DEENDAYAL PORT AUTHORITY
(Erstwhile: DEENDAYAL PORT TRUST)

दीनदयाल पत्तन प्राधिकरण
DEENDAYAL PORT AUTHORITY

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EG/WK/4660(EC) Part -V/ 350

Date: 14/08/2023

To,
The Deputy Director General of Forests,
Ministry of Environment, Forest & Climate Change
Integrated Regional Office,
Gandhinagar, A wing-407 & 409
Aranya Bhavan Near CH-3 Circle
Sector 10A, Gandhinagar - 382010
Email :eccomplaince-guj@gov.in

Sub: "Construction of 13th to 16th Cargo Berths at Kandla" by M/s Deendayal Port Authority (Erstwhile Deendayal Port Trust) – **Compliance Report of conditions stipulated in Environmental & CRZ Clearance and Monitoring Report in Data Sheet reg.**

Ref.: 1) EC & CRZ Clearance granted by MoEFF, GoI vide F.No. 11-70/2006-IA-III dated 1/10/2008.
2) KPT letter no.EG/WK/4660 (EC)/654 dated 6/10/2010.
3) KPT letter no.EG/WK/4660 (EC)/ 112 dated 4/2/2012.
4) KPT letter no. EG/WK/4660(EC)/223 dated 4/9/2012.
5) KPT letter no. EG/WK/4660(EC)/144 dated 16 (17) /5/2013.
6) KPT letter no. EG/WK/4660 (EC)/Part 111/1087 dated 9/12/2013.
7) KPT letter no. EG/WK/4660 (EC)/Part 111/250 dated 17/05/2014.
8) KPT letter no. EG/WK/4660 (EC)/Part 111/198 dated 14/11/2014.
9) KPT letter no. EG/WK/4660 (EC)/Part 111/256 dated 11/05/2015.
10) KPT letter no. EG/WK/4660 (EC)/Part 111/162 dated 15/10/2015.
11) KPT letter no. EG/WK/4660 (EC)/Part 111/133 dated 09/05/2016.
12) KPT letter no. EG/WK/4660 (EC)/Part IV/167 dated 26/12/2016.
13) DPT letter no. EG/WK/4660 (EC)/Part IV/325 dated 26/06/2018.
14) DPT letter no. EG/WK/4660 (EC)/Part V/53 dated 14(16)/2/2019.
15) DPT letter no. EG/WK/4660(EC)/PartV/205 dated 30(6)/11 (12)/2019.
16) DPT letter no. EG/WK/4660 (EC)/Part V dated 15/01/2021.
17) DPT letter no. EG/WK/4660 (EC)/Part V/92 dated 30(07)/9(10)/2021.
18) DPT letter no. EG/WK/4660 (EC)/Part V dated 28/03/2022
19) DPA letter no. EG/WK/4660 (EC)/Part V/149 dated 19/07/2022
20) DPA letter no. EG/WK/4660 (EC)/Part V/230 dated 02/02/2023

Sir,

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

In this connection, it is to state that, as directed under above referred letter dated 5/8/2009 of MoEF, Regional Office, Gandhinagar, Deendayal Port Authority (Erstwhile Deendayal Port Trust) vide above referred letters had regularly submitted Six Monthly compliance report of stipulated conditions and Monitoring report in Data Sheet, in connection with subject project.

.....cont.....

Now, as directed in above referred letter dated 5/8/2009 of MoEF, GoI, please find enclosed herewith point wise compliance to various stipulation in Environmental & CRZ Clearance granted by MoEF, GoI vide letter 11-70/2006-IA.III dated Sept, 2008 (**Annexure 1**) & Monitoring Report in Data Sheet (**Annexure 2**), for the period upto May, 2023 for kind information and record please.

Further, as per the MoEF&CC, Notification S.O.5845 (E) dated 26.11.2018, stated that ***"In the said notification, in paragraph 10, in sub-paragraph (ii), for the words "hard and soft copies" the words "soft copy" shall be substituted".*** Accordingly, we are submitting herewith soft copy of the same via e-mail ID rowz.bpl-mef@nic.in & eccompliance-guj@gov.in.

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

Thanking You.

