towards the reinstatement of the physical, chemical and biological characteristics of the coastal ecosystem which are much complex and vulnerable on which the human is highly dependent. Management of the marine biodiversity is the prime concern in the development of Ports and harbors which occupy the fragile continental shelf which is highly productive and harbors numerous living resources. Hence Environmental Management Plan (EMP) is considered as an important component in any developmental activity with sustainable management goals which are to be fulfilled within a time frame. Thus, EMP aims to suggest concrete measures that would mitigate the impacts paving way for maintaining the integrity of the project environment.

Development of ports involves effective management plan towards environmental wellbeing that guarantees both sustainable port growth and a healthy ecosystem functioning in its vicinity. There is a need for innovative solutions for port development which are in harmony with the ecosystem and which are robust or adaptable under change. The recent trends like growth of global trade, increasing vessel movements and size, modernize port facilities, driving urgent investments in ports have been found negatively impact water quality and marine flora and fauna. This simultaneously calls for sustainable and inclusive development which ensures productive nature of its marine environment.

The port authorities mandate to their activities environmentally sustainable and benign need to understand the marine ecological setting of their ports including water quality, biotic components and the factors that impact them. In spite of all the pressures, the ecosystem continues to deliver many services which are often intangible. In order to maintain these services intact, it is imperative that different biotic and abiotic components of the port environment are to be sustainably managed in the long run.

Accordingly, Deendayal Port has initiated several environmental management measures as mandated by the MoEF &CC from time to time with the purpose of maintaining and preserving its terrestrial and coastal environmental integrity.

The following measures have been taken by the port authorities:

Ongoing Environment Management Measures by DPA

A holistic and comprehensive study on the marine ecology of the port including different marine faunal and floral components and preparation of a management plan based on the results obtained has been initiated as per the specific condition No. xviii of the EC & CRZ Clearance accorded by the MoEF & CC, GoI dated 19/12/2016. The results of the seasonal observations on the environmental characteristics and biodiversity of the intertidal zones have been compiled along with the conservation plan recommendation for three consecutive years (2017 to 2021). Mangrove plantation has been carried out to the tune of 900 ha in Sat Saida Island, 150 ha in Nakti creek, 450 ha in Kantiyajal by Deendayal Port. The black mangrove Avicennia marina was used in these plantation activities as this species is more suitable to the existing environmental condition of this coast.

Based on the information gathered through the seasonal studies on the different biotopes and the biodiversity along with the mangrove, macrofauna, plankton density and diversity, productivity of mudflat and avifauna for the period 2018-2022 within the limits of the Deendayal port, it is evident that the impact is insignificant since management action plans are showing positive responses to a large extent in spite of the climate change induced impacts on the marine

ecosystem. This project aims to draw a holistic management framework for conserving the Marine Biodiversity and Ecology of the DPA port marine environment which include many biotopes such as mangroves, intertidal and subtidal realms, mudflats and salt marshes, each serving as an abode for a variety of fauna and flora. Given the economic importance of DPA port and the increasing national and global demand for sustainability, it is planned to study the marine ecology of this port seasonally, with the long term objective of rendering the port existence and operations environmentally sustainable. The proceeding section outlines management initiatives to be undertaken by the port authorities for holistic management of marine biodiversity within the port limits envisaging several facilities will be built within port premises in the future.

Intertidal and Subtidal Biodiversity Management

The intertidal zone constitutes the coastal environment where land and sea meet, i.e., the area between extreme high-water springs (EHWSs) and extreme low water springs (ELWSs). The subtidal zone lies below the lowest water level beyond the intertidal zone. Both these zones provide habitats for various marine fauna and flora and needs to be managed effectively for the overall wellbeing of the ecosystem. In addition, intertidal zone biodiversity index did not vary very much in the recent years but the population density has not increased and remained stable. The intertidal zone may be susceptible to natural and anthropogenic pressures such as soil erosion, industrial pollution, continuous dredging and sedimentation. Hence, interventions are required to mitigate or support the natural recovery of the fauna in the bottom sediment. The sedentary benthic species produce a large number of their larva as an adaptation for their survival which get attached to the mangrove surfaces and metamorphose into adults and also serve as food for several fishes and shellfishes. Hence, soil erosion control interventions could help to improve the restoration of many benthos and plankton productivity. In the DPA vicinity, intertidal and subtidal zones are mostly dominated by clayey substratum admixed with silt and there are no rocky or sandy

shores. The intertidal belts of the study area support many biological elements indicating the overall health of the ecosystem.

Mangrove Management

The mangrove cover in the vicinity of DPA is 23.967km^2 encompassing the major and minor creek systems within its limit of which the port infrastructure occupies only ~1% of the total area. Establishment of facilities is a continuous process and the expansion of infrastructure over the coming years will bring remarkable changes in the landscape and seascape in and around the port area. Mangrove environment will continue to be stable and balanced if there are no external stressors such as change in hydrology, elevation and slope, soil and water salinity and pH, soil texture and wave energy are maintained in a natural condition without wide fluctuations. In addition, human centered stress factors such as resource collection, camel grazing, tree felling and other habitat modification activities are to be minimized. Generally, micro-topography controls the distribution and well-being of mangroves, and physical processes play a dominant role in the formation and their functioning through reproduction, seed germination and establishment of young plants. The mangrove forests undergo self-repair over a period of time, provided that the normal tidal hydrology is not disrupted and the availability of water borne seeds are not blocked. Regular monitoring of mangrove hydrology through simple scientific methods will go a long way in maintaining ecosystem balance. The natural regeneration capacity of the stand is to be assessed by quantifying the degree and extent of the entrance of younger classes such as saplings into the mature tree category. The ratio between these different size classes will indicate the dynamic state of the mangrove forest. Only if the natural seedling recruitment is not occurring does the system requires an assisted recovery by plantation and physical amendments. The present study displays that natural regeneration in the studied mangrove formations is expected, as indicated by the entry of younger classes into adult categories. In addition to *A. marina,* three species namely, *Rhizophora mucronata, Ceriops tagal* and *Aegiceras corniculatum*, have been recorded sporadically within DPA limits. It is strongly recommended that in all the future plantation efforts, these additional species also could be selected at appropriate locations and tidal levels.

Conservation of Island

Islands support a rich marine fauna, flora and avifauna diversity and deserve special conservation efforts. Land cover classification of Sat Saida Island using GIS tool revealed sparse and dense mangroves, mudflats and halophytic vegetation other than mangroves are other prominent land cover categories. Though equipped with all the features to support a dense mangrove formation, the Sat Saida Island has sparse and scrubby plants confined mostly to creek banks. Different elevation features of the Island render the reduced flooding rate at the interior regions results in sparse and open mangrove formations. This Island could be an ideal site for mangrove plantations while implementing plantation activities, other mangrove restoration and rehabilitation activities with biophysical amendments such as desilting the existing the minor creeks could help to increase the mangrove cover in this Island. These physical activities in the mangrove lined minor creeks will increase tidal flooding and hydro-period and convert sparse to dense mangroves in due course of time. The Deendayal port authority has already carried out 1400 ha of mangrove plantation since 2006 with good success rate in various locations and additional 100 ha is in progress.

Management plan to improve the water quality in the port area

- The drains and outfall should be cleaned regularly to avoid anaerobic decomposition and also for proper flow of water/wastewater. This will also enable the characterization of wastewater and calculation of waste load.
- Domestic and canteen wastewater should be discharged only after proper treatment.
- The solid waste generated from the canteen and other diffused sources should be collected and disposed properly for which modern purification system should be established.
- The discharge of oil waste into the sea from the following main sources should be controlled
    1. Discharge of oil waste from liquid chemical corridor area. This liquid waste is generated during tanker cleaning, and oil spills during filling operations,
    2. Oil spills at berth during unloading operations.
    3. Tanker ballast discharge from ships.
- Bulk material should not be disposed into the sea. All drains and roads should be cleaned before the rainy season to avoid runoff from land to sea carrying a myriad

of pollutants, including chemicals that may be impose oily discharges in and around the port.

Management plan for marine fisheries

Regular dredging activities in the Port area can impact marine fauna and the flora particularly the phytoplankton and seaweeds. The fishes and other fishery resources such as shrimps and crabs are distracted through noise and vibration levels, water quality and habitat loss along with food sources. Generally, fishes in the water column are free swimming in nature, they tend to avoid the turbid areas and move to safer zones. Once the turbidity increase becomes reversed due to sedimentation and dispersion by current and wave influences, the fishes are expected to occupy the area. Hence, there will be virtually no impact on fish due to dredging in the long term. The dredging is usually carried out on the main channel of the creeks, the impact on the fishes are minimum during the dredging phase. The most important potential impact would be the rise in suspended solid load, which hinders the photosynthesis of the producer communities, especially the phytoplankton and affects the pelagic food chain. The high turbidity due to heavy suspended solids load during dredging and reclamation can result in the clogging of the gills of the filter feeding organisms, thereby causing asphyxiation.

Co-Management with the Community

Management program for mangroves is feasible in the case of Deendayal Port Authority since all the mangrove formations are under its legal control and hence any management program could be implemented without any sectoral conflicts with forest or any other government departments. It was proven in many instances that involving the stakeholder communities in the surrounding villages will yield better results in mangrove management. Though the population in the port surroundings has different livelihood activities, fishermen community could be targeted to involve in community-based mangrove management.

The fishermen in the villages such as Vera, Khari Rohar, and Tuna close to the port could be involved by forming “Samithies” for the conservation of mangroves with possible funding resources. The communities are expected to involve in the plantation and management activities for which awareness campaign and interactive sessions are to be conducted time to time and the feedback and experiences are to be recorded and duly acknowledged. The community’s resource dependency, perception about the conservation of mangroves and associated flora and fauna and their level of involvement

in such resource management activities are to be assessed before forming such a community-based organization. They could be assigned the specific task of conserving the mangroves by involving them in plantation/restoration activities, physical protection and other conservation measures. This could be taken up as part of the port's CSR activity.

Mannagement plan for Avifauna

1. Direct and indirect impact on ecologically sensitive ecosystems

The Deendayal SEZ project site is located in the mid of the Deendayal Port area surrounded by port associated industrial sectors and salt industries. Since there are no Protected Areas located within 10 km radius of the SEZ site, impacts on sensitive ecosystem was not visualized.

2. Loss of Inter-tidal habitats - Coastal

- The project proponent (Deendayal Port Authority) should take up compensatory mangrove plantation in and around the project area
- The plantation needs to be carried out with fourfold density of seedlings compared to the natural mangrove density of the Kandla creek area and to maintain the density at the required level
- This mangrove plantation expected to support mangrove associated bird species and thereby enhance the avifauna diversity of the local environment
- Since the intertidal (mangrove and creeks) and salt pan habitats supports few thousands of aquatic and migratory species, the project proponent should plan the establishment /construction activities (if any) should be planned non migratory season (November – February) to avoid the disturbance to the migratory species.
- The above suggested mangrove plantation needs to be monitored at least for the next five years till it attains maturity with the expert team to understand the growth rate and enhancement and assemblage of associated faunal species.
- Since the area located in the Intertidal habitat and adjacent areas supports thousands of aquatic avifauna, the project proponent (Deendayal Port authority) should take up long-term (five years) Ecological Monitoring Program of the creek, mangrove and salt pan habitats to assess the change in avifaunal diversity due the any developmental activities take place in the future project.

Phosphorus management

Anthropogenic inputs of nitrogen (N) and phosphorus (P) from agriculture, aquaculture, wastewater treatment, urban runoff, and burning of fossil fuels, are now reported to exceed the natural inputs worldwide (CENR, 2000, NRC, 2000). The nutrient enrichment has led to deadly blooms of phytoplankton and seaweeds, coral reef deterioration and altered ecosystem functioning. As marine ecosystems continue to experience land use change, rising sea levels, altered weather patterns, and global warming, the threat of nutrient enrichment is predicted to intensify.

It is understood that mangrove wetlands can alleviate nutrient pollution through rapid nutrient uptake, long-term burial, or denitrification, thus protecting surrounding marine waters and organisms (Valiela and Cole, 2002). However, coastal wetlands themselves are still vulnerable to the impacts of nutrient enrichment. In this circumstance studies have reported that due to high rates of nutrient uptake and denitrification, nutrient enrichment can have direct and indirect impacts on mangrove trees (Kaplan et al., 1979; Seitzinger, 1988).

The blue-green algae (Cyanobacteria) blooms are predominantly), tend to grow in high density under situations of low ratios of nitrogen to phosphorus. numerous long-term studies have pointed out that reducing inputs of a single nutrient: phosphorus could control the incidence of algal bloom and also by introduction of iron, alum, or other compounds to sequester phosphorus in sediments. This management is possible in inland water bodies.

In creeks and coastal environments, the water is dynamic in nature mitigation measures are in general impractical. It is recommended that it is necessary to identify the possible primary sources of input and to control awarenessdrive are to be implemented to the concerned community, industries and the government bodies.The influx of sewage ,land run off from the cropland and the industries are major sources of phosphorus/phophates into aquatic systems. Traditional wastewater treatment methods do not fully remove phosphates, leading to their accumulation even though modern filtration technologies can effectively eliminate phosphates which are expensive. Many countries have imposed strict regulations on the use of phosphate-containing detergents and implemented laws to reduce phosphate pollution.

Phosphates are salts of phosphoric acid formed with the reactions of metals and there is dihydrogen phosphate that dissolves in water while the hydrogen phosphate is less

dissolution in water. In water, phosphorus exists in the form of inorganic, organic, and organo-mineral compounds and is also part of the cells of aquatic organisms. Notably, inorganic compounds have the highest bioavailability. Today, phosphates in marine and freshwater systems present a significant environmental challenge. Human waste is a natural source of phosphorus. In this context it is understood that improper sewage treatment could lead to higher level of phosphate-phosphorus in the coastal water bodies. These effluents contain biological phosphorus as well as phosphate components from detergents, food products, etc. When phosphorus and nitrogen levels in water become excessive, microorganisms receive more nutrients, leading to rapid reproduction. This process, known as eutrophication, reduces oxygen levels, kills fish, and makes water treatment more complex due to the increased biomass.

Petroleum hydrocarbon Management

Increasing petroleum consumption and a rise in incidental oil spillages have become global concerns due to their persistent nature and toxicity to aquatic and terrestrial living organisms. Various physicochemical and biological treatment strategies have been studied to tackle them and their impact on environment. Combinations of biological, chemical, and eco-toxicological techniques are used for this process while monitoring the efficacy of bacterial products and nutrient amendments to stimulate the biotransformation of contaminated soil. One of such approaches in this regard in the marine environment is the use of microbial processes due to their being “green” and also apparent low cost and high effectiveness. Different hydrocarbon removal levels were observed with bacterial augmentation (*Beta proteobacterium* and *Rhodococcus ruber*), exhibiting a total petroleum hydrocarbon (TPH) reduction of 61%, which was further improved to a 73% reduction using bacterial augmentation combined with nutrient amendment (nitrogen, potassium, and phosphorus). Mixed bacterial consortia isolated from the hydrocarbon-contaminated soil samples were used

Chemical treatments suggest agents like dispersants, solidifiers, and chemical oxidants are the remediations are grouped. The surfactants present in dispersants help to break down oil slicks into smaller droplets,then undergo rapid dilution by transferring it into the water and are degradable. This method makes oil spills less harmful for living organisms and the marine life. Nokomis 3-F4, Slickgone NS,Finasol OSR 52, SPC 1000™, Neon AB3000, ZI-400, Corexit 9500, Corexit 8667, and Saf-Ron Gold are some of the examples of chemical dispersants.

Bioremediation is a cost-efficient method used for the treatment of petroleum consisting of biodegradable hydrocarbons and indigenous microbes. Biological techniques are more economical and proficient than physicochemical techniques.. Three distinctive approaches are adopted in the context of bioremediation, namely, bioaugmentation, biostimulation and bioventilation. Bioaugmentation is used to enhance the performance of the microbial population through the addition of bacterial with specific catabolic activities, strains or enrichment consortia to increase the rate of contaminant degradation.Many microorganisms are responsible for increasing the surface area of the substrate by excreting emulsifiers including *Bacillus licheniformis, Pseudomonas putida, Bacillus cereus, Pseudomonas aeruginosa, Bacillus subtilis,* and *Bacillus laterosporus* are well known for degradation of oil pollutants. The water should maintained be suitable for the normal growth of the oil degrading microbes so that by natural processes by itself the PHCs will be degraded under with time.The biodegradation rates are improved by the biosurfactant's addition which increases the elimination and solubility of these pollutants.

It is recommended that proper measures should be taken to avoid the introduction of petroleum related products from the ports, during the loading and unloading of consignments , navigation channel maintenance and such activities.

9. Summary and Conclusion

The physico-chemical characteristics during the entire year was dynamic with respect to sptio-temporal situation in the gulf environment. The phytoplankton genera for the period May 2024 to May 2025 varied from 8 to 29 number with an average of 16-23. The highest number of genera was reported during post-monsoon which is followed by monsoon and pre monsoon. The Zooplankton for the period 2024 to 2025 showed high number of representatives of phylum and group during post-monsoon followed by pre-monsoon than the monsoon period.

It is imperative to create strong baseline data on the marine environment in the port vicinity in tune with the spatial extent of developmental activities. Continuous marine ecological monitoring study since May 2017 focused on the biological diversity and productivity of the mudflats. Based on the detailed investigations of marine ecological components and the possible impacts of the DPA port environment, it could be concluded that the effects on the various biotic components are minimal and confined to high activity areas only with limited impacts on the surroundings. From the results of the studies conducted by GUIDE, 2017 to 2024, it was inferred that there was no significant variation with respect 2024 to 2025 on the taxa/genera/species composition as well as fauna and plankton community, eventhough the values of and in term of phosphate and petroleum hydrocarbon compounds were slightly increased. The mangrove tree category density has shown higher values in all the sampling locations in the Deendayal port Authority and its creek environments.

In this respect it is recommended that In addition to the monitoring of the biological parameters, of the water and sediment in the creeks, petroleum hydrocarbons and phosphate level in the port environment to be assessed intensively in future in order to sort out the more effective management plans in the mangroves and the encompassing creek environment nearer to the Deendayal Port Authority .

Knowledge of marine species diversity is incomplete, however, studies have highlighted an increase in the rate of decline in the population density of many vulnerable species with space and time due to several reasons including habitat destruction and alterations and the related stresses. The biodiversity of the coastal zone has been explored more extensively than the deep offshore areas due to the accessibility for sampling. These areas

are considered to be highly productive due their shallow and dynamic nature suitable for the growth of the flora , phytoplankton, seaweeds and sea grasses. The, bio-geochemically more active zone provides all the major,minor and trace elements for the floating micro flora as well as the macroscopic algae and sea grasses that flourishes in the nearshore environments. The abiotic physical and chemical parameters of the water in all the study sites are found to be within the optimum level during the seasonal assessment. The prevailing higher turbidity of the water due to the high tidal currents inhibits the primary productivity of the phytoplankton and the benthic algae and seagrass. However, there exists several diatoms which have higher adaptive features to survive under such circumstances as evidenced from the present study. There are indicator species to assess the biodiversity status of ecosystems, the keystone species, such as the coral reefs, sea grasses and macro algae which are specific for the benthic habitat. These groups of plants and the fauna require clear water, optimum temperature aided through the high rate of light penetration through the water column. The absence of the seaweeds and seagrass beds could be well correlated with the relatively high level of suspended particles in the water in the selected study sites. The sediment entire creek environment bottom substratum is dominated by fine clay which holds organic and inorganic elements and acts as a sink for essential nutrient elements for the multitude of micro algae which are the primary source for the pelagic and benthic food chain, including the fin fishes and shell fishes in the creek as well as the nearby oceanic zone. The concentration of petroleum hydrocarbon at some locations is higher than the admissible level in the coastal waters. This chemical compound is highly hydrophobic in nature and tends to attach to the surface film of the water. Though the degradation is a slow process it has been distributed to longer distances and tends to settle down as tarballs. Also, the residues if such particles persist for longer duration, affects the pelagic communities and ultimately the fishes and higher vertebrates. In the Kandla adjacent creek complex such incidents have not been reported and fishing is a regular activity in the mangrove environment by the fishermen who have a valid registration from the port Authority.

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Annexture 1. Checklist of Avifauna recorded during the pre-monsoon season from the Deendayal Port Authority, Kandla, India.

Sl. No.	Order, Family, Common & Scientific Name	MS	FS	IUCN 2024	WPA, 1972	Habitat
A	**CHARADRIIFORMES**					
1	**Charadriidae**					
1	Little ringed plover *Charadrius dubius* Scopoli, 1786	R	C	LC	Schedule II	A
2	Red-wattled Lapwing *Vanellus indicus* (Boddaert, 1783)	R	I	LC	Schedule II	T
3	Yellow-wattled Lapwing *Vanellus malabaricus* (Boddaert, 1783)	R	I	LC	Schedule II	T
2	**Dromadidae**					
4	Crab-plover *Dromas ardeola* Paykull, 1805	M	C	LC	Schedule II	A
3	**Laridae**					
5	Common tern *Sterna hirundo* Linnaeus, 1758	RM	P	LC	Schedule II	A
6	Little tern *Sternula albifrons* (Pallas, 1764)	R	P	LC	Schedule II	A
7	River Tern *Sterna aurantia* (Gray, JE, 1831)	R	P	V	Schedule I	A
8	Caspian gull *Larus cachinnans* Pallas, 1811	M	P	LC	Schedule II	A
9	Lesser black-backed gull *Larus fuscus* Linnaeus, 1758	M	C	LC	Schedule II	A
10	Black-headed Gull *Chroicocephalus ridibundus* (Linnaeus, 1766)	M	O	LC	Schedule II	A
11	Brown-headed Gull *Chroicocephalus brunnicephalus* (Jerdon, 1840)	M	P	LC	Schedule II	A
12	Gull-billed Tern *Gelochelidon nilotica* (Gmelin, JF, 1789)	M	P	LC	Schedule I	A
4	**Recurvirostridae**					
13	Black Winged Stilt *Himantopus himantopus* (Linnaeus, 1758)	R	C	LC	Schedule II	A
5	**Scolopacidae**					
14	Black-tailed Godwit *Limosa limosa* (Linnaeus, 1758)	M	O	NT	Schedule II	T
15	Common Greenshank *Tringa nebularia* (Gunnerus, 1767)	M	I	LC	Schedule I	T
16	Common Redshank *Tringa tetanus* (Linnaeus, 1758)	M	I	LC	Schedule II	A
17	Common Sandpiper *Actitis hypoleucos* (Linnaeus, 1758)	M	I	LC	Schedule II	A
18	Eurasian curlew *Numenius arquata* (Linnaeus, 1758)	M	C	NT	Schedule II	A

19	Green Sandpiper *Tringa ochropus* Linnaeus, 1758	M	I	LC	Schedule II	T
20	Marsh Sandpiper *Tringa stagnatilis* (Bechstein, 1803)	M	C	LC	Schedule II	T
21	Temminck's stint *Calidris temminckii* (Leisler, 1812)	M	C	LC	Schedule II	T
22	Whimbrel *Numenius phaeopus* (Linnaeus, 1758)	M	P	LC	Schedule II	A
B	**COLUMBIFORMES**					
6	**Columbidae**					
23	Blue Rock Pigeon *Columba livia* (Gmelin, JF, 1789)	R	G	LC	NA	T
24	Spotted Dove *Spilopelia chinensis* (Scopoli, 1786)	R	G	LC	Schedule II	T
25	Eurasian Collared Dove *Streptopelia decaocto* (Frivaldszky, 1838)	R	G	LC	Schedule II	T
26	Laughing Dove *Spilopelia senegalensis* (Linnaeus, 1766)	R	G	LC	Schedule II	T
27	Red Collared Dove *Streptopelia tranquebarica* (Hermann, 1804)	R	G	LC	Schedule II	T
C	**CORACIIFORMES**					
7	**Alcedinidae**					
28	Common Kingfisher *Alcedo atthis* (Linnaeus, 1758)	R	P	LC	Schedule II	A
29	White-throated Kingfisher *Halcyon smyrnensis* (Linnaeus, 1758)	R	C	LC	Schedule II	T
8	**Meropidae**					
30	Green Bee-eater *Merops orientalis* Latham, 1801	R	I	LC	Schedule II	T
D	**PELECANIFORMES**					
9	**Pelecanidae**					
31	Great White Pelican *Pelecanus onocrotalus* Linnaeus, 1758	M	P	LC	Schedule II	A
10	**Ardeidae**					
32	Cattle Egret *Bubulcus ibis* (Linnaeus, 1758)	R	C	LC	Schedule II	T
33	Great Egret *Ardea alba* (Linnaeus, 1758)	R	P	LC	Schedule II	A
34	Indian Pond Heron *Ardeola grayii* (Sykes, 1832)	R	C	LC	Schedule II	A
35	Intermediate Egret *Ardea intermedia* (Wagler, 1829)	R	P	LC	Schedule II	A
36	Little Egret *Egretta garzetta* (Linnaeus, 1766)	R	C	LC	Schedule II	A
37	Grey Heron *Ardea cinerea* Linnaeus, 1758	R	P	LC	Schedule II	T
38	Western Reef Heron *Egretta gularis* (Bosc, 1792)	RM	P	LC	Schedule II	A

39	Purple Heron *Ardea purpurea* Linnaeus, 1766	R	C	LC	Schedule II	A
11	**Threskiornithidae**					
40	Black Headed Ibis *Threskiornis melanocephalus* (Latham, 1790)	R	C	NT	Schedule II	A
41	Glossy Ibis *Plegadis falcinellus* (Linnaeus, 1766)	R	C	NT	Schedule II	T
E	**CICONIIFORMES**					
12	**Ciconiidae**					
42	Painted Stork *Mycteria leucocephala* (Pennant, 1769)	R	C	NT	Schedule II	A
F	**PHOENICOPTERIFORMES**					
13	**Phoenicopteridae**					
43	Greater Flamingo *Phoenicopterus roseus* Pallas, 1811	RM	C	LC	Schedule II	A
G	**PASSERIFORMES**					
14	**Corvidae**					
44	House Crow *Corvus splendens* (Vieillot, 1817)	R	O	LC	NA	T
15	**Dicruridae**					
45	Black Drongo *Dicrurus macrocercus* Vieillot, 1817	R	I	LC	Schedule II	T
16	**Hirundinidae**					
46	Barn Swallow *Hirundo rustica* (Linnaeus, 1758)	RM	I	LC	Schedule II	T
47	Wire-tailed Swallow *Hirundo smithii* Leach, 1818	R	I	LC	Schedule II	T
17	**Laniidae**					
48	Bay-backed Shrike *Lanius vittatus* Valenciennes, 1826	R	I	LC	Schedule II	T
49	Brown shrike *Lanius cristatus* Linnaeus, 1758	R	I	LC	Schedule II	T
18	**Motacillidae**					
50	White Wagtail *Motacilla alba* Linnaeus, 1758	M	I	LC	Schedule II	T
51	Yellow Wagtail *Motacilla flava* Linnaeus, 1758	M	I	LC	Schedule II	T
19	**Muscicapidae**					
52	Oriental Magpie Robin *Copsychus saularis* (Linnaeus, 1758)	R	I	LC	Schedule II	T
20	**Nectariniidae**					

53	Purple Sunbird *Cinnyris asiaticus* (Latham, 1790)	R	N	LC	Schedule II	T
21	**Pycnonotidae**					
54	White Eared Bulbul *Pycnonotus leucotis* (Gould, 1836)	R	O	LC	Schedule II	T
55	Red-vented Bulbul *Pycnonotus cafer* (Linnaeus, 1766)	R	O	LC	Schedule II	T
22	**Sturnidae**					
56	Common Myna *Acridotheres tristis* (Linnaeus, 1766)	R	O	LC	Schedule II	T
57	Brahminy Starling *Sturnia pagodarum* (Gmelin, JF, 1789)	R	I	LC	Schedule II	T
H	**SULIFORMES**					
23	**Phalacrocoracidae**					
58	Little Cormorant *Microcarbo niger* (Vieillot, 1817)	R	P	LC	Schedule II	A
I	**Apodiformes**					
24	**Apodidae**					
59	House Swift *Apus nipalensis* (Hodgson, 1837)	R	I	LC	Schedule II	
J	**ACCIPITRIFORMES**					
25	**Accipitridae**					
60	Black-winged Kite *Elanus caeruleus* (Desfontaines, 1789)	R	C	LC	Schedule I	T
61	Black Kite *Milvus migrans* (Boddaert, 1783)	R	C	LC	Schedule II	T
62	Oriental Honey Buzzard *Pernis ptilorhynchus* (Temminck, 1821)	R	C	LC	Schedule II	T
63	Shikra *Tachyspiza badia* (Gmelin, JF, 1788)	R	C	LC	Schedule I	T
K	**CUCULIFORMES**					
26	**Cuculidae**					
64	Asian Koel *Eudynamys scolopaceus* (Linnaeus, 1758)	R	F	LC	Schedule II	T

Note: FG- Feeding Guild, C- Carnivore, F- Frugivore, G- Granivore, I- Insectivore, N- Nectarivore, O- Omnivore, P- Piscivore; MS-Migratory Status, R- Resident, M- Migratory, RM- Resident Migrant; IUCN- International Union for Conservation of Nature, LC- Least Concern, NT- Near Threatened, VU- Vulnerable

Annexure–C

दीनदयाल पत्तन प्राधिकरण

(आईएसओ 9001:2008 एवं आईएसओ 14001:2004 प्रमाणित पोर्ट)

DEENDAYAL PORT AUTHORITY

(AN ISO 9001:2008 & ISO 14001:2004 CERTIFIED PORT)

यातायात प्रबंधक का कार्यालय, दीनदयाल पत्तन प्राधिकरण,श्रमदीप बिल्डिंग, नया कंडला (कच्छ) 370210

E-mail : traffiemanager@deendayalport.gov.in

KANDLA SAGARMALA

No.TF/SII/GPCB/2019-N/ 4134

Date : 07/05/2025.

CIRCULAR

Please refer earlier circulars and SOP issued by DPA to control the pollution inside the port area. During the recent inspection, the team of the Gujarat Pollution Control Board (GPCB) has observed the pollution/a huge quantity of dust at Cargo Jetties due to inappropriate handling of bulk cargo. They have taken it seriously and advised to take appropriate measures to control the dust pollution and submit the compliance report.

In view of above, it is once again directed to follow the directions issued under the above referred Circular/SOP strictly, failing which strict actions will be initiated including imposing penalty against the concerned.

Traffic Manager
Deendayal Port Authority

All Port Users and Trade Associations

Copy to :

1. C.E. ...for kind information please
2. Environment Management Cell....for information & necessary action
3. A.T.M. (Operation) & A.T.M. (R/P)...for information & necessary action

Annexure–D

List of CSR Works for the year 2025(April to Till November-2025)		
Sr.No	**Name of work**	**Approved cost (Rs in Lakhs)**
1	Request for construction of relocatable of sports arena at Gandhidham Military Station,HQ 98 Artillery Brigade Military Station Gandhidham	₹ 28.00
2	Proposal for construction of Police Community Hall at Police Headquarters Shinay.Office of the Superintendent of Police, East – Kutch Gandhidham.	₹ 100.00
3	Proposal for providing AWG system at their check posts located in the Runn of Kutch,Commandant BSF Station Gandhidham	₹ 82.70
4	Proposal for providing 4000 pieces of Tripal/Tarpaulin,Matri Sena Charitable Trust	₹ 32.00
5	Proposal for Upgrading Satellite Eye Hospital at Bhuj.1.Request for financial support for the addition of cornea and retina outpatient departments (OPD), a spectacle dispensing unit, and a medicine counter as part of our OPD activities, & equipment purchase.	₹ 35.08
6	Proposal for financial assistance for purchase of C Arm and OT table to start Orthopedic at St. Joseph's Hospital Gandhidham,ST. Joseph's Hospital Trust, Gandhidham.	₹ 28.78
7	Proposed to establish a women empowerment center, through Ujjas Mahila Sangh,Gandhidham	₹ 119.48
8	CSR Grant for 'Strengthening of School Ecosystem at Primary School Level in Kachchh District,Ladies Environment Action Foundation (LEAF), Gandhinagar	₹ 50.00
9	Proposal for recharge Ponds and Solar based initiatives.Providing solar street lights, home lighting and solar lights for boats, specially targets sea farming families in the Tuna & Vandi village within Gandhidham block of Kutch district,Baif Institute for sustainable livelihoods and development, (BISLAD)Pune- Maharashtra.	₹ 30.00
10	Proposal for the Financial assistance for Ramakrishna Mission Centre for Human Excellance and Social Sciences also called 'Viveka Thirtha', New Town Kolkata. Human Excellence building ,Ramakrishna Mission, West Bengal	₹ 150.00
11	Funding for Distribute Biomass Green Cook Stove free of cost across Gujarat state.,Ramdas Athawale Foundation Ahemdabad	₹ 27.00
12	Request to Allotment of Fund for Development of School premises and providing furniture etc from CSR Fund.,Shree J.H Shukla Madhyamik Shala	₹ 25.92
13	Re-accreditation of sport academy under Khelo India Scheme.Request for Infrastructure for the proposals i) seating gallery & amenities ii) up gradation of existing hostel for elite athletes iii) surrounding road & infrastructure, etc.,Usha School Athletics, Kerala.	₹ 69.00
14	Proposal for Skill Development Training Program for Unemployed and Underprivileged Youth under CSR Initiative of Deendayal Port Authority (DPA) through Centre of Excellence in Maritime and Shipbuilding (CEMS),Mumbai	₹ 124.00
15	Submission of application along with requisite documents for construction of Kabrastan and fund for basic amenities under CSR,Etihadul Muslemin E Hind Trust, Anjar	₹ 50.00
16	Request Letter for the purchase of stainless steel Water Cooler with filter and dispenser for the school,Sunflower School, Gandhidham	₹ 3.19
17	Proposal for Placement Linked Skill and Capacity Building Training on Tourism and Hospitality Request for funding under Corporate social Responsibility (CSR) initiative,Pragati Edutech, Guwahati	₹ 50.00
18	Fund for establishment of New Facilities and upgradation of existing facilities at 'Adhar Sankul (Excluding cost of Building Construction.),'Adhar Sankul' Manav Seva Trust, Gandhidham.	₹ 75.00
19	Earnest Appeal to Contribute under CSR Activities for the construction of sainik school at silvassa in the name of NETAJI CHANDRA BOSE MILITARY ACEDEMY,VidhyaBharti Gujarat Pradesh, Ahemdabad.	₹ 445.23
20	Construction of an educational and social purpose building having 28 rooms & 2 halls.Shree Akhil Kutch Samasta Meghvanshi Gurjar Meghwal Charitable Trust, Bhuj.	₹ 75.00
21	Request to allotment of fund for development of school premises and providing furniture from CSR fund.Sunrise Global School, Gandhidham	₹ 12.60
22	Financial assistance to construction of Building Mind Power development centre for specially visually impaired children. With Equipments, Furniture CCTV, Airconditioner etc.,Shri Navchetan Adhjan Mandal, Madhapar	₹ 107.00

23	Proposal for DPA support Kutch Muslim Shifa Hospital,Muslim Shifa Medical Trust-Bhuj	₹	200.00
24	Request for help from CSR for providing Kits to the Children . List of government schools in khambhaliya taluka,for school Bags/Kits etc. They have requested for 1000 kits ,District Primary Education Officer, Devbhumi Dwarka-Khambhaliya	₹	4.00
25	Project proposal is for Education,Health and Livelihood project in kutch area Electric vehicle project for migrant community school,mobile health van project proposal, school structure project,tailoring training project, computer class for bhadreshwar centre, school-toilet-project, vermin compose unit, fisherman livelihood project.Yusuf Meherally Centre, Bhadreshwar-Kutch	₹	97.67
26	Request for renovation and construction of the shed work above G.F. slab, both side jali for shed, repairing work, painting.Missionaries of Charity, Bhachau (Mother Teresa's distitudi's home)	₹	55.00
27	River Reincarnation Project of the Bhukhi River.Krushi Research Innovation and Development Association, Mumbai (KRIDA)	₹	400.00
28	Providing Financial Assistance to R.D.S Kalavad Taluka Meghwar Seva samaj Education and Charitable Trust, Kalavad,SWA Ramji Daya Somaiya Shri Kalavad Taluka Meghwar Seva Samaj Education and Charitable trust, Kalavad	₹	75.00
29	CSR funding towards cure of Baby Aasmika Das diagnosed with Spinal Muscular Atrophy (SMA Type-1).	₹	20.00
30	CSR Funding for Providing Nutrition Kit to T.B. Patients under TB Mukat Bharat Abhiyan as Nishyray Mitra.	₹	14.02
31	Financial assistance under the CSR initiative to facilitate the urgent upgradation of the training and parade ground at the 176 BN BSF campus, Bhuj, Frontier Headquarters, Border Security Force (BSF)	₹	171.90
32	Financial assistance under the CSR initiative for Construction of a Martyr's Column at the 176 BN BSF campus, Bhuj, Frontier Headquarters, Border Security Force (BSF)	₹	32.20

Annexure–E

ANNEXURE

Subject: Compliance of mitigation measures suggested in EIA report of the project "**Development of Integrated facilities (Stage II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat (1. Setting up of Oil Jetty No. 7 2. Setting up of Barge Jetty at Jafrabadi 3. Setting up of Barge port at Veera 4. An administrative office building at Tuna Tekra 5. the road connecting from Veera barge jetty to Tuna gate by M/s Deendayal Port Trust (Erstwhile Kandla Port Trust)**"

Reference: Specific Condition no. XXIII of Environmental and CRZ Clearance granted by MoEF&CC, GoI vide letter vide file no. 11-13/2015-IA-III dated 19/02/2020

Sr No.	Particular	Location	Quantification	Proposed Measure	Compliance
1.	Generation of particulate	Applicable to the proposed project and surrounding	Not quantified	Spraying water Reducing speed of vehicle Deploying vehicles with PUC certificate	To control dust pollution, regular sprinkling through tankers on roads and other area is being done DPA has issued circular no. TF/SH/Circulars/2022/1341 dated 04/11/2022 considering the safety norms provided for smooth and continuous operation. DPA has issued circular regarding implementation of RFID enabled access control system (e-Drishti); wherein, PUC certificate has been made mandatory for vehicle registration in e-Drishti portal to obtain valid permit for entry in the port premises.
2.	Generation of Noise	Along proposed projects	Not quantified	Restricted operation in the night time Selection of machinery generating noise less than 72 db(A) fitting on noise attenuation devices	DPA has issued circular no. TF/SH/Circulars/2022/1341 dated 04/11/2022 considering the safety norms provided for smooth and continuous operation DPA has been conducting regular Monitoring of environmental parameters since the year 2016 and the monitoring data has been regularly submitted to all the concerned authorities along with compliance reports submitted. The Environmental monitoring report, is enclosed with the EC compliance Further, routine maintenance is being carried out to keep check on the efficiency and noise
	Soil & Geology				
3.	Soil erosion	Applicable to the proposed projects	Not quantified; initiates a chain of impacts	Water bars; stabilization of slopes Control of discharged water	Topography at the site location is generally flat with average ground level of about 6.5 m CD with marshy topsoil. Section 3.4.1 Topography of the EIA report (**Copy attached as Annexure 1**) Point noted The area falls under arid/semi-arid region, thus the

Sr No.	Particular	Location	Quantification	Proposed Measure	Compliance
				Conducting construction activities in non-monsoon season Oil spill prevention measures	rainfall is very scanty DPA has Oil Spill Contingency Plan in place. Copy of the same is submitted with the EC compliance report submitted on 03/05/2023.
hydrology					
4.	Surface water contamination	At the proposed projects Soil erosion prone area	Not quantified	Soil erosion control measures	For mitigation soil erosion, DPA entrusted work of green belt development in and around the port area to the Forest Department, Gujarat at Rs. 352 lakhs (Area 32 hectares) and the work is already completed. For strengthening of the coastal resilience, DPA had already undertaken Mangrove Plantation in an area of 1600 Ha. till date since the year 2005. A statement showing details of the mangrove plantation and the cost incurred is already enclosed with the EC compliance report. DPA has been regularly monitoring environmental parameters including surface water since the year 2016 and the monitoring data has been regularly submitted to all the concerned authorities along with compliance reports submitted. The Environmental monitoring report, is enclosed with the EC compliance
	Spillage and sanitary wastes			Waste management and spill control.	For waste management, companies authorized by Central Pollution Control Board (CPCB) and State Pollution Control Board have been awarded the work of collection, transporting and disposal of solid waste by the DPA DPA has Oil Spill Contingency Plan in place. Copy of the same is submitted with the EC compliance report submitted on 03/05/2023.
5.	Ground water contamination	Not expected	--	--	--
Land use Aesthetics					