Yours faithfully,

Manager (Env.)
Deendayal Port Authority

Copy along with point wise compliance of stipulated conditions, to:

1) Shri Amardeep Raju, MoEF&CC,GoI and Member Secretary (EAC-Infra.1), Indira Paryavaran Bhavan, Ministry of Environment, Forest and Climate Change Jor Bagh Road, Aliganj, New Delhi-110003. Email: ad.raju@nic.in

2) Shri Prasoon Gargav, Scientist E & Regional Director, Central Pollution Control Board, Parivesh Bhawan, Opp. VMC Ward Office No.10, Subhanpura, Vadodara – 390 023. Email: prasoon.cpcb@nic.in

3) Shri T. C. Patel, Unit Head, Kachchh, Gujarat Pollution Control Board, Paryavaran Bhavan, Sector 10A, Gandhinagar- 382 010. Email-kut-uh-gpcb@gujarat.gov.in

4) The Regional Officer, Gujarat Pollution Control Board, Regional Office (East Kutch), Administrative Office Building, Deendayal Port Trust, Gandhidham. Email Id. ro-gpcb-kute@gujarat.gov.in

Annexure -1

Annexure 1

Compliance Report for the period upto May, 2023

Subject: - Compliance of conditions stipulated in Environmental & CRZ Clearance granted by the MoEF&CC, GoI for "Construction of 13th to 16th Cargo Berths at Deendayal Port Authority (Erstwhile: Deendayal Port Trust)".

- The MoEF, GoI granted Environmental & CRZ Clearance for the subject project vide no. F.No. 11-70/2006-IA-III dated Sep 2008.

- 7/2/2014 – The MoEF&CC, GoI extended the validity period of Environmental & CRZ Clearance for a further period of 5 years i.e. up to 30/9/2018.

STATUS OF Berths:

13thCargo Berth: Under operation since 18/2/2013.
15thCargo 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.

CONSENT TO OPERATE:

Consolidated Consent & Authorization (CC&A) issued by the GPCB (Consent Order no-AWH-110594 dated of issue-8/12/2020, with a validity period upto 21/7/2025)– Detailed Order issued by the GPCB vide outward no. 581914 dated 22/1/2021 & subsequently, issued Correction in CC&A order vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/588116 dated 9/4/2021.

Sr. No.	Conditions	Remarks
A	**Specific Condition**	
1	All measures indicated in the letter dated 4/8/2008 shall be strictly complied with.	Compliance Report of conditions stipulated in the CRZ recommendation granted by Forest & Environment Department, GoG vide letter dated 14/02/2008 is placed at **Annexure A.**
2	Necessary clearances from the Gujarat State Pollution Control Board shall be obtained before initiating the project.	GPCB vide order no. PCC/CCA-BHUJ-179(3)/575 dated 9/1/2009 granted No Objection Certificate to the said project. Currently, all the 4 berths are under operation. Further, GPCB vide order dated 22/1/2021 has issued Consolidated Consent & Authorization. Subsequently, GPCB issued Correction in CC&A order vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/ 588116 dated 9/4/2021. The copy of the same has already been communicated with the earlier compliance reports submitted**.**
3	The project proponent shall not undertake any destruction of mangroves during construction and operation of project.	All the 4 berths are under operation. As per the directions of the GCZMA and MoEF&CC, GoI, till date, DPA has undertaken Mangrove Plantaion in an area of 1500 Hectares since the year 2005. In addition to it, DPA has carried out additional mangrove plantation of 100 ha. in consultation with Gujarat Ecology Comission vide Work Order No. DD/WK/3050/Pt-I/GIM/PC-44 dated 02/06/2022. The copy of the details has already been communicated with the earlier compliance reports submitted. It is also relavent to mention here that, as per the direction of the Gujarat Coastal Zone Management Authority, DPA has 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 M/s GUIDE has already been communicated with the last compliance report submitted**.**
4	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 existing STP of 1.5 MLD capacity 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. For monitoring of environmental parameters including the STP, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the Regional Office, MoEF&CC, Gandhinagar as well as to the MoEF&CC, GoI, New Delhi. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The Environmental Monitoring Plan submitted by GEMI is attached herewith as **Annexure B.**
5	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. The copy of the same has been communicated with earlier compliance reports submitted.
6	There shall be no withdrawal of ground water in COASTAL REGULATION ZONE area, for this project. The proponent shall ensure that as a result of the proposed constructions, ingress of saline water into ground water does not take place. Piezometers shall be installed for regular monitoring for this purpose at appropriate locations on the project site.	All the 4 berths are currently under operation.
7	The facilities to be constructed in the COASTAL REGULATION ZONE area as part of this project shall be strictly in conformity with the provisions of the COASTAL REGULATION ZONE Notification,	All the 4 berths are currently under operation.

	1991 as amended subsequently.	
8	Green belt area shall be developed along the project and budget earmarked.	DPA had entrusted the work to Forest Department, Gujarat for developing green belt in and around 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 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 final report submitted by GUIDE, Bhuj is attached herewith as **Annexure C**.
9	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 back-up area of berths viz. 13th to 16th CB, as per the EC & CRZ Clearance accorded by the MoEF&CC, GoI.
B	**General Conditions**	
I	Construction of the proposed structures shall be undertaken meticulously conforming to the existing Central/Local rules and regulations including COASTAL REGULATION ZONE Notification, 1991 & its amendments. All the construction design/drawings relating to the proposed construction activities must have approvals of the concerned State Government Department/Agencies.	Currently, all the 4 berths are under operation.
II	Adequate provisions for infrastructure facilities such as water supply, fuel, sanitation etc. shall be ensured for construction workers during the construction phase of the project so as to avoid feeling of trees / mangroves and pollution of water and surroundings.	All the 4 berths are currently under operation.
iii	The project authorities must make necessary arrangement for disposal of solid wastes and for the treatment of Effluents by providing a proper wastewater treatment	Companies authorized by State Pollution Control Board (SPCB) have been awarded the work of collection, transporting and disposal of solid waste by the Deendayal Port Authority.

	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.	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 the existing STP (1.5 MLD capacity) of DPA. In addition to that, it also has septic tanks at places where STP is inaccessible. 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 Environmental Monitoring Plan submitted by GEMI is attached herewith as **Annexure B.**
Iv	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.	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 Environmental Monitoring Plan submitted by GEMI is attached herewith as **Annexure B.**
V	In order to carry out the environmental monitoring during the operational phase of the project, the 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.	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 Environmental Monitoring Plan submitted by GEMI is attached herewith as **Annexure B.**
vi	The sand dunes if any on the site shall not be disturbed in any way.	No sand dunes at project site prevail.
Vii	A copy of the clearance letter will be marked to the concerned	No suggestion/ representation has been received while processing the proposal.

	Panchayat/local NGO, if any from whom any suggestion/ representation has been received while processing the proposal.	
Viii	The Gujarat Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Centre and Controller's Office/Tehsildar's Office for 30 days.	-------
ix	The funds earmarked for environment protection measures shall be 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.	Point noted. The allocation made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" during BE 2023-24 is Rs. 274 Lakhs. The expenditure made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" is Rs. 73.99 Lakhs from Dec, 2022 to May 2023. The year wise expenditure on environmental safeguards is regularly submitted in the monitoring datasheet to Ministry's Regional Office at Bhopal (Now Gandhinagar).
X	Full support shall be extended to the officers of this Ministry's Regional Office at Bhopal and the officers of the central and State Pollution Control Board by the project proponents during their inspection for monitoring purpose, by furnishing full details and action plans including the action taken reports in respect of mitigate measures and other environment protection activities.	DPA had given required support to the officer of Ministry's Regional Office, Bhopal during site inspection carried out on 29/12/2016 for the purpose of certifying EC Conditions. DPA has also given required support to the officials of Gujarat Pollution Control Board during their visits to DPA for inspection etc. Further, it is also assured that DPA shall extend full support in future also to the officials of Ministry's Regional Office at Bhopal (Now Gandhinagar) and the officers of the Central and State Pollution Control Board during their inspection.
xi	In case of deviation of alteration in the project including the implementing agency, a fresh reference shall be made to this Ministry for modification in the clearance conditions or imposition of new ones for ensuring environment protection.	Point Noted.
Xii	This ministry reserves the right to revoke this clearance, if any of the	Point Noted.