Sr No.	Particular	Location	Quantification	Proposed Measure	Compliance
6.	Land use and Aesthetics	At project site At campsites At other utilities like scraper stations	Not quantifiable	Contouring of the affected areas Cleaning of stretch immediately after the construction activities are over. Restoration and re-vegetation to the best possible extent	Topography at the site location is generally flat with average ground level of about 6.5 m CD with marshy topsoil. Section 3.4.1 Topography of the EIA report (**Copy attached as Annexure 1)** DPA has included clause in tender/ Concession agreement for the contractor to undertake Clearance of site on completion and environmental protection measures. Copy of the relevant page of the tender is attached herewith as **Annexure 2** DPA entrusted work of green belt development in and around the Port area to the Forest Department , Gujarat at Rs. 352 lakhs (Area 32 hectares) and the work is already completed. Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part[Greenbelt GUIDE, dated 31st May 2022. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The same is in process DPA had already undertaken Mangrove Plantation in an area of 1600 Ha. till date since the year 2005. A statement showing details of the mangrove plantation and the cost incurred is again attached with EC compliance report.
Biological Environment: Flora and Vegetation					
7.	Due to dusting on floral cover	At project site & approach road	Limited	Sprinkling of water for dust suppression	DPA has installed Mist Canon at the Port area to minimize the dust Further, to control dust pollution in other area, regular sprinkling of treated water through tankers on roads is being done
8.	Removal of vegetation	At project site	Limited	Restoration and re-vegetation and plantation;	DPA entrusted work of green belt development in and around the Port area to the Forest

Sr No.	Particular	Location	Quantification	Proposed Measure	Compliance
				Compensatory vegetation	Department, Gujarat at Rs. 352 lakhs (Area 32hectares) and the work is already completed. Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-I)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. DPA had already undertaken Mangrove Plantation in an area of 1600 Ha. till date since the year 2005. A statement showing details of the mangrove plantation and the cost incurred is again attached with EC compliance report.
9.	Due to Piling activity	At project site	Limited	Piling should be done in closed vessels to minimize the impact	DPA has included clause in tender/ Concession agreement for the contractor to undertake piling installation in accordance with IS 2911. Copy of the relevant page of the tender is attached herewith as **Annexure 3**
10.	Due to dredging	At project site in Sea	Not quantified	Silt curtain should be used to minimize the impact	The possibility of providing silt curtains to minimize the impacts while dredging activities in a study for "Comprehensive study for the Deepening of Navigational channel to increase the draught of Navigational channel at Deendayal Port Trust including Capital & Maintenance dredging requirements and Preparation of Technical & Commercial Feasibility Report" has been awarded to IIT, Madras
11.	Oil spillage & waste disposal from ships	Sea & creeks	Unlimited	Oily wastes and sewage should not be discharged directly; MARPOL norms should be followed	DPA issued Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" from Vessels calling at Deendayal Port" through DPA contractors. Further, it is to state that, all ships are required to follow DG Shipping circulars in line with MARPOL norm regarding the reception facilities at Swachch Sagar portal
12.	Fishes & Fishery	In project area	Limited	No legal fishery is in study area, major fish landing site is far from project site	There is no fish landing centre in the study area. Sub-section D: Marine Fishes of Section 3.5.5 Fauna of the EIA report. (Copy of the relevant page is attached herewith as **Annexure 4**).
Fauna and Wildlife					
13.	Loss of wildlife	No wildlife habitation in proximity	Not applicable	Strictly prohibiting hunting and similar activities	It is a custom bonded area, therefore, no hunting or similar activities are permitted in the port area. Moreover, in the study area of the KPT no National Park, wildlife sanctuary or biosphere reserve is present.Section

Sr No.	Particular	Location	Quantification	Proposed Measure	Compliance
				Restriction of speed of movement of vehicles Keeping "Trench plugs" at strategic location. Shifting the nests, wherever possible.	3.5.5.4 Occurrence of National Park/Sanctuary/ Biosphere Reserve etc. of the EIA report (**Copy attached as Annexure 5).** DPA has issued Circular No. TF/SH/Circulars/2022/1341 dated 04/11/2022 considering the safety norms provided for smooth and continuous operation Point noted There is no considerable habitat of fauna in vicinity of the project site. Section 4.3.1 Noise generation during Construction Phase (**Copy attached as Annexure 6**).
Socio- Economic and Cultural Environment					
14.	Human habitations affected	No habitation falling within the project site	Not quantified, but critical locations are identified	Villagers in the proximity will kept informed on the project activities	DPA has already given advertisement regarding grant of Environmental & CRZ clearance in two local news papers viz. KUTCHMITRA (In Gujarati) dated 23/2/2020 and in the Indian Express (In English) dated 23/02/2020 and also forwarded to the Regional Office , MoEF&CC, Bhopal vide letter dated 28/2/2020 (Copy of the same placed with EC&CRZ compliance report submitted on 03/05/2023).
15.	Economic implications	Along the project site	Not quantified. The Implications with regard to loss of seasonal crops and plantations are identified	Compensation to the affected people; Employment, wherever possible, to the unskilled local people.	The law of the land will be followed by the BOT operators for employment. As per the guidelines issued by the Ministry of Ports, Shipping & Waterways, Government of India, the CSR activities are being carried out by the DPA (Details attached with the EC compliance report)
16.	Agriculture lands	At project site	No agriculture land involved	Restoration of the land; Management of topsoil	No agriculture land is involved. For topsoil management, DPA entrusted work of green belt development in and around the Port area to the Forest Department, Gujarat at Rs. 352 lakhs (Area 32 hectares) and the work is already completed. Further, DPA has appointed GUIDE for "Green belt development in Deendayal Port Authority and its surrounding areas (Phase I) vide work order No.EG/WK/4757/Part dated 31st May 2022
17.	Infrastructure	Near human habitations; Road and	Not quantified	Rehabilitation of the affected infrastructure components; leaving behind the	N/A

Sr No.	Particular	Location	Quantification	Proposed Measure	Compliance
		railway crossings		infrastructure facilities like approach roads and facilities at the campsites for the local inhabitants.	
18.	Social conflicts	Surrounding the proposed project	Not quantifiable	Keeping good relationship with the local people; Keeping them informed on the project and project development	As per the Guidelines issued by the Ministry of Ports, Shipping & Waterways, Government of India, the CSR activities are being carried out by the DPA (Details attached with the EC compliance report). DPA has already given advertisement regarding grant of Environmental & CRZ clearance in two local news papers viz. KUTCHMITRA (In Gujarati) dated 23/2/2020 and in the Indian Express (In English) dated 23/02/2020 and also forwarded to the regional office, MoEF&CC, Bhopal vide letter dated 28/2/2020
19.	Political conflicts	--	Not quantifiable	Keeping the key players informed on the pros and cons of the project	The key players shall be informed on the pros and cons of the project
20.	Historic and archaeological importance	Surrounding the 15.0 Km. radiusfrom the proposed project	No structure on the surface possibilities are there of sub-surface structure	Inform the concerned authority in case of coming across any archaeological significance	Point noted. Further, it is relevant to mention here that, no area of cultural importance is present near the project point h of Section 2.5 Size or magnitude of operation of the EIA report. (**Copy attached as Annexure 7).**

Annexure–F

Planning and monitoring of the activities to be undertaken under Environment Management Plan (EMP) under EIA and EC

March 2025

Prepared By :

Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

'GEMI Bhavan', B 246-247, GIDC Electronic Estate, Sector-25, Gandhinagar-382024

Submitted to:

Deendayal Port Authority

www.gemi.gujarat.gov.in 079-23240964 info-gemi@gujarat.gov.in

FINAL REPORT

We Provide Environmental Solutions

DISCLAIMER

This report has been prepared by Gujarat Environment Management Institute (GEMI), solely as a part of the assignment “Planning and monitoring of the activities to be undertaken under Environment Management Plan (EMP) under EIA and EC”. The report on rainwater harvesting has been prepared by outsourced consultant M/s Furaat Earth Pvt. Ltd. The reports are based on the data and information furnished by DPA and GEMI is not responsible for the accuracy and correctness of the same. GEMI has taken all reasonable precautions in the preparation of this report. However, it is impossible to dismiss absolutely, the possibility of errors or omissions. GEMI therefore specifically disclaims any liability resulting from the use or application of the information contained in this report.

About this Document

Name of the Document:	Planning and monitoring of the activities to be undertaken under Environment Management Plan (EMP) under EIA and EC
Name of Client:	Deendayal Port Authority
Date of issue:	10/03/2025
Reference no.:	GEMI/DPA-EMP/844/2025/178
Version:	Final Report

Dedicated Team:

Overall supervision and guidance:	Dr. Jaipal Singh, IFS, Addl. PCCF & Director Dr. Nitasha Khatri, Sr. Scientific Officer & Lab Head
Project Head:	Mr. Gunjan Gupta, Dy. Environmental Engineer
Project Manager:	Mr. Bodhisatwa Nayak, Asst. Environmental Engineer
Project Assistants:	Ms. Honey Panchal, Project Assistant (till 29-02-2024) Mr. Jay Italiya, Project Assistant Mr. Hiren Chaudhary, Project Assistant (till 18-11-2024)

Contents

List of Tables

Chapter-1: Introduction

1.1. About Deendayal Port Authority

Kandla Port, also known as the Deendayal Port is one of the major seaports on the western coast in Kutch District of Gujarat, India. It is located near the city of Gandhidham. It is situated on the west bank of Kandla Creek at Latitude 23º 01' N and Longitude 70º 13' E. It is the largest port of India by volume of cargo handled. This port is operational throughout the year as it is an all-weather port. There are no adverse wave effects as it is a sheltered port situated in a creek. The rainfall is scanty in this region making the port the most suitable option for handling food grains. It is well connected with the hinterland by a broad-gauge railway system and National Highway No. 8-A. This port handles dry bulk, break bulk, liquid bulk and container cargo. Kandla is the closest major port to the Middle East and Europe. It is also enroute port for ships calling at Karachi, Pakistan's only major port handling its seaborne cargo. Presently, the Port has a total 1-16 dry cargo berths for handling dry cargo, 7 oil jetties, and one barge jetty at Bunder basin, dry bulk terminal at Tuna Tekra, barge jetty at Tuna and two SPMs at Vadinar for handling oil. The off-shore oil terminals at Vadinar, located in the Devbhumi Dwarka district, roughly 300 km away from Kandla by road and 50 nautical miles by sea, is also managed by DPA.

Since its formation in the 1950s, the Deendayal Port caters to the maritime trade requirements of Rajasthan, Madhya Pradesh, Uttar Pradesh, Haryana and Gujarat. Because of its proximity to the Gulf countries, large quantities of crude petroleum are imported through this port. About 35% of the country's total export takes place through the ports of Gujarat in which the Deendayal port has a considerable contribution. Assortments of liquid and dry cargo are being handled at DPA Port. The dry cargo includes fertilizers, iron and steel, food grains, metal products, ores, cement, coal, machinery, sugar, wooden logs, etc. The liquid cargo includes edible oil, crude oil and other petroleum products.

Deendayal Port Authority is committed to sustainable development by taking adequate measures to maintain the environmental well-being of the Port and its surrounding. DPA is also committed to follow the necessary due diligence in obtaining the requisite environmental nodes viz. EC, CRZ etc. The Environment Impact Assessment (EIA) report prepared for each project requiring environment (EC) or CRZ clearance enumerates the budgetary provisions allocated for conservation, protection and management of environment as part of the Environment Management Plan (EMP). In some EC letters, this budgetary allocation has been categorically done by the concerned statutory authority as per

MoEF&CC's OM F. No. 22-65/2017-IA III dated 1st May, 2018 under Corporate Environment Responsibility.

To effectively manage these funds for various environment related works, DPA has appointed GEMI to identify projects/activities that can be taken up as per EMP provisions and allocate funds for such activities. The said activities also need to be monitored by GEMI during their implementation for 1 year.

1.2. Scope of work

Phase-1

To review the notification/Circular/Office memorandum/conditions mentioned in the EC and CRZ clearance issued by the MoEF&CC for EMP and to prepare a preliminary report indicating:

a) Activities/projects that can be taken up by DPA as per the EMP provisions
b) Allocate funds for the suggested activities

Phase 2:

To monitor the activities of the implementation agencies engaged by DPA

Chapter 2: Environment Clearances and EMPs

1.1. Important Acts, Rules, Notifications, etc. related to EMP

i. The Environment (Protection) Act, 1986
ii. EIA Notification, 2006
iii. Coastal Regulation Zone Notification, 2011

1.2. Budgetary provision in EMPs

A good EMP should include a delineation of financial plan for implementing the mitigation measures in the form of budgetary estimates and demonstration of its inclusion in the project budget estimates. This should be part of the total project cost. Below are the benefits of having budgetary provisions in the EMP:

i. Helps the project proponent in allocating funds and resources for EMP
ii. Ensures effective implementation of the EMP
iii. Fixes accountability on part of the project proponent

1.3. About Corporate Environment Responsibility

Corporate Environment Responsibility (CER) is a concept that suggests that it is the responsibility of the corporations/companies/departments operating within society to contribute towards economic, social and environmental development that creates a positive impact on society at large.

Sustainable development has many important facets/components like social, economic, environmental, etc. and these components are closely interrelated and mutually reinforcing. The general structure of EIA document, prescribes inter-alia public consultation, social impact assessment and R&R action plan besides environment management plan (EMP). The Corporate Environmental Responsibility incorporates the infrastructure creation for drinking water supply, sanitation, health, education, skill development, roads, cross drains, electrification including solar power, solid waste management facilities, scientific support and awareness to local farmers to increase yield of crop and fodder, rain water harvesting, soil moisture conservation works, avenue plantation, plantation in community areas, etc.

On 1st May 2018, the Ministry of Environment, Forest & Climate change issued an Office Memorandum F. No. 22-65/2017-IA III to suggest a common principal for affixing the corporate environmental responsibility for Greenfield as well as Brownfield projects. It also

involves the projects which are not governed by Section 135 of the Companies Act, 2013 or yet to make any net profit.

As per the OM, the maximum percentage of fund allocation for CER is prescribed as follows.

Table 1: Fund allocation for CER as per OM dated 1st May 2018

S. No.	Capital Investment / Additional Capital Investment (In Rs.)	Greenfield Project- % of Capital Investment	Brownfield Project- % of Additional Capital Investment
1.	≤ 100 crores	2.0%	1.0%
2.	> 100 crores to ≤ 500 crores	1.5%	0.75%
3.	> 500 crores to ≤ 1000 crores	1.0%	0.50%
4.	> 1000 crores to ≤ 10000 crores	0.5%	0.25%
5.	> 10000 crores	0.25%	0.125%

In the year 2020, the centre has decided against levying costs of CER, which were introduced in 2018 for projects whose capital was more than Rs 100 crore.

In an OM of the Ministry dated 30th Sept 2020, it directed that Expert Appraisal Committee (EAC) or State Level Expert Appraisal Committee (SEAC) shall deliberate on the commitments made by the project proponent to address the concerns raised during the public consultation and prescribe specific condition(s) in physical terms while recommending the proposal, for grant of prior environment clearance instead of allocation of funds under Corporate Environment Responsibility

Also, the Ministry directed that all the activities proposed by the project proponent or prescribed by the EAC or SEAC, as the case may be, shall be part of the Environment Management Plan.

1.4. List of projects and budgetary provisions as per EMP/CER

DPA has received environmental clearance (EC) of 15 projects as on date. The list of projects, their cost, fund allocated for EMP and those prescribed under CER by the EAC/SEAC are presented in **Table 2.**

Table 2: List of projects and fund allocation as per EMP/CER

S. No	Project	Cost of Project (in lakhs)	Fund allocation under EMP in EIA reports (lakhs)		Fund allocation under CER (lakhs)
			Capital cost	Recurring cost	
1.	Construction of 13th to 16th Cargo Berth at Kandla *(Ref. No. 11-70/2006-IA-III dated 1/10/2008)*	Not specified	Not specified	Not specified	NA
2.	Development of Plots for Construction of liquid storage tank farms for handling edible and non-edible oil and petroleum products *(Ref. No. F.No. 10-36/2008-IA-III dated 02/02/2010)*	919.2	Not specified	Not specified	NA
3.	Development of Plots for Construction of Warehouses / Godowns (Stage II) at Kandla, Gujarat by Deendayal Port Authority *(Ref. No. SEIAA/GUJ/EC/8(b)/351/2012 dated 27/11/2012)*	39,582	Not specified	23.70 per year for env monitoring	150 lakh (0.75% of 200 Cr)
4.	Single Point Mooring (SPM) and allied facilities off Veera in Gulf of Kutch for handling crude oil on BOT basis in the state of Gujarat *(Ref. No. 11-27/2010-IA.III dated 11/12/2013)*	83,000	Not specified	Not specified	NA
5.	Development of 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit at District Kutch (Gujarat) *(Ref. No. 11-82/2011-IA.III dated 19/12/2016)*	1,91,132	Not specified	23.70 per year for env monitoring	NA
6.	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side- Northeast of Antarjaal, South of Tagore	50,000	2300	152	NA

S. No	Project	Cost of Project (in lakhs)	Fund allocation under EMP in EIA reports (lakhs)		Fund allocation under CER (lakhs)
			Capital cost	Recurring cost	
	Road, 580 Acres), Gandhidham, Kutch Gujarat *(Ref. No. 21- 295/2017-IA-III dated 10/10/2017)*				
7.	Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850 Acres), Gandhidham, Kutch — Gujarat *(Ref. No. 10-10-2017)*	67,617	2300	152	NA
8.	Development of 3 Remaining Integrated Facilities (stage I) within the existing Deendayal Port Authority (Erstwhile: Deendayal Port Trust) at Gandhidham, Kutch, Gujarat *(Ref. No. 10-9/2017-IA III dated 18/2/2020)*	3,21,417	1826	103.75	804 (@0.25% of project Cost)
9.	Development of Integrated facilities (Stage II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat *(Ref. No. F. No. 11-13/2015-IA-III dated 19/02/2020)*	39,582	Not specified	Not specified	297 (@ 0.75% of project Cost)
10.	Construction of Interchange cum Road Over Bridge (ROB) at LC-236 (Kutch salt junction) on N.H-141 to Nehru gate of Kandla port, Gandhidham, Kutch *(Ref. No. SEIAA/GUJ/EC/8(b)/728/2020 DATED 19-06-2020)*	23,262	15	10	174.4 (@ 0.75% of project Cost)
11.	Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for	1,50,574	913	53.5	NA

S. No	Project	Cost of Project (in lakhs)	Fund allocation under EMP in EIA reports (lakhs)		Fund allocation under CER (lakhs)
			Capital cost	Recurring cost	
	associated facilities for storage at Old Kandla *(Ref. No. 1/2017-IA-III dated 20/11/2020)*				
12.	Bifurcation (600 mt waterfronts out of a total 4800 mt) of Environmental and CRZ clearance issued to M/s Essar Bulk Terminal Limited for Expansion of Port Facility at Hazira, Surat *(Ref. No. 11-46/2011 - IA III dated 4/4/2022)*	NA	Pending	Pending	Pending
13.	Setting up of RoRo/RoPax Facility at, Muldwarka Port, Gujarat at Survey No. 7413 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath. *(Ref. No. EC23B033GJ179470 dated 30/12/2023)*	14,000	181	4.70	NA
14.	Setting up of RoRo/RoPax Facility at Pipavav, Gujarat *(Ref. No. EC23B033GJ148149 dated 30/12/2023)*	16,500	181	4.70	NA
15.	Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernization of Existing Pipeline Network at Oil Jetty Area, Deendayal Port Trust, Kandla *(Ref. No. EC24A033GJ192347 dated 01/01/2024)*	17,100	15	NA	NA
	Total	**10,14,685.2**	**7,650.00**	**959.05**	**1,425.4**

**Allocated specifically for conservation of Schedule-I species*

Chapter-3: EMP Activities to be undertaken as part of EMP as per EC, CRZ conditions

3.1. Greenbelt Development and Mangrove Plantation

Details about greenbelt to be developed and mangrove plantation for each project are as per various Environmental Clearance (EC) and Coastal Regulation Zone (CRZ) requirements are mentioned in below Table 3.

Table 3: Details of Greenbelt Development and Mangrove Plantation

Sr. No.	Name of Project	Greenbelt to be developed (ha)		Remarks	Mangrove plantation (ha)	
		EC	CRZ		EC	CRZ
1	Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla	74.6	-	Committed in EIA Report	-	-
2	Development of Integrated facilities (Stage II) within the existing Deendayal Port Trust	3485 plants	-	Committed in EIA Report	-	-
3	Development of 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit	36.8	-	11.62 ha will be carried out by plot allottee	-	100
4	Single Point Mooring (SPM) and allied facilities off Veera in Gulf of Kutch for handling crude oil on BOT basis in the state of Gujarat	-	-	-	50	50
5	Construction of 13th to 16th Cargo Berth at Kandla, District Kachchh	-	-	-	-	1000
6	Development of Plots for Construction of liquid storage tank farms for handling edible and non-edible oil and petroleum products	-	-	-	-	50

7	Bifurcation (600 mt waterfronts out of a total 4800 mt) of Environmental and CRZ clearance issued to M/s Essar Bulk Terminal Limited for Expansion of Port Facility at Hazira, Surat, Gujarat	-	-	-	-	500
8	Development of 3 Remaining Integrated Facilities (stage I) within the existing Deendayal Port Authority	31.35	-	Committed in EIA Report	-	50
9	Construction of Interchange cum Road Over Bridge (ROB) at LC-236	2.5	-	-	-	-
10	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side-Northeast of Antarjaal, South of Tagore Road, 580 Acres)	39.3	-	-	-	-
11	Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850 Acres), Gandhidham, Kutch	39.3	-	-	-	-
12	Development of Plots for Construction of Warehouses/Godowns (Stage II) at Kandla, Gujarat	-	-	-	-	200
13	Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernization of Existing Pipeline Network at Oil Jetty Area	-	-		-	50
14	Setting up of RoRo/RoPax Facility at Pipavav, Gujarat	1.98		Committed in EIA Report		-

	Pipavav, Rajula, Amreli Proposed by M/s. DPA					
15	Setting up of RoRo/RoPax Facility at, Muldwarka Port, Gujarat at Survey No. 7413 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath	1.98		Committed in EIA Report		-
Total		**227.81 ha and 3485 trees**	**31.94 ha + 4000 existing plants + 15,000 completed and**		**1500 ha + 500 ha by Essar**	**1600 + 350 by Essar**

DPA has been directed for the **81.1** ha of greenbelt as outlined in the ECs. Additionally, a total of **146.71** ha and **3485** trees of greenbelt were committed in the EIA reports. In total, **227.81** ha area + **3485** trees greenbelt is to be developed.

For mangrove plantations, the compliance directly specifies that the port shall plant **1500 ha** of mangroves and Essar is required to plant an additional **500 ha**. According to the current compliance status, DPA has successfully planted **1600 hectares**, and Essar has planted **350 hectares**.

3.2. Renewable Energy Initiatives

The conditions in various EC and CRZ clearance letters pertaining to renewable energy are outlined in Table 4.

Table 4: Conditions pertaining to Renewable Energy ss

S. No	Project	Condition
1	Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla	• Provide solar power generation on rooftops of buildings, for solar light systems for all common areas, street lights, and parking around the project area and maintain the same regularly; • Provide LED lights in their offices and port areas
2	Development of 3 Remaining Integrated Facilities (stage I) within the existing Deendayal Port Authority	• **CRZ:** Compliance to ECBC-2017 shall be ensured for all the building complexes. Solar/wind or other renewable energy shall be installed to meet energy demand of 1 % equivalent.
		• **EC**: Compliance to ECBC-2017 shall be ensured for all the building complexes. Solar/wind or other renewable energy shall be installed to meet energy demand of 1 % equivalent.
5	Development of 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit	• **CRZ:** All the recommendations and suggestions given by the Mantec Consultant Pvt. Ltd. New Delhi in their Comprehensive EIA report for conservation/protection and betterment of environment shall be implemented strictly by the KPT.
6	Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust)	
7	Construction of Interchange cum Road Over Bridge (ROB) at LC-236 {Kutch salt junction] on N.H-141 to Nehru gate of Kandla port, Gandhidham, Kutch	• Application of solar energy shall be incorporated for illumination of common areas, lighting for gardens and street lighting • solar water heating system shall also be provided • Energy conservation measures like maximum use of natural light, wind & ventilation through architectural design, solar based LED lights in landscaped and drive way areas etc. shall be provided as proposed
8	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side-Northeast of Antarjaal,	• Provide 100% solar lighting in open areas with a 50% power backup.

	South of Tagore Road, 580 Acres)	• Each unit will receive solar-based electric power for at least two bulbs/lights and one fan. Central and street lighting will also be based on solar power. • Renewable energy sources will be installed to meet 1% of the demand load or state/local building by-laws requirements. • Solar power is recommended for apartment lighting to reduce grid power load. Solar power is installed separately, meeting 20% of commercial and institutional building hot water demand or local building by-laws, and residential buildings should also use solar water heaters. • Energy conservation measures, such as installing CFLs/LED for outdoor lighting, should be integrated into the project design. • Compliance with the ECBC of BEE shall be ensured. Buildings in the States which have notified their own ECBC shall comply with the State ECBC. Outdoor and common area lighting shall be LED. The concept of passive solar design that minimizes energy consumption in buildings by using design elements, such as building orientation, landscaping, efficient building envelope, appropriate fenestration, increased daylighting design and thermal mass etc. shall be incorporated in the building design. Wall, window, and roof values shall be as per ECBC specifications.
9	Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850 Acres),	• Provide 100% solar lighting in open areas with a 50% power backup. • Each unit will receive solar-based electric power for at least two bulbs/lights and one fan. Central and street lighting will also be based on solar power. • Renewable energy sources will be installed to meet 1% of the demand load or state/local building by-laws requirements. Solar power is recommended for apartment lighting to reduce grid power load. • Energy conservation measures, such as installing CFLs/LED for outdoor lighting, should be integrated into the project design.

10	Development of Plots for Construction of Warehouses/ Godowns (Stage II) at Kandla, Gujarat	• The transformers and motors shall have a minimum efficiency of 85%. Only variable-frequency motor drives shall be used in the project. Solar lights shall be provided in the open sunlit areas. • Install the electric utilities/devises, which are energy efficient and meeting with the BEE norms, wherever applicable. ECBC norms shall be implemented in the project.
11	Development of plot for construction of liquid storage tank farm for handling edible & non-edible oil & petroleum products	• Effort may be made to use solar energy to the maximum extent possible.
12	Setting up of RoRo/RoPax Facility at, Muldwarka Port, Gujarat at Survey No. 7413 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath.	• Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly • Provide LED lights in their offices and residential areas.
13	Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernization of Existing Pipeline Network at Oil Jetty Area, DPT	
14	Setting up of RoRo/RoPax Facility at Pipavav, Gujarat Pipavav, Rajula, Amreli Proposed by M/s. DPT	• Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly • The proposed energy conservation measures include maximizing natural lighting, using energy-efficient motors and pumps, water-efficient taps, solar lights, 5 KVA solar power generation, aerated blocks & RMC, LED fixtures & low voltage lighting, and rooftop thermal insulation.

3.3. Water conservation

The conditions in various EC and CRZ clearance letters pertaining to water conservation are outlined in Table 5.

Table 5: Conditions pertaining to Water Conservation and their compliance status

S. No	Project	Condition
1.	Creation of water front facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla, Gandhidham, Kutch, Gujarat by M/s Deendayal Port Trust	• The proposed landscape planning concepts will be followed to minimize major changes, limit land use patterns to port limits, and ensure proper drainage through surface drainage systems including as stormwater network.
2.	Construction of Interchange cum Road Over Bridge (ROB) at LC-236 (Kutch salt junction) on N.H-141 to Nehru gate of Kandla port, Gandhidham, Kutch proposed by M/s Deendayal Port Trust. In Category 8(b) of Schedule annexed with EIA Notification dated 14/09/2006 and CRZ Notification, 2011. 19-06-2020	• A water meter shall be installed on rainwater harvesting & ground water recharge well system & compliance report of the same shall be submitted to concerned authorities • Rain water harvesting system shall be properly maintained & kept functional and periodical cleaning of the same shall be undertaken specifically including the period before onset of the monsoon.
3.	Development of 3 Remaining Integrated Facilities (stage I) within the existing Deendayal Port Authority at Gandhidham	• Rainwater harvesting shall be followed as per local bye-law and harvested water shall be stored, treated and reused to reduce the additional water requirement since Chennai is a water-deficient area, besides the use of water-efficient appliances.
4.	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side- Northeast of Antarjaal, South of Tagore Road, 580 Acres), Gandhidham, Kutch Gujarat by M/s Deendayal Port Authority	• The local bye-law provisions on rain water harvesting should be followed. If local bye-law provision is not available, adequate provision for storage and recharge should be followed as per the MoUD Model Building Byelaws, 2016. 2 nos. of rain water storage ponds (catchment channels) for safe percolation of water into ground shall be provided as per CGWB guidelines
5.	Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850 Acres), Gandhidham, Kutch — Gujarat by M/s Kandla Port Trust	• The local bye-law provisions on rain water harvesting should be followed. If local bye-law provision is not available, adequate provision for storage and recharge should be followed as per the Ministry of Urban Development Model Building Byelaws, 2016. As proposed, 2 nos. of rain water storage ponds (catchment channels) for safe percolation of water into

		ground shall be provided as per CGWB guidelines.
6.	Development of plot for construction of liquid storage tank farm for handling edible & non-edible oil & petroleum products	• Stormwater control and its re-use as per CGWB and BIS standards for various applications. • Weep holes in the compound walls shall be provided to ensure natural drainage of rainwater in the catchment area during the monsoon period. • Rainwater harvesting for roof runoff, as the plan submitted should be implemented. Before recharging the surface runoff, pre-treatment must be done to remove suspended matter, oil and grease. The bore well for rainwater recharging should be kept at least 5 mts above the highest ground table. • Undertake rooftop water harvesting in areas wherever it is feasible.

3.4. Waste Management

The conditions in various EC and CRZ clearance letters pertaining to waste management are outlined in Table 6.

Table 6: Conditions pertaining to Waste Management and their compliance status

S. No	Project	Condition
1.	Creation of water front facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla, Gandhidham, Kutch, Gujarat by M/s Deendayal Port Trust	• The solid wastes shall be managed and disposed of as per the norms of the Solid Waste Management Rules, 2016. • Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986.
2.	Development of 3 Remaining Integrated Facilities (Stage I) within the existing Deendayal Port Authority at Gandhidham, Kutch, Gujarat	• Necessary arrangements for the treatment of the effluents and solid wastes/ facilitation of reception facilities under MARPOL must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the CPCB/SPCB and under the EP Act, 1986. The provisions of SWM Rules, 2016, E-waste Management Rules, 2016, and Plastic Waste Management Rules, 2016 shall be followed

3.	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side-Northeast of Antarjaal, South of Tagore Road, 580 Acres), Gandhidham, Kutch Gujarat by M/s Deendayal Port Authority	• The plan requires separate wet and dry bins in each unit and ground level for waste segregation. Solid waste will be divided into wet garbage and inert materials, composted in an Organic Waste Converter, and managed within an acre space. Inert waste from group housing projects will be sent to a dumping site. The rules are outlined in the SWM Rules, 2016, the C&D Waste Management Rules, 2016, and the PWM Rules, 2016 shall be followed.
4.	Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850 Acres), Gandhidham, Kutch — Gujarat by M/s Kandla Port Trust	• Separate wet and dry bins must be provided in each unit and at the ground level for facilitating segregation of waste. Solid waste shall be segregated into wet garbage and inert materials. Wet garbage shall be composted in Organic Waste Converter. Adequate space shall be provided for solid waste management within the premises which will include area for segregation, composting. The inert waste from group housing project will be sent to dumping site • The provisions of the SWM Rules, 2016, e-Waste (Management) Rules, 2016, the C&D Waste Management Rules, 2016 and the PWM Rules, 2016 shall be followed.
5.	Development of 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit at District Kutch (Gujarat) by M/s Kandla Port Trust Limited	• Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they confirm to the standards laid down by competent authorities including the state or Central Pollution Control Board and under the Environmental (Protection) Act, 1986. • Municipal Solid Waste and Hazardous wastes shall be managed as per Municipal Solid Waste Rules, 2016 and Hazardous Waste Management Rules 2016
6.	Single Point Mooring (SPM) and allied facilities off Veera in Gulf of Kutch for handling crude oil on BOT basis in the state of Gujarat by M/s. Kandla Port trust.	• It must be ensured that the untreated effluents and solid wastes are not discharged into the sea or on the beach, and no effluent or solid waste shall be discharged on the beach
7.	Development of Plots for Construction of Warehouses/Godowns (Stage II) at Kandla, Gujarat by Deendayal Port Authority (Erstwhile: Deendayal Port Trust)	• The municipal solid waste shall be properly collected and segregated at source. Recyclable waste shall be sold off to vendors whereas non-recyclable wastes shall be disposed through the local body.

8.	Construction of 13th to 16th Cargo Berths at Kandla" by M/s Deendayal Port Authority (Erstwhile Deendayal Port Trust)	• The project authorities must make necessary arrangement for disposal of solid wastes and for the treatment of Effluents by providing a proper wastewater treatment plant outside the CRZ area. • The construction debris and / or any other of waste shall not be disposed of into the sea, creek or the CRZ areas. The debris shall be removed from the construction site immediately after the construction is over.
9.	Bifurcation (600 mt waterfront out of total 4800 mt) of Environmental and CRZ clearance issued to M/s Essar Bulk Terminal Limited for Expansion of Port Facility at Hazira, Surat, Gujarat -	• There shall be no disposal of wastes in to the coastal areas. • The hazardous wastes generated shall be collected and disposed of as per rules, disposable wastes shall be sent to authorized TSDF. MoU in this regard shall be submitted to the RO, MoEF along with the six-monthly monitoring report. • The construction debris and / or any other type of waste shall not be disposed of in to the sea, creek or in the CRZ area. The debris shall be removed from the construction site immediately after the construction is over.
10.	Setting up of RoRo/RoPax Facility at, Muldwarka Port, Gujarat at Survey No. 7413 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath.	• The treatment of effluents and solid wastes must adhere to standards set by authorities like the State Pollution Control Board and the Environment (Protection) Act, 1986, and used CFLs and TFLs must be properly collected and recycled as per the prevailing guidelines of the regulatory authority to avoid mercury contamination
11.	Setting up of RoRo/RoPax Facility at Pipavav, Gujarat Pipavav, Rajula, Amreli Proposed by M/s. Deendayal Port trust.	• The treatment of effluents and solid wastes must adhere to standards set by authorities like the SPCB and the EPA 1986, and used CFLs and TFLs must be properly collected and recycled as per the prevailing guidelines of the regulatory authority to avoid mercury contamination • The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management 2016. • Used CFLs and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/ rules of the regulatory authority to avoid mercury contamination
12.	Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernization of Existing Pipeline Network at Oil Jetty Area, Deendayal Port Trust, Kandla	

3.5. Environmental Monitoring and related studies

The conditions in various EC and CRZ clearance letters pertaining to environmental monitoring and related studies are outlined in Table 7.

Table 7: Conditions pertaining to Environmental Monitoring and their compliance status

S. No	Project	Compliance
1.	Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla	**Air quality monitoring:** • Install an AAQMS for pollutants (e.g., PM_{10} and $PM_{2.5}$ and SO2 and NOx) at least four locations within and outside the project area, covering upwind and downwind directions. • D.G. sets for backup power must conform to rules under EPA 1986 rules, use low sulphur diesel, and the location of the D.G. sets decided with in consultation with the SPCB.
		Noise monitoring: • The ambient noise levels should conform to the standards prescribed under EPA Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.
2.	Development of 3 Remaining Integrated Facilities (stage I) within the existing Deendayal Port Authority	• Continuous online monitoring for air and water covering the total area shall be carried out and the compliance report of the same shall be submitted along with the 6 monthly compliance report to the regional office of MOEF&CC. • **Air quality** shall be maintained at prescribed levels. The existing **AAQ** stations shall have a system of reporting exceedances separately to the Pollution Control Board.
3.	Development of 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit	• **AAQMS**: Install a continuous automatic ambient air quality monitoring system (24 x 7) for all relevant parameters at two locations to monitor the ambient air quality status of the project area. Data should be transferred online to CPCB and SPCB websites. • **Water:** A 24-x7 automatic monitoring system for water pollution will be installed, measuring flow and pollutants in the treatment system, with data accessible to the SPCB and the company's website. • The stipulations will be enforced under various legislations, including the water (Prevention and Control of Pollution) Act 1974, the air (Prevention and Control of Pollution) Act 1981, the EPA 1986,

		the Public Liability (Insurance) Act 1991, and EIA Notification 1994.
4.	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side- Northeast of Antarjaal, South of Tagore Road, 580 Acres), Gandhidham, Kutch Gujarat by M/s Deendayal Port Authority	• The Noise Pollution (Control and Regulation) Rules, 2000 mandate that ambient noise levels must meet residential standards, both day and night. During construction, incremental pollution loads and noise quality must be closely monitored, and measures must be taken to reduce noise levels, to conform to the stipulated standards by CPCB / SPCB
5.	Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850 Acres),	• Periodical monitoring of water quality of treated sewage shall be conducted.
6.	Development of Plots for Construction of Warehouses/ Godowns (Stage II) at Kandla, Gujarat	• Ambient noise levels should confirm to residential standards both during day and night. Incremental pollution load on the ambient air and noise quality should be closely monitored during construction phase.
7.	Construction of 13th to 16th Cargo Berths at Deendayal Port Authority	• The quality of treated effluents, solid wastes and noise level, etc. must conform to the standards laid down by the competent authorities including the CPCB/SPCB and the Union Ministry of Environment and Forests
8.	Setting up of RoRo/RoPax Facility at, Muldwarka Port, Gujarat at Survey No. 7413 for Onshore area -6 Ha, Muldwarka, Kodinar	I. **<u>Air quality monitoring:</u>** • Install an AAQMs for pollutants (e.g., PM_{10}, $PM_{2.5}$, SO_2 and NO_x) at least four locations within and outside the project area, covering upwind and downwind directions. • D.G. sets for backup power must conform to rules under EPA 1986 rules, use low sulphur diesel, and the location of the D.G. sets decided with in consultation with the SPCB. II. **<u>Noise monitoring:</u>** • The ambient noise levels should conform to the standards prescribed under EPA Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.
9.	Setting up of RoRo/RoPax Facility at Pipavav, Gujarat Pipavav, Rajula, Amreli Proposed by M/s. Deendayal Port trust.	
10.	Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernization of Existing Pipeline Network at Oil Jetty Area, Deendayal Port Trust, Kandla	

Chapter-4: EMP Activities undertaken by DPA as part of EMP

Being an environmentally responsible organization, DPA has undertaken various activities as a part of Environment Management Plan (EMP). The initiatives carried out by DPA can be broadly categorized into the following categories:

1. Greenbelt development
2. Renewable energy projects
3. Rainwater harvesting
4. Dust Management
5. Environmental Monitoring and other studies
6. Waste Management
7. Any other works, equipment, infrastructure for pollution prevention or environment management

4.1. Activities undertaken under greenbelt development

- DPA entrusted the work to the Forest Department, Gujarat, for developing a greenbelt in and around the Port area at a cost of Rs. 352 lakhs in an area of about 32 hectares, and the work is already completed.
- DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l) (5000 plants)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The site adjacent to Berth 11-12 (Wood log site) was selected and plantation was done on the peripheral boundary of two sides. The work is completed.
- Further, DPA assigned work to GUIDE, Bhuj, via a work order dated 23/06/2023 for "Green belt development in Deendayal Port Authority and its Surrounding Areas (Phase II) (10,000 plants). The site at Railway Over-bridge and another site opposite to Berth no. 15-16 along the wall on the peripheral boundary were selected for plantation. The work is completed.

Greenbelt Phase-1 plantation of 5,000 plants

Greenbelt Phase-2 plantation of 10,000 plants

For mangrove Plantation and its Conservation

- As per the directions of the GCZMA and MoEF&CC, GoI, to date, DPA has undertaken a Mangrove Plantation in an area of 1600 Hectares since the year 2005.

- In addition to the above, DPA appointed M/s GUIDE, Bhuj, for "Regular Monitoring of Mangrove Plantation carried out by DPA" (period 15/9/2017 to 14/9/2018 vide work order dated 1/9/2017 and 24/5/2021 to 23/5/2022 vide work order dated 3/5/2021).
- For all projects that are being implemented, there is a provision that mangrove areas will get proper flushing of water and free flow of water is not obstructed.