	conditions stipulated are not complied with to satisfaction of this ministry.	
Xiii	This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environment protection, which shall be complied with.	Point Noted.
Xiv	The project proponent shall advertise in at least two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality Concerned, informing that the project has been accrued environment clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen at website of the Ministry of Environment & Forests at http;//www.envfornic.in. The advertisement shall be made within 7 days from the date of issue of the clearance letter and a copy of the same shall be forwarded to the Regional office of this Ministry at Bangalore.	Advertisement had already been made in Kutch Mitra on 21/10/2008 and Kutch Uday on 22/10/2008. Further, Newspaper cuttings had already been sent to Regional office, MoEFCC, Bhopal vide DPA letter No.: EG/WK/4660(EC)/01 dated 31/10/2008.
xv	The project proponent shall inform the Regional office at Bhopal as well as the Ministry the date of financial closer and final approval of the Project by the concerned authorities and the date of Start of Land Development work.	The necessary details have already been provided by the DPA from time to time along with the earlier compliance reports submitted. Now, all the 4 berths are under operation.
10	The above-mentioned stipulations will be enforced among others under the water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981, the Environment (Protection) Act 1986, the Hazardous Chemicals (Manufactures, storage and Import) Rules, 1989, the Coastal Regulation Zone Notification, 1991 and its subsequent amendments and the Public Liability Insurance Act, 1991 and the Rules made there under	DPA has obtained consolidated consent and authorization vide GPCB (Consent Order no-AWH-110594 dated of issue-8/12/2020, with a validity period upto 21/7/2025)– Detailed Order issued by the GPCB vide outward no. 581914 dated 22/1/2021 & subsequently, issued Correction in CC&A order vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/588116 dated 9/4/2021. The copy of the same has already been communicated with the earlier compliance reports submitted. For monitoring of environmental parameters,

	from time to time. The project proponents shall also ensure that the proposal complies with the provisions of the approved Coastal Zone Management Plan of Gujarat State.	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 Environmental Monitoring Plan submitted by GEMI is attached herewith as **Annexure B.** Public Liability Insurance is renewed time to time as required. The Public Liability Insurance has been renewed and is valid till 23/07/2023. The copy of the same has already been communicated with the earlier compliance report submitted. Deendayal Port Authority had already obtained Coastal Regulation Zone Recommendations dated 14/02/2008 from State Forest &Environment Department, Government of Gujarat for the project. All the 4 berths are under operation.

Site Observations made during the inspection carried out on 29/12/2016:

Observation	**Compliance**
During the site visit, it is noted that KPT had signed Concession Agreement with M/s RAS Infraport Pvt. Ltd. for 13th CB and with M/s JRE Infra.Pvt. Ltd. for 15th CB. While visiting the 13th CB it has been observed that the plantation around the boundary line of 13th CB was scanty. It has been instructed to BOT Operator that they have to develop a greenbelt around the boundary within their campus. Further, it has been observed that the stocking of coal and iron ore were being carried out in the CB No.13. Strom water drainage system is found to be inadequate and coal &	The Concession Agreement signed with 13th Cargo Berth (M/s RAS InfraPort Pvt. Ltd.) & 15thCargo Berth (M/s JRE Infra. Pvt. Ltd.) both stand terminated on 29/9/2017.The BOT operators of 13th& 15th CB handed over the possession of the 13th & 15th berths & DPA started operation on the same. **GREEN BELT**: DPA has already developed sufficient greenbelt area for 13th to 16th CB. Further, 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 Forest Department, Gujarat for developing green belt in and around Port area at a cost of Rs. 352 lakhs in an area of about 32**

iron ore fines runoff with storm water cannot be ruled out during monsoon season. Adequate control measures shall be put in place to prevent run-off contaminated with coal/iron ore fines. Septic tanks were observed in every check post and admin building at 13th CB. Further, continuous sprinkling were suggested at the coal stack yard. Again at 15th CB, there were scanty plantation were observed and instruction has been given to BOT operator that they have to develop a greenbelt around the boundary within their campus.BOT operator of 15th CB is found handling dray cargo (wind mill machinery).	**hectares and the work is completed.** **Further, 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 copy of the final report submitted by GUIDE, Bhuj is attached herewith as Annexure C.** **Strom Water Drainage**: As far as storm water drainage system is concerned, necessary improvement measures have already been taken by DPA to prevent runoff contaminated with coal/iron ore fines. Pre monsoon cleaning of SWD 13th CB was carried out. The necessary action has already been taken for development of Basic amenities/facilities including SWD network in the back up area of the 13th to 16th CB. **SPRINKLING SYSTEM:** It is also to informed that, DPA has already installed continuous sprinkling system in coal stack yard in DPA (40 ha. area) for 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.
Although Environmental Management cell is in place for monitoring of berths under the control of KPT, the same is not - available in respect of the BOT operators. Further, the EMC headed by Superintending Engineer (Design) having environmental qualifications is found to be in place, the other members of EMC are hired on contractual basis for a short period. This inadequacy of regular staff with environmental expertise in EMC is	As per the Government guidelines/norms, there is no new recruitment will be permitted in the Government Organization. Hence, DPA appointed consultants (accredited with NABET/QCI) from time to time under Environmental Management Cell with expertise in the field of Environment. 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