4.2. Activities undertaken under Renewable Energy projects

- DPA is already generating 20 MW of Wind energy. In addition to it, DPA has installed the solar rooftop system under CSR scheme at St. Joseph Hospital, Gandhidham of 45 KWp in 2022 and at Jeev Seva Samiti, Gandhidham of 5.5 KWp in 2024. Further, it is relevant to mention that, two out of four Nos. of Harbour Mobile Crane (HMC) made electric operated. Balance 02 Nos. shall be made electric operated by 2023-2024. Four Nos. of Deisel operated RTGs converted to e-RTGs. Retrofitting of hydrogen fuel cell in Tug Kalinga and Pilot Boat Niharika to be done as a pilot project under the guidance of MoPSW. Also, 14 Nos. of EV cars to be hired and 03 Nos. EV Bus to be procured by the year 2023-24.
- DPA has installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham.
- Necessary solar lighting will be installed in the SIPC project as per the requirement of the condition. At present only one plot is allotted. The allottee has submitted that, the solar power generation system with capacity 2 MW has been installed.
- DPA has installed 400 KWP solar plant and 600 KWP to be installed by PPP operator.
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.
- All the conventional HPSV lights of 2x400 & 1x1000 Watts are replaced with ~3100 nos. 470 Watts Energy efficient LED lights.
- Major Energy needs of port and colony are met from the captive wind generation project.
- DPA is also planning to install RE Hybrid Park of total 70 MW for captive utilization in phased manner.
- 1500 LEDs have been installed in port area.

4.3. Activities undertaken under dust management

- Deendayal Port Authority issued a Circular (SOP) to the trade with regard to control of dust pollution arising out of coal handling and ensuring safety in coal handling (circular no. TF/SH/Circulars/2019/1256 dated 10/10/2019).
- DPA has already installed sprinkling system inside Cargo Jetty area for Coal Dust Suppression in Coal Yard (40 Ha. area) at the cost of Rs. 14.44 crores.
- Continuous water sprinkling is being carried out on the heap of coal, at regular intervals to prevent dusting, fire and smoke
- DPA has installed Mist Canons at the Port area to minimize the dust. Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done.

Dust Management in the port area

4.4. Activities undertaken under environmental monitoring

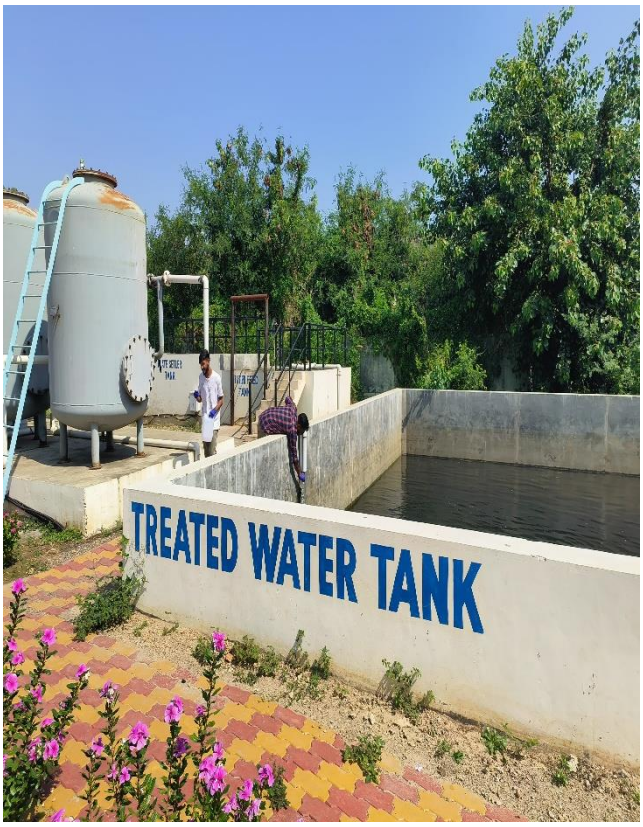
- DPA has appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The environmental monitoring includes monitoring of drinking water, ambient air, noise, DG stack, STPs, Marine water, Marine sediments, Marine ecology in different locations such as Kandla, Vadinar, Ghogha, Hazira.
- DPA has entrusted the work to M/s GUIDE, Bhuj for continuous monitoring of Marine Ecology since the year 2017 and the reports in this regard have already been submitted to the Regional Office, MoEF&CC, GoI, Bhopal/Gandhinagar & to the MoEF&CC, GoI, New Delhi along with six monthly compliance reports submitted.
- Further, DPA assigned work to M/s GUIDE, Bhuj, vide work order dated 3/5/2021 for "Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and Marine sediment samples coupled with biological indices, as per the requirements of EC & CRZ Clearances reg. for periods 2021-2024 and 2024-2027.
- DPA has already floated tender for installation of Online Continuous Ambient Air Quality Monitoring (CAAQM) for the period of three years.

Environmental Monitoring by GEMI personnel at Kandla

4.5. Activities undertaken under waste management

- The sewage generated in the port area is treated in the 1.5 MLD STP at Kandla. The treated wastewater is utilized for gardening and plantation purposes.
- In addition to that, it also has septic tanks at places where STP is inaccessible.
- Agencies authorized by the State Pollution Control Board (SPCB) have been awarded the work of collecting, transporting, and disposing of solid waste.
- Further, DPA has appointed GEMI, Gandhinagar, for the work of "Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority" vide Work Order dated 24/01/2023. The report has been submitted.
- DPA already has Oil Spill Contingency and Disaster Management Plan.
- Deendayal Port Authority (Erstwhile, Deendayal Port Trust) vide Work order no. EG/WK/4751/Part (EC–Shoreline study)/98 dated 12/10/2021 had appointed NCSCM, Chennai for carrying out the work "Shoreline Change Study for Deendayal Port Trust, Kandla, Kachchh District, Gujarat, to Study the Effect of Dumping, if any".

- Construction activities are being carried out, with due care so that construction material /debris do not fall into the water. Further, it is also ensured that, construction materials including labour camps are located outside CRZ areas.
- DPA has assigned work to M/s GUIDE, Bhuj for “Study on dredged material for presence of Contaminants” since the year 2017.
- DPA has entered into 'Selling Agency' agreement with M/s. MSTC (Govt. of India Entreprise), Vadodara since 04/01/2022 for collection, transporting and disposal of scrap, surplus items, unserviceable equipment etc.
- DPA issued a Grant of License/Permission to collect and dispose of “Hazardous Waste/Sludge/ Waste Oil” from Vessels calling at Deendayal Port” through GPCB authorized agencies.



1.5 MLD STP for wastewater treatment at Kandla

4.6. Activities undertaken under water conservation

- DPA has proposed provision for storm water collection for harvesting the rainwater and using it for irrigation or fire-fighting purpose which will also act as a buffer to cater for the risk for flooding due high intensity rainfall coincident with the high tide.
- The selected BOT operator will explore the possibility of rainwater harvesting for additional water requirements if any.
- The allottee in SIPC-1 has submitted that a rainwater storage pond is installed for rainwater harvesting.

The plot allotees of liquid storage tank farm for handling edible & non-edible oil & petroleum products have taken following measures for rainwater harvesting:

- DPA has already provided area for weep holes in the compound walls to ensure natural drainage of rainwater in the catchment area during the monsoon period.

- Aegis Logistics Ltd-Kandla, an open pit RWH pond approx. 500 sq mts area have been developed and maintained.
- DPA has considered the provision of RWH while approving the drawing.
- Allottees of 13 plots (plot no. 3, 4, 5, 6, 7, 10, 12, 13, 14, 15, 17, 18 & 19 had constructed RWH as per drawing approved by DPA.

4.7. Activities undertaken to strengthen EMC cell

DPA already has an Environment Management Cell. Further, DPA has also appointed an expert agency to provide Environmental Experts from time to time. DPA appointed M/s Precitech Laboratories, Vapi vide work order dated 5/2/2021. Further, DPA has appointed Manager Environment on a contractual basis for a period of 3 years, further extended upto 2 years.

4.8. Other initiatives

DPA has ISO 14001 certification for providing port facility and related maritime services for vessels and Cargo Handling including storage.

Chapter 5: Expenditure incurred

5.1. Year-wise expenditure of various activities/projects under EMP

As per data shared by DPA, the expenditure incurred for activities/works under EMP from F.Y. 2018-19 to F.Y. 2022-23 is presented in **Table 8.**

Table 8: Expenditure of various activities/project under EMP

S. No	Name of Work	Expenditure in lakhs				
		RBE 18-19	RBE 19-20	BE 20-21	RBE 21-22	BE 22-23
1.	Appointment of Environment Consultant for Obtaining Environmental / CRZ Clearance for the proposal of "Construction of Interchange Cum Road Over Bridge (ROB) at LC-236 (KUTCH SALT JUNCTION) on NH-141 (Phase-1) in the State of Gujarat under EPC Mode" M/s Mantec Consultants WO amount- 7.60 Lakhs	3.8	-	-	-	
2.	Appointment of IE for the work of "Development of Oil Jetty to handle liquid cargo and Ship Bunkering Terminal at Old Kandla. M/s IIT, Madras WO amount – 1.30 Cr	13.5	-	-	-	
3.	EC & CRZ Clearance OJ. 8 to 11. M/s SV Enviro WO Amount- 23.40 Lakhs	20.19	-	-	-	
4.	Appointment of Environment Consultant for SIPC. M/s EQMS WO amount-23.87 Lakhs	2.39	-	-	-	

S. No	Name of Work	Expenditure in lakhs				
		RBE 18-19	RBE 19-20	BE 20-21	RBE 21-22	BE 22-23
5.	Preparation of regional strategic impact assessment report (EC & CRZ clearance accorded by the MoEF&CC, GoI dtd 19/12/2016-specific condition no viii) reg. W O 1/9/2017 to GUIDE, Bhuj.	-	31	0	-	
6.	Regular Monitoring of marine ecology (EC & CRZ clearance accorded by the MoEF&CC, GoI dated 19/12/2016-Specific condition no xviii) for three years (2018 to 2021) reg (Work awarded to GUIDE 22/5/2018-Monitoring period 2018-19)	-	14	23.5	-	
7.	Studies on Dredged material for presence of contaminants (EC & CRZ Clearance 19/12/2016 – Specific condition vii) (Period 2018-2021). Work awarded to GUIDE, Bhuj vide dated 16/10/2018.	-	40	24	-	
8.	Appointment of Advisor Green Port Work awarded to M/s GEMI dated 29/6/2019.	-	8.8	-	-	
9.	Proposal for an afforestation Project in DPT (Deposit work) – MoU executed with Forest Dept, Gog 1/8/2019.	-	176	-	-	
10.	Strengthening of existing environmental management cell of KPT for environment Monitoring & Management.	-	-	60	36.25	45
11.	Preparing and Monitoring Environmental Management Plan of Kandla Port Trust.M/s Detox Corp, Surat (1ST YEAR-94L, 2ND YEAR 79L)	-	-	60	79	80
12.	ISO 14001:2004 Certificate of Kandla Port Trust includes Surveillance Audits for the period of 3 years. M/s Jovial Certification	-	-	0.35	0.35	1.15

S. No	Name of Work	Expenditure in lakhs				
		RBE 18-19	RBE 19-20	BE 20-21	RBE 21-22	BE 22-23
13.	Continual Improvement of ISO 14001-2004 environmental Management System of Kandla Port Trust for the period of one year.M/s QMS , Jaipur	-	-	1	0.75	1
14.	Studies of Dredged material for presence of contaminants (EC & CRZ clearance accorded by MoEF&CC,GoI, dtd 19/12/2016-specific condition no vii) reg- W.O 15/10/2018 to GUIDE,Bhuj.(For 3 years 2018-21)	-	-	40	-	-
15.	Preparation of regional strategic impact assessment report (EC & CRZ clearance accorded by the MoEF&CC, GoI dtd 19/12/2016-specific condition no viii) reg. W O 1/9/2017 to GUIDE,Bhuj.	-	-	1	-	-
16.	Carrying out EIA/EMP studies for replacement and revamping of pipeline network at Oil Jetty area, Kandla of Deedayal Port Trust (DPT) at Kandla, Gujarat (work awarded to MECON 23/3/2018)	-	-	5	-	-
17.	Proposal for an afforestation Project in DPT (Deposit Work) – MoU executed with Forest Dept, GoG dtd 1/8 & MoU 8/9/20)	-	-	255.5	126	
18.	Online continuous ambient air quality monitoring for the period of three years at Deendayal Port Trust.	-	-	0	50	200
19.	Appointment of advisor for preparation of plan of management of plastic waste, solid waste including C&D waste, E-wastes, Hazardous waste including biomedical and non-hazardous waste in the Deendayal Port Trust area".	-	-	-	-	24
20.	Preparation of Detailed Marine Biodiversity Management Plan for Oil Jetty no 8 to 11. M/s GUIDE (Rs. 11 Lakhs)	-	-	-	11	-

S. No	Name of Work	Expenditure in lakhs				
		RBE 18-19	**RBE 19-20**	**BE 20-21**	**RBE 21-22**	**BE 22-23**
21.	Regular Monitoring of Marine Ecology & Continuous Monitoring programme for three years. M/s GUIDE (Rs 141.57 Lakhs)	-	-	-	47.19	47.19
Sub-total		**39.88**	**269.8**	**470.35**	**350.54**	**398.34**
Grand Total		**1528.91**				

Of the above works, the following have been treated under works of recurring nature:

Table 9: Works that may be treated of recurring nature

S. No	Name of Scheme	Expenditure in lakhs				
		RBE 18-19	**RBE 19-20**	**BE 20-21**	**RBE 21-22**	**BE 22-23**
1.	Regular Monitoring of marine ecology (EC & CRZ clearance accorded by the MoEF&CC, GoI dated 19/12/2016-Specific condition no xviii) for three years (2018 to 2021) reg (Work awarded to GUIDE 22/5/2018-Monitoring period 2018-19)	-	14	23.5	47.19	47.19
2.	Strengthening of existing environmental management cell of KPT for environment Monitoring & Management.	-	-	60	36.25	45
3.	Preparing and Monitoring Environmental Management Plan of Kandla Port Trust. M/s Detox Corp, Surat (1ST YEAR-94L, 2ND YEAR 79L)	-	-	60	79	80
4.	ISO 14001:2004 Certificate of Kandla Port Trust includes Surveillance Audits for the period of 3 years. M/s Jovial Certification	-	-	0.35	0.35	1.15

5.	Continual Improvement of ISO 14001-2004 environmental Management System of Kandla Port Trust for the period of one year. M/s QMS , Jaipur	-	-	1	0.75	1
Sub-total		**0**	**14**	**144.85**	**163.54**	**174.34**
Grand Total		**496.73**				

The expenditure made under CER funds is summarized below.

Table 10: Expenditure on CER till date

S. No	Name of Work	Name of contractor	Contract value / expenditure incurred
1	Design, Construction, Procurement, Installation, and commissioning of 50 Tonne per day Semi-Automatic MRF Plant at Deendayal Port Gandhidham on EPC mode	M/s Jainum Food & Waste Projects Pvt. Ltd. Indore	2,49,90,000 + GST
2	Design, Construction, Procurement, Installation and commissioning of 50 Tonne per day Semi-Automatic wet waste processing Plant at Deendayal Port Gandhidham on EPC mode	M/s Jainum Food & Waste Projects Pvt. Ltd. Indore	2,44,00,000 + GST
3	Construction of boundary wall with precast wall panel surrounding MRF & Wet West processing plant behind DC5 (Under CER).	M/s. Mandeep Infrastructure, Adipur.	4,90,208 + GST

The expenditure made for EMP works have been broadly categorized into the following categories and expenditure made is mentioned against them in the below table.

Table 11: Cost components of EMP

S. No	Name of Scheme	Expenditure in lakhs from RBE18-19 to RBE 23-24
1	Strengthening of Environment Cell of DPA	141.25
2	Consultancy services for obtaining environment / CRZ clearance	62.38
3	Studies undertaken as part of fulfilment of specific conditions in EC / CRZ	105
4	Environmental monitoring and marine ecology studies	611.88
5	Afforestation and greenbelt development	557.5
6	ISO 14001:2004 Certification	4.6
7	Waste management related infrastructure (under CER)	497.9
8	Other consultancy assignments	46.3
Grand Total		**2026.81**

The balance funds remaining under EMP by the end of F.Y. 2022-23 are given in Table below.

Table 12: Funds remaining under EMP by the end of F.Y. 2022-23

S. No.	Particulars	Funds under EMP (in lakhs)		Funds under CER (in lakh)
		Capital	Recurring	
1.	Total funds earmarked	7,650.00	954.35	1,425.4
2.	Expenditure upto F.Y. 2022-23	1,123.03	496.73	497.9*
3.	Balance remaining from 2023-24 onwards	**6,526.97**	**457.62**	**927.5**

**Expenditure in 2024-25*

Chapter-6: Project-wise EMP compliance status and proposed action plan

The scope envisages to propose activities/projects that can be taken up by DPA as per the EMP provisions and allocate funds for the same. This chapter highlights the compliance status of various EMP related conditions specified in EC / CRZ letters (obtained from most recent compliance reports) of each project.

For fulfilment of EMP related compliance conditions, detailed plans are proposed for the following activities for each project:

a) Greenbelt development
b) Renewable Energy – Solar Power
c) Rainwater harvesting
d) Dust management
e) Waste Management
f) Environmental Monitoring

I. Creation of water front facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla, Gandhidham, Kutch, Gujarat

(Environment and CRZ clearance accorded by the MoEF&CC, GoI vide file no. 10-1/2017-IA III dated 20/11/2020.)

Project Status: (Up to Feb, 2025)

Sr. No.	Name of Project	Status
1.	Oil Jetty No. 8 (Jetty & allied facilities)	Construction work is completed
2.	Oil Jetties no. 9, 10 & 11 to be implemented on BOT/PPP Mode.	The SFC recommendation and the MoPSW, GoI approval for Oil Jetties 9, 10 & 11, under PPP mode, has been received on 19/04/2021. • The bid for OJ – 09 is invited fourth time. In the meeting with MoPSW, GoI, it was decided that project may be restructured, if bids are not received. • For Restructured project proposal for OJ 9, 10 & 11 (PPP Mode), the SFC meeting was held on 04/06/2024. Approval is awaited. • No construction activity started yet on project site.
3	Development of Land (area 554 acres) for associated facilities for storage.	Initially, partial development of embankment for road network along with reclamation of land is undertaken.

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Greenbelt and Mangroves		
1	Green belt shall be developed in area as provided in project details with a native tree species in accordance with CPCB guidelines.	It is assured that the necessary green belt will be provided as per the conditions stipulated. Further, it is relevant to mention that, DPA had already taken up the greenbelt Development activity through Forest Department, GoG, at the cost of 352.32 lakhs (Green Belt development in DPA area in an area of 31.942 Ha.) Further,

		DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The work is completed a copy is submitted along with the compliance report submitted on 18/09/2023. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023.
2	Top soil shall be separately stored and used in the development of green belt.	Point noted for compliance.
CRZ		
3	The DPA shall effectively implement the Mangrove Development, Protection & Management plan for control of indirect impact on mangrove habitat	As per the directions of the GCZMA and MoEF&CC, GoI, DPA had already undertaken Mangrove Plantation in an area of 1600 Ha. till date since the year 2005. It is also relevant to submit here that, as per the direction of the Gujarat Coastal Zone Management Authority, DPA had already prepared & submitted a report on mangrove conservation and management plan formulated by Gujarat Institute of Desert Ecology during the study period of Jan-April, 2015 (Report already submitted along with earlier compliance reports submitted). In addition to the above, DPA appointed M/s GUIDE, Bhuj for "Regular Monitoring of Mangrove Plantation carried out by DPA" (period 15/9/2017 to 14/9/2018 vide work order dated 1/9/2017 and 24/5/2021 to 23/5/2022 vide work order dated 3/5/2021). Further DPA has assigned work to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Monitoring of Mangrove Plantation 1600 Ha

		carried out by DPA" for the Period of 10/06/2024 to 09/06/2025.
4	DPA shall take up greenbelt development activities in consultation with the Gujarat institute of Desert Ecology / Forest Department / Gujarat Ecology Commission	DPA has already developed green belt in and around the Port area. Further, DPA assigned work for green belt development in an area of about 32 hectares to the Forest Department, Govt. of Gujarat during August, 2019 at the cost of Rs. 352.32 lakhs. The work is completed. Further, DPA also undertook massive green belt development in and around the Port area and at Gandhidham area. Further, DPA also assigned the work of "Greenbelt Development in Deendayal Port Authority and its surrounding areas Charcoal Site (Phase I)" vide Work Order dated 31/05/2022 at the cost of Rs. 33.22 lakhs. The work is completed. The final report is submitted along with the compliance submitted on 18/09/2023. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The work is completed.
Marine Ecology		
5	A detailed marine biodiversity management plan shall be prepared through the NIO or any other institute of repute on marine, brackish water and fresh water ecology and biodiversity and submitted to and implemented to the satisfaction of the State Biodiversity Board and the CRZ authority. The report shall be based on a study of the impact of the project activities on the intertidal biotopes, corals and coral	Further, it is once again to submit here that, DPA issued work order to M/s GUIDE vide its letter no. EG/WK/ 4751 /Part (Marine Ecology Monitoring) /12 dated 03/05/2021 for preparation of Detailed marine biodiversity plan. The copy of the final report submitted is already communicated with earlier compliance report.

	communities, molluscs, sea grasses, sea weeds, sub-tidal habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods and include underwater photography.	
6	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components including all micro, macro and mega floral and faunal components of marine biodiversity.	DPA assigned work to M/s GUIDE, Bhuj for regular monitoring of Marine Ecology since the year 2017 (From 2017 – 2021) and reports of the same has been submitted to the Regional Office, MoEF&CC, GoI, Gandhinagar as well as to the MoEF&CC, GoI, New Delhi along with compliance reports submitted. The final report for the Holistic Marine Ecological Monitoring for the period upto May 2021 was submitted on 22.05.2021. Copy of the report was communicated vide earlier compliance report submitted vide letter dated 29/6/2021. Further, it is once again to submit here that, DPA issued work order to M/s GUIDE vide its letter no. EG/WK/ 4751 /Part (Marine Ecology Monitoring) /11 dated 03/05/2021 for Regular monitoring of Marine Ecology in and around Deendayal Port Authority (Erstwhile Deendayal Port Trust) and continuous Monitoring Program covering all seasons on various aspects of the Coastal Environs for the period 2021-24. In continuation of the same, DPA has assigned the work of "Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and marine sediment samples coupled with

		biological indices reg. (for three years (2024-2027) vide letter dated 10/06/2024.
Environmental Monitoring		
EC		
7	Marine ecological monitoring and its mitigation measures for protection of phytoplankton, zooplanktons, macrobenthos, estuaries, sea-grass, algae, sea weeds, Crustaceans, Fishes, coral reefs and mangroves and migratory birds etc. as given in the EIA-EMP Report shall be complied with in letter and spirit through a reputed university/institute with financial support as desired. Six monthly reports of the studies to be provided to the regional office of MoEFCC.	DPA assigned work to M/s GUIDE, Bhuj vide work order dated 3/5/2021 for "Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and marine sediment samples coupled with biological indices reg. (for three years (2021-2024)). The final year report for the year 2023-2024 submitted. In continuation of the same, DPA has assigned the work of "Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and marine sediment samples coupled with biological indices reg. (for three years (2024-2027).
8	Continuous online monitoring of air and water covering the total area shall be carried out and the compliance report of the same shall be submitted along with the 6 monthly compliance report to the regional office of MoEF&CC.	DPA appointed NABL Accredited laboratory for regular Monitoring of environmental parameters since the year 2016 in continuation of this DPA appointed M/s Gujarat Environment Management Institute (GEMI), Gandhinagar (NABL Accredited laboratory) for regular Monitoring of environmental parameters vide work order dated 15/02/2023. The work is in progress & DPA is submitting the monitoring data regularly to all the concerned authorities along with compliance reports submitted. DPA has already initiated the action for inviting the tenders for carrying out online ambient air quality monitoring system (24 X 7). However, no response received. Hence, now, DPA is

		exploring other possibilities for appointing agency for installation of CAAQMS system.
9	The project proponent shall install system to carryout Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM 10 and PM 2.5 in reference to PM emission, and S02 and NOx in reference to S02 and NOx emissions) within and outside the project area at least at four locations, covering upwind and downwind directions.	DPA appointed NABL Accredited laboratory for regular Monitoring of environmental parameters since the year 2016 in continuation of this DPA appointed M/s Gujarat Environment Management Institute (GEMI), Gandhinagar (NABL Accredited laboratory) for regular Monitoring of environmental parameters vide work order dated 15/02/2023. The work is in progress & DPA is submitting the monitoring data regularly to all the concerned authorities along with compliance reports submitted. DPA has already initiated the action for inviting the tenders for carrying out online ambient air quality monitoring system (24 X 7). However, no response received. Hence, now, DPA is exploring other possibilities for appointing agency for installation of CAAQMS system.
10	Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed emission standards.	To control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done. –Further, it is relevant to mention here that, DPA had already issued general circular vide dated 3/9/2019 regarding Construction and Demolition Waste Management for strict implementation in DPA. Copy submitted with compliance report submitted on 05/05/2023.
11	Diesel power generating sets proposed as source of backup power should be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use of low sulphur diesel. The location of the DG sets may be	Point noted for compliance.

	decided with in consultation with State Pollution Control Board.	
CRZ		
12	The noise level during transport and construction of marine facilities shall be kept minimum.	DPA appointed NABL Accredited laboratory for regular Monitoring of environmental parameters since the year 2016 in continuation of this DPA appointed M/s Gujarat Environment Management Institute (GEMI), Gandhinagar (NABL Accredited laboratory) for regular Monitoring of environmental parameters vide work order dated 15/02/2023. The work is in progress & DPA is submitting the monitoring data regularly to all the concerned authorities along with compliance reports submitted.
Dust Management		
13	Shrouding shall be carried out in the work site enclosing the dock/proposed facility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers.	DPA has included clause in the tender to take all the necessary measures to reduce dust.
14	Dust collectors shall be deployed in all areas where blasting (surface cleaning) and painting operations are to be carried out, supplemented by stacks for effective dispersion.	Point noted for compliance.
Renewable Energy		
15	Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking	It is assured that; the stipulated condition will be complied with.

	around project area and maintain the same regularly;	Further, it is relevant to mention here that, DPA has commissioned a 45 kWP Solar Plant at Gandhidham on 7th July, 2022. DPA has installed 400 KWP solar plant and 600 KWP to be installed this year by PPP operator. DPA has installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.
16	Provide LED lights in their offices and port areas.	All the conventional HPSV lights of 2x400 & 1x1000 Watts are replaced with ~3100 nos. 470 Watts Energy efficient LED lights
Waste Management		
17	Dredged material shall be disposed safely in the designated areas.	No dredging activity has been started yet. However, it is assured that, the dredged material will be disposed at designated dumping ground.
18	Shoreline should not be disturbed due to dumping. Periodical study on shore line changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six-monthly monitoring reports.	DPA assigned the work "Shoreline Change Study for Deendayal Port Authority (Erstwhile Deendayal Port Authority), Kandla, Kachchh District, Gujarat, to Study the Effect of Dumping, if any" vide their work order dated 12/10/2021 to NCSCM, Chennai. The work has been completed and the final report is attached.
19	Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986.	Generated waste water from the oil jetty no. 8 will be treated in septic tank/soak pit. However, after completion of entire project facility (Oil Jetties 8 to 11 & associated area for storage), possibility may be explored to treat the waste water generation (about 16 KLD) through existing STP of DPA. Further, DPA has been conducting regular Monitoring of environmental parameters including STP monitoring since the year 2016 through NABL Accredited laboratories.

20	The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management Rules, 2016.	DPA has included clause in the tender for the Contractor to implement procedures regarding Construction Waste Management and disposal. Further, DPA appointed GEMI, Gandhinagar for "Preparation of Plan for Management of Plastic Wastes, Solid Wastes including C&D wastes, E-Wastes, Hazardous Wastes including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority Area", vide work order dated 24/1/2023.
21	Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction and Demolition Waste Management Rules, 2016.	DPA has included clause in the tender for the Contractor to implement procedures regarding Construction Waste Management and disposal. DPA had already issued general circular vide dated 3/9/2019) regarding Construction and Demolition Waste Management for strict implementation in DPA. Copy submitted with the compliance report submitted on 05/05/2023. Further, DPA appointed GEMI, Gandhinagar for "Preparation of Plan for Management of Plastic Wastes, Solid Wastes including C&D wastes, E-Wastes, Hazardous Wastes including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority Area", vide work order dated 24/1/2023.
22	A certificate from the competent authority handling municipal solid wastes should be obtained, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project.	It is assured that necessary certification from the competent authority will be obtained.
23	Used CFLs and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/ rules of	Point Noted for compliance.

	the regulatory authority to avoid mercury contamination.	
24	Oil spill contingency plan shall be prepared and part of DMP to tackle emergencies. The equipment and recovery of oil from a spill would be assessed. Guidelines given in MARPOL and Shipping Acts for oil spill management would be followed. Mechanism for integration of terminals oil contingency plan with the overall area contingency plan under the coordination of Coast should be covered.	DPA is already having Oil Spill Contingency Plan and Disaster Management.
EMC Cell		
25	A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly report to the head of the organization.	DPA is already having Environment Management cell. Further, DPA has also appointed expert agency for providing Environmental Experts from time to time. Recently, DPA appointed M/s Precitech Laboratories, Vapi for providing Environmental Experts vide work order dated 5/2/2021 Copy submitted along with the compliance report submitted with 05/05/2023 Further DPA has appointed Environmental Manager on contractual basis for the period of 3+2 years. A copy of office order is attached herewith as Copy submitted along with the compliance report submitted with 05/05/2023
Other		
26	Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution which impacts marine life. This shall be prevented by suitable precautions and also by providing necessary mechanisms to trap the spillage.	DPA has included clause in the tender to not let any oil and greasy wastes in the sea water. Further, it is also relevant to mention here that DPA is already having Oil Spill Contingency Plan.

27	As per the Ministry's Office Memorandum F. No. 22-65/2017-IA.III dated 30th September, 2020, the project proponent, based on the commitments made during the public hearing, shall include all the activities required to be taken to fulfil these commitments in the Environment Management Plan along with cost estimates of these activities, in addition to the activities proposed as per recommendations of EIA Studies and the same shall be submitted to the ministry as part of the EIA Report. The EMP shall be implemented at the project cost or any other funding source available with the project proponent.	DPA assigned work of "Planning & Monitoring of the activities to be undertaken under Environment Management Plan under EIA & EC", to the GEMI, Gandhinagar vide work order dated 25/10/2023. The work is in progress. After completion of work, the desired details will be submitted in due course. Public Hearing is exempted. However, as specified in the Environmental Management Plan, DPA is engaging NABL Accredited laboratory for regular Monitoring of environmental parameters since the year 2016 in continuation of this DPA appointed M/s Gujarat Environment Management Institute (GEMI), Gandhinagar (NABL Accredited laboratory) for regular Monitoring of environmental parameters vide work order dated 15/02/2023. The work is in progress & DPA is submitting the monitoring data regularly to all the concerned authorities along with compliance reports submitted. DPA issued work order to M/s GUIDE vide its letter no. EG/WK/ 4751 /Part (Marine Ecology Monitoring)/12 dated 03/05/2021 for preparation of Detailed marine biodiversity plan. The copy of the final report submitted by GUIDE, Bhuj has already been communicated with earlier compliance report submitted. DPA had already taken up the greenbelt Development activity through Forest Department, GoG, at the cost of 352.32 lakhs (Green Belt development in DPA area in an area of 31.942 Ha.) Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The work is completed a

		copy of same is submitted along with compliance report submitted on 18/09/2023. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. TThe work is completed . it is relevant to mention here that, DPA already issued Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" from Vessels calling at Deendayal Port through DPA contractors. Further, it is to state that, all ships are required to follow DG Shipping circulars regarding the reception facilities at Swachch Sagar portal.
28	A detailed traffic management and traffic decongestion plan shall be drawn up to ensure that the current level of service of the roads within a 05 kms radius of the project is maintained and improved upon after the implementation of the project. This plan should be based on cumulative impact of all development and increased habitation being carried out or proposed to be carried out by the project or other agencies in this 05 Kms radius of the site in different scenarios of space and time and the traffic management plan shall be duly validated and certified by the State Urban Development department and the P.W.D.! competent authority for road augmentation and shall also have their consent to the implementation of components of the plan which involve the	DPA appointed M/s Tata Consulting Engineers Limited for traffic studies and management as a part of Master Plan preparation for the SIPC Location 1(Adipur) & Location 2(Kandla) in 2016. Further, for diversion of port-related traffic and transportation, DPA has obtained Environmental & CRZ Clearance from SEIAA, GoG vide letter dated 19/06/2020 for construction of Interchange cum Road Over Bridge. The same is in operation.

	participation of these departments.	

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Greenbelt development**

As per requirement, greenbelt over an area of 74.6 ha shall be developed. As per current project status, the development of 554 acres of land is under progress and no major construction has started. Once the land starts developing, greenbelt shall be provided as per detailed plan given in Annexure. The master plan of the said land shall have provision to develop 74.6 ha greenbelt. Greenbelt is not feasible in Oil Jetty area.

2. **Dust Management**

As per the EC letter, condition no II (iii) dated 20th November, 2020, for the preservation of air quality, shrouding shall be carried out in the work site enclosing the dock/proposed facility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers.

In the construction industry, the term "shroud" refers to a protective covering or enclosure used to shield various elements of a structure or machinery. Shrouds play a crucial role in enhancing safety, aesthetics, and functionality in construction projects.

Types of Shrouds in Construction

a) Scaffold Shrouds

Scaffold shrouds are used to cover scaffolding structures, providing protection against weather elements, reducing the risk of falling debris, and enhancing the appearance of the construction site.

b) Equipment Shrouds

Equipment shrouds are enclosures that cover construction machinery and equipment, protecting them from environmental factors and reducing noise pollution.

c) Architectural Shrouds

Architectural shrouds are used to conceal structural elements, such as beams, columns, and mechanical systems, improving the aesthetic appeal of a building.

Applications of Shrouds in Construction

- Safety and Protection
- Environmental Control
- Aesthetics and Concealment

3. **Renewable Energy Initiatives**

I. Solar power generation on roof tops of buildings:

As per the project area, 7 MW renewable energy from rooftop solar panels can be produced. DPA is already producing

- 20 MW of Wind energy
- 45 KWP solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham.
- 5.5 KWp solar roof top system under CSR scheme at Jeev Seva Samiti, Gandhidham.
- Initiation of solar power generation system with capacity 2 MW.
- Already installed 400 KWP solar plant and 600 KWP to be installed by PPP operator this year.
- Installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham.
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.

Therefore, no additional initiative in renewable energy is required. However, DPA at its discretion, can provide rooftop solar modules as per the plan given in Chapter 7 of the report.

II. LED lights in their offices and port areas

All the conventional HPSV lights of 2x400 & 1x1000 Watts are replaced with ~3100 nos. 470 Watts Energy efficient LED lights. The same may be installed at new establishments.

III. Solar Street lighting:

Solar-powered LEDs should be installed. The design specifications and spacing between solar street lights are mentioned in Chapter 7 (7.4). The construction at 554 acres is not completed yet. Once the master plan for the project is developed, the design mentioned in the Annexure may be used for planning of solar LED lights.

4. Waste Management:

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

5. Environmental Monitoring:

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

II. Project Name: Development of 3 Remaining Integrated Facilities (stage I) within the existing Deendayal Port Authority

(Ref. No. 10-9/2017-IA III dated 18/2/2020)

Project Status (up to May 2024):

Sr. No.	Name of Project	Status	Area (ha)
1	Development of Container Terminal at Tuna off-Tekra on BOT Basis:	No Construction activity started yet	84
2	Providing Railway Line from NH 8A to Tuna Port.	Work Completed	11 Km
3	Construction of Port Craft Jetty & Shifting of SNA Section.	Work Completed	

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Renewable Energy		
1	Compliance to Energy Conservation Building (ECBC-2017) shall be ensured for all the building complexes. Solar/wind or other renewable energy shall be installed to meet energy demand of 1 % equivalent.	The projects mentioned in the EC & CRZ Clearance dated 18/2/2020 are mainly related to the construction of the jetty/berth (Container Terminal & Port Craft Jetty) and associated activities and the project related to the laying of the Railway line. DPA is already generating 20 MW of Wind energy. In addition to it, DPA has commissioned a 45 kWP Solar Plant at Gandhidham. Further, it is relevant to mention that, two out of four Nos. of Harbour Mobile Crane (HMC) made electric operated. Balance 02 Nos. shall be made electric operated by 2023-2024. Four Nos. of Deisel operated RTGs converted to e-RTGs. Retrofitting of hydrogen fuel cell in Tug Kalinga and Pilot Boat Niharika to be done as a pilot project under the guidance of MoPSW. Also, 14 Nos. of EV cars to be hired in this year and 03 Nos. EV Bus to be procured by the year 2023-24.
Greenbelt Development		
EC		
2	KPT shall take up massive greenbelt development activities	DPA had already taken up the greenbelt Development activity through the Forest

	in and around Kandla and also within the KPT limits.	Department, GoG, at the cost of 352.32 lakhs (Green Belt development in DPA area in an area of 31.942 Ha.) Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l) (5000 plants)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The work is completed. Further, DPA assigned work to GUIDE, Bhuj, via a work order dated 23/06/2023 for "Green belt development in Deendayal Port Authority and its Surrounding Areas (Phase II) (10000 plants). The work is in progress
CRZ		
3	The KPT shall effectively implement the Mangrove Development, Protection & Management Plan for control of indirect impact on mangrove habitat.	DPA has undertaken Mangrove Plantation in an area of 1600 Hectares since the year 2005. The copy of the details has already been communicated with the earlier compliance reports submitted. Further, the Study on the present Status, Conservation and Management Plan for Mangroves of Kandla Port region submitted by M/s GUIDE, Bhuj, had already been communicated to the GCZMA & to the MoEF&CC, GoI. In addition to the above, DPA appointed M/s GUIDE, Bhuj for "Regular Monitoring of Mangrove Plantation carried out by DPA" (period 15/9/2017 to 14/9/2018 vide work order dated 1/9/2017 and 24/5/2021 to 23/5/2022 vide work order dated 3/5/2021). The final report submitted by M/s GUIDE, Bhuj, for the years 2017 to 2018 and 2021 to 2022 has already been communicated with the six-monthly compliance submitted. Further, vide work order dated 10/06/224 DPA appointed M/s GUIDE, Bhuj, for "Regular Monitoring of Mangrove Plantation carried out by DPA" (Period 10/06/2024 to 09/06/2025)

4	Mangrove plantation in an area of 50 ha. Shall be carried out by the KPT within 2 years in time bound manner on Gujarat coastline either within or outside the Kandla port Trust area and six-monthly compliance reports along with the satellite images shall be submitted to the Ministry of Environment and Forest as well as to this Department without fail.	As per the directions of the GCZMA and MoEF&CC, GoI, till date, DPA has undertaken Mangrove Plantation in an area of 1600 Hectares since the year 2005, which includes 50 Hectares mangrove plantation as per stipulated condition. Further, DPA appointed M/s GUIDE, Bhuj for "Regular Monitoring of Mangrove Plantation carried out by DPA" (period 15/9/2017 to 14/9/2018 vide work order dated 1/9/2017 and 24/5/2021 to 23/5/2022 vide work order dated 3/5/2021). The final report submitted by M/s GUIDE, Bhuj, for the years 2017 to 2018 and 2021 to 2022 have already been submitted in the six-monthly compliance communicated vide letter 06/07/2022. In continuation of the same, DPA issued a work order to M/s GUIDE vide its letter no. EG/ WK/ 4751/ Part (Marine Ecology Monitoring) /72 dated 10/06/2024 for further period of 2024 – 27
5	The KPT shall take up massive greenbelt development activities in and around Kandla and also within the KPT limits.	DPA has planted about one lakhs trees in roadside dividers, colony areas at Kandla and Gopalpuri, in the greenbelt area of Gandhidham & Adipur Township, Sewage Treatment Plants at Gopalpuri & Kandla and extensive green belt development plans initiated at different locations in Township areas. DPA entrusted work of greenbelt development in and around the Port area to the Forest Department, Gujarat, at the cost of Rs. 352 lakhs (Area 32 hectares), and the work is completed. Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The final report

		submitted by GUIDE, Bhuj has been submitted in the last compliance report. Further, DPA assigned work to GUIDE, Bhuj vide work order dated 23/06/2023 for "Green belt development in Deendayal Port Authority and its Surrounding Areas (Phase II) (10000 plants). The work is in progress.
Environmental Monitoring		
6	A continuous monitoring programme covering all the seasons on various aspects of the coastal environs need to be undertaken by a competent organization available in the State or by entrusting to the National Institutes/renowned Universities/accredited Consultant with rich experiences in marine science aspects. The monitoring should cover various physico-chemical parameters coupled with biological indices such as sand dune vegetation, mangroves, sea grasses, macrophytes and phytoplankton on a periodic basis during construction and operation phase of the project. Any deviations in the parameters shall be given adequate care with suitable measures to conserve the marine environment and its resources.	DPA had assigned the work to M/s GUIDE, Bhuj, for continuous monitoring of Marine Ecology since the year 2017, and the reports in this regard are being submitted from time to time to the Regional Office, MoEF&CC, GoI, Gandhinagar, to the MoEF&CC, GoI, New Delhi along with six monthly compliance reports submitted. In continuation to the same, DPA issued a work order to M/s GUIDE vide its letter no. EG/ WK/ 4751/ Part (Marine Ecology Monitoring) /72 dated 10/06/2024 for the period of 2024-27
7	Continuous online monitoring of for air and water covering the total area shall be carried out and the compliance report of the same shall be submitted along with the 6 monthly compliance report to the regional office of MOEF&CC.	DPA has been appointing a NABL-accredited laboratory for monitoring environmental parameters, and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to monitor environmental parameters regularly via a Work Order dated 15/02/2023. The work is in progress, and the annual environmental

		monitoring report submitted by GEMI, Gandhinagar. DPA has already initiated the action of inviting the tenders to carry out an online ambient air quality monitoring system (24/7).
8	Ambient air quality shall be maintained at prescribed levels. The existing ambient air quality stations shall have a system of reporting exceedances separately to the Pollution Control Board.	DPA has been appointing a NABL-accredited laboratory for monitoring environmental parameters, and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to monitor environmental parameters regularly via a Work Order dated 15/02/2023. The work is in progress, and the annual environmental monitoring report submitted by GEMI, Gandhinagar.
9	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components as part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity	DPA had assigned the work to M/s GUIDE, Bhuj, for continuous monitoring of Marine Ecology since the year 2017, and the reports in this regard are being submitted from time to time to the Regional Office, MoEF&CC, GoI, Gandhinagar, to the MoEF&CC, GoI, New Delhi along with six monthly compliance reports submitted. In continuation to the same, DPA issued a work order to M/s GUIDE vide its letter no. EG/ WK/ 4751/ Part (Marine Ecology Monitoring) /72 dated 10/06/2024 for the period of 2024-27.
10	An Environmental reports indicating the changes, if any, with respect to the baseline environmental quality in the coastal and marine environment shall be submitted every year by the KPT to this Department as well as to the MoEF&CC,GOI.	For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the annual environmental monitoring report submitted by GEMI, Gandhinagar.