reflected in a number of shortcomings in the implementation of EC conditions. A dedicated Environmental Management Cell with dedicated and regular manpower with environmental expertise shall be put in place for better management of environment in the Kandla Port Area within 6 months period and an action taken report shall be submitted to MoEF&CC, RO Bhopal. The EMC shall be made responsible for the strict compliance of each and every EC condition stipulated by MoEF&CC/SEIAA.	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).

Annexure -A

Annexure 1

Compliance Report for the Period upto May, 2023.

Name of Work: Construction of 13th to 16th Cargo Berth at Kandla, District Kachchh.

CRZ Recommendations: Letter No. ENV-I0-2006-138-P dated 14/02/2008 of Director (Environment), Forest & Environment Department, GoG. Further, Ministry of Environment & Forest–New Delhi, Govt. of India accorded the Environmental/ CRZ clearance vide letter no. 11-70/2006-IA.III dated Sep 2008 & the validity of the same had been extended by MoEF, GoI vide letter No.F.NO.11–70/2006–IA.III dated 7th February, 2014 for a further period of 5 years.

STATUS OF Berths:

13thCargo Berth: Under operation since 18/2/2013.
15thCargo 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.

CONSENT TO OPERATE:

Consolidated Consent & Authorization (CC&A) issued by the GPCB (Consent Order no-AWH-110594 dated of issue-8/12/2020, with a validity period upto 21/7/2025)– Detailed Order issued by the GPCB vide outward no. 581914 dated 22/1/2021 & subsequently, issued Correction in CC&A order vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/588116 dated 9/4/2021.

Sr. No.	Conditions in CRZ Recommendation Letter	Compliance
Specific Conditions		
1	The provisions of the CRZ notification of 1991 and subsequent amendments issued from time to time shall be strictly adhered to by the KPT. No activity in contradiction to the Provisions of the CRZ Notification shall be carried out by the KPT.	All the 4 berths are under operation. The provisions of the CRZ notification of 1991 and subsequent amendments issued from time to time are being strictly followed by Deendayal Port Authority (Erstwhile Deendayal Port Trust).
2	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.	As informed earlier also, DPA had already contributed an amount of Rs. 41.25 Crores for installing and operating the VTMS in Gulf of Kachchh. VTMS has been handed over to Directorate General of Lighthouse and Lightships, Ministry of Shipping, GoI for operating and updating regularly to statutory authorities.
3	The KPT shall strictly ensure that no creeks or rivers are blocked due to any activity at Kandla.	All the four berths are under operation
4	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 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.	As per the directions of the GCZMA and MoEF&CC, GoI, till date, DPA has undertaken Mangrove Plantaion in an area of 1500 Hectares since the year 2005. In addition to it, DPA has carried out additional mangrove plantation of 100 ha. in consultation with Gujarat Ecology Commission vide Work Order No. DD/WK/3050/Pt-I/GIM/PC-44 dated 02/06/2022. The copy of the details has already been communicated with the earlier compliance reports submitted. 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.
5	No activities other than those permitted by the competent authority under the CRZ	All the four berths are under operation.