		DPA has been submitting the environmental monitoring report along with the six-monthly compliance report to IRO, MoEF&CC, GoI.
Waste Management		
11	Necessary arrangements for the treatment of the effluents and solid wastes/ facilitation of reception facilities under MARPOL must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986. The provisions of Solid Waste Management Rules, 2016. E - waste Management Rules, 2016, and Plastic Waste Management Rules, 2016 shall be followed	No industrial effluent is generated in the port area. DPA issued a Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" and "Dry Solid Waste (Non- Hazardous)" from Vessels calling at Deendayal Port through DPA contractors. Further, all ships are required to follow DG Shipping circulars regarding the reception facilities at the Swachch Sagar portal. DPA has entered into a 'Selling Agency' agreement with M/s. MSTC (Govt. of India Enterprise), Vadodara on 04/01/2022 for disposal of scrap, surplus items, unserviceable equipment, etc. The copy of the MoU has already been communicated with the last compliance report submitted. DPA had already issued circulars dated 3/9/2019 regarding Plastic Waste Management and Construction and Demolition Waste Management for strict implementation in DPA (The copy of the Circular has already been communicated with the last compliance report submitted). Further, DPA has appointed GEMI, Gandhinagar, for the work of "Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority" vide Work Order dated 24/01/2023. The work is in progress.
12	No effluent or sewage shall be discharged into sea/creek or in the CRZ area and it shall be treated to conform to the norms prescribed by the GPCB and	DPA already has a Sewage Treatment Plant capacity of 1.5 MLD. The treated wastewater is utilized for plantation/gardening purposes. Further, BOT Operator will provide necessary arrangements for a sewage treatment facility.

	would be reused /recycled within the plant premises	
Dust Management		
13	All the recommendations and suggestion given by the Mantec Consultants Pvt. Ltd. in their Comprehensive Environment Impact Assessment report for conservation / protection and betterment of environment shall be implemented strictly by the KPT.	DPA has installed Mist Canon at the Port area to minimize the dust. Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done.
Environment Cell		
14	A separate environmental management cell with qualified personnel shall be created for environmental monitoring and management during construction and operational phases of the project.	DPA is already having Environment Management cell. Further, DPA has also appointed expert agency for providing Environmental Experts from time to time. Recently, DPA appointed M/s Precitech Laboratories, Vapi for providing Environmental Experts vide work order dated 5/2/2021. In addition, it is relevant to submit here that, DPA has appointed Manager (Environment) on contractual basis for the period of 3 years and further extendable to 2 years (Copy of the details has already been communicated with the last compliance report submitted). Further, for monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the annual environmental monitoring report submitted by GEMI, Gandhinagar.

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Greenbelt development**

The total land requirement under the project (as per EC letter) is 95 ha of which 84 ha is for Container Terminal at Tuna off-Tekra. Remaining 11 ha is for port craft jetty & shifting of SNA section and 11 km railway line from NH 8A to Tuna Port combined. Pg. no. 211 of the EIA report states *"As per CPCB guidelines green belt will be developed on 33% of the total project area. Therefore, green belt will be developed on 62.7 ha area".* Project area is nowhere mentioned in the EIA report. However, as per EC letter, considering 95 ha as project area, 62.7 ha is 66% land area. Hence, developing greenbelt in 66% area would be impractical. 33% of 95 ha would be 31.35 ha. Hence, it is proposed to develop greenbelt over 31.35 ha area of the project.

In case DPA intends to proceed with 62.7 ha, it may consider offsetting the 32-ha greenbelt that was developed by Forests Dept. In such case, net greenbelt to be developed would be 62.7 – 32 = 30.7 ha.

As per current project status, the construction activity of Railway Line from NH 8A to Tuna Port and port craft jetty & shifting of SNA section are completed (11 ha combined). Major portion of project area will be covered by Container Terminal at Tuna off-Tekra (84 ha) whose work has not yet started.

If 31.35 ha greenbelt is to be developed, its project-wise bifurcation would be as below:

- Development of Container Terminal at Tuna off-Tekra on BOT Basis
  Total land area: 84 ha
  Greenbelt to be developed: 27.72 ha
  Since no construction has started yet, no greenbelt to be developed as of now.
- Providing Railway Line from NH 8A to Tuna Port.
  Total length of railway line: 11Km
  Greenbelt to be developed: 3.63 ha

The greenbelt development of 3.63 ha is to be done in 1st Phase. DPA has already planted 6500 plants opposite 15-16th Berth along the wall. This plantation has been offset for the 3.63 ha planation to be done in 1st Phase (considering the Plantation density of approx. 1800 plants per hectare). Considering this, no additional greenbelt development is required in 1st phase of this project.

The total greenbelt development of 31.35 ha is also mentioned in the Annexure which is to be implemented with the development of other project components.

2. **Mangrove plantation:**

As per CRZ condition, 50 ha mangrove plantation is to be carried out.

For this, as a part of mangrove conservation, DPA has undertaken Mangrove Plantation in an area of 1600 Hectares at various locations since 2005-06 under the directions of the GCZMA and MoEF&CC, GoI.

Further DPA has assigned work to to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Mangrove Plantation in an area of 50 Ha for Deendayal Port Authority" for the period of 10/06/2024 to 09/03/2025.

So additional plantation may not be required for this project.

3. Dust Management

The coal dust arising from coal storage area in the port is a major source of air pollution. DPA has installed Mist Canon at the Port area to minimize the dust. Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done. The mix of dust suppressant with water should be employed instead of spraying only water through sprinklers and mist cannon.

Water can be considered as one of the ancient dust palliatives, as it is readily available to apply by spraying over the surface of road. Water is used apply moisture to the surface area, but the capacity of dust suppression is less due to evaporation. In order to achieve the maximum effect in terms of dust control and to reduce the environmental and other impacts; dust suppressant chemical can be a great option.

For Dust suppressant chemical

- EPRl's Dust Suppressant (hygroscopic liquid compound with bio-additives) helps to reduce dust for 5-6 hours, as compared to water which last for 15 - 30 minutes. EPRI's Dust suppressant spraying shows more efficiency to reduced particulate matter emission as compared to water spraying.
- The cost of EPRI's Dust Suppressant is less i.e. 10-15 paisa per m^2 with no maintenance and does not require any trained person and suitable for surface area and air, wide roads (Industrial areas, construction etc.).
- Application Rate: 2 litres per m^2.

Dust suppressant chemical Financial Calculation for 100 m^2 area:

As per results obtained from CPCB study, dust suppressant chemical lasts for 6-8 hours.

Considering application of chemical to be 2 times per day.

Total requirement of solution for 100m^2 area for single time= 200 lit.

Total requirement of solution for 100m^2 area for one day = 400 lit.

Chemical requirement (30%) = 120 lit

Water requirement (70%) = 280 lit.

Cost of chemical = 10-15 paisa per m^2

Total cost of chemical to be used during the day =Rs. 20-30 /-

4. Renewable Energy Initiatives

For renewable energy, DPA is already producing

- 20 MW of Wind energy
- 45 KWP Solar Plant at Gandhidham
- Initiation of solar power generation system with capacity 2 MW
- Already installed 400 KWP solar plant and 600 KWP to be installed this year
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.
- 6 MW wind power project have been commissioned at Village Sukhpur, District - Amreli, Gujarat on 31.03.2017
- 14 MW wind power project commissioned at Village Jodiya, District - Jamnagar, Gujarat on 30.03.2019.

As per above information, no additional initiative in renewable energy generation is required.

5. Waste Management:

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

6. Environmental Monitoring:

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

III. Development of 7 integrated facilities (Stage I) within existing Deendayal Authority at Kandla.

(Ref. No. 11-82/2011-IA.III dated 19/12/2016)

Project Status (up to Jan, 2024):

Name of Project	Status	Area (ha)
1. Development of oil jetty to handle liquid cargo and ship bunkering terminal at old Kandla under PP mode (jetty: 300m x 15m, approach 450 m X 10 m, back up area 5.5 HA, capacity – 3.39 MMTPA, capital dredging 1,73,660 m^3 maintenance dredging 1,56,294 m^3 (Estimated cost: 276.53 Cr.).	The Concession Agreement was executed between DPA and M/s KOTPL on 16/11/2013 to implement the project on Built, Transfer & Operate (BOT- PPP) Basis by M/s KOTPL. The award of concession was issued on 11/12/2020 to M/s KOTPL by DPA. The Project is under construction phase.	5.5
2. Multipurpose Cargo Terminal at Tekra off Tuna on BOT basis (T shape jetty 600 m X 80 m Capacity 18 MMTPA, back up area 101 Ha capital dredging 1,26,57,175 m^3 maintenance dredging 18,98,576. 25 m^3 Estimated cost: 1686.66 Cr.	The Board of DPA approved the Feasibility Report in its meeting on 19.02.2021. The MoPSW, GoI vide communication dated 21/10/2022 has conveyed approval granted by the Cabinet Committee on Economic Affairs to the project. The project is under bidding stage. No construction activity has started yet	101
3. Up gradation of Barge handling capacity at Bundar basis at Kandla capacity 3.33 MMTA back-up area 5 Ha, Estimated cost: 109.59 Cr.	The up-gradation work is completed.	5
4. Construction of Rail over Bridge at NH 8 A near Nakti Bridge (crossing of NH 8 A Estimated cost: 32.17 Cr.	Construction activity has not yet started.	1140 m
5. Mechanization of Dry Cargo handling capacity at Kandla Port (Berth 7 and 8 capacity 7.35 MMTPA estimated cost 80.61 Cr.	Mechanization works completed.	-
6. Strengthening of Oil jetty 1 (Estimated cost: 7.5 Cr.	Work completed.	-

7. Modification and strengthening of Cargo berth No. 6 at Kandla Port Estimated cost: 11.5 Cr.	Work completed.	-

Out of a total of 7 project activities, construction activities of 4 projects (i.e. Sr. No. 3, 5, 6 & 7 mentioned in the EC & CRZ Clearance) have already been completed. Whereas construction activity of the project at Sr. No. 2 & 4 have not yet started. Sr. No. 1 is under construction.

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Greenbelt Development		
1	As proposed, green belt over an area of 36.8 ha shall be developed with at least 10-meter-wide green belt on all sides along the periphery of the project area, in downward direction and along road side etc. Selection of plant species shall be as per the CPCB guidelines in consultation with the DFO.	As already informed, DPA entrusted work of green belt development in and around the Port area to the Forest Department, Gujarat at Rs. 352 lakhs (Area 32 hectares). The work is completed. Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The final report submitted by GUIDE, already submitted along with compliance report submitted on 12/04/2023. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The work is completed
2	Mangrove plantation in an area of 100ha shall be carried out by KPT within 2 years in a time bound manner. Action taken report shall be submitted to the Regional Office of MoEF&CC.	Mangrove Plantation carried out during (2018- 2020) through the Gujarat Ecology Commission. Totally DPA has undertaken Mangrove Plantation in an area of 1600 Hectares since the year 2005, through various agencies viz. GUIDE, GEC, State Forest Department etc., which includes 100 Ha. The details have already been communicated with the earlier compliance reports submitted.
Environmental Monitoring		
3	Automatic/Online monitoring system (24 x 7 monitoring devices)	For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO,

	for water pollution in respect of flow measurement and relevant pollutants in the treatment system to be installed. The data to be made available to the respective SPCB and in the company's website.	MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the annual environmental monitoring report submitted by GEMI, Gandhinagar.
4	Marine ecology shall also be monitored regularly in terms of sea weeds, grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine bio diversity components as part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity.	DPA assigned work to M/s GUIDE, Bhuj, for regular monitoring of Marine Ecology since the year 2017 and final reports prepared by GUIDE, Bhuj have already been communicated to the Integrated Regional Office, MoEF&CC, GoI, Gandhinagar as well as to the MoEF&CC, GoI, New Delhi along with compliance reports submitted from time to time. (Period from 2017 to 2021). Further, it is again to submit that DPA issued a work order to M/s GUIDE vide its letter no. EG/ WK/ 4751/ Part (Marine Ecology Monitoring) /11 dated 03/05/2021 for Regular monitoring of Marine Ecology in and around Deendayal Port Authority (Erstwhile Deendayal Port Trust) and continuous Monitoring Program covering all seasons on various aspects of the Coastal Environs for the period 2021- 24. Final Reports for the period 2021-22, 2022-23 & 2023-24, have already been submitted along with compliance report submitted from time to time. In continuation of the same, DPA issued a work order to M/s GUIDE vide its letter no. EG/ WK/ 4751/ Part (Marine Ecology Monitoring) /72 dated 10/06/2024 for further period of 2024 – 27.
5	PP shall install a continuous automatic ambient air quality monitoring system (24 x 7) for all relevant parameters at two locations to monitor the ambient air quality status of the project area. Data should be	a) For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the annual environmental monitoring report submitted by GEMI, Gandhinagar.

	transferred online to CPCB and SPCB websites.	DPA has already initiated the action for inviting the tenders for carrying out online ambient air quality monitoring system (24 X 7). However, no response received. Hence, now, DPA is exploring other possibilities for appointing agency for installation of CAAQMS system. b) Further, w.r.t. Project at Sr.No.1, kindly refer to the Monitoring reports submitted by M/s KOTPL along with compliance report.
6	Automatic/Online monitoring system (24 x 7 monitoring devices) for water pollution in respect of flow measurement and relevant pollutants in the treatment system to be installed. The data to be made available to the respective SPCB and in the company's website.	For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the annual environmental monitoring report submitted by GEMI, Gandhinagar.
7	Marine ecology shall also be monitored regularly in terms of sea weeds, grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine bio diversity components as part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity.	DPA assigned work to M/s GUIDE, Bhuj, for regular monitoring of Marine Ecology since the year 2017 and final reports prepared by GUIDE, Bhuj have already been communicated to the Integrated Regional Office, MoEF&CC, GoI, Gandhinagar as well as to the MoEF&CC, GoI, New Delhi along with compliance reports submitted from time to time. (Period from 2017 to 2021). Further, it is again to submit that DPA issued a work order to M/s GUIDE vide its letter no. EG/ WK/ 4751/ Part (Marine Ecology Monitoring) /11 dated 03/05/2021 for Regular monitoring of Marine Ecology in and around Deendayal Port Authority (Erstwhile Deendayal Port Trust) and continuous Monitoring Program covering all seasons on various aspects of the Coastal Environs for the period 2021- 24. Final Reports for the period 2021-22, 2022-23 & 2023-24, have already been submitted along with compliance report submitted from time to time. In continuation of the same, DPA issued a work order to M/s GUIDE vide its letter no. EG/ WK/ 4751/ Part

		(Marine Ecology Monitoring) /72 dated 10/06/2024 for further period of 2024 – 27.
Water Conservation		
8	The ground water shall not be tapped within the CRZ areas by the PP to meet with the water requirement in any case.	a) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) b) Further, w.r.t. Project at Sr. no.2 & 4 (construction not yet started), Water requirement will be met through procurement from GWSSB or private tankers. No ground water will be tapped. In addition, for completed projects, the Water requirement is being met through GWSSB (Narmada Pipeline) & through private tankers.
Waste Management		
9	Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they confirm to the standards laid down by competent authorities including the state or Central Pollution Control Board and under the Environmental (Protection) Act, 1986.	a) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project). b) Further, it is also relevant to submit here that, w.r.t. completed projects (modification/ strengthening/ up-gradation of existing facilities), Sewage is being treated in the STP of Kandla (1.5 MLD). The treated sewages from STP of DPA are utilized for plantation / Gardening. DPA has entered into 'Selling Agency' agreement with M/s. MSTC (Govt. of India Enterprise), Vadodara since 04/01/2022 for collection, transporting and disposal of scrap, surplus items, unserviceable equipment etc. Further, DPA has appointed GEMI, Gandhinagar for the work of "Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority" vide Work Order dated 24/01/2023. The work is completed.
10	All the operational areas will be connected with the network of liquid waste collection corridor comprising of storm water, oily waste and sewage collection pipelines.	The 4 projects completed are of modification/strengthening/up-gradation of existing facilities, having already developed network of storm water drainage & other facilities. Further, oil wastes are being disposed of by selling to the authorized vendor of GPCB/CPCB, as per norms.

		However, for the operational phase of the ongoing as well as the remaining projects, DPA/BOT operator will provide the necessary facilities
11	Ship/barges shall not be allowed to release any oily bilge waste or ballast water in the sea. Any effluent from the jetty which have leachable characteristics shall be segregated and recycled/disposed as per SPCB guideline.	It is assured that Ships/barges shall not be allowed to release any oily bilge waste or ballast water in the sea. It is assured that any effluent from the jetty which has leachable characteristics shall be segregated, treated and recycled/disposed of as per SPCB guidelines. DPA issued a Grant of License/Permission to collect and dispose of "Hazardous Waste/Sludge/ Waste Oil" from Vessels calling at Deendayal Port" through DPA contractors. Further, it is to state that, all ships are required to follow DG Shipping circulars regarding the reception facilities at Swachch Sagar portal.
12	Municipal Solid Waste and Hazardous wastes shall be managed as per Municipal Solid Waste Rule, 2016 and Hazardous Waste Management Rules 2016	Municipal solid waste and hazardous waste management by DPA are undertaken by appointing GPCB authorized vendor per the Municipal solid waste Rule, 2016 and Hazardous waste management Rules, 2016, for further treatment. Further, DPA has appointed GEMI, Gandhinagar for the work of "Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority" vide Work Order dated 24/01/2023. The work is completed.
Dust Management		
13	All the mechanized handling systems and other associated equipments such as hoppers, belt conveyors, stacker cum reclaimers shall have integrated dust suppression system. Dust suppression system shall be provided at all transfer point.	a) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project). b) DPA being an old establishment and the area is quite big, possibilities of mechanization is being explored. The work of mechanization at Cargo berth 8 and 9 were attended in 2023. However, both the tenders were discharged as none of the bidders were meeting the eligibility criteria. Based on stipulations requirement the project will be restructured accordingly. Further, w.r.t. Project at Sr.No.2 (construction not yet started), BOT operator will take the necessary step to provide all the mechanised handling systems and other associated equipment, such as hoppers, belt conveyors, and stacker cum reclaimers with integrated dust

		suppression systems. DPA/BOT operator will provide a Dust suppression system at all transfer points. DPA has already installed a water sprinkling system in the Port area for coal handling areas.
Other		
14	Dredged materials should be analyzed for presence of contaminants and also to decide the disposal options. Monitoring of dredging activities should be conducted and the findings should be shared with the Gujarat SPCB and regional office of the ministry	Dredged Material will be disposed of at designated location as identified by the CWPRS, Pune. DPA assigned work to M/s GUIDE, Bhuj for analysis of dredged material since the year 2017 and the reports are being submitted from time to time along with compliance reports submitted. In continuation of same, DPA had issued work order to GUIDE, Bhuj for "Study on dredged material for presence of Contaminants for year 2021-2024. The copy of 1st Season, 2nd season & 3rd reason report submitted by M/s GUIDE, Bhuj for the period 2023 2024
15	PP in consultation with GCZMA should prepare a regional strategic Impact Assessment Report with a special focus on region where the PP started construction without permission. The cost towards the study should be borne by the PP.	Based on the ToR finalized by the GCZMA vide letter dated 13/10/2022, M/s GUIDE, Bhuj had prepared and submitted final RSIA report dated 12/01/2024 Copy of same also submitted along with compliance report submitted on 25/07/2024. Further, a copy of final RSIA report has already been submitted to the GCZMA vide DPA letter dated 30/01/2024 and to the MoEF&CC, GOI vide DPA letter dated 30/01/2024 Copy of same also submitted along with compliance report submitted on 25/07/2024
16	A comprehensive and integrated conservation plan including detailed Bathymetry Study and protection of Creeks / Mangrove area including buffer zone, mapping of coordinates, running length, HTL, CRZ boundary should be	The final report submitted by M/s GUIDE, Bhuj (vide letter dated 21/5/2018) had already been communicated to the MoEF&CC, GoI, Bhopal & copy to the MoEF&CC, GoI, New Delhi, along with six monthly compliance report submitted vide letter dated 21/06/2018.

	put in place. The plan should take note of all the conditions of approvals granted to all the project Proponents in this area, and the reported cases of disappearance of Mangroves near project site. The preservation of entire area to maintain the fragile ecological conditions should be a part of the plan in relation to the creek and Mangrove conservation.	
17	Disposal sites for excavated materials should be so designed that the revised land use after dumping and changes in the land use pattern do not interfere with the natural drainage.	a) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project). b) For the remaining projects Sr. No 2 & 4 (construction not y et started), it is assured that the land use pattern will not interfere with the natural drainage.
18	Measure should be taken to contain, control and recover the accidental spills of fuel and cargo handle.	DPA already having Oil Spill Contingency Plan. An adequate control measure has already been taken to control and recover accidental fuel and cargo handle spills.
19	Location of DG sets and other emission generating equipment shall be decided keeping in view the predominant wind direction so that emission do not affect nearby resident areas. Installation and	a) DG sets will be installed keeping in view the predominant wind direction; as per prescribed guidelines, DG sets shall be used in case of power failure only. b) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project)

	operation of DG Sets shall comply with the guideline of CPCB	
20	The Project Proponent shall set up separate Environmental Management Cell for effective implementation of the stipulated environmental safeguards under the supervision of a senior executive	a) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) . b) DPA is already having Environment Management cell. Further, DPA has also appointed expert agency for providing Environmental Experts from time to time. Recently, DPA appointed M/s Precitech Laboratories, Vapi for providing Environmental Experts vide work order dated 5/2/2021. In addition, it is relevant to submit here that, DPA has appointed Manager (Environment) on contractual basis for the period of 3 years and further extendable to 2 years (Copy of the details has already been communicated with the last compliance report submitted).
21	The funds earmarked for environmental management plan shall be included in the budget and this shall not be diverted for any other purpose.	a) The allocation made under the "Environmental Services & Clearance of other related Expenditure" scheme during BE 2023-24 is Rs. 657 Lakhs. b) The funds earmarked for EMP by the Concessionaire M/s KOTPL w.r.t. project at Sr.No. 1 are delineated in the compliance report submitted.
22	Company shall prepare operating manual in respect of all activities. It shall cover all safety & environment related issues and system. Measure to be taken for protection. One set of environmental manuals shall be made available at the project site. Awareness shall be created at each level of the management. All the schedules and results of environmental monitoring shall be	The operating manual plan in respect of all activities has already been communicated along with the compliance report submitted vide letter dated 2/4/2019.

	available at the project site office.	

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Green belt development**

As per EC condition, greenbelt over an area of 36.8 ha shall be developed. As per current status, out of 110.5 ha land, only 10.5 is developed.

Facility	Land allotted (ha)	Plantation (ha)
Development of oil jetty at old Kandla	5.5	1.82
Multipurpose Cargo Terminal at Tekra off Tuna	101	33.33
Upgradation of Barge handling capacity at Bunder Basin at Kandla	5	1.65

So as per project status, 3.47 ha area is to be developed as greenbelt in the first phase. Rest of the area will be developed after the development of Multipurpose Cargo Terminal at Tekra off Tuna on BOT basis.

DPA entrusted work of green belt development in and around the Port area to the Gujarat Forest Department for 32-hectare area initiated in 2019 and the work is completed. This plantation has been offset for the 1st phase greenbelt of this project. So, no additional greenbelt development is required.

The total comprehensive plan of greenbelt consisting 36.8 ha is given in Annexure.

Mangrove plantation:

Mangrove plantation in an area of 100 ha is required to be done as per CRZ condition.

For this, as a part of mangrove conservation, DPA has undertaken Mangrove Plantation in an area of 1600 Hectares at various locations since 2005-06 under the directions of the GCZMA and MoEF&CC, GoI.

Further DPA has assigned work to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Mangrove Plantation in an area of 50 Ha for Deendayal Port Authority" for the period of 10/06/2024 to 09/03/2025.

So additional plantation may not be required for this project.

2. **Dust Management**

The roads in and around DPA are frequented by heavy loading vehicles of various categories contributing to road dust to a large extent. For road sweeping, the following Vacuum Sweeper, Regenerative air vacuum sweepers can be used. The cost of such sweepers varies between 30 lakhs to 70 lakhs in Indian market. Following machines can be used.

S. No.	Item	Cost	Remarks
1.	Vacuum Sweeper	30,00,000 to 70,00,000	For roadside and pavement dust sweeping
2.	Road washer truck	5,00,000 to 10,00,000	For washing of roads and pavements with heavy dust loading
3.	Dust suppressant chemical	Rs. 100-200 per kg	To be mixed with water and sprayed at surfaces with heavy dust loading such as on roadsides and coal yards

Water can be considered as one of the ancient dust palliatives, as it is readily available to apply by spraying over the surface of road. Water is used apply moisture to the surface area, but the capacity of dust suppression is less due to evaporation. In order to achieve the maximum effect in terms of dust control and to reduce the environmental and other impacts; dust suppressant chemical can be a great option.

For Dust suppressant chemical

- EPRl's Dust Suppressant (hygroscopic liquid compound with bio-additives) helps to reduce dust for 5-6 hours, as compared to water which last for 15 - 30 minutes. EPRI's Dust suppressant spraying shows more efficiency to reduced particulate matter emission as compared to water spraying.
- The cost of EPRI's Dust Suppressant is less i.e. 10-15 paisa per m2 with no maintenance and does not require any trained person and suitable for surface area and air, wide roads (Industrial areas, construction etc.).
- Application Rate: 2 litre per m^2

Dust suppressant chemical Financial Calculation for 100m^2 area:

As per results obtained from CPCB study, dust suppressant chemical lasts for 6-8 hours.

Considering application of chemical to be 2 times per day.

Total requirement of solution for 100m^2 area for single time= 200 lit.

Total requirement of solution for 100m^2 area for one day = 400 lit.

Chemical requirement (30%) = 120 lit

Water requirement (70%) = 280 lit.

Cost of chemical = 10-15 paisa per m^2

Total cost of chemical to be used during the day =Rs. 20-30 /-

3. **Waste Management:**

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

4. **Environmental Monitoring:**

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

IV. Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat. (1. Setting up of Oil Jetty No.7. 2. Setting up of Barge jetty at Jafarwadi 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; 5. Road connecting from Veera barge jetty to Tuna gate by M/s Deendayal Port Trust (Erstwhile Kandla Port Trust)

(Ref. No. F. No. 11-13/2015-IA-III dated 19/02/2020)

Current Project Status (Upto May 2024)

Name of Project	Status
Setting up of Oil Jetty No.7	Under operation w.e.f January 2023.
Setting up of Barge jetty at Jafarwadi	No construction activity started yet.
Setting up of Barge port at Veera	No construction activity started yet.
Administrative office building at Tuna Tekra	No construction activity started yet.
Road connecting from Veera barge jetty to Tuna gate	No construction activity started yet.

Status of compliance of various EC/CRZ conditions pertaining to EMP

S No.	Condition	Compliance
Greenbelt Development		
1	Implement the mangrove Development, Protection & Management plan for control of indirect impacts on mangrove habitat	DPA had already undertaken Mangrove Plantation in an area of 1600 Ha. till date since the year 2005. in addition to the above, DPA appointed M/s GUIDE, Bhuj, for "Regular Monitoring of Mangrove Plantation carried out by DPA" (period 15/9/2017 to 14/9/2018 vide work order dated 1/9/2017 and 24/5/2021 to 23/5/2022 vide work order dated 3/5/2021). The final report submitted by M/s GUIDE, Bhuj for the year 2021 to 2022.
2	Provision that mangrove areas get proper flushing water and free flow of water shall not be obstructed	provision will be made for mangrove areas will get proper flushing of water and free flow of water is not obstructed.

3	Massive green belt development activities in and around Kandla and also within the KPT limits	DPA assigned work for green belt development in an area of about 32 hectares to the Forest Department, Govt. of Gujarat, in August 2019 at the cost of Rs. 352.32 lakhs. The work is completed. Further, DPA also undertook massive green belt development in and around the Port area and at the Gandhidham area. DPA has appointed Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May, 2022. The work completed. A copy of Final report is submitted along with the compliance report submitted on 03/10/2023. Further DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The same is in process.
Waste Management		
4	Dispose of the dredged material only after scientific study to be carried out by the Institute of National repute and at a location suggested by them.	Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. Capital Dredging at O.J. completed on 14/04/2023. It is submitted that, in compliance of specific condition no. xi of the EC dated 19/02/2020 DPA appointed IIT Mumbai as an Independent agency for monitoring the dredging activities undertaken, vide work order no. HD/WK/1078/2022/OJ7/dredging/ENV610 dated 21/12/2022.
5	Maintain the record for generation and disposal of capital dredging and maintenance dredging	Point noted for the compliance

6	Regularly update their Local oil spill contingency and disaster management plan in consonance with the National oil Spill and Disaster Contingency plan and shall submit the same to this Department after having it vetted through the Indian Coast Guard.	DPA already has updated Disaster management plan and Local oil spill contingency plan, the last compliance report communicated vide letter dated 11/07/2022. DPA has also executed MOU with Oil companies, i.e., IOCL, HPCL, BPCL etc, for setting up of Tier I facility for combating the Oil Spill at Kandla.
7	The construction debris and/or any other type of waste shall not be disposed of into the sea, creek or in the CRZ areas. The debris shall be removed from the construction site immediately after the construction is over.	DPA had already issued general circular vide dated 3/9/2019 regarding Construction and Demolition Waste Management for strict implementation in DPA. Setting up of Oil jetty no. 7" is Completed and it is under operation w.e.f January 2023. The Consent to Operate (CCA) from the Gujarat Pollution Control Board has already been obtained dated 20/1/2023.
8	The construction and operational activities shall be carried out in such a way that there is no negative impact on mangrove and other coastal/marine habitats. The construction activities and dredging shall be carried out only under the constant supervision and guidelines of the Institute of National repute like NIOT	The construction work for the project at Sr 1 is completed and it is under operation w.e.f January 2023 and due care is being taken for so that, there is no negative impact on mangrove and other coastal/marine habitats. Further, for project at Sr. No. 2 to 5 (Construction not yet started); however, the specified condition will be complied with
Environmental Monitoring		
9	Environmental report indicating the changes if any, with respect to the baseline environmental quality in the coastal and marine environment	DPA has been conducting regular monitoring of Environmental parameters through NABL Accredited laboratory since the year 2016 in continuation of this DPA appointed M/s Gujarat Environment Management Institute (GEMI), Gandhinagar (NABL Accredited laboratory) for regular Monitoring of environmental parameters vide work order dated 15/02/2023. The work is in progress & DPA is submitting the monitoring data regularly to all

		the concerned authorities along with compliance reports submitted.
Dust Management		
10	All the recommendations and suggestions given by the Mantec Consultant Pvt. Ltd. New Delhi in their Comprehensive Environment Impact Assessment report for conservation/protection and betterment of environment shall be implemented strictly by the KPT.	DPA has installed Mist Canon at the Port area to minimize the dust DPA has already installed continuous sprinkling system to prevent dust pollution Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done Regular sweeping of spilled cargo from roads is done by parties on regular basis
Other		
11	A separate environmental management cell with qualified personnel shall be created for environmental monitoring and management during construction and operational phases of the project	DPA already has an Environment Management Cell. Further, DPA has also appointed an expert agency to provide Environmental Experts from time to time. Recently, DPA appointed M/s Precitech Laboratories, Vapi, vide work order dated 5/2/2021 Further, DPA has appointed a Manager Environment on a contractual basis for a period of 3+2 years.
12	A separate budget shall be earmarked for environmental management and socio-economic activities and details there of shall be furnished	DPA has already kept Rs. 657 lakhs in B.E. 2024-25 under the scheme "Environmental Services & Clearance thereof".
13	Contribute financially for taking up the socio-economic upliftment activities in this region in consultation with the Forests and Environment Department and the District Collector/District development officer.	DPA has already been undertaking CSR activities. The details of CSR Activities implemented as well as proposed
14	Cost of the external agency that may be appointed by this Department for supervision/monitoring of proposed activities and the	Point noted for the compliance.

	environmental impacts of the proposed activities.	
15	Contribute financially for any common study or project that may be proposed by this Department for environmental management/conservation /improvement for the Gulf of Kutch	Point noted for the compliance.

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Green belt development**

For greenbelt 3485 plants have been committed in the EIA report. As per current project status, Oil Jetty No.7 is completed. Rest of the project's construction activity has not started yet. Therefore, greenbelt development at present is not required. Greenbelt of 3485 plants would be done along the road connecting from Veera barge jetty to Tuna gate and across the periphery of administrative office building at Tuna Tekra once the construction work is completed. The plan is provided in the Annexure.

2. **Dust Management**

For road sweeping, the following Vacuum Sweeper, Regenerative air vacuum sweepers can be used. The cost of such sweepers varies between 30 lakhs to 70 lakhs in Indian market. Following machines can be used.

S. No.	Item	Cost	Remarks
1.	Vacuum Sweeper	30,00,000 to 70,00,000	For roadside and pavement dust sweeping
2.	Road washer truck	5,00,000 to 10,00,000	For washing of roads and pavements with heavy dust loading
3.	Dust suppressant chemical	Rs. 100-200 per kg	To be mixed with water and sprayed at surfaces with heavy dust loading such as on roadsides and coal yards

Water can be considered as one of the ancient dust palliatives, as it is readily available to apply by spraying over the surface of road. Water is used apply moisture to the surface area, but the capacity of dust suppression is less due to evaporation. In order to achieve the maximum effect in terms of dust control and to reduce the environmental and other impacts; dust suppressant chemical can be a great option.

For Dust suppressant chemical

- EPRl's Dust Suppressant (hygroscopic liquid compound with bio-additives) helps to reduce dust for 5-6 hours, as compared to water which last for 15 - 30 minutes. EPRl's Dust suppressant spraying shows more efficiency to reduced particulate matter emission as compared to water spraying.
- The cost of EPRI's Dust Suppressant is less i.e. 10-15 paisa per m^2 with no maintenance and does not require any trained person and suitable for surface area and air, wide roads (Industrial areas, construction etc.).
- Application Rate: 2 litre per m^2

Dust suppressant chemical Financial Calculation for 100m^2 area:

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Chemical requirement (30%) = 120 lit

Water requirement (70%) = 280 lit.

Cost of chemical = 10-15 paisa per m^2

Total cost of chemical to be used during the day =Rs. 20-30 /-

3. Renewable Energy Initiatives

I. Provide solar power generation on roof tops of buildings

As per the project area, 0.067 MW renewable energy from rooftop solar panels can be produced. DPA is already producing

- 20 MW of Wind energy
- 45 KWP solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham.
- 5.5 KWp solar roof top system under CSR scheme at Jeev Seva Samiti, Gandhidham.
- Initiation of solar power generation system with capacity 2 MW.
- Already installed 400 KWP solar plant and 600 KWP to be installed by PPP operator this year.
- Installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham.
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.

As per above information, no additional initiative in renewable energy generation required. However, DPA at its own discretion, can develop renewable energy generation capacity as per the design given in the Chapter- 7 of the report, after the construction is completed.

4. Waste Management:

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

5. Environmental Monitoring:

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly.

V. Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side Northeast of Antarjaal, South of Tagore Road, 580 Acres), Gandhidham, Kutch Gujarat by M/s Deendayal Port Authority

(Ref. No. 21- 295/2017-IA-III dated 10/10/2017)

Current Project Status (As on May 2024): **The construction has not yet started**

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Compliance	Condition
Greenbelt Development		
1.	A minimum of 1 tree for every 80 sqm of land should be planted and maintained. The existing trees will be counted for this purpose. Preference should be given to planting native species. Where the trees need to be cut, compensatory plantation in the ratio of 1:3 (i.e. planting of 3 trees for every 1 tree that is cut) shall be done and maintained. As proposed 3, 93,035 sq m area shall be provided for green belt development.	It is hereby assured that stipulated condition will form part of the contractor agreement and lessee agreement.
Renewable Energy		
2.	Open areas would be serviced by 100% Solar Lighting with a 50% power backup.	Shall be implemented
3.	Compliance with the Energy Conservation Building Code (ECBC) of Bureau of Energy Efficiency shall be ensured. Buildings in the States which have notified their own ECBC, shall comply with the State ECBC. Outdoor and common area lighting shall be LED. Concept of passive solar design that minimize energy consumption in buildings by using design elements, such as building orientation, landscaping, efficient building envelope, appropriate fenestration, increased daylighting design and thermal mass etc. shall	It is hereby assured that stipulated condition will form part of the contractor agreement and lessee agreement.

	be incorporated in the building design. Wall, window, and roof uvalues shall be as per ECBC specifications.	
4.	Solar based electric power shall be provided to each unit for at least two bulbs/light and one fan. As proposed, central lighting and street lighting shall also be based on solar power.	It is hereby assured that the stipulated condition will form part of the contractor agreement and lessee agreement.
5.	Solar, wind or other Renewable Energy shall be installed to meet electricity generation equivalent to 1% of the demand load or as per the state level/ local building by-laws requirement, whichever is higher.	it is hereby assured that, Solar, wind, or other Renewable Energy will be installed to meet electricity generation equivalent to 1% of the demand load or as per EC Condition by DPA/Plot Allottee as applicable.
6.	Solar power shall be used for lighting in the apartment to reduce the power load on grid. Separate electric meter shall be installed for solar power. Solar water heating shall be provided to meet 20% of the hot water demand of the commercial and institutional building or as per the requirement of the local building bye-laws, whichever is higher. Residential buildings are also recommended to meet its hot water demand from solar water heaters, as far as possible.	It is hereby assured that the stipulated condition will form part of the contractor agreement and lessee agreement.
7.	Energy conservation measures like installation of CFLs/ LED for the lighting the area outside the building should be integral part of the project design and should be in place before project commissioning. Used CFLs, TFL and LED shall be properly collected and disposed of/sent for recycling as per the prevailing guidelines/rules of the regulatory	It is hereby assured that the stipulated condition will form part of the contractor agreement and lessee agreement.

	authority to avoid mercury contamination.	
Environment Monitoring		
8.	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM, SO2, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	DPA has already submitted the status of compliance with the stipulated EC conditions to R.O., MoEF&CC, and other statutory authorities vide their letter dated 05/01/2024, and the same has been uploaded on the DPA website.
Waste Management		
9.	Sewage shall be treated in the STP based on Submerged Aerated Fixed Reactor and Moving Bed Bio-Reactor (MBBR) technology with tertiary treatment (preferably Ultra Filtration). The treated effluent from STP shall be recycled/reused for flushing, horticulture, and road washing.	It is hereby assured that the stipulated condition will form part of the contractor agreement and lessee agreement.
10.	The project will provide a CETP for effluent treatment.	Residential & allied cum commercial development, the necessary space of about 6.31 acres has already been earmarked in the Master Plan of SIPC for the development of STP.
11.	Separate wet and dry bins must be provided in each unit and at the ground level for facilitating segregation of waste. Solid waste shall be segregated into wet garbage	It is hereby assured that the stipulated condition will form part of the contractor agreement and lessee agreement.

	and inert materials. Wet garbage shall be composted in Organic Waste Converter. As proposed 1-acre space shall be provided for solid waste management within the premises which will include area for segregation, composting. The inert waste from group housing project will be sent to dumping site	
12.	All construction and demolition debris shall be stored at the site (and not dumped on the roads or open spaces outside) before they are properly disposed. All demolition and construction waste shall be managed as per the provisions of the Construction and Demolition Waste Rules, 2016. All workers working at the construction site and involved in loading, unloading, carriage of construction material and construction debris or working in any area with dust pollution shall be provided with dust mask	It is hereby assured that the stipulated condition will form part of the contractor agreement and lessee agreement. Further, it is relevant to mention here that, DPA had already issued a circular vide dated 3/9/2019 regarding Construction and Demolition Waste Management for strict implementation in DPA.
13.	Any hazardous waste generated during construction phase shall be disposed of as per applicable rules and norms with necessary approvals of the State Pollution Control Board.	It is hereby assured that the stipulated condition will form part of the contractor agreement and lessee agreement.
14.	The provisions of the Solid Waste Management Rules, 2016, e-Waste (Management) Rules, 2016, the Construction and Demolition Waste Management Rules, 2016, and the Plastics Waste Management Rules, 2016 shall be followed.	It is hereby assured that the stipulated condition will form part of the contractor agreement and lessee agreement.
Water Conservation		
15.	The local bye-law provisions on rainwater harvesting should be followed. If local byelaw provision is not available, adequate provision for	It is hereby assured that the stipulated condition will form part of the contractor agreement and lessee agreement.

	storage and recharge should be followed as per the Ministry of Urban Development Model Building Byelaws, 2016. As proposed, 2 nos. of rainwater storage ponds (catchment channels) for safe percolation of water into ground shall be provided as per CGWB guidelines.	
Dust Management		
16.	Construction site shall be adequately barricaded before the construction begins. Dust, smoke & other air pollution prevention measures shall be provided for the building as well as the site. These measures shall include screens for the building under construction, continuous dust/windbreaking walls all around the site (at least 3-meter height). Plastic/tarpaulin sheet covers shall be provided for vehicles bringing in sand, cement, murram and other construction materials prone to causing dust pollution at the site as wells taking out debris from the site. Sand, murram, loose soil, cement, stored on site shall be covered adequately so as to prevent dust pollution. Wet jet shall be provided for grinding and stone cutting. Unpaved surfaces and loose soil shall be adequately sprinkled with water to suppress dust.	It is hereby assured that stipulated condition will form part of the contractor agreement and lessee agreement.