	Notification shall be carried out in the CRZ area.	
6	No ground water shall be tapped for any purpose during the proposed expansion modernization activities.	Groundwater requirement is met through GWSSB or private tankers.
7	All necessary permissions from different Government Departments / agencies shall be obtained by the KPT before commencing the expansion activities.	DPA obtained Consolidated Consent & Authorization (CC&A) from the GPCB vide Consent Order no-AWH-110594 dated of issue-8/12/2020, with a validity period upto 21/7/2025– Detailed Order issued by the GPCB vide outward no. 581914 dated 22/1/2021 & subsequently, issued Correction in CC&A order vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/588116 dated 9/4/2021 (The copy of the Order has already been communicated with the last compliance report submitted).
8	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 the existing STP (1.5 MLD capacity) of DPA. 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. For monitoring of environmental parameters including the STP, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the Regional Office as well as to the MoEF&CC, GoI, New Delhi. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The Environmental Monitoring Plan submitted by GEMI is attached herewith as **Annexure A**.
9	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, till date, DPA has undertaken Mangrove Plantaion in an area of 1500 Hectares since the year 2005. In addition to it, DPA has carried out additional mangrove plantation of 100 ha. in consultation with Gujarat Ecology Commission vide Work Order No. DD/WK/3050/Pt-I/GIM/PC-44 dated 02/06/2022. The copy of the details has already been communicated with the 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 vide work order dated 03/05/2021 has assigned work to M/s GUIDE 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 second year post-monsoon report for the year 2022-2023 submitted by GUIDE, Bhuj is attached herewith as **Annexure B.** To control fugitive emissions, DPA has installed Mist Canon at the Port area. Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done. it is relevant to mention that Pollution under Control (PUC) Certificates has been made mandatory for vehicles in the port area. For waste generated from ships, DPA issued 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, it is to state that, all ships are required to follow DG Shipping circulars regarding the reception facilities at Swachch Sagar portal. Further, DPA vide work order dated 24/01/2023 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 work is in progress. For monitoring of environmental parameters including the STP, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the Regional Office as

		well as to the MoEF&CC, GoI, New Delhi. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The Environmental Monitoring Plan submitted by GEMI is attached herewith as **Annexure A**.
10	The construction activities and dredging shall be carried out only under the constant supervision and guidelines of the NIOT.	All the four berths are currently under operation.
11	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 Kachchh.	Point noted
12	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.	All the 4 berths are currently under operation.
	General Conditions	
13	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.	All the 4 berths are currently under operation.
14	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
15	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 Forest Department, Gujarat during August, 2019 for developing green belt in and around 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 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 has been completed and the final report submitted by GUIDE, Bhuj is attached as **Annexure C**.
16	The KPT shall have to contribute financially for talking up the socio-economic upliftment activities in this region in construction with the Forest and Environment Department and the District Collector / District Development Officer.	CSR activities are being attended by DPA. Copy of the activities undertaken by DPA as a part of CSR is enclosed as **Annexure D.**
17	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 2023-24 is Rs. 274 Lakhs. The expenditure made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" is Rs. 73.99 Lakhs from Dec, 2022 to May 2023.
18	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).
19	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.	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 Environmental Monitoring Plan submitted by GEMI is attached herewith as **Annexure A**.
20	The KPT shall have to contribute financially to support the National Green Corps Scheme being implemented in Gujarat by the GEER Foundation, Gandhinagar, in	Point noted

	construction with Forests and Environment Department	
21	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 and MoEF&CC, GOI. The last compliance report of the conditions stipulated in CRZ recommendations issued by GCZMA was submitted on 02/02/2023.
22	Any other condition that may be stipulated by this department from time to time for environmental protection/management purpose shall also have to be complied with by the KPT.	Point noted

Annexure -B

Environmental Monitoring Plan (EMP) for "Preparing and monitoring of environmental monitoring and management plan for Deendayal Port Authority at Kandla and Vadinar for a period of 3 years"

Document Ref No.: GEMI/DPA/782(2)/2022-23/36

Submitted to:

Deendayal Port Authority (DPA), Kandla

Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

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"AN ISO 9001:2015, ISO 14001:2015 AND ISO 45001:2018 Certified Institute"

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About this Document

Gujarat Environment Management Institute (GEMI) has been assigned with the project "***Preparing and Monitoring of Environmental Monitoring and Management Plan for Deendayal Port Authority at Kandla and Vadinar for a period of 3 years*** by Deendayal Port Authority, Kandla. Under the said project the Environmental Monitoring Plan is prepared.

Name of the Report:	Environmental Monitoring Plan for Deendayal Port Authority (DPA)
Date of Issue:	21/03/2023
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Document Ref.:	GEMI/DPA/782(2)/2022-23/36
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Table of Contents