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Greenbelt development**

As per EC condition, greenbelt over an area of 39.3 ha shall be developed. As per current status, the construction activity for development of 580 acres of land has not started yet. Greenbelt development would be initiated as the project construction progresses. As of now, no greenbelt development is required. The detailed greenbelt plan is available in Annexure.

2. Dust Management

For road sweeping, the following Vacuum Sweeper, Regenerative air vacuum sweepers can be used. The cost of such sweepers varies between 30 lakhs to 70 lakhs in Indian market. Following machines can be used.

S. No.	Item	Cost	Remarks
1	Vacuum Sweeper	30,00,000 to 70,00,000	For roadside and pavement dust sweeping
2	Road washer truck	5,00,000 to 10,00,000	For washing of roads and pavements with heavy dust loading
3	Dust suppressant chemical	Rs. 100-200 per kg	To be mixed with water and sprayed at surfaces with heavy dust loading such as on roadsides and coal yards

DPA has installed Mist Canon at the Port area to minimize the dust. Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done. The mix of dust suppressant with water should be employed instead of spraying only water through sprinklers and mist cannon.

Water can be considered as one of the ancient dust palliatives, as it is readily available to apply by spraying over the surface of road. Water is used apply moisture to the surface area, but the capacity of dust suppression is less due to evaporation. In order to achieve the maximum effect in terms of dust control and to reduce the environmental and other impacts; dust suppressant chemical can be a great option.

For dust suppressant chemical

- EPRl's Dust Suppressant (hygroscopic liquid compound with bio-additives) helps to reduce dust for 5-6 hours, as compared to water which last for 15 - 30 minutes. EPRl's Dust suppressant spraying shows more efficiency to reduced particulate matter emission as compared to water spraying.
- The cost of EPRI's Dust Suppressant is less i.e. 10-15 paisa per m^2 with no maintenance and does not require any trained person and suitable for surface area and air, wide roads (Industrial areas, construction etc.).
- Application Rate: 2 litre per m^2

Dust suppressant chemical Financial Calculation for 100m^2 area:

As per results obtained from CPCB study, dust suppressant chemical lasts for 6-8 hours.

Considering application of chemical to be 2 times per day.

Total requirement of solution for 100m^2 area for single time= 200 lit.

Total requirement of solution for 100m^2 area for one day = 400 lit.

Chemical requirement (30%) = 120 lit

Water requirement (70%) = 280 lit.

Cost of chemical = 10-15 paisa per m^2

Total cost of chemical to be used during the day =Rs. 20-30 /-

3. Renewable Energy Initiatives

I. **Provide solar power generation on roof tops of buildings**

As per the availability of rooftop area for the project, it is estimated to produce 66.43 MW renewable energy through solar rooftop. DPA is already producing

- 20 MW of Wind energy
- 45 KWP solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham.
- 5.5 KWp solar roof top system under CSR scheme at Jeev Seva Samiti, Gandhidham.
- Initiation of solar power generation system with capacity 2 MW.
- Already installed 400 KWP solar plant and 600 KWP to be installed by PPP operator this year.
- Installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham.
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.

As per above information, no additional initiative in renewable energy generation required. However, DPA in its own discretion, can develop renewable energy generation capacity as per the design given in chapter- 7 of the report after the construction completed.

II. **Solar Street lighting**:
Necessary solar lighting will be installed in the SIPC project as per the requirement of the condition.

III. **Renewable Energy= 1% of the power demand**.
As per the EIA report, 37 MW is the maximum power demand. As mentioned above, no additional initiative in renewable energy generation is required, however, to meet 1% power demand from renewable energy, DPA at its discretion can develop solar rooftop on the site. The detailed design of solar rooftop is mentioned in the chapter 7 (7.4.1).

4. Waste Management:

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

5. Environmental Monitoring:

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

6. Water Conservation:

DPA has appointed GEMI, Gandhinagar, for planning of rainwater harvesting system. Report of the same is annexed separately.

VI. Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850 Acres), Gandhidham, Kutch - Gujarat

(Ref. No. 21-169/2017-IA-III dated 10-10-2017)

Present Status of the project: The basic Infrastructure facilities proposed to be developed by DPA in the SIPC Project consists of various components viz. Development of Land (land filling), Roads, Utilities, UG & OHT etc. out of which the work of land filling is completed. Road of Stage I is completed in Oct 2021. Development of road and storm water drainage for Plot no. 49 is completed.

Presently the total project area of Smart Industrial Port City Location-2, Kandla is 843.16 acres instead of **849.84 acres due to 6.23 acres** of Smart Industrial Port City Location-2 has given to ROB which was constructed & completed recently.

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Greenbelt Development		
1.	A minimum of 1 tree for every 80 sqm of land should be planted and maintained. The existing trees will be counted for this purpose. Preference should be given to planting native species. Where the trees need to be cut, compensatory plantation in the ratio of 1:3 (i.e. planting of 3 trees for every 1 tree that is cut) shall be done and maintained. As proposed 3,80,158 sqm area shall be provided for green belt development	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance.
Waste Management		
2.	Sewage shall be treated in the STP based on Submerged Aerated Fixed Reactor and Moving Bed Bio Reactor (MBBR) technology with tertiary treatment (preferably Ultra Filtration). The treated effluent from STP shall be	Noted. Area of about 2.88 acres is earmarked for STP. After sufficient no. of industries are set up, assessment will be done and accordingly STP will be developed. At present only one plot is allotted. The allottee has submitted that, the STP of 20 KLD is installed and the recycled water is used for flushing, horticulture, road washing and gardening.

	recycled/re-used for flushing, horticulture, and road washing.	
3.	The project will provide a CETP for effluent treatment	Area of about 2.88 acres is earmarked for STP/CETP. At present only one plot is allotted. After sufficient no. of industries is set up, assessment will be done and accordingly CETP will be developed. Before that every plot owner shall treat their waste by own by providing appropriate arrangement. Further, the treated sewage will be recycled/reused by the plot owner.
4.	Separate wet and dry bins must be provided in each unit and at the ground level for facilitating segregation of waste. Solid waste shall be segregated into wet garbage and inert materials. Wet garbage shall be composted in Organic Waste Converter. Adequate space shall be provided for solid waste management within the premises which will include area for segregation, composting. The inert waste from group housing project will be sent to dumping site	Point noted. EC conditions will be made as a part of lease agreement with the Plot allottee. At present only one plot is allotted.
5.	The provisions of the SWM Rules, 2016, e-Waste (Management) Rules, 2016, the C&D Waste Management Rules, 2016 and the PWM Rules, 2016 shall be followed.	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance.
6.	Sludge from the onsite sewage treatment, including septic tanks, shall be collected, conveyed and disposed as per	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will

	the Ministry of Urban Development, Central Public Health and Environmental Engineering Organization (CPHEEO) Manual on Sewerage and Sewage Treatment Systems, 2013	be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance.
7.	No sewage or untreated effluent water would be discharged through storm water drains	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance.
8.	Any hazardous waste generated during construction phase, shall be disposed off as per applicable rules and norms with necessary approvals of the State Pollution Control Board	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance.
Renewable Energy		
9.	Open areas would be serviced by 100% Solar Lighting with a 50% power backup.	Necessary solar lighting will be installed in the SIPC project as per the requirement of the condition. At present only one plot is allotted. The allottee has submitted that, the solar power generation system with capacity 2 MW has been initiated
10.	Solar, wind or other Renewable Energy shall be installed to meet electricity generation equivalent to 1% of the demand load or as per the state level/ local building bye laws requirement, whichever is higher	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, solar

		power generation of 2 MW capacity has been installed.
11.	Solar power shall be used for lighting in the apartment to reduce the power load on grid. Separate electric meter shall be installed for solar power. Solar water heating shall be provided to meet 20% of the hot water demand of the commercial and institutional building or as per the requirement of the local building bye-laws, whichever is higher. Residential buildings are also recommended to meet its hot water demand from solar water heaters, as far as possible.	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee.
12.	Energy conservation measures like installation of CFLs/ LED for the lighting the area outside the building should be integral part of the project design and should be in place before project commissioning. Used CFLs, TFL and LED shall be properly collected and disposed off/sent for recycling as per the prevailing guidelines/rules of the regulatory authority to avoid mercury contamination.	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance.
Water Conservation		
13.	The quantity of fresh water usage, water recycling and rainwater harvesting shall be measured and recorded to monitor the water balance as projected by the project proponent. The record shall be submitted to the Regional	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee.

	Office, MoEF&CC along with six monthly Monitoring reports.	At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance.
Dust Management		
14.	Construction site shall be adequately barricaded before the construction begins. Dust, smoke & other air pollution prevention measures shall be provided for the building as well as the site. These measures shall include screens for the building under construction, continuous dust/ wind breaking walls all around the site (at least 3-meter height). Plastic/ tarpaulin sheet covers shall be provided for vehicles bringing in sand, cement, murram and other construction materials prone to causing dust pollution at the site as well as taking out debris from the site. Sand, murram, loose soil, cement, stored on site shall be covered adequately so as to prevent dust pollution. Wet jet shall be provided for grinding and stone cutting. Unpaved surfaces and loose soil shall be adequately sprinkled with water to suppress dust.	Noted for compliance. DPA will develop basic infrastructure facilities land filling, Roads, SWd's etc. within the SIPC and then, Plots will be allotted to the successful bidder through e-tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance.
Others		
15.	Use of environment friendly materials in bricks, blocks and other construction materials, shall be required for at least 20% of the construction material quantity. These include Fly Ash bricks, hollow bricks, AACs, Fly Ash Lime Gypsum blocks, Compressed	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee.

	earth blocks, and other environment friendly materials. Fly ash should be used as building material in the construction as per the provision of Fly Ash Notification of September, 1999 and amended as on 27th August, 2003 and 25th January, 2016. Ready mixed concrete must be used in building construction.	At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, ready-mix concrete is used in building construction.
16.	For indoor air quality the ventilation provisions as per National Building Code of India.	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance.
17.	An environmental management plan (EMP) shall be prepared and implemented to ensure compliance with the environmental conditions specified above. A dedicated Environment Monitoring Cell with defined functions and responsibility shall be put in place to implement the EMP. The environmental cell shall ensure that the environment infrastructure like Sewage Treatment Plant, Landscaping, Rain Water Harvesting, Energy efficiency and conservation, water efficiency and conservation, solid waste management, renewable energy etc. are kept operational and meet the required standards. The	EMP prepared and incorporated in EIA by M/s EQMS India Pvt. Ltd., Copy already forwarded vide EC Compliance dated 07.08.2018. Plots will be allotted to the successful bidder through e-tender cum e auction process for further development for various permissible purposes. EC conditions will be made as a part of lease agreement with the Plot allottee. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, they are complying with the environmental conditions specified herein.

	environmental cell shall also keep the record of environment monitoring and those related to the environment infrastructure.	
18.	The company shall draw up and implement a corporate social Responsibility plan as per the Company's Act of 2013	Noted. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, they are complying with the condition specified. Further, it is relevant to mention here that, DPA has already done CSR activities for Upliftment and Socioeconomic welfare as per guideline of Ministry of Shipping.
19.	An assessment of the cumulative impact of all activities being carried out or proposed to be carried out by the project, shall be made for traffic densities and parking capabilities in a 05 kms radius from the site. A detailed traffic management and a traffic decongestion plan drawn up through an organization of repute and specializing in Transport Planning shall be implemented to the satisfaction of the State Urban Development and Transport Departments shall also include the consent of all the concerned implementing agencies.	DPA appointed M/s Tata Consulting Engineers Limited for preparation of Master Plan of the proposed SIPC Location 1 (Adipur) & Location 2 (Kandla) in 2016, in the said Master Plan, M/s Tata had incorporated traffic studies & management, Copy already forwarded vide EC Compliance dated 07.08.2018.
20.	The funds earmarked for environmental protection measures shall be kept in separate account and shall not be diverted for other purpose. Year-wise expenditure shall be reported to this Ministry and its concerned Regional Office	Noted please. The allocation made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" during BE 2022-23 is Rs. 345 Lakhs & BE 2023-24 is Rs. 274 Lakhs.

21.	At least 20% of the open spaces as required by the local building bye laws shall be pervious. Use of Grass pavers, paver blocks with at least 50% opening, landscape etc. would be considered as pervious surface	Noted please. Plots will be allotted to the successful bidder through e tender cum e-auction process for further development for various permissible purposes. At present, DPA allotted only one plot in SIPC project. The allottee has submitted that, the condition specified herein is in compliance. EC conditions will be made as a part of lease agreement with the Plot allottee.

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Green belt development**

As per EC condition, greenbelt over an area of 39.3 ha shall be developed. As per current status, the basic Infrastructure facilities proposed to be developed by DPA in the SIPC Project consists of various components viz. Development of Land (land filling), Roads, Utilities, UG & OHT etc. out of which the Work of land filling is completed. Road of Stage I is completed in Oct 2021. Development of road and Storm water drainage for Plot no. 49 is completed.

As the development progresses, phase-wise greenbelt would be developed as per plan provided in Annexure. As of now, no greenbelt provision is required.

2. **Dust Management**

For road sweeping, the following Vacuum Sweeper, Regenerative air vacuum sweepers can be used. The cost of such sweepers varies between 30 lakhs to 70 lakhs in Indian market. Following machines can be used.

S no.	Item	Cost	Remarks
1	Vacuum Sweeper	30,00,000 to 70,00,000	For roadside and pavement dust sweeping
2	Road washer truck	5,00,000 to 10,00,000	For washing of roads and pavements with heavy dust loading
3	Dust suppressant chemical	Rs. 100-200 per kg	To be mixed with water and sprayed at surfaces with heavy dust loading such as on roadsides and coal yards

DPA has installed Mist Canon at the Port area to minimize the dust. Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done. The mix of dust suppressant with water should be employed instead of spraying only water through sprinklers and mist cannon.

Water can be considered as one of the ancient dust palliatives, as it is readily available to apply by spraying over the surface of road. Water is used apply moisture to the surface area, but the capacity of dust suppression is less due to evaporation. In order to achieve the

maximum effect in terms of dust control and to reduce the environmental and other impacts; dust suppressant chemical can be a great option.

For Dust suppressant chemical

- EPRl's Dust Suppressant (hygroscopic liquid compound with bio-additives) helps to reduce dust for 5-6 hours, as compared to water which last for 15 - 30 minutes. EPRl's Dust suppressant spraying shows more efficiency to reduced particulate matter emission as compared to water spraying.
- The cost of EPRI's Dust Suppressant is less i.e. 10-15 paisa per m^2 with no maintenance and does not require any trained person and suitable for surface area and air, wide roads (Industrial areas, construction etc.).
- Application Rate: 2 litre per m^2

Dust suppressant chemical Financial Calculation for 100 m^2 area:

- As per results obtained from CPCB study, dust suppressant chemical lasts for 6-8 hours.
- Considering application of chemical to be 2 times per day.
- Total requirement of solution for 100 m^2 area for single time= 200 lit.
- Total requirement of solution for 100 m^2 area for one day = 400 lit.
- Chemical requirement (30%) = 120 lit
- Water requirement (70%) = 280 lit.
- Cost of chemical = 10-15 paisa per m^2
- Total cost of chemical to be used during the day =Rs. 20-30 /-

3. Renewable Energy Initiatives

I. Provide solar power generation on roof tops of buildings

As per the project area, 110 MW renewable energy from rooftop solar panels can be produced. DPA is already producing

- 20 MW of Wind energy
- 45 KWP solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham.
- 5.5 KWp solar roof top system under CSR scheme at Jeev Seva Samiti, Gandhidham.
- Initiation of solar power generation system with capacity 2 MW.
- Already installed 400 KWP solar plant and 600 KWP to be installed by PPP operator this year.
- Installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham.
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.

As per above information, no additional initiative in renewable energy generation is required. However, DPA at its discretion, can develop renewable energy generation capacity as per the plan given in chapter-7 of the report after the construction is completed.

II. **Solar Street lighting**:

Necessary solar lighting will be installed in the SIPC project as per the requirement of the condition once the master plan is developed.

III. **Renewable Energy equivalent to 1% of the power demand**.

As per the EIA report, 41MW is the maximum power demand. Already 2MW solar power project initiation is done by the plot allottee, which fulfils the 1% power demand by renewable energy sources.

4. Waste Management:

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

5. Environmental Monitoring:

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

6. Water Conservation:

DPA has appointed GEMI, Gandhinagar, for planning of rainwater harvesting system. Report of the same is annexed separately.

VII. Construction of Interchange cum Road Over Bridge (ROB) at LC-236 (Kutch salt junction) on N.H-141 to Nehru gate of Kandla port, Gandhidham, Kutch

(Ref. No. SEIAA/GUJ/EC/8(b)/728/2020 DATED 19-06-2020)

Project status: The work is already completed.

Status of compliance of various EC/CRZ conditions pertaining to EMP

S No.	Condition	Compliance
	Greenbelt Development	
1.	Green belt area of 25,000 m^2 (2.5ha) shall be developed as proposed plantation along the bridge and road shall be done with native verities	It was ensured that the that green belt area was developed as per the tender provision.
	Renewable Energy	
2.	1.) Application of solar energy shall be incorporated for illumination of common areas, lighting for gardens and street lighting: In addition, the provision for the solar water heating system shall also be provided 2.) Energy conservation measures like maximum use of natural light, wind & ventilation through architectural design, solar based LED lights in landscaped and drive way areas etc. shall be provided as proposed	1.) Point noted for compliance 2.) It was ensured that the LED lights are provided in all the offices and site for energy conservation
	Water Conservation	
3.	1) A water meter shall be installed on rainwater harvesting & ground water recharge well system & compliance report of the same shall be submitted to concerned authorities 2) Rain water harvesting system shall be properly maintained & kept functional and periodical cleaning of the same shall be undertaken specifically including the period before onset of the monsoon.	1) Not applicable as the project 2) IPRCL has submitted that this segment is not applicable as the project site area has saline water and impervious soil strata
	Waste Management	
4.	The project proponent strictly complies with the rules and regulations with regards to handling and disposal of hazardous waste in accordance with the Hazardous	No hazardous waste was generated during the project construction.

	waste (Management, Handling and Transboundary) Rules 2008. Authorization from the GPCB must be obtained for collection/ treatment/ storage/ disposal of hazardous wastes.	
5.	The Project proponent shall have to ensure that the plastic waste is segregated and disposed of by selling it to be registered recycler	IPRCL was ensured that the Container/Carboys and used/Lubricating oil sold to the authorized recycler only
6.	Necessary arrangements shall be made for safe disposal of municipal solid waste management rules,2016 as amended from time to time and solid wastes shall not be released in marine water/ coastal area in any case	It was ensured that the Solid Wastes are disposed in compliance to the Solid Waste Management rules-2016

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Green belt development**

DPA has already planted 4500 plants which have been planted at RoB site which can be incorporated for 2.5 ha planation (considering the Plantation density of approx. 1800 plants per hectare). Considering this, no additional greenbelt development is required in this project.

2. **Renewable Energy Initiatives**

DPA is producing

- 20 MW of Wind energy
- 45 KWP solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham.
- 5.5 KWp solar roof top system under CSR scheme at Jeev Seva Samiti, Gandhidham.
- Initiation of solar power generation system with capacity 2 MW.
- Already installed 400 KWP solar plant and 600 KWP to be installed by PPP operator this year.
- Installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham.
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.

As per above information, no additional initiative in renewable energy generation is required. However, DPA at its discretion, can develop renewable energy generation capacity as per the plan given in the chapter-7 of the report after the construction is completed.

I. **Street lighting:** The detailed design of solar street lighting along the road side is mentioned in the chapter-7 along with the cost calculation.

VIII. Construction of 13th to 16th Cargo Berths at Deendayal Port Authority (Erstwhile: Deendayal Port Trust)

(Ref. No. 11-70/2006-IA-III dated 1/10/2008)

Status of project:

- 13th Cargo Berth: Under operation since 18/2/2013.
- 15th Cargo Berth: Under Operation since 16/11/2013.
- 14th Cargo Berth: Under Operation since 8/4/2019.
- 16th Cargo Berth: Under Operation since 10/3/2019.

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Greenbelt Development		
EC		
1.	Green belt area shall be developed along the project and budget earmarked.	DPA had entrusted the work to the Forest Department, Gujarat, for developing a green belt in and around the Port area at a cost of Rs. 352 lakhs in an area of about 32 hectares, and the work is already completed. Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE], dated 31st May 2022. The final report has already been communicated with the last compliance report. DPA has assigned the Greenbelt development in Deendayal Port Authority and its surrounding areas, Phase II, to M/s GUIDE vide Work order EG/WK/4751/Part (Greenbelt)/327 dated 23.06.2023. The work is completed..
CRZ		
2.	Mangrove plantation in an area of 1000 ha. Shall be carried out by the KPT within 5 years in time bound manner on Gujarat coastline either within or outside the Kandla port	As per the directions of the GCZMA and MoEF&CC, GoI, to date, DPA has undertaken a Mangrove Plantation in an area of 1600 Hectares since the year 2005. The details have already been communicated with the earlier compliance reports submitted.

	Trust area at an appropriate place in consultation with the Forest and Environment Department. A six-monthly compliance report along with the satellite images shall be submitted to the Ministry of Environment and Forest as well as to this Department without fail.	It is also relevant to submit here that, as per the direction of the Gujarat Coastal Zone Management Authority, DPA had already prepared & submitted a report on mangrove conservation and management plan formulated by Gujarat Institute of Desert Ecology during the study period of Jan-April, 2015 (Report already submitted along with earlier compliance reports submitted). For regular monitoring, DPA vide work order dated 3/5/2021 has assigned work to M/s GUIDE, Bhuj, for Monitoring of mangrove plantation carried out by DPA (Period from 24/5/2021 to 23/5/2022). The final report submitted by GUIDE, Bhuj has already been communicated with the last compliance report submitted. Further DPA has assigned work to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Monitoring of Mangrove Plantation 1600 Ha carried out by DPA" for the Period of 10/06/2024 to 09/06/2025. The Inception report is submitted by GUIDE, Bhuj.
3.	The KPT shall take up massive greenbelt development activities in and around Kandla and also within the KPT limits.	Deendayal Port Authority had taken up massive greenbelt development activities in and around Kandla, Residential colony, administrative building, etc. DPA had entrusted the work to the Forest Department, Gujarat, in August 2019 for developing a green belt in and around the Port area at a cost of Rs. 352 lakhs in an area of about 32 hectares, and the work is completed. Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l) (5,000 plants)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The work is completed. Further, DPA assigned work to GUIDE, Bhuj, via a work order dated 23/06/2023 for "Green belt development in Deendayal Port Authority and its

		Surrounding Areas (Phase II) (10,000 plants). The work is completed.
Waste Management		
EC		
4.	The project authorities must make necessary arrangement for disposal of solid wastes and for the treatment of Effluents by providing a proper wastewater treatment plant outside the COASTAL REGULATION ZONE area. The quality of treated effluents, solid wastes and noise level etc. must conform to the standards laid down by the competent authorities including the Central/State Pollution Control Board and the Union Ministry of Environment and Forests under the Environment (Protection) Act, 1986, whichever are more stringent.	Companies authorized by the State Pollution Control Board (SPCB) have been awarded the work of collecting, transporting, and disposing of solid waste by the Deendayal Port Authority. Further, DPA has appointed GEMI, Gandhinagar, for the work of "Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority" vide Work Order dated 24/01/2023. The work is in progress. Generated sewage is treated in DPA's existing STP (1.5 MLD capacity). In addition to that, it also has septic tanks at places where STP is inaccessible. DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters, and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the latest environmental monitoring report submitted by GEMI, Gandhinagar.
5.	Sewage arising in the Port area shall be treated to conform to the standards stipulated by Gujarat State Pollution Control Board and shall be utilized/ recycled or gardening, plantation and irrigation.	The sewage generated in the port area is treated in the 1.5 MLD STP at Kandla. The treated wastewater is utilized for gardening and plantation purposes. In addition to that, it also has septic tanks at places where STP is inaccessible. DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters, and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to

		regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the latest environmental monitoring report submitted by GEMI, Gandhinagar.
CRZ		
6.	No effluent or sewage shall be discharged into the sea/creek or in the CRZ area and It shall be treated to conform to the Norms prescribed by Gujarat Pollution Control Board and would be reused/recycled within the plant premises to the extent possible.	Generated sewage is treated in DPA's existing STP (1.5 MLD capacity). In addition to that, it also has septic tanks at places where STP is inaccessible. The treated sewage is being used for gardening and plantation purposes. DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters, and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the latest environmental monitoring report submitted by GEMI, Gandhinagar.
Environmental Monitoring		
EC		
7.	The proponents shall provide for a regular monitoring mechanism as to ensure that the treated effluents conform to the prescribed standards. The records of analysis reports must be properly maintained and made available for inspection to the concerned State/Central officials during their visits.	DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters, and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the latest environmental monitoring report submitted by GEMI, Gandhinagar.
8.	In order to carry out the environmental monitoring during the operational phase of the project, the	DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters, and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar.

	project authorities shall provide an environmental laboratory well equipped with standard equipment and facilities and qualified manpower to carry out the testing of various environmental parameters.	Recently, DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the latest environmental monitoring report submitted by GEMI, Gandhinagar.
CRZ		
9.	An Environmental report indicating the changes, if any, with respect to the baseline environmental quality in the coastal and marine environment shall be submitted every year by the KPT to this Department as well as to the MoEF, GOI.	DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters, and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the latest environmental monitoring report submitted by GEMI, Gandhinagar.
Other		
EC		
10.	Project proponent shall prepare Disaster Management Plan covering emergency evacuation mechanisms etc.deal with natural disaster events and regularly update from time to time.	DPA is already having a Disaster Management Plan.
11.	No product other than those permissible in the COASTAL REGULATION ZONE Notification, 1991 shall be stored in the COASTAL REGULATION ZONE area.	Point Noted. Cargo is being stored at the backup area of berths, viz. 13th to 16th CB, as per the EC & CRZ Clearance accorded by the MoEF&CC, GoI.
12.	The funds earmarked for environment protection measures shall be	Point noted. The allocation made under the scheme of "Environmental Services & Clearance thereof

	maintained, in a separate account and there shall be no diversion of these funds for any other purpose. A year-wise expenditure on environmental safeguards shall be reported to this Ministry's Regional Office at Bhopal and the State Pollution Control Board	other related Expenditure" during BE 2024 25 is Rs. 657 Lakhs. The expenditure made under the "Environmental Services & Clearance of other related Expenditure" is Rs. 172 Lakhs from up to September 2024. The yearly expenditure on environmental safeguards is regularly submitted in the monitoring datasheet to the Ministry's Regional Office at Bhopal (Now Gandhinagar).
CRZ		
13.	The KPT shall participate financially for installing and operating the Vessel Traffic Management System in the Gulf of Kachchh and shall also take lead in preparing and operationalizing and updating regularly after getting it vetted by the Indian Coast Guard.	DPA had already contributed an amount of Rs. 41.25 Crores for installing and operating the VTMS in the Gulf of Kachchh. VTMS has been handed over to the Directorate General of Lighthouse and Lightships, Ministry of Shipping, and GoI for operating and updating regularly to statutory authorities.
14.	All the recommendations and suggestion given by the NIOT in their Comprehensive Environment Impact Assessment report for conservation / protection and betterment of environment shall be implemented strictly by the KPT.	Currently, all the four berths are under operation. As per the directions of the GCZMA and MoEF&CC, GoI, to date, DPA has undertaken a Mangrove Plantation in an area of 1600 Hectares since the year 2005. The details have already been communicated with the earlier compliance reports submitted. For regular monitoring, DPA vide work order dated 3/5/2021 has assigned workto M/s GUIDE, Bhuj for "Monitoring of mangrove plantation" carried out by DPA (Period from 24/5/2021 to 23/5/2022). The final report submitted by GUIDE, Bhuj, has already been communicated with the last compliance report submitted. Further DPA has assigned work to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Monitoring of Mangrove Plantation 1600 Ha carried out by DPA" for the Period of 10/06/2024

		to 09/06/2025. The inception report was submitted by GUIDE. DPA assigned work to M/s GUIDE, Bhuj for "Regular monitoring of Marine Ecology in and around Deendayal Port Authority (Erstwhile Deendayal Port Trust) and continuous Monitoring Program covering all seasons on various aspects of the Coastal Environs" since 2017. The reports are being submitted time to time along with compliance reports submitted. In continuation of same, DPA had issued work order to GUIDE, Bhuj for "Regular Monitoring of Marine Ecology in and around Deendayal Port Authority" for the year 2024-2027. The work is in progress. To control fugitive emissions, DPA has installed Mist Canon in the Port area. Further, regular sprinkling through tankers on roads and other staking yards is being done to control dust pollution in other areas. it is relevant to mention that Pollution under Control (PUC) Certificates have been made mandatory for vehicles in the port area. For waste generated from ships, DPA issued a Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" and for removal of "Dry Solid Waste (Non- Hazardous)" from Vessels calling at Deendayal Port through DPA contractors. Further, all ships are required to follow DG Shipping circulars regarding the reception facilities at the Swachch Sagar portal. Further, DPA vide work order dated24/01/2023 has appointed GEMI, Gandhinagar, for "Preparation of Plan for Management of Plastic Wastes, Solid Waste including C&D waste, Hazardous wastes including Biomedical and Non Hazardous Waste in the Deendayal Port Authority area". The Final report was submitted by GEMI. DPA has been appointing a NABL-accredited laboratory to monitor environmental parameters,

		and reports are being submitted from time to the GPCB, IRO, MoEF&CC, GoI, and Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters vide Work Order dated 15/02/2023. The work is in progress, and the latest environmental monitoring report was submitted by GEMI, Gandhinagar.
15.	The KPT shall have to contribute financially for talking up the socioeconomic upliftment activities in this region in construction with the Forest and Environment Department and the District Collector / District Development Officer.	The details of CSR activities undertaken /to be undertaken by DPA is mentioned in the compliance report.
16.	A separate budget shall be earmarked for environmental management and socioeconomic activities and details there of shall be furnished to this Department as well as the MoEF, GOI. The details with respect to the expenditure from this budget head shall also be furnished.	The allocation made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" during BE 2024-25 is Rs. 657 Lakhs. The expenditure made under the "Environmental Services & Clearance of other related Expenditure" is Rs. 172 Lakhs from up to September 2024
17.	A separate environmental management cell with qualified personnel shall be created for environmental monitoring and management during construction and operational phases of the project.	DPA already has an Environment Management Cell. Further, the DPA has also appointed an expert agency to provide Environmental Experts from time to time. DPA appointed M/s Precitech Laboratories, Vapi, to provide Environmental Experts via a work order dated 5/2/2021. In addition, it is relevant to submit here that DPA has appointed a Manager (Environment) on a contractual basis for a period of 3 years, further

		extendable to 2 years (A copy of the details has already been communicated with the last compliance report submitted).
18.	Six monthly reports on compliance of the conditions mentioned in this letter shall have to be furnished by the KPT on regular basis to this department/ MoEF, GOI.	DPA has regularly submitted the compliance reports to GCZMA, Gandhinagar, MoEF&CC, and GOI. The last compliance report of the conditions stipulated in CRZ recommendations issued by GCZMA was submitted on 24/07/2024.

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Mangrove plantation:**

As mentioned in CRZ condition, the DPA shall take up mangrove plantation in an area of 1000 ha. as well as greenbelt development with the Gujarat ecology commission/forest department.

DPA has undertaken mangrove plantation in an area of 1600 ha at various locations since 2005-06 under the directions of the GCZMA and MoEF&CC, GoI.

Further DPA has assigned work to to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Mangrove Plantation in an area of 50 Ha for Deendayal Port Authority" for the period of 10/06/2024 to 09/03/2025.

Additional mangrove plantation is not needed.

2. Waste Management:

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

3. Environmental Monitoring:

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

IX. Bifurcation (600 mt waterfront out of total 4800 mt) of Environmental and CRZ clearance issued to M/s Essar Bulk Terminal Limited for Expansion of Port Facility at Hazira, Surat, Gujarat

(Ref. No. 11-46/2011 - IA III dated 4/4/2022)

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Greenbelt Development		
EC		
1.	Natural drainage system shall be maintained so that there is free flow to the existing mangroves. Mangrove plantation in 500 ha of land in consultation with GEC/Forests Department, Government of Gujarat.	The GMB had allotted land of 24 Hectares to Deendayal Port Authority devoid of Mangroves. However, due care is being taken so that Natural Drainage System will be maintained. As per the directions of the MoEF&CC, GoI/GCZMA, till date, DPA had undertaken Mangrove Plantation in an area of 1500 Hectares at various locations (Copy of the statement has already been communicated with the compliance report dated 05/08/2022). Further, DPA has carried out additional mangrove plantation of 100 ha. with consultation of Gujarat Ecology Commission vide Work Order No. DD/WK/3050/PtI/GIM/PC-44 dated 02/06/2022 (Copy of the work order has already been communicated with the compliance report dated 05/08/2022). For regular monitoring of mangroves, DPA engaged M/s GUIDE, Bhuj during the year 2017 & subsequently, vide work order dated 3/5/2021. The final report submitted by M/s GUIDE has already been communicated with the compliance report dated 05/08/2022.
CRZ		
2.	The Essar Bulk Terminal Limited shall take up mangrove plantation in 500 ha of land in consultation with GEC/Forest department.	The GMB had allotted land of 24 Hectares to Deendayal Port Authority devoid of Mangroves. However, due care is being taken so that Natural Drainage System will be maintained. As per the directions of the MoEF&CC, GoI/GCZMA, till date, DPA had undertaken Mangrove Plantation in an area of 1500 Hectares

		at various locations (Copy of the statement has already been communicated with the compliance report dated 05/08/2022). Further, DPA has carried out additional mangrove plantation of 100 ha. with consultation of Gujarat Ecology Commission vide Work Order No. DD/WK/3050/PtI/GIM/PC-44 dated 02/06/2022 (Copy of the work order has already been communicated with the compliance report dated 05/08/2022). For regular monitoring of mangroves, DPA engaged M/s GUIDE, Bhuj during the year 2017 & subsequently, vide work order dated 3/5/2021. The final report submitted by M/s GUIDE has already been communicated with the compliance report dated 05/08/2022.
Waste Management		
3.	Sewage shall be treated and the Treatment Facility shall be provided in accordance with the Coastal Regulation Zone Notification, 2011. The disposal of treated water shall confirm the regulation of State Pollution Control Board.	Septic Tanks has already been provided for treatment of sewage.
4.	Solid Waste Management shall be as per Municipal Solid (Management and Handling) Rules, 2000.	Point Noted for compliance.
5.	There shall be no disposal of wastes in to the coastal areas.	It is assured that no disposal of wastes will be made in to the coastal areas.
6.	The hazardous wastes generated shall be collected and disposed as per rules, disposable wastes shall be sent to authorized TSDF. MoU in this regard shall be submitted to the Ro, MoEF along with the six monthly monitoring report.	Point Noted for compliance.

7.	The construction debris and / or any other type of waste shall not be disposed of in to the sea, creek or in the CRZ area. The debris shall be removed from the construction site immediately after the construction is over.	
Environmental Monitoring		
CRZ		
8.	Environmental Audit report indicating the changes, if any, with respect to the baseline environmental quality in the coastal and marine environment shall be submitted every year by M/s EBTL to this department as well as to the MoEF, GoI	In this regard, it is relevant to mention here that, DPA had assigned the work of monthly environmental monitoring to M/s A 2 Z Envirotech vide Work Order dated 15/09/2022. Further, DPA has assigned the work of monthly environmental monitoring to GEMI, Gandhinagar for a period of 3 years vide letter dated 18/04/2023. The work is in progress.
Other		
9.	A separate Environment Monitoring Cell shall be set up especially for this plant and details shall be submitted to the Ministry prior to the commencement of operation.	DPA is already having dedicated EMC. Further, DPA has also appointed expert agency for providing Environmental Experts from time to time. Recently, DPA appointed M/s Precitech Laboratories Pvt.Ltd., Vapi for three years vide work order dated 5/2/2021 In addition, DPA has also appointed Manager (Environment) on contractual basis for a period of 3 years & further extendable for 2 years

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Mangrove plantation:**

As proposed, The KPT shall take up mangrove plantation in an area of 500 ha. as well as greenbelt development with the Gujarat ecology commission/forest department.

For this, as a part of mangrove conservation, DPA has undertaken Mangrove Plantation in an area of 1600 Hectares at various locations since 2005-06 under the directions of the GCZMA and MoEF&CC, GoI.

Further DPA has assigned work to to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Mangrove Plantation in an area of 50 Ha for Deendayal Port Authority" for the period of 10/06/2024 to 09/03/2025.

Additional mangrove plantation is not needed.

2. **Waste Management:**

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

3. **Environmental Monitoring:**

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly.

X. Single Point Mooring (SPM) and allied facilities off Veera in Gulf of Kutch for handling crude oil on BOT basis in the state of Gujarat.

(Ref No: -MoEF&CC, GoI vide F. No. 11-27/2010-IA.III dated 11/12/2013 accorded EC&CRZ Clearance to the subject project. Further, MoEF&CC, GoI vide letter dated 29/12/2020 granted extension of validity of the accorded EC&CRZ Clearance for a further period of 3 years up to 10/12/2023.)

Project status: Activity not yet started

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Mangrove Development		
1.	The KPT shall take up mangrove plantation in an area of 50 Ha. as well as greenbelt development with the Gujarat ecology commission/forest department.	As a part of mangrove conservation, DPA has undertaken Mangrove Plantation in an area of 1600 Hectares at various locations since 2005-06 under the directions of the GCZMA and MoEF&CC, GoI. Further DPA has assigned work to to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Mangrove Plantation in an area of 50 Ha for Deendayal Port Authority" for the period of 10/06/2024 to 09/03/2025. The work order has been submitted along with last compliance report. DPA had entrusted the work to Forest Department, Gujarat for developing a greenbelt in and around the Port area at a cost of Rs. 352 lakhs in an area of about 32 hectares and the work is already completed. Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE], dated 31st May 2022. The final report has already been communicated with the earlier compliance report. DPA has assigned the Greenbelt development in Deendayal Port Authority and its surrounding areas, Phase II, to M/s GUIDE vide Work order EG/WK/4751/Part (Greenbelt)/327 dated 23.06.2023. The work has been completed and the Final report submitted by M/s GUIDE, Bhuj.

Environmental Monitoring		
2.	An environmental report indicating the changes, if any, with respect to the baseline environmental quality in the coastal and marine environment shall be submitted every year by the KPT to this department as well as to MoEF, GOI	No activity has started yet.
Waste Management		
3.	No effluent or sewage shall be discharged into the sea/creek or in the CRZ area and shall be treated to confirm to the norms prescribed by the Gujarat Pollution Control Board and would be reused/recycled within the plant premises to extract possible.	No activity has started yet.
4.	The KPT shall prepare and regularly update their Local Oil Spill Contingency and Disaster Management Plan in consonance with the National Oil Spill and Disaster Contingency Plan and shall submit the same to this department after having it vetted through the Indian coast guard.	No activity has started yet. It is relevant to mention that, DPA already has Oil Spill Contingency and Disaster Management Plan.
EMC Cell		
5.	A separate environmental management cell with qualified personnel shall be created for environmental monitoring and management during construction and operational phases of the project**.**	DPA already has an Environment Management Cell. Further, DPA has also appointed an expert agency to provide Environmental Experts from time to time. Recently, DPA appointed M/s Precitech Laboratories, Vapi vide work order dated 5/2/2021 Further, DPA has appointed Manager Environment on a contractual basis for a period of 3yrs, further extended upto 2 years

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Mangrove plantation:**

As proposed, The KPT shall take up mangrove plantation in an area of 50 Ha. as well as greenbelt development with the Gujarat ecology commission/forest department.

For this, as a part of mangrove conservation, DPA has undertaken Mangrove Plantation in an area of 1600 Hectares at various locations since 2005-06 under the directions of the GCZMA and MoEF&CC, GoI.

Further DPA has assigned work to to M/s GUIDE, Bhuj vide work order dated 10/06/2024 for "Mangrove Plantation in an area of 50 Ha for Deendayal Port Authority" for the period of 10/06/2024 to 09/03/2025.

Additional mangrove plantation is not needed.

2. **Waste Management:**

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

3. **Environmental Monitoring:**

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

XI. Development of Setting up of RoRo/RoPax Facility at, Muldwarka, Gujarat, by Deendayal Port Authority at Survey No. 74/3 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath

(Ref. No. 11-27/2010-IA.III dated 11/12/2013)

Project status: Activity not yet started

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Greenbelt Development		
1.	PP shall carry out gardening area of 33 % in premises	No construction activity has been started. However, it is assured that, necessary gardening area as per the stipulated condition will be developed.
2.	Green belt shall be developed in area as provided in project details with a native tree species in accordance with CPCB guidelines. The greenbelt shall inter alia cover the entire periphery of the plant.	Point Noted for compliance
3.	Top soil shall be separately stored and used in the development of green belt	Point Noted for compliance
Renewable Energy		
4.	Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly	Point Noted for compliance
5.	Provide LED lights in their offices and residential areas.	Point Noted for compliance
Waste Management		
6.	Provide STP of 22 KLD capacity in premises & treated domestic wastewater will be used for gardening & green belt development in premises	No construction activity has been started. However, it is assured that, STP will be provided to treat domestic wastewater and treated wastewater will be used for gardening & green belt development, as per stipulated condition.

7.	Authorized end-users shall have permissions from the concerned authorities under the rule-9 of the Hazardous and other wastes (Management and transboundary movement) Rules 2016.	Not applicable.
8.	Domestic wastewater generated shall be sent to Septic Tanks equipped with Soak Pits. Wastewater generated from terminal buildings shall be treated and used for green cover development only.	No construction activity has been started. Generated waste water shall be sent to septic tank equipped with soak pits. However, it is assured that if waste water quantity exceed, STP shall be provided to treat domestic wastewater and treated wastewater will be used for gardening & green belt development, as per stipulated condition.
9.	Shrouding shall be carried out in the work site enclosing the dock/proposed facility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers	Point Noted for compliance
10.	Dust collectors shall be deployed in all areas where blasting (surface cleaning) and painting operations are to be carried out, supplemented by stacks for effective dispersion.	Point Noted for compliance
11.	Necessary arrangements for the treatment of the effluents and solid wastes must be made and it ensured that they conform to the standards laid down by the competent authorities including the central or State Pollution Control Board and under the Environment (Protection)Act, 1986	Point Noted for compliance

12.	The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management Rules, 2016.	Point Noted for compliance
13.	Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction and Demolition Waste Management Rules, 2016.	Point Noted for compliance
14.	A certificate from the competent authority handling municipal solid wastes should be obtained, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project.	Point Noted for compliance
Environment Monitoring		
15.	A continuous monitoring programme covering all the seasons on various aspects of the estuarine, coastal and marine environs including intertidal and subtidal marine flora and fauna with focus on sea turtles, corals and sea grass (if any) need to be undertaken by reputed universities available in the State or by entrusting to the National lnstitutes/renowned Universities/accredited Consultant with rich experiences in marine science aspects. The monitoring should cover various physico-chemical parameters along with PHC coupled with biological indices such as microbes, plankton, benthos and fishes on a periodic basis during construction and operation phase of the project. Any deviations in the parameters shall be given adequate care with suitable measures to conserve the marine environment and its resources. Adequate funds be allocated for the same	Point Noted for compliance
16.	The project proponent shall install system to carryout Ambient Air Quality	Point Noted for compliance

	monitoring for common/criterion parameters relevant to the main pollutants released (e.9. PM10 and PM2.5 in reference to PM emission, and SO2 and NOx in reference to SO2 and NOx emissions) within and outside the project area at least at four locations (one within and three outside the plant area at an angle of 120'each), covering upwind and downwind directions	
17.	Diesel power generating sets proposed as source of backup power should be of enclosed type and conform to rules made under the Environment (Protection)Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use of low sulphur diesel. The location of the DG sets may be decided with in consultation with State Pollution Control Board.	Point Noted for compliance
Marine Ecology		
18.	While carrying out dredging, an independent monitoring shall be carried out through a Government Agency/lnstitute to assess the impact and necessary measures shall be taken on priority basis if any adverse impact is observed.	Point Noted for compliance
19.	A detailed marine biodiversity management plan shall be prepared through the NIO or any other institute of repute on marine, brackish water and fresh water ecology and biodiversity and submitted to and implemented to the satisfaction of the State Biodiversity Board and the CRZ authority. The report shall be based on a study of the impact of the project activities on the intertidal biotopes, corals and coral communities, molluscs, sea grasses, sea weeds, subtidal	Point Noted for compliance

	habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods and include underwater photography	
20.	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components including all micro, macro and mega floral and faunal components of marine biodiversity.	Point Noted for compliance

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Green belt development**

As committed in EIA report, greenbelt of 1.98 ha is required to be developed. As per current status. As of now, the project is not yet started, so no plantation to be done as of now. The details of the plantation cost and species are mentioned in Annexure.

2. **Renewable Energy Initiatives**

As per the project area, 0.23 MW renewable energy from rooftop solar panels can be produced. DPA is already producing

- 20 MW of Wind energy
- 45 KWP solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham.
- 5.5 KWp solar roof top system under CSR scheme at Jeev Seva Samiti, Gandhidham.
- Initiation of solar power generation system with capacity 2 MW.
- Already installed 400 KWP solar plant and 600 KWP to be installed by PPP operator this year.
- Installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham.
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.

As per above information, no additional initiative in renewable energy generation required. However, DPA in its own discretion, can develop renewable energy generation capacity as per the design given in chapter-7 of the report.

I. Provide LED lights in their offices and port areas.

All the conventional HPSV lights of 2x400 & 1x1000 Watts are replaced with ~3100 nos. 470 Watts Energy efficient LED lights.

II. Solar Street lighting: The detailed design of solar street lighting along the road side is mentioned in the chapter-7 along with the cost calculation

3. Waste Management:

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

4. Environmental Monitoring:

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

XII. Development of Setting up of RoRo/RoPax Facility at Pipavav, Gujarat, Rajula, Amreli by Deendayal Port Authority

(Ref. No. EC23B033GJ148149 dated 30/12/2023)

Project status: Activity not yet started

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Greenbelt Development		
1.	PP shall carry out gardening area of 33 % in premises	No construction activity has been started. However, it is assured that, necessary gardening area as per the stipulated condition will be developed.
2.	Green belt shall be developed in area as provided in project details with a native tree species in accordance with CPCB guidelines. The greenbelt shall inter alia cover the entire periphery of the plant.	Point Noted for compliance
3.	Top soil shall be separately stored and used in the development of green belt	Point Noted for compliance
Renewable Energy		
4.	Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly	Point Noted for compliance
5.	Provide LED lights in their offices and residential areas.	Point Noted for compliance
Waste Management		
6.	PP shall provide STP of 35 KLD capacity in premises & treated domestic wastewater will be used for gardening & green belt development in premises	No construction activity has been started. However, it is assured that, STP will be provided to treat domestic wastewater and treated wastewater will be used for gardening & green belt development, as per stipulated condition.
7.	Authorized end-users shall have permissions from the concerned	Point Noted for compliance

	authorities under the rule-9 of the Hazardous and other wastes (Management and transboundary movement) Rules 2016.	
8.	Domestic wastewater generated shall be sent to Septic Tanks equipped with Soak Pits. Wastewater generated from terminal buildings shall be treated and used for green cover development only.	Point Noted for compliance
9.	Shrouding shall be carried out in the work site enclosing the dock/proposed facility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers	Point Noted for compliance
10.	Dust collectors shall be deployed in all areas where blasting (surface cleaning) and painting operations are to be carried out, supplemented by stacks for effective dispersion.	Point Noted for compliance
11.	Necessary arrangements for the treatment of the effluents and solid wastes must be made and it ensured that they conform to the standards laid down by the competent authorities including the central or State Pollution Control Board and under the Environment (Protection)Act, 1986	Point Noted for compliance
12.	The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management Rules, 2016.	Point Noted for compliance
13.	Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction and	Point Noted for compliance

	Demolition Waste Management Rules, 2016.	
14.	A certificate from the competent authority handling municipal solid wastes should be obtained, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project.	Point Noted for compliance
Environment Monitoring		
15.	A continuous monitoring programme covering all the seasons on various aspects of the estuarine, coastal and marine environs including intertidal and subtidal marine flora and fauna with focus on sea turtles, corals and sea grass (if any) need to be undertaken by reputed universities available in the State or by entrusting to the National lnstitutes/renowned Universities/accredited Consultant with rich experiences in marine science aspects. The monitoring should cover various physico-chemical parameters along with PHC coupled with biological indices such as microbes, plankton, benthos and fishes on a periodic basis during construction and operation phase of the p@ect. Any deviations in the parameters shall be given adequate care with suitable measures to conserve the marine environment and its resources. Adequate funds be allocated for the same	Point Noted for compliance
16.	The project proponent shall install system to carryout Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.9. PM10 and PM2.5 in reference to PM emission, and SO2 and NOx in reference to SO2 and NOx emissions) within and outside the project area at least at four locations	Point Noted for compliance

	(one within and three outside the plant area at an angle of 120'each), covering upwind and downwind directions	
17.	Diesel power generating sets proposed as source of backup power should be of enclosed type and conform to rules made under the Environment (Protection)Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use of low sulphur diesel. The location of the DG sets may be decided with in consultation with State Pollution Control Board.	Point Noted for compliance
Marine Ecology		
18.	While carrying out dredging, an independent monitoring shall be carried out through a Government Agency/lnstitute to assess the impact and necessary measures shall be taken on priority basis if any adverse impact is observed.	Point Noted for compliance
19.	A detailed marine biodiversity management plan shall be prepared through the NIO or any other institute of repute on marine, brackish water and fresh water ecology and biodiversity and submitted to and implemented to the satisfaction of the State Biodiversity Board and the CRZ authority. The report shall be based on a study of the impact of the project activities on the intertidal biotopes, corals and coral communities, molluscs, sea grasses, sea weeds, subtidal habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods and include underwater photography	Point Noted for compliance

20.	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components including all micro, macro and mega floral and faunal components of marine biodiversity.	Point Noted for compliance

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. **Green belt development**

As committed in EIA report, greenbelt of 1.98 ha is required to be developed. As per current status. As of now, the project is not yet started, so no plantation to be done as of now. The details of the plantation cost and species are mentioned in Annexure.

2. **Renewable Energy Initiatives**

As per the project area, 0.23 MW renewable energy from rooftop solar panels can be produced. DPA is already producing

- 20 MW of Wind energy
- 45 KWP solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham.
- 5.5 KWp solar roof top system under CSR scheme at Jeev Seva Samiti, Gandhidham.
- Initiation of solar power generation system with capacity 2 MW.
- Already installed 400 KWP solar plant and 600 KWP to be installed by PPP operator this year.
- Installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham.
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.

As per above information, no additional initiative in renewable energy generation required. However, DPA at its own discretion, can develop renewable energy generation capacity as per the design given in chapter-7 of the report.

I. Provide LED lights in their offices and port areas.

All the conventional HPSV lights of 2x400 & 1x1000 Watts are replaced with ~3100 nos. 470 Watts Energy efficient LED lights.

II. Solar Street lighting

The detailed design of solar street lighting along the road side is mentioned in the chapter-7 along with the cost calculation.

3. **Waste Management:**

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

4. **Environmental Monitoring:**

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

XIII. Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernization of Existing Pipeline Network at Oil Jetty Area, Deendayal Port Trust, Kandla
(Ref. No. EC24A033GJ192347 dated 01/01/2024)

Project status: Activity not yet started

Status of compliance of various EC/CRZ conditions pertaining to EMP

Sr. No.	Condition	Compliance
Greenbelt Development		
1.	An overall green area of at-least 33% of the Industrial Area should be developed with native species. The green area shall be 40% in case of critically polluted area. The project proponent of the Industrial Area shall comply with the additional commitment made by them in the EIA report regarding the development of green belt.	DPA entrusted the work for Greenbelt development to the Forest Department, GoG for plantation in an area of 32.5 Ha. The work is completed. DPA has appointed Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May, 2022. The work completed (5000 saplings) . Further, DPA has accorded the work of "Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The work is completed.
2.	Wherever possible, plantations around the periphery of the Industrial Area, in the downwind direction and along the road sides shall be provided for containment of pollution and for formation of a screen between the industrial area and the outer civil area. The choice of plants should include shrubs of height 1 to 1.5 m and tree of 3 to 5 m height. The intermixing of trees	DPA entrusted the work for Greenbelt development to the Forest Department, GoG for plantation in an area of 32.5 Ha. The work is completed. DPA has appointed Gujarat Institute of Desert Ecology (GUIDE) for Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-l) vide Work Order No.EG/WK/4757/Part Greenbelt GUIDE, dated 31st May,

	and shrubs should be such that the foliage area density in vertical is almost uniform	2022. The work completed (5000 saplings) . Further, DPA has accorded the work of Green belt development in DPA and its surrounding area (Phase II) to Gujarat Institute of Desert Ecology (GUIDE), Bhuj for the plantation of 10000 saplings of suitable species vide work order dated 23/06/2023. The work is completed.
Renewable Energy		
3.	Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly;	DPA has installed the solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham of 45 KWp in 2022 and at Jeev Seva Samiti, Gandhidham of 5.5 KWp in 2024. DPA has installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham. DPA has installed 400 KWP solar plant and 600 KWP to be installed this year by PPP operator. 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.
4.	Provide LED lights in their offices and residential areas.	All the conventional HPSV lights have been replaced by Energy efficient LED lights.
Waste Management		
5.	Necessary arrangements for the treatment of the effluents and solid wastes/ facilitation of reception facilities under MARPOL must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986. The provisions of Solid Waste Management Rules, 2016. E- Waste Management Rules,	DPA already issued Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" from Vessels calling at Deendayal Port through DPA contractors to GPCB authorized recycler. Further, it is to state that, all ships are required to follow DG Shipping circulars regarding the reception facilities at Swachch Sagar portal. DPA has appointed GEMI, Gandhinagar for the "Preparation of

	2016, and Plastic Waste Management Rules, 2016 shall be complied with.	Plan for management of Plastic waste, Solid Waste including C&D wastes, E-waste, hazardous waste including biomedical waste and Non-hazardous waste in DPA vide work order dated 24/01/2023". The work is completed.
6.	Sewage Treatment Plant shall be provided to treat the wastewater generated from the project. Treated water shall be reused for horticulture, flushing, backwash, HVAC purposes and dust suppression	Looking at the small quantity of Waste water generated it will be treated in the Septic tanks/Soak pits.
7.	The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management Rules, 2016.	Companies authorized by Central Pollution Control Board(CPCB) and State Pollution Control Board (SPCB) have been awarded the work of Grant of Permission / License for removal of Dry Solid Waste(Non Hazardous) from Vessels calling at Deendayal Port" for collection, transporting and disposal of solid waste by the Deendayal Port Trust.
8.	Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction and Demolition Waste Management Rules, 2016.	Demolition of any building or masonry structure is not envisaged in the present project.
9.	A certificate from the competent authority handling municipal solid wastes should be obtained, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project.	A MoU has been signed for the Municipal solid waste management along with the Gandhiham Municipal Corporation.
Environment Monitoring		
10.	A continuous monitoring programme covering all the seasons on various aspects of the coastal and marine environs need to be undertaken by a competent organization available in the State or by entrusting to the National Institutes/renowned	DPA issued work order to Gujarat Institute of desert Ecology, Bhuj (expert agency in the field) vide letter no. EG/WK/ 4751 /Part (Marine Ecology Monitoring) / 72 dated 10/06/2024 for "Regular Monitoring of Marine Ecology in and around the Deendayal Port Authority and

	Universities/accredited Consultant with rich experiences in marine science aspects. Monitoring should include sea weeds, sea grasses, mudflats, sand dunes, fisheries, mangroves and other marine biodiversity components as part of the management plan.	Continuous Monitoring Programme covering all seasons on various aspects of the Coastal Environs covering Physico-chemical parameters of marine water and marine sediment samples coupled with biological indices (for three years 2024-2027) reg.". A copy work order had already been submitted along with compliance report submitted on 29/07/2024. The work is in progress.
11.	Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Officer of the Ministry as a part of six-monthly compliance report.	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area including Noise parameter vide work order dated 15/02/2023.
12.	The project proponent shall install system to carryout Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM10 and PM2.5 in reference to PM emission, and SO2 and NOx in reference to SO2 and NOx emissions) within and outside the project area at least at four locations, covering upwind and downwind directions	DPA has appointed Gujarat Environment Management Institute (GEMI), Gandhinagar for regular monitoring of environmental parameters for the whole port area including Air Quality Monitoring vide work order dated 15/02/2023.
Dust Management		
13.	Shrouding shall be carried out in the work site enclosing the dock/proposed facility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers.	There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines).

14.	Dust collectors shall be deployed in all areas where blasting (surface cleaning) and painting operations are to be carried out, supplemented by stacks for effective dispersion	There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines) .
15.	Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed fugitive emission standards.	There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines).

Various activities/initiatives that can be undertaken as part of EMP based on compliance status is specified below:

1. Renewable Energy Initiatives

No activity has started yet. So as of now, there is no requirement for renewable energy initiatives. However, DPA is already producing

- 20 MW of Wind energy
- 45 KWP solar roof top system under CSR scheme at St. Joseph Hospital, Gandhidham.
- 5.5 KWp solar roof top system under CSR scheme at Jeev Seva Samiti, Gandhidham.
- Initiation of solar power generation system with capacity 2 MW.
- Already installed 400 KWP solar plant and 600 KWP to be installed by PPP operator this year.
- Installed 6 KWP solar plant at Jeev Seva Samiti, Gandhidham.
- 4000 Acres of land has been identified for developing 150 MW Hybrid (Solar Cum Wind) Energy Park.

As per above information, no additional initiative in renewable energy generation required.

III. Provide LED lights in their offices and port areas.

All the conventional HPSV lights have been replaced by Energy efficient LED lights.

IV. Solar Street lighting

Necessary solar lighting will be installed in the project as per the requirement of the condition.

2. Waste Management:

Waste Management for the project shall be done as per applicable waste management rules. Strategies and action points in the report submitted by GEMI *"Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority"*. should be implemented separately for each waste category.

3. Environmental Monitoring:

DPA appointed GEMI, Gandhinagar, to regularly monitor environmental parameters and the reports are submitted regularly. Environmental monitoring work as per EC conditions should be continued.

4. Dust Management:

There is no point for of the generation of dust at the project site. The entire project area is located within the Customs Bonded Area of Deendayal Port Authority, Kandla (Oil Jetty Complex). The project involves replacement and revamping of existing Pipeline network at Oil Jetty area (Scrapping of 125 old existing pipelines and laying of 84 new pipelines).

Sector-specific Action Plans

Chapter-7: Greenbelt Development

7.1 Statutory requirements w.r.t. greenbelt development:

In India, we do not have any exclusive greenbelt policy or greenbelt regulation, as available in other countries. However, on the basis of other environmental policies and Acts, we do have certain areas of land as green belts where no industrial and residential projects is encouraged.

The National Forest Policy, 1988 in section 4.2.2 states that, *"It is necessary to encourage the planting of trees alongside of roads, railway lines, rivers and streams and canals, and on other unutilized lands under State/corporate, institutional or private ownership. Green belts should be raised in urban/industrial areas as well as in arid tracts. Such a programme will help to check erosion and desertification as well as improve the microclimate."*

Whereas, the National Environment Policy, 2006 has recommended to "Formulate an innovative strategy for increase of forest and tree cover from the 2003 level of 23.69 percent of the country's land area, to 33 percent in 2012, through afforestation of degraded forest land, wastelands, and tree cover on private or revenue lands."

The Ministry of Environment, Forests & Climate Change (MoEF&CC) has taken up different initiatives and has always promoted integration of environmental issues in developmental projects. Greenbelt development is often mandated for developmental projects requiring environmental clearance (EC).

7.1.1. Preservation and improvement of existing greenbelt

Measures for preservation and improvement of existing greenbelt include:

i. **Support Irrigation:**

- For existing greenbelt, support irrigation should be done through flood irrigation as per the below schedule. The estimated quantity of water is 5 litre per plant per month.

ii. **Application of fertilizer and pesticide/insecticide:**

- Application of fertilizer to be done during monsoon and at the time of flood irrigation.
- Pesticide/insecticide to be applied as per requirement.

iii. **Maintenance:**

- Forest Department/ GUIDE will maintain the plantation done by them as per contract conditions.

iv. **Supervision:**

Day-to-day supervision is mandatory for successful plantation. Therefore, it is advisable to appoint one retired forest official of minimum rank of Range Forest Officer (RFO) or Forester. He will day-to-day supervise / monitor the plantation and will carry out the tasks as per site specific requirements.

7.1.2. Approach and Methodology for Greenbelt Development

In general, tree plantation involves the following broad steps

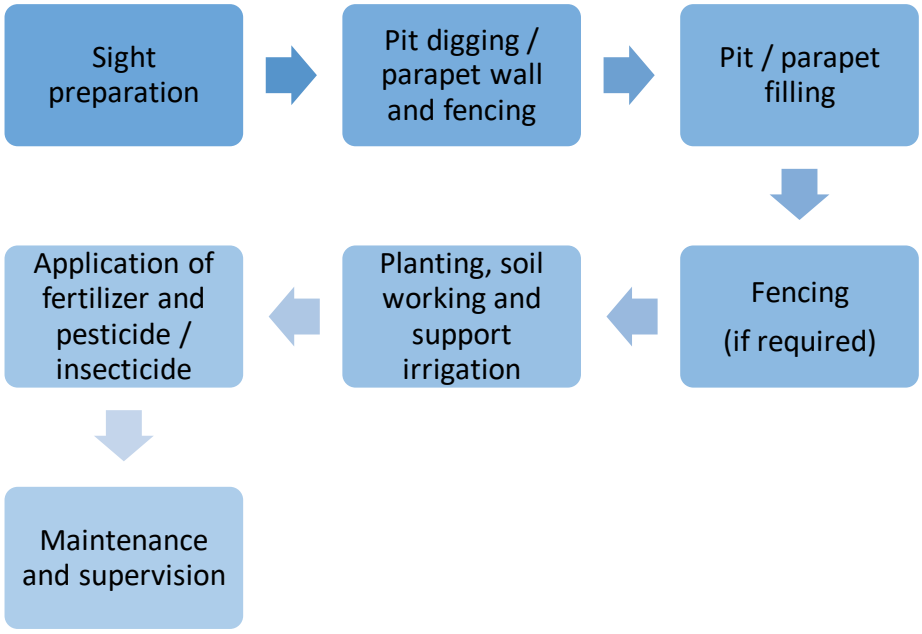


Figure 1: Steps of Tree Plantation

The steps are explained in brief in the following sections:

i. Sight preparation:

- It involves site cleaning and removal of any unwanted debris or coal dust that may have accumulated over the top soil.

ii. Pit digging:

- In areas where the tree is to be planted in the soil, dig a pit of dimension 45 cm × 45 cm × 45 cm. (approx. 0.091 m^3)

iii. Spacing:

- The spacing between rows should be determined based on the available space.
- Considering the green belt density to be 2000 plants per hectare, the spacing g can be calculated from the following equation:

  PD=10,000/(SBP∗SBR)

  Here:

  PD is the Plant Density per hectare (plants/10,000 m^2)

  SBP is the space between plants (m)

SBR is the space between rows (m)

SBP∗SBR = 10,000/2000 = 5 m^2

So, provide spacing of 2.5m*2m

iv. Species proposed, spacing and area developed

It is proposed to plant 4,59,445 plants in current year along with 20% casualty for 1st and 2nd year each. The species proposed are given in Table:13 and detailed costing of the plantation program is given in Annexure.

Planting and pit filling:

- Pit filling is to be done with 70% rich clay soil, 20% gypsum and 10% cow dung manure.

v. Selection of species

The selection of species for the proposed greenbelt is based on the recommendations under the CPCB guidelines for the applicable bio-climatic sub-zone. While selecting the species from the recommended list, quick growing species with longer duration of foliage and tolerant to different pollutants, considering the usage by local people, have been preferred. With these considerations, the following species have been selected for greenbelt development.

Table 13: Tree Species proposed for Greenbelt

Sr.no	Common / Local Name	Botanical Name	Quantity Proposed		
			Current Year	First Year	Second Year
				20% casualty for 1st and 2nd year	
1	Neem	*Azadirachta indica*	19995	3999	3999
2	Putra Jiva	*Putranjiva roxburghii*	14325	2865	2865
3	Garmalo	*Cassia Fistula*	20175	4035	4035
4	Ashoka	*Saraca Ashoka*	14505	2901	2901
5	Mango	*Mangifera indica*	14325	2865	2865
6	Drumstick	*Moringa olifera*	17370	3474	3474
7	Bili	*Aegle marmelos*	19995	3999	3999
8	Sitafal	*Annona squamosa*	14325	2865	2865
9	Kanchnar	*Bauhinia purpurea*	17370	3474	3474
10	Asundro	*Bauhinia racemosa*	14505	2901	2901
11	Khakhro	*Butea monosperma*	20175	4035	4035
12	Bhangro	*Erythrina variegata*	14325	2865	2865

13	Sharu	*Casuarina equisetifolia*	22700	4540	4540
14	Sisham	*Dalbergia sissoo*	14325	2865	2865
15	Pilu	*Salvadora Persica*	14505	2901	2901
16	Bougainvel	*Bougainvillea*	23000	4600	4600
17	Scarlet bush	*Hamelia patens*	22950	4590	4590
18	Jasud	*Hibiscus rosa-sinensis*	22900	4580	4580
19	Ixora	*Ixora coccinea*	22925	4585	4585
20	Kamini	*Murraya paniculata*	22950	4590	4590
21	Karen	*Nerium oleander*	22950	4590	4590
22	Tagar	*Tabernaemontana divaricata*	22950	4590	4590
23	Tecoma	*Tecoma stans*	22950	4590	4590
24	Pili Karen	*Thevetia peruviana*	22950	4590	4590
Total			**4,59,445**	**91,889**	**91,889**

vi. Soil working:

- Planting of saplings of a minimum 3 feet height is preferred that too during onset of monsoon.
- 3 soil working shall be done during monsoon season.
- Every flood support watering (irrigation) should be followed by soil working.

vii. Support Irrigation (watering):

- For support irrigation, flood irrigation is recommended
- The estimated quantity of water is 5 litre per plant per watering.
- Watering through tanker service or any other method should be done as per below schedule. (Table 14)

Table 14: Schedule for Watering

S. No	Month	Number of Times
1	January	8 times/ month
2	February	8 times/ month
3	March	12 times/ month
4	April	12 times/ month
5	May	12 times/ month
6	June	10 times/ month
7	July	3 times/ month*
8	August	3 times/ month*
9	September	4 times/month*

10	October	5 times/ month
11	November	8 times/ month
12	December	8 times/ month

**May vary depending on actual rainfall in that particular month*

viii. Application of fertilizer and pesticide/insecticide:

- Application of fertilizer to be done during monsoon and at the time of flood irrigation.
- Pesticide/insecticide to be applied as per requirement.

ix. Maintenance:

Table 15: Yearly maintenance of plantation

Activity	**1st year**	**2nd year**	**3rd year**	**4th year**
Casualty replacement	20% casualty for 1st and 2nd year			
Soil working	• During monsoon soil working is mandatory after rains. • In case of flood watering, each support watering should be followed by soil working. • In case of drip irrigation, soil working should be done twice in a month.			
Support watering	As per schedule			
Application of fertilizer	Application of fertilizer to be done during monsoon and at the time of flood irrigation			
Application of pesticide / insecticide	To be applied as per requirement			

x. Supervision:

- Day-to-day supervision is mandatory for a successful plantation. Therefore, it is advisable to appoint one retired forest official of the minimum rank of Range Forest Officer (RFO) or Forester. He will day-to-day supervise/monitor the plantation and will carry out the tasks as per site-specific requirements.

xi. Fencing

In order to protect the plants from the menace of damage by cattle or theft or vehicular traffic, it is advisable to have fencing around the plantation done on the roadside as well as on the dividers of the road. Fencing can be done based on requirement.

The dimensions of the fencing is shown below:

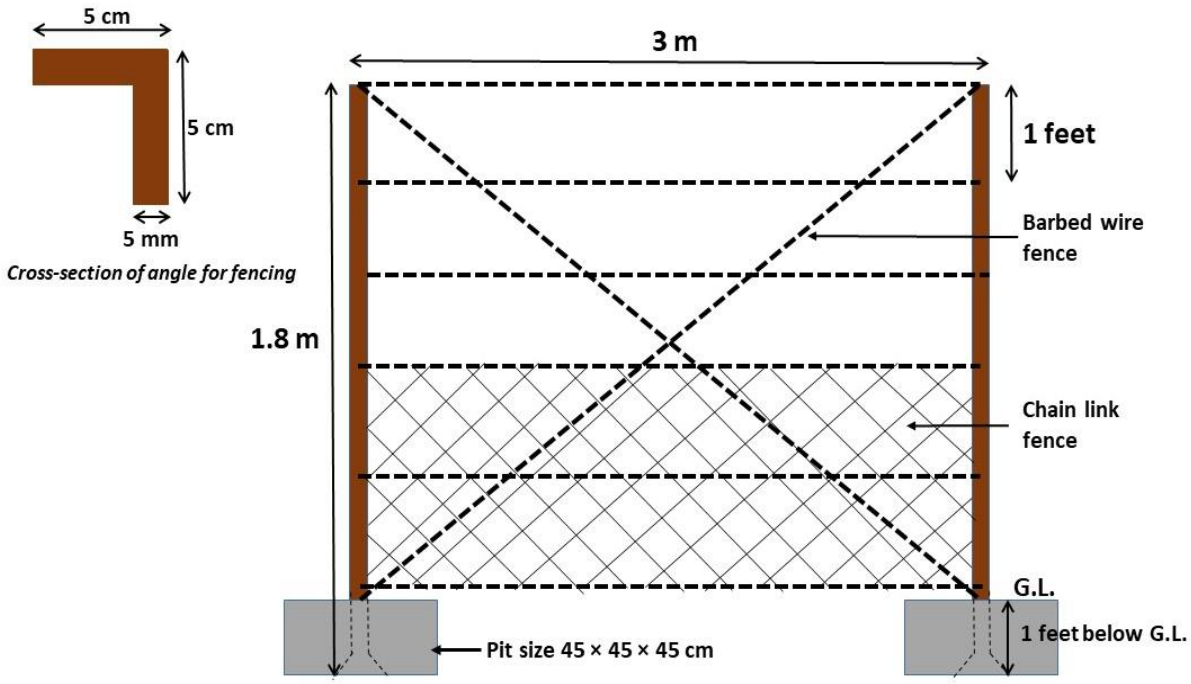
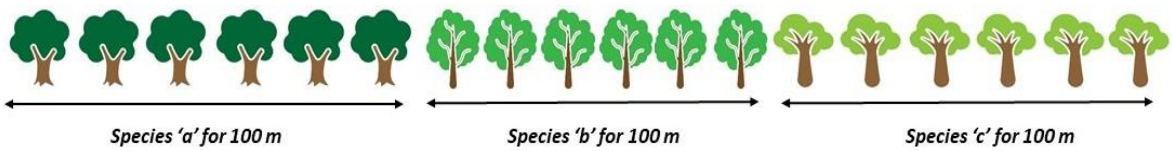


Figure 4 Dimensions for fencing

xii. Plantation of multiple species in a row(s):

Multiple species of plants have been proposed in the plan and therefore to promote diversity as well as improve aesthetic appearance, it is recommended to vary the species after every 100 m length. An example of the same has been shown in the figure below:

Figure 5 Plantation of multiple species in a row(s)



7.1.3. Summary of financial outlay for greenbelt development

Summary of financial outlay of the comprehensive development of greenbelt for is mentioned in Table:16.

Table 16 : comprehensive greenbelt development plan for all the projects

S No	Name of Project	Plantation (ha)	No. Of plants		Rate of plant			Cost of Rich clay, gypsum, cow dung and fertilizer			Labour Cost			Total cost
			Current Year	1st & 2nd Year (20 % Casualty Replacement)	Current Year	First Year	Second Year	Current Year	First Year	Second Year	Current Year	First Year	Second Year	
1	Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla	74.6	1,50,000	30,000	56,47,000	11,29,400	11,29,400	2,22,90,000	4,50,000	4,50,000	3,25,04,318	2,62,17,749	2,88,39,524	11,86,57,391
2	Development of Integrated facilities (Stage II) within the existing	3485 plant	3,485	697	130,400	26,080	26,080	9,01,000	12,500	12,500	7,55,188	7,55,188	6,70,044	32,88,980

	Deendayal Port Trust													
3	Development of 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit at District Kutch (Gujarat)	36.8	74,000	14,800	27,81,500	5,56,300	5,56,300	1,09,98,000	2,22,000	2,22,000	1,60,35,463	1,29,34,090	1,42,27,499	5,85,33,152
4	Development of 3 Remaining Integrated Facilities (stage I) within the existing Deendayal Port Authority	31.35	63,000	12,600	23,73,250	4,74,650	4,74,650	93,61,800	1,89,000	1,89,000	13651813	1,10,11,455	1,21,12,600	4,98,38,218
5	Construction of Interchange cum Road Over Bridge (ROB) at LC-236	2.5	5,000	1,000	1,88,300	37,660	37,660	7,43,000	15,000	15,000	10,83,477	8,73,925	9,61,317	39,55,340
6	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side-Northeast of Antarjaal, South of Tagore Road, 580 Acres)	39.3	80,000	16,000	30,12,500	6,02,500	6,02,500	1,18,88,000	2,40,000	2,40,000	1,73,35,636	1,39,82,800	1,53,81,080	6,32,85,015
7	Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850	39.3	80,000	16,000	30,12,500	6,02,500	6,02,500	1,18,88,000	2,40,000	2,40,000	1,73,35,636	1,39,82,800	1,53,81,080	6,32,85,015

	Acres), Gandhidham, Kutch													
8	Setting up of RoRo/RoPax Facility at Pipavav, Gujarat Pipavav, Rajula, Amreli Proposed by M/s. DPA	1.98	3,960	792	149275	29,855	29,855	5,88,456	11,880	11,880	8,58,126	6,92,162	7,61,378	31,32,866
9	Development of Setting up of RoRo/RoPax Facility at, Muldwarka, Gujarat, by Deendayal Port Authority	1.98	3,961	792	1,49,275	29,855	29,855	5,88,456	11,880	11,880	8,58,126	6,92,162	7,61,378	31,32,866
Total cost for greenbelt development													**36,71,08,843**	

7.1.4. Estimation of water requirement for the green belt development

The total water requirement for greenbelt development of all the projects is mentioned below in Table 18.

Table 17: Water requirement for greenbelt development

		Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla	Development of Integrated facilities (Stage II) within the existing Deendayal Port Trust	Development of 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit at District Kutch	Development of 3 Remaining Integrated Facilities (stage I) within the existing Deendayal	Construction of Interchange cum Road Over Bridge (ROB) at LC-236	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side- Northeast	Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850 Acres), Gandhidham, Kutch	Setting up of RoRo/RoPax Facility at Pipavav, Gujarat Pipavav, Rajula, Amreli Proposed by M/s. DPA	Development of Setting up of RoRo/RoPax Facility at, Muldwarka, Gujarat, by Deendayal Port Authority
Current Year	**No of Plants**	150000	3485	74000	63000	5000	80000	80000	3960	3960
	Total watering in a year in KL	69750	1621	34410	29295	2325	37200	37200	1841	1841
	January	6000	139	2960	1260	200	3200	3200	158	158
	February	6000	139	2960	1575	200	3200	3200	158	158
	March	9000	209	4440	2520	300	4800	4800	238	238
	April	9000	209	4440	2520	300	4800	4800	238	238
	May	9000	209	4440	2520	300	4800	4800	238	238
	June	7500	174	3700	2520	250	4000	4000	198	198

	July	2250	52	1110	3780	75	1200	1200	59	59
	August	2250	52	1110	3780	75	1200	1200	59	59
	September	3000	70	1480	3780	100	1600	1600	79	79
	October	3750	87	1850	3150	125	2000	2000	99	99
	November	6000	139	2960	945	200	3200	3200	158	158
	December	6000	139	2960	945	200	3200	3200	158	158
First Year	**No of Plants**	150000	3485	74000	63000	5000	80000	80000	3960	3960
	Total watering in a year in KL	69750	1621	34410	29295	2325	37200	37200	1841	1841
	January	6000	139	2960	1260	200	3200	3200	158	158
	February	6000	139	2960	1575	200	3200	3200	158	158
	March	9000	209	4440	2520	300	4800	4800	238	238
	April	9000	209	4440	2520	300	4800	4800	238	238
	May	9000	209	4440	2520	300	4800	4800	238	238
	June	7500	174	3700	2520	250	4000	4000	198	198
	July	2250	52	1110	3780	75	1200	1200	59	59
	August	2250	52	1110	3780	75	1200	1200	59	59
	September	3000	70	1480	3780	100	1600	1600	79	79
	October	3750	87	1850	3150	125	2000	2000	99	99
	November	6000	139	2960	945	200	3200	3200	158	158
	December	6000	139	2960	945	200	3200	3200	158	158
Second	**No of Plants**	150000	3485	74000	63000	5000	80000	80000	3960	3960

	Total watering in a year in KL	69750	1621	34410	29295	2325	37200	37200	1841	1841
	January	6000	139	2960	1260	200	3200	3200	158	158
	February	6000	139	2960	1575	200	3200	3200	158	158
	March	9000	209	4440	2520	300	4800	4800	238	238
	April	9000	209	4440	2520	300	4800	4800	238	238
	May	9000	209	4440	2520	300	4800	4800	238	238
	June	7500	174	3700	2520	250	4000	4000	198	198
	July	2250	52	1110	3780	75	1200	1200	59	59
	August	2250	52	1110	3780	75	1200	1200	59	59
	September	3000	70	1480	3780	100	1600	1600	79	79
	October	3750	87	1850	3150	125	2000	2000	99	99
	November	6000	139	2960	945	200	3200	3200	158	158
	December	6000	139	2960	945	200	3200	3200	158	158

7.1.5 Total cost of greenbelt development

The total cost of the different components of greenbelt development is given below.

Table 18: Total cost of greenbelt development

S No.	Particulars	Cost
1.	Plants	2,36,41,315
2.	Civil work	7,19,90,316
3.	Plantation related activities (Labour Cost)	26,83,71,909
Total Cost (Rs)		**36,71,08,843**

7.2. Air Pollution Control Measures

7.2.1 Background

As a major component of the transportation industry, ports regularly handle massive amounts of dust-generating material. From coal to grain and everything in between, constant disruption while loading and unloading cargo, movement of heavy vehicles and other allied activities causes fugitive particles to escape into the air. Containing potentially harmful minerals, such as silica, the dust generated during these activities is extremely hazardous to employees and the surrounding community. Implementing an effective dust control strategy becomes vital to meeting compliance regulations, protecting workers and maintaining positive relations with the stakeholders.

7.2.2 Dust sources

When handling any dry cargo (particularly coal), there are a number of sources of dust. For an unloading operation these sources are:

- Unloading at the ship
- Reception at the wharf side
- Conveying transfer points
- Drop from hopper to stockpile
- Time spent as a stockpile
- Vehicle movements around stockpile
- Transfer to onward transport (such as rail or dumpers)

Ship loading operations would be the reverse of the above list.

7.2.3 Constraints to effective dust control

a) Climate

Being a coastal area, the wind speed is high and found mostly between 14.6 – 31.5 km/hour for all the months. Velocity and direction of wind have a significant role in the dispersion of dust and air borne materials and therefore impacts the air quality of the area.

b) Soil Type

The land is generally barren and devoid of any natural vegetation. The soil is dry, saline and its texture is sandy. These factors also play pivotal role in heavy dust loading as soil particles tend to float in the air due to high winds.