Chapter: 1 4

Introduction 4

1.1 Introduction 4

1.2 Green Ports Initiative 4

1.3 Importance of EMP 5

1.4 Objectives and scope of the Study 7

1.5 Study Area: 8

Chapter: 2 10

Methodology adopted for the study 10

2.1 Introduction: 10

2.2 Preliminary site survey: 11

2.3 Sample collection, preservation, storage and transportation to GEMI's Laboratory 12

2.4 Testing and Analysis at GEMI's Laboratory 14

Chapter: 3 15

Environmental Monitoring at Kandla and Vadinar 15

3.1 Introduction 15

3.1.1 Ambient Air: 15

3.1.2 Drinking Water: 18

3.1.3 Noise Level Monitoring: 21

3.1.4 Soil Quality Monitoring: 23

3.1.5 Sewage Treatment Plant (STP) Monitoring: 26

3.1.6 Marine Water: 28

3.1.7 Marine Sediment Monitoring: 32

3.1.8 Monitoring of Meteorological Parameters 35

3.1.9 Monitoring of DG Sets 35

3.1.10 Marine Ecological Monitoring 36

Chapter 4 39

Deliverables of the study 39

Chapter 5 40

Detailed Monitoring Plan 40

List of Tables

Table 1: Details of the sampling collection by GEMI 12
Table 2: Details of monitoring locations of Ambient Air for Kandla and Vadinar 16
Table 3: List of parameters along with the instrument used for monitoring of Ambient Air 17
Table 4: Details of Sampling Locations for Drinking Water 18
Table 5: List of parameters to be monitored for the Drinking Water at Kandla and Vadinar 20
Table 6: Details of locations for Noise Monitoring at Kandla and Vadinar 22
Table 7: Details of the Noise Monitoring to be carried out at Kandla and Vadinar 23
Table 8: Details of the Soil quality monitoring locations 24
Table 9: List of parameters to be monitored for Soil Quality at Kandla and Vadinar 25
Table 10: Details of the monitoring locations of Sewage Water Treatment PlantTable:. 26
Table 11: List of parameters to be monitored for Inlet and Outlet of STP's at Kandla and Vadinar.. 28
Table 12: Details of the sampling locations for Marine water 29
Table 13: List of parameters to be monitored for Surface Water at Kandla and Vadinar 30
Table 14: Details of the sampling locations for Marine water 32
Table 15: List of parameters to be monitored for Sediments at Kandla and Vadinar 34
Table 16: Details of Meteorological Parameters to be monitorred at Kandla and Vadinar 35
Table 17: List of parameters to be monitored for DG Emissions at Kandla and Vadinar 35
Table 14: Details of the sampling locations for Marine water 36
Table 18: List of parameters to be monitored for Marine Ecological Monitoring at Kandla and Vadinar 38
Table 19: Detailed monitoring plan 40

List of Figures

Figure 1: Methodology adopted for the study 10
Figure 2: Photographs of the Preliminary Site Visit 11
Figure 3: GEMI's state of the art laboratory equipped with modern analystical Instrument 14
Figure 4: Detailed Monitoring plan for Kandla for the month of April 2023 43
Figure 5: Detailed Monitoring Plan for Vadinar for the month of April 2023 44
Figure 6: Detailed monitoring plan for Kandla for the month of May 2023 45
Figure 7: Detailed monitoring plan for Vadinar for the month of May 2023 46

List of Maps

Map 1: Map of Kandla and Vadinar Ports 9
Map 2: Monitoring locations for Ambient Air at Kandla 16
Map 3: Monitoring locations for Ambient Air at Vadinar 17
Map 4: Sampling and Monitoring locations for Drinking Water at Kandla 19
Map 5: Sampling and Monitoring locations for Drinking Water at Vadinar 19
Map 6: Locations for Noise Monitoring at Kandla 22
Map 7: Locations for Noise Monitoring at Vadinar 23
Map 8: Sampling location for Soil Quality Monitoring at Kandla 24
Map 9: Sampling location for Soil Quality Monitoring at Vadinar 25
Map 10: Sampling location for Sewage Water Treatment Plant Monitoring: Kandla 27
Map 11: Sampling location for Sewage Water Treatment Plant Monitoring: Vadinar 27
Map 12: Sampling location for Marine Water at Kandla 29
Map 13: Sampling loaction for Marine Water at Vadinar 30
Map 14: Locations for Marine Sediment Sampling at Kandla 33
Map 15: Locations of Marine Sediment sampling at Vadinar 33
Map 16: Locations for Marine Ecological Monitoring at Kandla 37
Map 17: Locations of Marine Ecolgical Monitoring at Vadinar 37

Chapter: 1
Introduction

1.1 Introduction

Deendayal Port's journey began in 1931 with the construction of RCC Jetty by Maharao Khengarji. After, the independence of India in 1947, Deendayal Port's success story continued and it emerged to be India's No. 1 Port in the year 2007-08 and has retained the top position for the 14th consecutive year since then. On 31st March 2016, Deendayal Port created history by handling 100 MMT cargo in a year – the first Major Port to achieve this milestone.