7.2.4 Road Dust Management

Road dust consists of solid particles that are generated by any mechanical processing of materials, including crushing, grinding, rapid impact, handling, detonation, and decrepitating of organic and inorganic materials such as rock, ore, and metal. When this dust becomes airborne, primarily by the friction of tires moving on unpaved dirt roads and dust-covered paved roads, it is referred to as road dust.

The roads in and around DPA are frequented by heavy loading vehicles of various categories contributing to road dust to a large extent. The following measures are proposed for road dust management:

a) Street Sweeping
b) Street Washing
c) Use of Dust Suppressant

- **Road Sweeping:** Manual and mechanical street sweeping are not proposed for DPA. The following category of sweepers can be employed:
- **Vacuum Sweeper:** They typically use a gutter broom to loosen dirt and debris from the road and direct it to a vacuum nozzle which sucks it into a hopper. The hopper usually consists of a chamber into which the material is collected by gravitational settling.
- **Regenerative air vacuum sweepers:** It directs all or some of the exhaust air back to one end of the pickup head at high speed or to a nozzle located immediately behind the pickup head. The blast of exhaust air is directed at an angle to the pavement to dislodge dirt.

	
Vacuum Sweeper	***Regenerative air vacuum sweeper***

The cost of such sweepers varies between **30 lakhs to 70 lakhs** in Indian market.

- **Road Washing / Sprinkling:** Mainly, recycled and reused water can be used for street washing. As per literature, it is recommended to spray 1 litre/ sq.m area. At Dusseldorf, 2µg/m3 reduction of dust was observed after application of flushing water on road (two times weekly) and similar results were obtained at Madrid by Karanasiou et al., (2011). At Stockholm, about 6% reduction of dust was observed while applying water spraying for 8 days.

Street washing is better in terms of controlling dust pollution than mechanical sweeping, if water is available and cost of transportation is reasonable.

	
Manual street watering	***Mechanical street watering***

- **Use of Dust Suppressant to Control Roadside Dust:** Variety of chemical dust suppressant is available to suppress fugitive dust emissions. Compared to water, these are more effective in suppressing dust and need to be applied much less in quantity and less frequently. While the application of water and chemical dust

suppressants are proven and effective options for mitigating dust, they have to be applied judiciously.

Their usage, while mitigating dust, can trigger hazardous environmental consequences. It is important to keep these environmental consequences in mind when deciding on the extent to which water and chemical dust suppressants are to be utilized. The most common dust control agents are chlorides, asphalt products, and lignin. The accompanying chart gives details on these products. The general characteristics of these and other treatments used For dust control are described here. Moisture causes dust particles to agglomerate into larger entities and to adhere to the surface. Dust can be suppressed using water but it lasts only until the water evaporates from the surface. Evaporation can be slowed down by adding dust suppressants to the water. The main dust suppressants that have been tested on paved roads in Europe to reduce PM_{10} concentrations are:

- magnesium chloride ($MgCl_2$);
- calcium chloride ($CaCl_2$);
- calcium magnesium acetate (CMA); and
- potassium formate (referred to as KF in some publications)

Typically, these are combined with lignosulphonates and surfactants in very small quantities. These are tested on different types of surfaces and then applied.

Amato et al. (2010) showed that application of $MgCl_2$ at dosage between 20 and 40 g/m^2 has resulted in 56% of reduction of PM_{10} and 70% reduction of PM2.5. They applied it for 10 continuous days to achieve this success.

In order to achieve the maximum effect in terms of dust control and to reduce the environmental and other impacts; CSIR-NEERI evaluated few options of dust suppressant. It has been validated through laboratory studies and field trials under Indian conditions and scenarios. When, it was applied in Delhi for trials, it showed about 6-8 hours of effectiveness from its applications. Hence, dust suppressant can be used to control road' side dust.

At Delhi, water sprinkling was effective for 10-15 mins while dust suppressant was effective for more than 6-8 hours after its applications

Enviro Policy Research India Pvt. Ltd.'s Dust Suppressant Efficiency (Finding of CPCB Study)

Water can be considered as one of the ancient dust palliative, as it is readily available to apply by spraying over the surface of road. Water is used apply

moisture to the surface area, but the capacity of dust suppression is less due to evaporation.

EPRI's Dust Suppressant (hygroscopic liquid compound with bio-additives) helps to reduce dust for 5-6 hours, as compared to water which last for 15 - 30 minutes. EPRI's Dust suppressant spraying shows more efficiency to reduced particulate matter emission as compared to water spraying.

The cost of EPRI's Dust Suppressant is less i.e. 10-15 paisa per m^2 with no maintenance and does not require any trained person and suitable for surface area and air, wide roads (Industrial areas, construction etc.)

The cost of suppressant is effective as it gives more efficiency and durability with minimal cost as compared to water/ recycled water.

Application Rate: 2 litre per m^2

Process to apply:

- Mix the dust suppressant (which is already coupled with bio-additive) in water
- (recycled or fresh water or tanker water can be used)
- 30% dust suppressant solution must be spayed at 2 litre per m^2 area. Spraying can be done using sprinklers, tankers retrofitted with sprinkler. It can be used as fogging too
- Carry out application depending on the level of pollutants
- Mostly last for 6 - 8 hours (as per results obtained from CPCB study)
- Cost of dust suppressant chemical with added bio-additive is 10 - 15 paisa per m^2

The cost of this dust suppressant chemical is **Rs. 100 to 200 per kg.**

7.2.5 Management of Dust from Storage Piles

The coal dust arising from coal storage area in the port is a major source of air pollution. The existing mechanisms employed for control of airborne coal dust include:

a) Water sprinklers

b) Mist Cannon

The mix of dust suppressant with water should be employed instead of spraying only water through sprinklers and mist cannon.

Note: *Dust suppressants shall not be sprayed on food grains or any edible cargo*

7.2.6 Dust control from transportation vehicles

Another major source of airborne dust is dust arising from transportation vehicles (trucks, dumpers and rail wagons).

- **Wheel Washing Facility**

The use of wheel washing facility at entry and exit of construction sites. At such facility, high pressure water jet is directed at wheels of vehicles to remove all spoil and dirt so as to avoid any deposition of material on public road.

	
Automated Wheel Washing	***Manual Wheel Washing***

7.2.7 Outdoor Air Purifiers

Outdoor air purifiers are emerging technologies designed to combat air pollution in urban environments. These systems, often resembling large cubes or towers, utilize various filtration mechanisms to capture harmful pollutants like particulate matter ($PM_{2.5}$ and PM_{10}), nitrogen oxides, and even bacteria and viruses.

The technology employs fans to draw in polluted air, which then passes through multiple filter stages. Pre-filters remove large dust particles, while HEPA filters trap finer pollutants. Some systems additionally use UV light or ionizers to neutralize bacteria and viruses.

While promising, outdoor air purifiers have limitations. Their effectiveness is often localized, impacting only the immediate surrounding area. Additionally, they require significant energy to operate and raise concerns about noise pollution and filter maintenance.

Despite these limitations, outdoor air purifiers offer a potential solution for improving air quality in specific areas. As the technology evolves and becomes more efficient, it may play a role in creating cleaner and healthier urban environments.

A few air purifying systems available in the Indian market are proposed below. DPA may check its effectiveness and usefulness on a pilot-scale basis initially and if the same is successful, long-term implementation can be done.

Table 19: Outdoor air purifying systems available in Indian Market

S. No	Name of Device	Product Description	Manufacturer / Make	Images	Approx. Cost
1.	HEPA Aluminium Smog Tower, 1 Hp	• The unit is capable of bringing down the PM2.5 level from 200 to 50 within 60 min. • Each unit is capable of pumping out over 40,000 Cubic meters of Clean Air per hour and 10 lakh cubic meters of Clean Air per day. • Filter type: HEPA Filter	Florida Electrical Industries Limited, New Delhi		55,00,000
1.	Wind Augmentation and purifying Unit (WAYU)	• Co-developed by NEERI and DST, GoI • Filters were made of non-woven fabric and their removal efficiency for PM was 80 to 90 % and of the poisonous gases 40 to 50 %. the device is 5.5 feet tall and one foot wide. • The WAYU device works in two stages. • The first stage uses a fan to suck in air around the device, which contains all kinds of pollutants like dust and particulate matter.	NEERI and DST	 	60,000

		• These are separated using three blades of different dimensions. • Post this, the air enters into a specially designed chamber where oxidation takes place using activated carbon coated with titanium oxide. The oxidation is supported by two ultraviolet lights. The purified air is then pumped out into the atmosphere.			
2.	Stand Alone Mild Steel Wayu Ambient air purification system, Automation Grade: Fully Automatic	• Designed to give clean air to the city, Airbin is a next-generation, multi-function outdoor device that has an automated control system and can be accessed from a distant location. • The unit is ready to operate 24 hours a day, seven days a week on the automated air quality index monitoring system. • The unit cleans the air from particulates as small as PM 20 to PM 2.5. • The device is weatherproof and fully automated. • The unit has an IOT-based unit for fine monitoring.	Zylm Energy Private Limited, Jaipur		20,00,000

To summarise, the following equipment may be procured for air pollution control, particularly for dust management:

Table 20:Equipment / items may be procured for air pollution control

S. No.	Item	Cost	Remarks
19.	Vacuum Sweeper	30,00,000 to 70,00,000	For roadside and pavement dust sweeping
20.	Road washer truck	5,00,000 to 10,00,000	For washing of roads and pavements with heavy dust loading
21.	Dust suppressant chemical	Rs. 100-200 per kg	To be mixed with water and sprayed at surfaces with heavy dust loading such as on roadsides and coal yards
22.	Automated Wheel Washing Facility	4,00,000 to 26,00,000	At Entry and Exit of Port
23.	Outdoor air purification system	60,000 to 55,00,000	May be installed on pilot-scale basis near coal handling area

7.2.8 Water and dust suppressant chemical requirements of road dust management inside DPA areas

The roads in and around DPA are frequented by heavy-loading vehicles of various categories, contributing to road dust to a large extent. A cluster of roads was considered for dust management inside the port area. The length and width of roads were calculated, and water requirement is calculated as follows.

As per results obtained from CPCB study, dust suppressant chemical lasts for 6-8 hours.

Considering the application of chemicals to be 2 times per day.

Total requirement of solution for 100m^2 area for single time= 200 lit.

Total requirement of solution for 100m^2 area for one day = 400 lit.

Chemical requirement (30%) = 120 lit

Water requirement (70%) = 280 lit.

Cost of chemical = 10-15 paisa per m^2

Total cost of chemicals to be used during the day =Rs. 20-30 /-.

The road section of the concerned port area is divided into various clusters. The combined road area of a cluster of roads is taken into consideration. A total of 6 road clusters were considered, and the water requirement, along with dust suppressant for those clusters, are mentioned in Table-20.

Figure 1: Road cluster-1 selected for dust management

Figure 2: Road cluster-2 selected for dust management

Figure 3:Road cluster-3 selected for dust management

Figure 4:Road cluster-4 selected for dust management

Figure 5:Road cluster-5 selected for dust management

Figure 6:Road cluster-6 selected for dust management

The detailed calculation of water and chemical requirements for dust control in the above-mentioned road cluster is mentioned in Table 21 below.

Table 21: Calculation of total water and chemical requirement for dust control

S No.	Road Cluster	Combined Area (m^2)	Dust Suppressant Solution Requirement (KLD)	Chemical Requirement (KLD)	Water Requirement (KLD)	Cost of Chemical (Rs) (Per day)
1	R-1	42,185	168.7	50.6	118.1	8,437-12,656
2	R-2	66,818	267.3	80.2	187.1	13,364-20,045
3	R-3	55,762	223.0	66.9	156.1	11,152-16,729
4	R-4	40,359	161.4	48.4	113.0	8,072-12,108
5	R-5	99,014	396.1	118.8	277.2	19,803- 29,704
6	R-6	1,52,155.5	608.6	182.6	426.0	30,431-45,647
Total		**456293.5**	**1825.174**	**547.6**	**1277.6**	**91,259- 1,36,888**

7.3. Renewable Energy

The renewable energy initiatives are to be implemented through

- Installation of rooftop solar.
- Providing solar lighting system in streets, roads wherever applicable.

7.2.1 Rooftop solar design:

The plan for rooftop solar installation is proposed for the following projects:

Table 22: Summary of rooftop solar installation and cost

S No	Project Name	Rooftop area Considered (m^2)	Solar rooftop power generation (MW)	Total cost	Detailed cost calculation
1	Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla	84,984	7	35,00,00,000	Table- 23
2	Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust	800	0.067	33,50,000	Table- 24
3	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side-Northeast of Antarjaal, South of Tagore Road, 580 Acres)	7,97,231	66.43	330, 00,00,000	Table- 25
4	Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side-Northeast of Antarjaal, South of Tagore Road, 580 Acres)	13,31,416	110	550,00,00,000	Table- 26
5	Setting up of RoRo/RoPax Facility at Pipavav, Gujarat	2,767	0.230	1,15,00,000	Table- 27

	Pipavav, Rajula, Amreli Proposed by M/s. DPT				
6	Setting up of RoRo/RoPax Facility at, Muldwarka Port, Gujarat at Survey No. 7413 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath	2,767	0.230	1,15,00,000	Table- 28
7	Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernization of Existing Pipeline Network at Oil Jetty Area, DPT	Not applicable as the project does not envisage construction of any building			
Total		**22,19,965**	**183.96**	**917,63,50,000**	

7.2.2 Project-wise Cost Calculation for Rooftop Solar Installation

i. Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla

Table 23: Calculation for Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla

Particulars	Quantity	Remarks
Total Builtup Area (m^2)	170534.53	Considering Admin block, Substation, Security cabin, fire station, parking area
Rooftop area Considered (m^2)	84984	Considering 50% of rooftop area is available
Area required for 1 MW solar rooftop (m^2)	12,000	
Proposed solar rooftop capacity (MW)	7	
Total solar power generation in a year (Assuming 16% CUF) MWh/year	9811.2	
Cost of 1KW solar rooftop	50,000	
Total cost for 7 MW rooftop	35,00,00,000	

ii. Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust)

Table 24:Calculation for Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust)

Particulars	Quantity	Remarks
Area of Administrative building at Tuna Tekra (m^2)	1600	
Rooftop area Considered (m^2)	800	Considering 50% of rooftop area is available
Area required for 1 KW solar rooftop (m^2)	12	
Proposed solar rooftop capacity (KW)	67	
Total solar power generation in a year (Assuming 16% CUF) KWh/year	93907	
Cost of 1KW solar rooftop	50,000	
Total cost for rooftop	33,50,000	

iii. Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side- Northeast of Antarjaal, South of Tagore Road, 580 Acres)

Table 25: calculation for Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side- Northeast of Antarjaal, South of Tagore Road, 580 Acres)

Particulars	Quantity	Remarks
Total Builtup Area (Education hub and medical hub, Hotel, Mall Complex, Housing new industry, Housing-Natural growth township, District Centre, Community Centre) in m^2	15,94,462	
Rooftop area Considered (m^2)	797231	Considering 50% of rooftop area is available
Area required for 1 KW solar rooftop (m^2)	12	
Proposed solar rooftop capacity (KW)	66435.95	
Proposed solar rooftop capacity (MW)	66.43	
Total solar power generation in a year (Assuming 16% CUF) MWh/year	93116.63	
Maximum power demand (MW)	41	Considering 0.9 power factor

Energy requirement MWh/year	3,59,160	Considering 100% load factor
% energy produced by solar	26	
Cost of 1KW solar rooftop	50,000	
Total cost for 66MW rooftop	330,00,00,000	

iv. Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side- Northeast of Antarjaal, South of Tagore Road, 580 Acres)

Table 26: Calculation for Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side- Northeast of Antarjaal, South of Tagore Road, 580 Acres)

Particulars	Quantity	Remarks
Total Builtup Area (Furniture Industry, Edible Oil Refinery Park, Engineering and Fabrication industry, Multi model logistic park, Housing for Single employees, District Centre, Community Centre) in m^2	26,62,832	
Rooftop area Considered (m^2)	13,31,416	Considering 50% of rooftop area is available
Area required for 1 KW solar rooftop (m^2)	12	
Proposed solar rooftop capacity (MW)	110	
Total solar power generation in a year (Assuming 16% CUF) MWh/year	1,54,176	
Maximum power demand (MW)	87.5	Considering 0.9 power factor
Energy requirement MWh/year	7,66,987	Considering 100% load factor
% energy produced by solar	20	
Cost of 1KW solar rooftop	50,000	
Total cost for 110 MW rooftop	550,00,00,000	

v. Setting up of RoRo/RoPax Facility at Pipavav, Gujarat Pipavav, Rajula, Amreli Proposed by M/s. DPT

Table 27: Calculation for Setting up of RoRo/RoPax Facility at Pipavav, Gujarat Pipavav, Rajula, Amreli Proposed by M/s. DPT

Particulars	Quantity	Remarks
Total Built-up Area (Main terminal building, Admin Building, Roofed Open Space, Quarter building, Substation building) in m^2	5534.5	
Rooftop area Considered (m^2)	2767	Considering 50% of rooftop area is available
Area required for 1 KW solar rooftop (m^2)	12	
Proposed solar rooftop capacity (KW)	230	
Total solar power generation in a year (Assuming 16% CUF) KWh/year	3,22,368	
Cost of 1KW solar rooftop	50,000	
Total cost for 230 KW rooftop	1,15,00,000	

vi. Setting up of RoRo/RoPax Facility at, Muldwarka Port, Gujarat at Survey No. 7413 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath

Table 28: Calculation for Setting up of RoRo/RoPax Facility at, Muldwarka Port, Gujarat at Survey No. 7413 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath

Particulars	Quantity	Remarks
Total Built-up Area (Main terminal building, Admin Building, Roofed Open Space, Quarter building, Substation building) in m^2	5534.5	
Rooftop area Considered (m^2)	2767	Considering 50% of rooftop area is available
Area required for 1 KW solar rooftop (m^2)	12	
Proposed solar rooftop capacity (KW)	230	
Total solar power generation in a year (Assuming 16% CUF) KWh/year	3,22,368	
Cost of 1KW solar rooftop	50,000	
Total cost for 230 KW rooftop	1,15,00,000	

7.2.3 Solar Street lighting design

As per Ministry of New and Renewable Energy, following specification is given for the solar street light design.

12 W WHITE-LED BASED SOLAR STREET LIGHTING SYSTEM

S No	Components	Specification
1.	PV module	75 Wp
2.	Battery	Minimum 12.8V, 30 AH capacity Lithium Ferro Phosphate battery.
3.	Light Source	White Light Emitting Diode (W-LED) 12-Watt, W-LED luminaire, dispersed beam, soothing to eyes with the use of proper optics and diffuser.
4.	Light Out put	The luminaire must use high efficacy W-LED with minimum 135 lumens per watt (and UV free).
5.	Mounting of light	Pole height 5 m above the ground level and 1 m below the ground. Luminaire shall be at least 4.5 m above the ground level.
6.	Duty Cycle	Dusk to dawn: First 4 Hours full light (Min. 24 Lux), rest of the time at lower light (50%, Min. 12 Lux) level.
7.	Autonomy	3 days or Minimum 36 operating hours per permissible discharge with fully charged Lithium-Ferro Phosphate Battery.

For spacing between two poles, As per National Lighting code: SP (72): 2010

As mentioned in clause 5.3.3: Spacing and Mounting Height Generally the mounting height determines the maximum spacing between adjacent columns or masts. The recommended spacing is 3.5 times the mounting height. In certain cases, this spacing can be reduced or increased, but special care will have to be taken to avoid excessive glare, long shadows and uniformity problems. In order to restrict glare, luminaires should not emit significant amounts of light above 75 degrees from the downward vertical, when correctly installed and aimed. Otherwise, they may produce excessive glare, both in the area intended to be lit and in its surroundings.

7.2.4 Financial outlay of solar street light design

Based on available infrastructure details, the solar street light plan has been designed for the following projects:

Table 29:Financial outlay of solar street light design

S No	Project Name	Project Components	Conditions				Remarks
			Road length	Type	No. Of Poles	Cost	
1	Construction of Interchange cum Road Over Bridge (ROB) at LC-236 {Kutch		14.892KM	Provide double sided solar light	851	*15000/- per module (As per market cost) = 1,27,65,000/-	

	salt junction] on N.H-141 to Nehru gate of Kandla port, Gandhidham, Kutch						
2	Development of Plots for Construction of Warehouses/ Godowns (Stage II) at Kandla, Gujarat						The solar lighting systems are to be done by the lease plot holders.
3	Development of plot for construction of liquid storage tank farm for handling edible & non edible oil & petroleum products						The solar lighting systems are to be done by the lease plot holders.
4	Setting up of RoRo/RoPax Facility at, Muldwarka Port, Gujarat at Survey No. 7413 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath.	Existing Approach	381 m	Provide Single sided solar light in both lanes	23*2=46	*10000/- per module (As per market cost) = 4,60,000/-	
		Existing deck	60 m	Provide Single sided solar light in both lanes	4*2=8	*10000/- per module (As per market cost) = 80,000/-	
		Link span	30 m	Provide Single sided solar light in both lanes	2*2=4	*10000/- per module (As per market cost) = 40,000/-	
		Walkway	184 m	Provide Single sided	11	*10000/- per module (As per market	

				solar light		cost) = 1,10,000/-	
Total					**69**	**6,90,000/-**	
5	Setting up of RoRo/RoPax Facility at Pipavav, Gujarat Pipavav, Rajula, Amreli Proposed by M/s. DPT	Approach Trestle	150m	Provide Single sided solar light in both lanes	9*2=18	*10000/- per module (As per market cost) = 1,80,000/-	
		Link span	42 m	Provide Single sided solar light in both lanes	3*2=6	*10000/- per module (As per market cost) = 60,000/-	
		walkway	202 m	Provide Single sided solar light	12	*10000/- per module (As per market cost) = 1,20,000/-	
Total					**36**	**3,60,000/-**	
Grand Total (1+2+3+4+5)					**956**	**1,38,15,000**	

Chapter-8 Summary of Cost

The estimated cost of all the components proposed in EMP is summarized below.

Table 30: Summary of expenditures

S No.	Particulars	Cost
1	Greenbelt Development	36,71,08,843
2	Cost of dust control chemical (per day)	91,259- 1,36,888
3	Renewable Energy	
a	Solar rooftop	917,63,50,000
b	Solar street lighting	1,38,15,000
4	Rainwater Harvesting	1,82,29,820

Annexure

Detailed Cost Breakup for Greenbelt Development

1. Creation of waterfront facilities (Oil Jetties 8, 9, 10 & 11) and development of land of area 554 acres for associated facilities for storage at Old Kandla

Current Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Rich clay	cubic m	1000	5460	5460000	NA	Market rates
2	Gypsum	cubic m	1500	5460	8190000		
3	Cow dung manure	cubic m	3000	2730	8190000		
6	Fertilizer	kg	25	18000	450000		
	Sub-total (a)				**22290000**		
(b) Saplings (Rates of saplings are inclusive of transportation, loading, unloading at pit site)							
1	Neem	nos.	40	6500	260000	NA	Market rates
2	Putra Jiva	nos.	30	4700	141000		
3	Garmalo	nos.	40	6500	260000		
4	Ashoka	nos.	30	4700	141000		
5	Mango	nos.	40	4700	188000		
6	Drumstick	nos.	30	5700	171000		
7	Bili	nos.	40	6500	260000		
8	Sitafal	nos.	40	4700	188000		
9	Kanchnar	nos.	35	5700	199500		
10	Asundro	nos.	30	4700	141000		
11	Khakhro	nos.	35	6500	227500		
12	Bhangro	nos.	30	4700	141000		
13	Sharu	nos.	40	7500	300000		

14	Sisham	nos.	40	4700	188000		
15	Pilu	nos.	30	4700	141000		
16	Bougainvel	nos.	40	7500	300000		
17	Scarlet bush	nos.	40	7500	300000		
18	Jasud	nos.	40	7500	300000		
19	Ixora	nos.	40	7500	300000		
20	Kamini	nos.	40	7500	300000		
21	Karen	nos.	40	7500	300000		
22	Tagar	nos.	40	7500	300000		
23	Tecoma	nos.	40	7500	300000		
24	Pili Karen	nos.	40	7500	300000		
	Sub-total (b)			150000	**5647000**		
(c)Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	15.15	150000	2272500	20 pits / person	
2	Planting with polypot	per plant	3.8	150000	570000	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	295.45	150	44318	1000 plants / person	
4	First soil workings during monsoon	per plant	5.1	450000	2295000	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.55	13950000	21622500	200 plants / person	As per watering Schedule
6	Subsequent soil workings	per plant	3.8	150000	5700000	80 plants / person	10 subsequent soil working per year
	Sub-total (c)				**32504318**		
	Total of Current Year (a+b+c)				**60441318**		
First Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	18000	450000	NA	Market rates
	Sub-total (a)				**450000**		

(b) Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	1300	52000	NA	Market rates
2	Putra Jiva	nos.	30	940	28200		
3	Garmalo	nos.	40	1300	52000		
4	Ashoka	nos.	30	940	28200		
5	Mango	nos.	40	940	37600		
6	Drumstick	nos.	30	1140	34200		
7	Bili	nos.	40	1300	52000		
8	Sitafal	nos.	40	940	37600		
9	Kanchnar	nos.	35	1140	39900		
10	Asundro	nos.	30	940	28200		
11	Khakhro	nos.	35	1300	45500		
12	Bhangro	nos.	30	940	28200		
13	Sharu	nos.	40	1500	60000		
14	Sisham	nos.	40	940	37600		
15	Pilu	nos.	30	940	28200		
16	Bougainvel	nos.	40	1500	60000		
17	Scarlet bush	nos.	40	1500	60000		
18	Jasud	nos.	40	1500	60000		
19	Ixora	nos.	40	1500	60000		
20	Kamini	nos.	40	1500	60000		
21	Karen	nos.	40	1500	60000		
22	Tagar	nos.	40	1500	60000		
23	Tecoma	nos.	40	1500	60000		
24	Pili Karen	nos.	40	1500	60000		
	Sub-total (b)			30000	**1129400**		
(c) Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	16.665	30000	499950	20 pits / person	
2	Planting with polypot	per plant	4.18	30000	125400	80 plants / person	

3	Fertilizer / Insecticide Application	per 1000 plant	324.995	150	48749	1000 plants / person	
4	First soil workings during monsoon	per plant	5.61	90000	504900	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.705	13950000	23784750	200 plants / person	As per watering Schedule
6	Subsequent soil workings	per plant	4.18	30000	1254000	80 plants / person	10 Times/year
	Sub-total (c)				**26217749**		
	Total of First Year (a+b+c)				**27797149**		
Second Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	18000	450000	NA	Market rates
	Sub-total (a)				**450000**		
(b) Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	1300	52000	NA	Market rates
2	Putra Jiva	nos.	30	940	28200		
3	Garmalo	nos.	40	1300	52000		
4	Ashoka	nos.	30	940	28200		
5	Mango	nos.	40	940	37600		
6	Drumstick	nos.	30	1140	34200		
7	Bili	nos.	40	1300	52000		
8	Sitafal	nos.	40	940	37600		
9	Kanchnar	nos.	35	1140	39900		
10	Asundro	nos.	30	940	28200		
11	Khakhro	nos.	35	1300	45500		
12	Bhangro	nos.	30	940	28200		
13	Sharu	nos.	40	1500	60000		
14	Sisham	nos.	40	940	37600		
15	Pilu	nos.	30	940	28200		

16	Bougainvel	nos.	40	1500	60000		
17	Scarlet bush	nos.	40	1500	60000		
18	Jasud	nos.	40	1500	60000		
19	Ixora	nos.	40	1500	60000		
20	Kamini	nos.	40	1500	60000		
21	Karen	nos.	40	1500	60000		
22	Tagar	nos.	40	1500	60000		
23	Tecoma	nos.	40	1500	60000		
24	Pili Karen	nos.	40	1500	60000		
	Sub-total (b)			30000	**1129400**		
(c) Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	18.33	30000	549945	20 pits / person	
2	Planting with polypot	per plant	4.60	30000	137940	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	357.49	150	53624	1000 plants / person	
4	First soil workings during monsoon	per plant	6.17	30000	555390	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.88	13950000	26163225	200 plants / person	As per watering Schedule
6	Subsequent soil workings	per plant	4.60	30000	1379400	80 plants / person	10 Times/year
	Sub-total (c)				**28839524**		
	Total of Second Year (a+b+c)				**30418924**		
	Total of Current, First & Second Year				**118657391**		

2. Development of Integrated facilities (Stage II) within the existing Deendayal Port Trust

Current Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Rich clay	cubic mt	1000	317	317000	NA	Market rates
2	Gypsum	cubic mt	1500	127	190500		
3	Cow dung manure	cubic mt	3000	127	381000		
6	Fertilizer	kg	25	500	12500		
	Sub-total (a)				**901000**		
(b) Saplings (Rates of saplings are inclusive of transportation, loading, unloading at pit site)							
1	Garmalo	nos.	40	180	7200	NA	Market rates
2	Ashoka	nos.	30	180	5400		
3	Kanchnar	nos.	35	180	6300		
4	Asundro	nos.	30	180	5400		
5	Khakhro	nos.	35	180	6300		
6	Pilu	nos.	30	180	5400		
7	Drumstick	nos.	30	180	5400		
8	Bougainvel	nos.	40	300	12000		
9	Scarlet bush	nos.	40	250	10000		
10	Jasud	nos.	40	200	8000		
11	Ixora	nos.	40	225	9000		
12	Kamini	nos.	40	250	10000		
13	Karen	nos.	40	250	10000		
14	Tagar	nos.	40	250	10000		

15	Tecoma	nos.	40	250	10000		
16	Pili Karen	nos.	40	250	10000		
25	**Sub-total (b)**			3485	**130400**		
(c)Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	15.15	3485	52798	20 pits / person	
2	Planting with polypot	per plant	3.8	3485	13243	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	295.45	3.5	1034	1000 plants / person	
4	First soil workings during monsoon	per plant	5.1	10455	53321	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.55	324105	502363	200 plants / person	As per watering Schedule
6	Subsequent soil workings	per plant	3.8	3485	132430	80 plants / person	10 subsequent soil working per year
	Sub-total (c)				**755188**		
	Total of Current Year (a+b+c)				**1786588**		
First Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	500	12500	NA	Market rates
	Sub-total (a)				**12500**		
Saplings (Casualty Replacement @ 20%)							
1	Garmalo	nos.	40	36	1440		Market rates
2	Ashoka	nos.	30	36	1080		
3	Kanchnar	nos.	35	36	1260		
4	Asundro	nos.	30	36	1080		
5	Khakhro	nos.	35	36	1260		
6	Pilu	nos.	30	36	1080		
7	Drumstick	nos.	30	36	1080		

8	Bougainvel	nos.	40	60	2400		
9	Scarlet bush	nos.	40	50	2000		
10	Jasud	nos.	40	40	1600		
11	Ixora	nos.	40	45	1800		
12	Kamini	nos.	40	50	2000		
13	Karen	nos.	40	50	2000		
14	Tagar	nos.	40	50	2000		
15	Tecoma	nos.	40	50	2000		
16	Pili Karen	nos.	40	50	2000		
	Sub-total (b)			697	**26080**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	16.665	697	11616	20 pits / person	
2	Planting with polypot	per plant	4.18	697	2913	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	324.995	3.5	1137	1000 plants / person	
4	First soil workings during monsoon	per plant	5.61	2091	11731	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.705	324105	552599	200 plants / person	As per watering Schedule
6	Subsequent soil workings	per plant	4.18	697	29135	80 plants / person	10 Times/year
	Sub-total (c)				**609131**		
	Total of First Year (a+b+c)				**647711**		
Second Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	500	12500		Market rates
	Sub-total (a)				**12500**		
Saplings (Casualty Replacement @ 20%)							
1	Garmalo	nos.	40	36	1440		

2	Ashoka	nos.	30	36	1080		Market rates
3	Kanchnar	nos.	35	36	1260		
4	Asundro	nos.	30	36	1080		
5	Khakhro	nos.	35	36	1260		
6	Pilu	nos.	30	36	1080		
7		nos.	30	36	1080		
8	Bougainvel	nos.	40	60	2400		
9	Scarlet bush	nos.	40	50	2000		
10	Jasud	nos.	40	40	1600		
11	Ixora	nos.	40	45	1800		
12	Kamini	nos.	40	50	2000		
13	Karen	nos.	40	50	2000		
14	Tagar	nos.	40	50	2000		
15	Tecoma	nos.	40	50	2000		
16	Pili Karen	nos.	40	50	2000		
	Sub-total (b)			697	**26080**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	18.33	697	12777	20 pits / person	
2	Planting with polypot	per plant	4.60	697	3205	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	357.49	3.5	1251	1000 plants / person	
4	First soil workings during monsoon	per plant	6.17	2091	12904	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.88	324105	607859	200 plants / person	As per watering Schedule
6	Subsequent soil workings	per plant	4.60	697	32048	80 plants / person	10 Times/year
	Sub-total (c)				**670044**		
	Total of Second Year (a+b+c)				**708624**		
	Total of Current, First & Second Year				**3142922**		

3. Development of 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit at District Kutch (Gujarat)

Current Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Rich clay	cubic mt	1000	2694	2694000	NA	Market rates
2	Gypsum	cubic mt	1500	2694	4041000		
3	Cow dung manure	cubic mt	3000	1347	4041000		
6	Fertilizer	kg	25	8880	222000		
	Sub-total (a)				**10998000**		
(b) Saplings (Rates of saplings are inclusive of transportation, loading, unloading at pit site)							
1	Neem	nos.	40	3300	132000	NA	Market rates
2	Putra Jiva	nos.	30	2400	72000		
3	Garmalo	nos.	40	3300	132000		
4	Ashoka	nos.	30	2400	72000		
5	Mango	nos.	40	2400	96000		
6	Drumstick	nos.	30	2800	84000		
7	Bili	nos.	40	3300	132000		
8	Sitafal	nos.	40	2400	96000		
9	Kanchnar	nos.	35	2800	98000		
10	Asundro	nos.	30	2400	72000		
11	Khakhro	nos.	35	3300	115500		
12	Bhangro	nos.	30	2400	72000		

13	Sharu	nos.	40	3600	144000		
14	Sisham	nos.	40	2400	96000		
15	Pilu	nos.	30	2400	72000		
16	Bougainvel	nos.	40	3600	144000		
17	Scarlet bush	nos.	40	3600	144000		
18	Jasud	nos.	40	3600	144000		
19	Ixora	nos.	40	3600	144000		
20	Kamini	nos.	40	3600	144000		
21	Karen	nos.	40	3600	144000		
22	Tagar	nos.	40	3600	144000		
23	Tecoma	nos.	40	3600	144000		
24	Pili Karen	nos.	40	3600	144000		
25	**Sub-total (b)**			74000	**2781500**		
(c)Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	15.15	74000	1121100	20 pits / person	
2	Planting with polypot	per plant	3.8	74000	281200	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	295.45	74	21863	1000 plants / person	
4	First soil workings during monsoon	per plant	5.1	222000	1132200	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.55	6882000	10667100	200 plants / person	As per watering Schedule
6	Subsequent soil workings	per plant	3.8	74000	2812000	80 plants / person	10 subsequent soil working per year
	Sub-total (c)				**16035463**		

	Total of Current Year (a+b+c)				**29814963**		
First Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	8880	222000	NA	Market rates
	Sub-total (a)				**222000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	660	26400	NA	Market rates
2	Putra Jiva	nos.	30	480	14400		
3	Garmalo	nos.	40	660	26400		
4	Ashoka	nos.	30	480	14400		
5	Mango	nos.	40	480	19200		
6	Drumstick	nos.	30	560	16800		
7	Bili	nos.	40	660	26400		
8	Sitafal	nos.	40	480	19200		
9	Kanchnar	nos.	35	560	19600		
10	Asundro	nos.	30	480	14400		
11	Khakhro	nos.	35	660	23100		
12	Bhangro	nos.	30	480	14400		
13	Sharu	nos.	40	720	28800		
14	Sisham	nos.	40	480	19200		
15	Pilu	nos.	30	480	14400		
16	Bougainvel	nos.	40	720	28800		
17	Scarlet bush	nos.	40	720	28800		
18	Jasud	nos.	40	720	28800		
19	Ixora	nos.	40	720	28800		
20	Kamini	nos.	40	720	28800		
21	Karen	nos.	40	720	28800		

22	Tagar	nos.	40	720	28800		
23	Tecoma	nos.	40	720	28800		
24	Pili Karen	nos.	40	720	28800		
	Sub-total (b)			14800	**556300**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	16.665	14800	246642	20 pits / person	
2	Planting with polypot	per plant	4.18	14800	61864	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	324.995	74	24050	1000 plants / person	
4	First soil workings during monsoon	per plant	5.61	44400	249084	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.705	6882000	11733810	200 plants / person	As per watering Schedule
6	Subsequent soil workings	per plant	4.18	14800	618640	80 plants / person	10 Times/year
	Sub-total (c)				**12934090**		
	Total of First Year (a+b+c)				**13712390**		
Second Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	8880	222000	NA	Market rates
	Sub-total (a)				**222000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	660	26400	NA	Market rates
2	Putra Jiva	nos.	30	480	14400		
3	Garmalo	nos.	40	660	26400		
4	Ashoka	nos.	30	480	14400		
5	Mango	nos.	40	480	19200		

6	Drumstick	nos.	30	560	16800		
7	Bili	nos.	40	660	26400		
8	Sitafal	nos.	40	480	19200		
9	Kanchnar	nos.	35	560	19600		
10	Asundro	nos.	30	480	14400		
11	Khakhro	nos.	35	660	23100		
12	Bhangro	nos.	30	480	14400		
13	Sharu	nos.	40	720	28800		
14	Sisham	nos.	40	480	19200		
15	Pilu	nos.	30	480	14400		
16	Bougainvel	nos.	40	720	28800		
17	Scarlet bush	nos.	40	720	28800		
18	Jasud	nos.	40	720	28800		
19	Ixora	nos.	40	720	28800		
20	Kamini	nos.	40	720	28800		
21	Karen	nos.	40	720	28800		
22	Tagar	nos.	40	720	28800		
23	Tecoma	nos.	40	720	28800		
24	Pili Karen	nos.	40	720	28800		
	Sub-total (b)			14800	**556300**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	18.33	14800	271306	20 pits / person	
2	Planting with polypot	per plant	4.60	14800	68050	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	357.49	74	26455	1000 plants / person	
4	First soil workings during monsoon	per plant	6.17	44400	273992	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.88	6882000	12907191	200 plants / person	As per schedule

6	Subsequent soil workings	per plant	4.60	14800	680504	80 plants / person	10 Times/year
	Sub-total (c)				**14227499**		
	Total of Second Year (a+b+c)				**15005799**		
	Total of Current, First & Second Year				**58533152**		

4. Development of 3 Remaining Integrated Facilities (stage I) within the existing Deendayal Port Authority

Current Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Rich clay	cubic mt	1000	2293.2	2293200	NA	Market rates
2	Gypsum	cubic mt	1500	2293.2	3439800		
3	Cow dung manure	cubic mt	3000	1146.6	3439800		
6	Fertilizer	kg	25	7560	189000		
	Sub-total (a)				**9361800**		
(b) Saplings (Rates of saplings are inclusive of transportation, loading, unloading at pit site)							
1	Neem	nos.	40	2800	112000	NA	Market rates
2	Putra Jiva	nos.	30	1950	58500		
3	Garmalo	nos.	40	2800	112000		
4	Ashoka	nos.	30	1950	58500		
5	Mango	nos.	40	1950	78000		
6	Drumstick	nos.	30	2350	70500		
7	Bili	nos.	40	2800	112000		
8	Sitafal	nos.	40	1950	78000		
9	Kanchnar	nos.	35	2350	82250		

10	Asundro	nos.	30	1950	58500		
11	Khakhro	nos.	35	2800	98000		
12	Bhangro	nos.	30	1950	58500		
13	Sharu	nos.	40	3150	126000		
14	Sisham	nos.	40	1950	78000		
15	Pilu	nos.	30	1950	58500		
16	Bougainvel	nos.	40	3150	126000		
17	Scarlet bush	nos.	40	3150	126000		
18	Jasud	nos.	40	3150	126000		
19	Ixora	nos.	40	3150	126000		
20	Kamini	nos.	40	3150	126000		
21	Karen	nos.	40	3150	126000		
22	Tagar	nos.	40	3150	126000		
23	Tecoma	nos.	40	3150	126000		
24	Pili Karen	nos.	40	3150	126000		
25	**Sub-total (b)**			63000	**2373250**		
(c)Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	15.15	63000	954450	20 pits / person	
2	Planting with polypot	per plant	3.8	63000	239400	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	295.45	63	18613	1000 plants / person	

4	First soil workings during monsoon	per plant	5.1	189000	963900	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.55	5859000	9081450	200 plants / person	10 support watering per year
6	Subsequent soil workings	per plant	3.8	63000	2394000	80 plants / person	10 subsequent soil working per year
	Sub-total (c)				**13651813**		
	Total of Current Year (a+b+c)				**25386863**		
First Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	7560	189000		Market rates
	Sub-total (a)				**189000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	560	22400	NA	Market rates
2	Putra Jiva	nos.	30	390	11700		
3	Garmalo	nos.	40	560	22400		
4	Ashoka	nos.	30	390	11700		
5	Mango	nos.	40	390	15600		
6	Drumstick	nos.	30	470	14100		
7	Bili	nos.	40	560	22400		
8	Sitafal	nos.	40	390	15600		
9	Kanchnar	nos.	35	470	16450		

10	Asundro	nos.	30	390	11700		
11	Khakhro	nos.	35	560	19600		
12	Bhangro	nos.	30	390	11700		
13	Sharu	nos.	40	630	25200		
14	Sisham	nos.	40	390	15600		
15	Pilu	nos.	30	390	11700		
16	Bougainvel	nos.	40	630	25200		
17	Scarlet bush	nos.	40	630	25200		
18	Jasud	nos.	40	630	25200		
19	Ixora	nos.	40	630	25200		
20	Kamini	nos.	40	630	25200		
21	Karen	nos.	40	630	25200		
22	Tagar	nos.	40	630	25200		
23	Tecoma	nos.	40	630	25200		
24	Pili Karen	nos.	40	630	25200		
	Sub-total (b)			12600	**474650**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	16.665	12600	209979	20 pits / person	
2	Planting with polypot	per plant	4.18	12600	52668	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	324.995	63	20475	1000 plants / person	
4	First soil workings during monsoon	per plant	5.61	37800	212058	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.705	5859000	9989595	200 plants / person	As per schedule

6	Subsequent soil workings	per plant	4.18	12600	526680	80 plants / person	10 Times/year
	Sub-total (c)				**11011455**		
	Total of First Year (a+b+c)				**11675105**		
Second Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	7560	189000		Market rates
	Sub-total (a)				**189000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	560	22400	NA	Market rates
2	Putra Jiva	nos.	30	390	11700		
3	Garmalo	nos.	40	560	22400		
4	Ashoka	nos.	30	390	11700		
5	Mango	nos.	40	390	15600		
6	Drumstick	nos.	30	470	14100		
7	Bili	nos.	40	560	22400		
8	Sitafal	nos.	40	390	15600		
9	Kanchnar	nos.	35	470	16450		
10	Asundro	nos.	30	390	11700		
11	Khakhro	nos.	35	560	19600		
12	Bhangro	nos.	30	390	11700		
13	Sharu	nos.	40	630	25200		
14	Sisham	nos.	40	390	15600		
15	Pilu	nos.	30	390	11700		
16	Bougainvel	nos.	40	630	25200		
17	Scarlet bush	nos.	40	630	25200		

18	Jasud	nos.	40	630	25200		
19	Ixora	nos.	40	630	25200		
20	Kamini	nos.	40	630	25200		
21	Karen	nos.	40	630	25200		
22	Tagar	nos.	40	630	25200		
23	Tecoma	nos.	40	630	25200		
24	Pili Karen	nos.	40	630	25200		
	Sub-total (b)			12600	**474650**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	18.33	12600	230977	20 pits / person	
2	Planting with polypot	per plant	4.60	12600	57935	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	357.49	63	22522	1000 plants / person	
4	First soil workings during monsoon	per plant	6.17	37800	233264	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.88	5859000	10988555	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.60	12600	579348	80 plants / person	10 Times/year
	Sub-total (c)				**12112600**		
	Total of Second Year (a+b+c)				**12776250**		
	Total of Current, First & Second Year				**49838218**		

5. Construction of Interchange cum Road Over Bridge (ROB) at LC-236

Current Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Rich clay	cubic mt	1000	182	182000	NA	Market rates
2	Gypsum	cubic mt	1500	182	273000		
3	Cow dung manure	cubic mt	3000	91	273000		
6	Fertilizer	kg	25	600	15000		
	Sub-total (a)				**743000**		
(b) Saplings (Rates of saplings are inclusive of transportation, loading, unloading at pit site)							
1	Neem	nos.	40	220	8800	NA	Market rates
2	Putra Jiva	nos.	30	155	4650		
3	Garmalo	nos.	40	220	8800		
4	Ashoka	nos.	30	155	4650		
5	Mango	nos.	40	155	6200		
6	Drumstick	nos.	30	190	5700		
7	Bili	nos.	40	220	8800		
8	Sitafal	nos.	40	155	6200		
9	Kanchnar	nos.	35	190	6650		
10	Asundro	nos.	30	155	4650		
11	Khakhro	nos.	35	220	7700		
12	Bhangro	nos.	30	155	4650		
13	Sharu	nos.	40	250	10000		
14	Sisham	nos.	40	155	6200		
15	Pilu	nos.	30	155	4650		
16	Bougainvel	nos.	40	250	10000		
17	Scarlet bush	nos.	40	250	10000		
18	Jasud	nos.	40	250	10000		
19	Ixora	nos.	40	250	10000		
20	Kamini	nos.	40	250	10000		
21	Karen	nos.	40	250	10000		

22	Tagar	nos.	40	250	10000		
23	Tecoma	nos.	40	250	10000		
24	Pili Karen	nos.	40	250	10000		
25	**Sub-total (b)**			5000	**188300**		
(c)Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	15.15	5000	75750	20 pits / person	
2	Planting with polypot	per plant	3.8	5000	19000	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	295.45	5	1477	1000 plants / person	
4	First soil workings during monsoon	per plant	5.1	15000	76500	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.55	465000	720750	200 plants / person	10 support watering per year
6	Subsequent soil workings	per plant	3.8	5000	190000	80 plants / person	10 subsequent soil working per year
	Sub-total (c)				**1083477**		
	Total of Current Year (a+b+c)				**2014777**		
First Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	600	15000		Market rates
	Sub-total (a)				**15000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	44	1760	NA	Market rates

2	Putra Jiva	nos.	30	31	930		
3	Garmalo	nos.	40	44	1760		
4	Ashoka	nos.	30	31	930		
5	Mango	nos.	40	31	1240		
6	Drumstick	nos.	30	38	1140		
7	Bili	nos.	40	44	1760		
8	Sitafal	nos.	40	31	1240		
9	Kanchnar	nos.	35	38	1330		
10	Asundro	nos.	30	31	930		
11	Khakhro	nos.	35	44	1540		
12	Bhangro	nos.	30	31	930		
13	Sharu	nos.	40	50	2000		
14	Sisham	nos.	40	31	1240		
15	Pilu	nos.	30	31	930		
16	Bougainvel	nos.	40	50	2000		
17	Scarlet bush	nos.	40	50	2000		
18	Jasud	nos.	40	50	2000		
19	Ixora	nos.	40	50	2000		
20	Kamini	nos.	40	50	2000		
21	Karen	nos.	40	50	2000		
22	Tagar	nos.	40	50	2000		
23	Tecoma	nos.	40	50	2000		
24	Pili Karen	nos.	40	50	2000		
	Sub-total (b)			1000	**37660**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	16.665	1000	16665	20 pits / person	
2	Planting with polypot	per plant	4.18	1000	4180	80 plants / person	

3	Fertilizer / Insecticide Application	per 1000 plant	324.995	5	1625	1000 plants / person	
4	First soil workings during monsoon	per plant	5.61	3000	16830	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.705	465000	792825	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.18	1000	41800	80 plants / person	10 Times/year
	Sub-total (c)				**873925**		
	Total of First Year (a+b+c)				**926585**		
Second Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	600	15000		Market rates
	Sub-total (a)				**15000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	44	1760	NA	Market rates
2	Putra Jiva	nos.	30	31	930		
3	Garmalo	nos.	40	44	1760		
4	Ashoka	nos.	30	31	930		
5	Mango	nos.	40	31	1240		
6	Drumstick	nos.	30	38	1140		
7	Bili	nos.	40	44	1760		
8	Sitafal	nos.	40	31	1240		
9	Kanchnar	nos.	35	38	1330		
10	Asundro	nos.	30	31	930		
11	Khakhro	nos.	35	44	1540		
12	Bhangro	nos.	30	31	930		
13	Sharu	nos.	40	50	2000		

14	Sisham	nos.	40	31	1240		
15	Pilu	nos.	30	31	930		
16	Bougainvel	nos.	40	50	2000		
17	Scarlet bush	nos.	40	50	2000		
18	Jasud	nos.	40	50	2000		
19	Ixora	nos.	40	50	2000		
20	Kamini	nos.	40	50	2000		
21	Karen	nos.	40	50	2000		
22	Tagar	nos.	40	50	2000		
23	Tecoma	nos.	40	50	2000		
24	Pili Karen	nos.	40	50	2000		
	Sub-total (b)			1000	**37660**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	18.33	1000	18332	20 pits / person	
2	Planting with polypot	per plant	4.60	1000	4598	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	357.49	5	1787	1000 plants / person	
4	First soil workings during monsoon	per plant	6.17	3000	18513	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.88	465000	872108	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.60	1000	45980	80 plants / person	10 Times/year
	Sub-total (c)				**961317**		
	Total of Second Year (a+b+c)				**1013977**		
	Total of Current, First & Second Year				**3955340**		

6. Proposed Smart Industrial Port City (SIPC) at green Field Site 1 (Adipur side- Northeast of Antarjaal, South of Tagore Road, 580 Acres)

Current Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Rich clay	cubic m	1000	2912	2912000	NA	Market rates
2	Gypsum	cubic m	1500	2912	4368000		
3	Cow dung manure	cubic m	3000	1456	4368000		
4	Fertilizer	kg	25	9600	240000		
	Sub-total (a)				**11888000**		
(b) Saplings (Rates of saplings are inclusive of transportation, loading, unloading at pit site)							
1	Neem	nos.	40	3500	140000	NA	Market rates
2	Putra Jiva	nos.	30	2500	75000		
3	Garmalo	nos.	40	3500	140000		
4	Ashoka	nos.	30	2500	75000		
5	Mango	nos.	40	2500	100000		
6	Drumstick	nos.	30	3000	90000		
7	Bili	nos.	40	3500	140000		
8	Sitafal	nos.	40	2500	100000		
9	Kanchnar	nos.	35	3000	105000		
10	Asundro	nos.	30	2500	75000		
11	Khakhro	nos.	35	3500	122500		
12	Bhangro	nos.	30	2500	75000		
13	Sharu	nos.	40	4000	160000		
14	Sisham	nos.	40	2500	100000		
15	Pilu	nos.	30	2500	75000		
16	Bougainvel	nos.	40	4000	160000		
17	Scarlet bush	nos.	40	4000	160000		
18	Jasud	nos.	40	4000	160000		

19	Ixora	nos.	40	4000	160000		
20	Kamini	nos.	40	4000	160000		
21	Karen	nos.	40	4000	160000		
22	Tagar	nos.	40	4000	160000		
23	Tecoma	nos.	40	4000	160000		
24	Pili Karen	nos.	40	4000	160000		
25	**Sub-total (b)**			80000	**3012500**		
1	Pit Digging	per pit	15.15	80000	1212000	20 pits / person	
2	Planting with polypot	per plant	3.8	80000	304000	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	295.45	80	23636	1000 plants / person	
4	First soil workings during monsoon	per plant	5.1	240000	1224000	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.55	7440000	11532000	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	3.8	80000	3040000	80 plants / person	10 subsequent soil working per year
	Sub-total (c)				**17335636**		
	Total of Current Year (a+b+c)				**32236136**		
First Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	9600	240000		
	Sub-total (a)				**240000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	700	28000	NA	Market rates
2	Putra Jiva	nos.	30	500	15000		
3	Garmalo	nos.	40	700	28000		
4	Ashoka	nos.	30	500	15000		

5	Mango	nos.	40	500	20000		
6	Drumstick	nos.	30	600	18000		
7	Bili	nos.	40	700	28000		
8	Sitafal	nos.	40	500	20000		
9	Kanchnar	nos.	35	600	21000		
10	Asundro	nos.	30	500	15000		
11	Khakhro	nos.	35	700	24500		
12	Bhangro	nos.	30	500	15000		
13	Sharu	nos.	40	800	32000		
14	Sisham	nos.	40	500	20000		
15	Pilu	nos.	30	500	15000		
16	Bougainvel	nos.	40	800	32000		
17	Scarlet bush	nos.	40	800	32000		
18	Jasud	nos.	40	800	32000		
19	Ixora	nos.	40	800	32000		
20	Kamini	nos.	40	800	32000		
21	Karen	nos.	40	800	32000		
22	Tagar	nos.	40	800	32000		
23	Tecoma	nos.	40	800	32000		
24	Pili Karen	nos.	40	800	32000		
	Sub-total (b)			16000	**602500**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	16.665	16000	266640	20 pits / person	
2	Planting with polypot	per plant	4.18	16000	66880	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	324.995	80	26000	1000 plants / person	
4	First soil workings during monsoon	per plant	5.61	48000	269280	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.705	7440000	12685200	200 plants / person	As per schedule

6	Subsequent soil workings	per plant	4.18	16000	668800	80 plants / person	10 Times/year
	Sub-total (c)				**13982800**		
	Total of First Year (a+b+c)				**14825300**		
Second Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	9600	240000		Market rates
	Sub-total (a)				**240000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	700	28000	NA	Market rates
2	Putra Jiva	nos.	30	500	15000		
3	Garmalo	nos.	40	700	28000		
4	Ashoka	nos.	30	500	15000		
5	Mango	nos.	40	500	20000		
6	Drumstick	nos.	30	600	18000		
7	Bili	nos.	40	700	28000		
8	Sitafal	nos.	40	500	20000		
9	Kanchnar	nos.	35	600	21000		
10	Asundro	nos.	30	500	15000		
11	Khakhro	nos.	35	700	24500		
12	Bhangro	nos.	30	500	15000		
13	Sharu	nos.	40	800	32000		
14	Sisham	nos.	40	500	20000		
15	Pilu	nos.	30	500	15000		
16	Bougainvel	nos.	40	800	32000		
17	Scarlet bush	nos.	40	800	32000		
18	Jasud	nos.	40	800	32000		
19	Ixora	nos.	40	800	32000		

20	Kamini	nos.	40	800	32000		
21	Karen	nos.	40	800	32000		
22	Tagar	nos.	40	800	32000		
23	Tecoma	nos.	40	800	32000		
24	Pili Karen	nos.	40	800	32000		
	Sub-total (b)			16000	**602500**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	18.33	16000	293304	20 pits / person	
2	Planting with polypot	per plant	4.60	16000	73568	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	357.49	80	28600	1000 plants / person	
4	First soil workings during monsoon	per plant	6.17	48000	296208	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.88	7440000	13953720	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.60	16000	735680	80 plants / person	10 Times/year
	Sub-total (c)				**15381080**		
	Total of Second Year (a+b+c)				**16223580**		
	Total of Current, First & Second Year				**63285015**		

7. Proposed Smart Industrial Port City (SIPC) at green Field Site 2 (KPT Complex, 850 Acres), Gandhidham, Kutch

Current Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**

1	Rich clay	cubic m	1000	2912	2912000	NA	Market rates
2	Gypsum	cubic m	1500	2912	4368000		
3	Cow dung manure	cubic m	3000	1456	4368000		
4	Fertilizer	kg	25	9600	240000		
	Sub-total (a)				**11888000**		
(b) Saplings (Rates of saplings are inclusive of transportation, loading, unloading at pit site)							
1	Neem	nos.	40	3500	140000	NA	Market rates
2	Putra Jiva	nos.	30	2500	75000		
3	Garmalo	nos.	40	3500	140000		
4	Ashoka	nos.	30	2500	75000		
5	Mango	nos.	40	2500	100000		
6	Drumstick	nos.	30	3000	90000		
7	Bili	nos.	40	3500	140000		
8	Sitafal	nos.	40	2500	100000		
9	Kanchnar	nos.	35	3000	105000		
10	Asundro	nos.	30	2500	75000		
11	Khakhro	nos.	35	3500	122500		
12	Bhangro	nos.	30	2500	75000		
13	Sharu	nos.	40	4000	160000		
14	Sisham	nos.	40	2500	100000		
15	Pilu	nos.	30	2500	75000		
16	Bougainvel	nos.	40	4000	160000		
17	Scarlet bush	nos.	40	4000	160000		
18	Jasud	nos.	40	4000	160000		
19	Ixora	nos.	40	4000	160000		
20	Kamini	nos.	40	4000	160000		
21	Karen	nos.	40	4000	160000		
22	Tagar	nos.	40	4000	160000		
23	Tecoma	nos.	40	4000	160000		

24	Pili Karen	nos.	40	4000	160000		
25	**Sub-total (b)**			80000	**3012500**		
1	Pit Digging	per pit	15.15	80000	1212000	20 pits / person	
2	Planting with polypot	per plant	3.8	80000	304000	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	295.45	80	23636	1000 plants / person	
4	First soil workings during monsoon	per plant	5.1	240000	1224000	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.55	7440000	11532000	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	3.8	80000	3040000	80 plants / person	10 subsequent soil working per year
	Sub-total (c)				**17335636**		
	Total of Current Year (a+b+c)				**32236136**		
First Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	9600	240000		Market rates
	Sub-total (a)				**240000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	700	28000	NA	Market rates
2	Putra Jiva	nos.	30	500	15000		
3	Garmalo	nos.	40	700	28000		
4	Ashoka	nos.	30	500	15000		
5	Mango	nos.	40	500	20000		
6	Drumstick	nos.	30	600	18000		
7	Bili	nos.	40	700	28000		
8	Sitafal	nos.	40	500	20000		
9	Kanchnar	nos.	35	600	21000		

10	Asundro	nos.	30	500	15000		
11	Khakhro	nos.	35	700	24500		
12	Bhangro	nos.	30	500	15000		
13	Sharu	nos.	40	800	32000		
14	Sisham	nos.	40	500	20000		
15	Pilu	nos.	30	500	15000		
16	Bougainvel	nos.	40	800	32000		
17	Scarlet bush	nos.	40	800	32000		
18	Jasud	nos.	40	800	32000		
19	Ixora	nos.	40	800	32000		
20	Kamini	nos.	40	800	32000		
21	Karen	nos.	40	800	32000		
22	Tagar	nos.	40	800	32000		
23	Tecoma	nos.	40	800	32000		
24	Pili Karen	nos.	40	800	32000		
	Sub-total (b)			16000	**602500**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	16.665	16000	266640	20 pits / person	
2	Planting with polypot	per plant	4.18	16000	66880	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	324.995	80	26000	1000 plants / person	
4	First soil workings during monsoon	per plant	5.61	48000	269280	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.705	7440000	12685200	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.18	16000	668800	80 plants / person	10 Times/year
	Sub-total (c)				**13982800**		
	Total of First Year (a+b+c)				**14825300**		
Second Year							
Civil work and other items							

S.N.	Particulars	Unit	Rate	Quantity	Amount	Work Norms	Remarks
1	Fertilizer	kg	25	9600	240000		Market rates
	Sub-total (a)				**240000**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	700	28000	NA	Market rates
2	Putra Jiva	nos.	30	500	15000		
3	Garmalo	nos.	40	700	28000		
4	Ashoka	nos.	30	500	15000		
5	Mango	nos.	40	500	20000		
6	Drumstick	nos.	30	600	18000		
7	Bili	nos.	40	700	28000		
8	Sitafal	nos.	40	500	20000		
9	Kanchnar	nos.	35	600	21000		
10	Asundro	nos.	30	500	15000		
11	Khakhro	nos.	35	700	24500		
12	Bhangro	nos.	30	500	15000		
13	Sharu	nos.	40	800	32000		
14	Sisham	nos.	40	500	20000		
15	Pilu	nos.	30	500	15000		
16	Bougainvel	nos.	40	800	32000		
17	Scarlet bush	nos.	40	800	32000		
18	Jasud	nos.	40	800	32000		
19	Ixora	nos.	40	800	32000		
20	Kamini	nos.	40	800	32000		
21	Karen	nos.	40	800	32000		
22	Tagar	nos.	40	800	32000		
23	Tecoma	nos.	40	800	32000		
24	Pili Karen	nos.	40	800	32000		
	Sub-total (b)			16000	**602500**		

Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	18.33	16000	293304	20 pits / person	
2	Planting with polypot	per plant	4.60	16000	73568	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	357.49	80	28600	1000 plants / person	
4	First soil workings during monsoon	per plant	6.17	48000	296208	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.88	7440000	13953720	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.60	16000	735680	80 plants / person	10 Times/year
	Sub-total (c)				**15381080**		
	Total of Second Year (a+b+c)				**16223580**		
	Total of Current, First & Second Year				**63285015**		

8. Setting up of RoRo/RoPax Facility at Pipavav, Gujarat Pipavav, Rajula, Amreli Proposed by M/s. DPA

Current Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Rich clay	cubic mt	1000	144	144144	NA	Market rates
2	Gypsum	cubic mt	1500	144	216216		
3	Cow dung manure	cubic mt	3000	72	216216		
4	Fertilizer	kg	25	475.2	11880		
	Sub-total (a)				**588456**		
(b) Saplings (Rates of saplings are inclusive of transportation, loading, unloading at pit site)							
1	Neem	nos.	40	175	7000	NA	Market rates
2	Putra Jiva	nos.	30	120	3600		

3	Garmalo	nos.	40	175	7000		
4	Ashoka	nos.	30	120	3600		
5	Mango	nos.	40	120	4800		
6	Drumstick	nos.	30	150	4500		
7	Bili	nos.	40	175	7000		
8	Sitafal	nos.	40	120	4800		
9	Kanchnar	nos.	35	150	5250		
10	Asundro	nos.	30	120	3600		
11	Khakhro	nos.	35	175	6125		
12	Bhangro	nos.	30	120	3600		
13	Sharu	nos.	40	200	8000		
14	Sisham	nos.	40	120	4800		
15	Pilu	nos.	30	120	3600		
16	Bougainvel	nos.	40	200	8000		
17	Scarlet bush	nos.	40	200	8000		
18	Jasud	nos.	40	200	8000		
19	Ixora	nos.	40	200	8000		
20	Kamini	nos.	40	200	8000		
21	Karen	nos.	40	200	8000		
22	Tagar	nos.	40	200	8000		
23	Tecoma	nos.	40	200	8000		
24	Pili Karen	nos.	40	200	8000		
25	**Sub-total (b)**			3960	**149275**		
(c)Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	15.15	3960	59994	20 pits / person	

2	Planting with polypot	per plant	3.8	3960	15048	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	295.45	4	1182	1000 plants / person	
4	First soil workings during monsoon	per plant	5.1	11880	60588	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.55	368280	570834	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	3.8	3960	150480	80 plants / person	10 subsequent soil working per year
	Sub-total (c)				**858126**		
	Total of Current Year (a+b+c)				**1595857**		
First Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	475.2	11880		Market rates
	Sub-total (a)				**11880**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	35	1400	NA	Market rates
2	Putra Jiva	nos.	30	24	720		
3	Garmalo	nos.	40	35	1400		
4	Ashoka	nos.	30	24	720		
5	Mango	nos.	40	24	960		
6	Drumstick	nos.	30	30	900		
7	Bili	nos.	40	35	1400		
8	Sitafal	nos.	40	24	960		
9	Kanchnar	nos.	35	30	1050		
10	Asundro	nos.	30	24	720		
11	Khakhro	nos.	35	35	1225		
12	Bhangro	nos.	30	24	720		
13	Sharu	nos.	40	40	1600		

14	Sisham	nos.	40	24	960		
15	Pilu	nos.	30	24	720		
16	Bougainvel	nos.	40	40	1600		
17	Scarlet bush	nos.	40	40	1600		
18	Jasud	nos.	40	40	1600		
19	Ixora	nos.	40	40	1600		
20	Kamini	nos.	40	40	1600		
21	Karen	nos.	40	40	1600		
22	Tagar	nos.	40	40	1600		
23	Tecoma	nos.	40	40	1600		
24	Pili Karen	nos.	40	40	1600		
	Sub-total (b)			792	**29855**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	16.665	792	13199	20 pits / person	
2	Planting with polypot	per plant	4.18	792	3311	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	324.995	4	1300	1000 plants / person	
4	First soil workings during monsoon	per plant	5.61	2376	13329	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.705	368280	627917	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.18	792	33106	80 plants / person	10 Times/year
	Sub-total (c)				**692162**		
	Total of First Year (a+b+c)				**733897**		
Second Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	475.2	11880		Market rates
	Sub-total (a)				**11880**		
Saplings (Casualty Replacement @ 20%)							

1	Neem	nos.	40	35	1400	NA	Market rates
2	Putra Jiva	nos.	30	24	720		
3	Garmalo	nos.	40	35	1400		
4	Ashoka	nos.	30	24	720		
5	Mango	nos.	40	24	960		
6	Drumstick	nos.	30	30	900		
7	Bili	nos.	40	35	1400		
8	Sitafal	nos.	40	24	960		
9	Kanchnar	nos.	35	30	1050		
10	Asundro	nos.	30	24	720		
11	Khakhro	nos.	35	35	1225		
12	Bhangro	nos.	30	24	720		
13	Sharu	nos.	40	40	1600		
14	Sisham	nos.	40	24	960		
15	Pilu	nos.	30	24	720		
16	Bougainvel	nos.	40	40	1600		
17	Scarlet bush	nos.	40	40	1600		
18	Jasud	nos.	40	40	1600		
19	Ixora	nos.	40	40	1600		
20	Kamini	nos.	40	40	1600		
21	Karen	nos.	40	40	1600		
22	Tagar	nos.	40	40	1600		
23	Tecoma	nos.	40	40	1600		
24	Pili Karen	nos.	40	40	1600		
	Sub-total (b)			792	**29855**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	18.33	792	14519	20 pits / person	
2	Planting with polypot	per plant	4.60	792	3642	80 plants / person	

3	Fertilizer / Insecticide Application	per 1000 plant	357.49	4	1430	1000 plants / person	
4	First soil workings during monsoon	per plant	6.17	2376	14662	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.88	368280	690709	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.60	792	36416	80 plants / person	10 Times/year
	Sub-total (c)				**761378**		
	Total of Second Year (a+b+c)				**803113**		
	Total of Current, First & Second Year				**3132866**		

9. Development of Setting up of RoRo/RoPax Facility at, Muldwarka, Gujarat, by Deendayal Port Authority at Survey No. 74/3 for Onshore area -6 Ha, Muldwarka, Kodinar, Gir Somnath

Current Year							
(a) Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Rich clay	cubic mt	1000	144	144144	NA	Market rates
2	Gypsum	cubic mt	1500	144	216216		
3	Cow dung manure	cubic mt	3000	72	216216		
4	Fertilizer	kg	25	475.2	11880		
	Sub-total (a)				**588456**		
(b) Saplings (Rates of saplings are inclusive of transportation, loading, unloading at pit site)							
1	Neem	nos.	40	175	7000	NA	Market rates
2	Putra Jiva	nos.	30	120	3600		
3	Garmalo	nos.	40	175	7000		

4	Ashoka	nos.	30	120	3600		
5	Mango	nos.	40	120	4800		
6	Drumstick	nos.	30	150	4500		
7	Bili	nos.	40	175	7000		
8	Sitafal	nos.	40	120	4800		
9	Kanchnar	nos.	35	150	5250		
10	Asundro	nos.	30	120	3600		
11	Khakhro	nos.	35	175	6125		
12	Bhangro	nos.	30	120	3600		
13	Sharu	nos.	40	200	8000		
14	Sisham	nos.	40	120	4800		
15	Pilu	nos.	30	120	3600		
16	Bougainvel	nos.	40	200	8000		
17	Scarlet bush	nos.	40	200	8000		
18	Jasud	nos.	40	200	8000		
19	Ixora	nos.	40	200	8000		
20	Kamini	nos.	40	200	8000		
21	Karen	nos.	40	200	8000		
22	Tagar	nos.	40	200	8000		
23	Tecoma	nos.	40	200	8000		
24	Pili Karen	nos.	40	200	8000		
25	**Sub-total (b)**			3960	**149275**		
(c)Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	15.15	3960	59994	20 pits / person	
2	Planting with polypot	per plant	3.8	3960	15048	80 plants / person	

3	Fertilizer / Insecticide Application	per 1000 plant	295.45	4	1182	1000 plants / person	
4	First soil workings during monsoon	per plant	5.1	11880	60588	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.55	368280	570834	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	3.8	3960	150480	80 plants / person	10 subsequent soil working per year
	Sub-total (c)				**858126**		
	Total of Current Year (a+b+c)				**1595857**		
First Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	475.2	11880		Market rates
	Sub-total (a)				**11880**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	35	1400	NA	Market rates
2	Putra Jiva	nos.	30	24	720		
3	Garmalo	nos.	40	35	1400		
4	Ashoka	nos.	30	24	720		
5	Mango	nos.	40	24	960		
6	Drumstick	nos.	30	30	900		
7	Bili	nos.	40	35	1400		
8	Sitafal	nos.	40	24	960		
9	Kanchnar	nos.	35	30	1050		
10	Asundro	nos.	30	24	720		
11	Khakhro	nos.	35	35	1225		
12	Bhangro	nos.	30	24	720		
13	Sharu	nos.	40	40	1600		
14	Sisham	nos.	40	24	960		

15	Pilu	nos.	30	24	720		
16	Bougainvel	nos.	40	40	1600		
17	Scarlet bush	nos.	40	40	1600		
18	Jasud	nos.	40	40	1600		
19	Ixora	nos.	40	40	1600		
20	Kamini	nos.	40	40	1600		
21	Karen	nos.	40	40	1600		
22	Tagar	nos.	40	40	1600		
23	Tecoma	nos.	40	40	1600		
24	Pili Karen	nos.	40	40	1600		
	Sub-total (b)			792	**29855**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	16.665	792	13199	20 pits / person	
2	Planting with polypot	per plant	4.18	792	3311	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	324.995	4	1300	1000 plants / person	
4	First soil workings during monsoon	per plant	5.61	2376	13329	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.705	368280	627917	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.18	792	33106	80 plants / person	10 Times/year
	Sub-total (c)				**692162**		
	Total of First Year (a+b+c)				**733897**		
Second Year							
Civil work and other items							
S.N.	**Particulars**	**Unit**	**Rate**	**Quantity**	**Amount**	**Work Norms**	**Remarks**
1	Fertilizer	kg	25	475.2	11880		Market rates
	Sub-total (a)				**11880**		
Saplings (Casualty Replacement @ 20%)							
1	Neem	nos.	40	35	1400	NA	Market rates

2	Putra Jiva	nos.	30	24	720		
3	Garmalo	nos.	40	35	1400		
4	Ashoka	nos.	30	24	720		
5	Mango	nos.	40	24	960		
6	Drumstick	nos.	30	30	900		
7	Bili	nos.	40	35	1400		
8	Sitafal	nos.	40	24	960		
9	Kanchnar	nos.	35	30	1050		
10	Asundro	nos.	30	24	720		
11	Khakhro	nos.	35	35	1225		
12	Bhangro	nos.	30	24	720		
13	Sharu	nos.	40	40	1600		
14	Sisham	nos.	40	24	960		
15	Pilu	nos.	30	24	720		
16	Bougainvel	nos.	40	40	1600		
17	Scarlet bush	nos.	40	40	1600		
18	Jasud	nos.	40	40	1600		
19	Ixora	nos.	40	40	1600		
20	Kamini	nos.	40	40	1600		
21	Karen	nos.	40	40	1600		
22	Tagar	nos.	40	40	1600		
23	Tecoma	nos.	40	40	1600		
24	Pili Karen	nos.	40	40	1600		
	Sub-total (b)			792	**29855**		
Plantation related activities (Labour Cost)							
1	Pit Digging	per pit	18.33	792	14519	20 pits / person	
2	Planting with polypot	per plant	4.60	792	3642	80 plants / person	
3	Fertilizer / Insecticide Application	per 1000 plant	357.49	4	1430	1000 plants / person	

4	First soil workings during monsoon	per plant	6.17	2376	14662	60 plants / person	3 times during monsoon
5	Support watering	per plant	1.88	368280	690709	200 plants / person	As per schedule
6	Subsequent soil workings	per plant	4.60	792	36416	80 plants / person	10 Times/year
	Sub-total (c)				**761378**		
	Total of Second Year (a+b+c)				**803113**		
	Total of Current, First & Second Year				**3132866**		

Annexure –II

Monitoring the implemental Safe guards Ministry of Environment & Forests Regional office (WZ), Gandhinagar.
Monitoring Report (For Upto September 2025) DATA SHEET

<table>
<tr><th>Sr. No.</th><th>Particulars</th><th>Reply</th></tr>
<tr><td>1.</td><td>Project type: River valley/ Mining/Industry/ thermal/nuclear/Other (specify)</td><td>Infrastructure and Miscellaneous Projects + CRZ</td></tr>
<tr><td>2.</td><td>Name of the project</td><td>Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat. (1. Setting up of Oil Jetty No.7. 2. Setting up of Barge jetty at Jafarwadi 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; 5. Road connecting from Veera barge jetty to Tuna gate by Deendayal Port Authority (Erstwhile: Deendayal Port Trust)</td></tr>
<tr><td>3.</td><td>Clearance Letter (s). OM no and date</td><td>Environmental/ CRZ Clearance accorded by the MoEF&CC vide File No. 11-13/2015-1A.III dated 19/02/2020.</td></tr>
<tr><td></td><td>Location
a) District (s)
b) State (s)
Location/latitude/longitude</td><td>
<table>
<tr><th>Project</th><th>Location</th><th>Coordinates</th></tr>
<tr><td>Setting up of oil jetty No. 7</td><td>Old Kandla, Kachchh, Gujarat</td><td>70◦13’14.09” E 23◦02’22.21” N</td></tr>
<tr><td>Setting up of Barge Jetty</td><td>Jafrawadi, Kachchh,Gujarat</td><td>70◦12’36.4” E 23◦04’33.6” N</td></tr>
<tr><td>Setting up of Barge Jetty</td><td>Veera, Kachchh, Gujarat</td><td>70◦01’21.08” E 22◦54’26.3” N</td></tr>
<tr><td>Administrative Office Building</td><td>Tuna Tekra, Kachchh, Gujarat</td><td>70◦06’00.0” E 22 ◦56’02” N</td></tr>
<tr><td>Road connecting from Veera barge jetty to Tuna Gate</td><td>Veera Barge Jetty to Tuna Gate, Kachchh, Gujarat</td><td>70◦01’21.0” E to 22◦54’26.3” N 70◦05’35” E to 22◦58’22” N</td></tr>
</table>
</td></tr>
<tr><td>5.</td><td>Address for Correspondence
a) address of Concerned Project Chief Engineer (with pin code & telephone/telex/fax numbers

b) Address of Executive project Engineer/manager/ (with pin code fax numbers)</td><td>Chief Engineer,
Deendayal Port Authority, A.O. Building,
Annex, Post Box No.-50, Gandhidham- Kutch.
Gujarat Pin – 370201
Tel: 02836-233192, Fax-02836-220050.

Executive Engineer (Pipeline)
Deendayal Port Authority, A.O. Building, Annex,
Post Box No.-50, Gandhidham- Kutch. Gujarat Pin – 370201</td></tr>
<tr><td>6.</td><td>Salient features
a) Of the Project</td><td>1. Setting up of Oil Jetty No.7 (Capacity - 2MMTPA, Size - 110m x 12.40m, Approach - 210m - Back up area 1 Ha, Capital dredging - 72000 m3. Maintenance dredging - @15% per annum i.e. 10800 m3/year, Cost - 72 Crores).
2. Setting up of Barge jetty at Jafarwadi (On BOT Basis) (Capacity - 3.00 MMTPA, Size - 180 x 20 m, Back up area - 20 Ha., Capital Dredging — 80000 m3, Maintenance dredging
- 15% per annum i.e. 12000 m3/year, Cost - 105 Crores).
3. Setting up of Barge port at Veera (On BOT Basis) (Capacity - 6.29 MMTPA, Size - 160 x 60 m, Back up area - 20 Ha., Cost 160 Crores).</td></tr>
</table>

	b) Of the Environmental Management plan	4. **Construction of Administrative office (Port Operational) building at Tuna Tekra** (Build up area - 1600m2, Plot Area - 15,000m2, Cost - 10 Crores). 5. **Road connecting from Veera barge jetty to Tuna Gate** (Length - 15500 m, Width - 7.30m, with both sides 1.50m shoulders, Cost - 48.82 Crores). The salient feature of the Environment management plan as specified in the Chapter 9 of the EIA report has already been Communicated with earlier compliance report submitted.
7.	Production Details during compliance period and (or) during the previous financial year	It is under Infrastructure and Miscellaneous Projects + CRZ so production not involved
8.	Breakup of the project area a) Submergence area: forest & non-forest b) Others	No forest area.
9.	Breakup of the project affected population with enumeration of those loing houses/dwelling units only agricultural land & landless laborer's/artisen a) SC. ST/Adivasis b) Others (please indicate whether these figures are based on any scientific and systematic survey carried out of only provisional figures, if a survey is carried out give details and years of survey).	Nil
	Financial details a) Project cost as originally planned and subsequent revised estimates and the year of prices reference	Estimated project cost: Rs. 395.82 Cr. 1. Setting up of Oil Jetty No.7 : Cost - Rs. 72 Crores 2. Setting up of Barge jetty at Jafarwadi (On BOT Basis) Cost - Rs. 105 Crores). 3. Setting up of Barge port at Veera (On BOT Basis) : Cost - Rs. 160 Crores). 4. 4. Construction of Administrative office (Port Operational) building at Tuna Tekra : Cost – Rs. 10 Crores. 5. Road connecting from Veera barge jetty to Tuna Gate : Cost – Rs. 48.82 Crores.
	b) Allocation made for environmental management plans with item wise and year wise break-up	The allocation made under the scheme of "Environmental Services & Clearance there of other related Expenditure" during RBE 2024 - 2025 is Rs. 585 Lakhs.
	c) Benefit cost ratio/Internal rate of Return and the year of assessment Whether (c) includes the cost of environmental management plans so far	IRR: 12.5.%
	d) Actual expenditure incurred on the project	1. Setting up of Oil Jetty No.7 : Cost - Rs. 71.6 Crore 2. Setting up of Barge jetty at Jafarwadi (On BOT Basis) :

		Construction not yet started 3. Setting up of Barge port at Veera (On BOT Basis) : Construction not yet started 4. Construction of Administrative office (Port Operational) building at Tuna Tekra : Construction not yet started. 5. Road connecting from Veera barge jetty to Tuna Gate : Construction not yet started.
	e) Actual expenditure incurred on the environmental management plans so	The expenditure made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" is Rs 136 lakhs for period of April 2025 to September 2025
11	Forest land requirement a) The status of approval for diversion of forest land for non-forestry use b) The status of clear felling c) The status of compensatory a forestation, if any d) Comments on the viability & sustainability of compensatory a forestation programmed in the light of actual field experience so far	Nil Nil NIL Nil None
12.	The status of clear felling in non- forest areas (such as submergence area of reservoir, approach roads), if any with quantitative information.	NA, no felling is required
13.	Status of construction a) Date of commencement (Actual and/or planned) b) Date of completion (Actual and/or planned)	**<u>Setting up of Oil Jetty No.7</u>** It is under operation w.e.f January 2023. **<u>Setting up of Barge jetty at Jafarwadi</u>** No work started – project under planning stage **<u>Setting up of Barge port at Veera</u>** No work started - project under planning stage **<u>The administrative office building at Tuna Tekra</u>** No work started - project under planning stage. **<u>A road connecting from Veera barge jetty to Tuna gate</u>** No work started - project under planning stage
14	Reasons for the delay if the Project is yet to start	**---**
15	Date of site visited a) The dates on which the project was monitored by the regional office on pervious occasion. if any The date site visit for this monitoring report	**---**
16	Details of the correspondence with project authorities for obtaining action plans/information on status of compliance	**---**

	to safeguard other than the routine letters for logistic support for site visit. (The first monitoring report may contain the details of all the letters issued so far but the later reports may cover only the letters issued subsequently.)	

Subject: **Development of Integrated facilities (Stage-II) within the existing Deendayal Port Trust (Erstwhile Kandla Port Trust) at District Kutch, Gujarat. (1. Setting up of Oil Jetty No.7. 2. Setting up of Barge jetty at Jafarwadi 3. Setting up of Barge port at Veera; 4. Administrative office building at Tuna Tekra; 5. Road connecting from Veera barge jetty to Tuna gate by M/s Deendayal Port Trust (Erstwhile Kandla Port Trust)**

CURRENT STATUS OF WORK – Upto September 2025

Sr.No.	Name of Project	Status
1.	**Setting up of Oil Jetty No.7**	Setting up of Oil Jetty No. 7 is under operation w.e.f. January 2023. Further, DPA has installed a 1 MW Green Hydrogen demonstration plant at the backup area of Oil Jetty No. 07.
2.	**Setting up of Barge jetty at Jafarwadi**	No construction activity started yet.
3.	**Setting up of Barge port at Veera**	No construction activity started yet.
4.	**Administrative office building at Tuna Tekra;**	No construction activity started yet.
5.	**Road connecting from Veera barge jetty to Tuna gate**	No construction activity started yet.