Kandla Port, also known as the Deendayal Port is a seaport in Kutch District of Gujarat state in the western India, near the city of Gandhidham. Located on the Gulf of Kutch, it is one of major ports on the western coast. Kandla was constructed in the 1950s as the chief seaport serving western India, after the independence of India. The Port of Deendayal is located on the Gulf of Kutch on the northwestern coast of India, some 256 nautical miles southeast of the Port of Karachi in Pakistan and over 430 nautical miles north-northwest of the Port of Mumbai (Bombay). It is the largest port of India by volume of cargo handled. Deendayal Port Authority, India's busiest major port in recent years, is gearing up to add substantial cargo handling capacity with private sector participation.

The Deendayal Port Authority had commissioned the Off-shore Oil Terminal facilities at Vadinar in the year 1978, for which M/s. Indian Oil Corporation Limited (IOCL) provided Single Bouy Mooring (SBM) system, having a capacity of 54 MMTPA, which was first of its kind in India. Further, significant Quantum of infrastructural upgradation has been carried out & excellent maritime infrastructure has been created at Vadinar for the 32MMTPA Essar Oil Refinery in Jamnagar District.

Deendayal Port Authority (DPA), Kandla crossed the landmark 100 MMT in cargo throughput for FY 2022-23 on December 28, 2022, thereby becoming the first Major Port to reach three figures in cargo handling, that too in only 3 quarters of a fiscal year.

1.2 Green Ports Initiative

Deendayal Port Authority is committed to sustainable development and adequate measures are being taken to maintain the Environmental well-being of the Port and its surrounding environs. Weighing in the environmental perspective for sustained growth, the Ministry of Shipping had started, Project Green Ports" which will help in making the Major Ports across India cleaner and greener. "Project Green Ports" will have two verticals - one

is "Green Ports Initiatives" related to environmental issues and second is "Swachh Bharat Abhiyaan".

The Green Port Initiatives include twelve initiatives such as preparation and monitoring plan, acquiring equipments required for monitoring environmental pollution, acquiring dust suppression system, setting up of sewage/waste water treatment plants/ garbage disposal plant, setting up Green Cover area, projects for energy generation from renewable energy sources, completion of shortfalls of Oil Spill Response (OSR) facilities (Tier-I), prohibition of disposal of almost all kind of garbage at sea, improving the quality of harbour wastes etc.

Deendayal Port Authority has also appointed Gujarat Environment Management Institute (GEMI) as an Advisor for "Making Deendayal Port a Green Port - Intended Sustainable Development under the Green Port Initiatives.

Deendayal Port Authority has also signed MoU with Gujarat Forest Department in August 2019 for Green Belt Development in an area of 31.942 Ha of land owned by Deendayal Port Authority. The plantation is being carried out by the Social Forestry division of Kachchh.

1.3 Importance of EMP

Port activities can cause deterioration of air and marine water quality in the surrounding areas due to multifarious activities. The pollution problems usually caused by port and harbour activities can be categorized as follows:

1. Coastal habitats may be destroyed and navigational channels silted due to causeway construction and land reclamation.
2. Unregulated mariculture activities in the port and harbour areas may threaten navigation safety.
3. Deterioration of surface water quality may occur during both the construction and operation phases.
4. Harbour operations may produce sewage, bilge wastes, solid waste and leakage of harmful materials both from shore and ships.
5. Human and fish health may be affected by contamination of coastal water due to urban effluent discharge.
6. Oil pollution is one of the major environmental hazards resulting from port/harbour and shipping operations. This includes bilge oil released from commercial ships handling non-oil cargo as well as the more common threat from oil tankers.

7. Air pollutant emissions due to ship emissions, loading and unloading activities, construction emission and emissions due to vehicular movement.

Hence, for the determination of levels of pollution, identification of pollution sources, control and disposal of waste from various point and non-point sources and for prediction of pollution levels for future, regular monitoring and assessment are required during the entire construction and operation phase of a major port. As per the Ministry of Environment, Forest and Climate Change (MoEF&CC), The Environmental Management Plan (EMP) is required for formulation, implementation and monitoring of environmental protection measures during and after commissioning of projects. The plan should indicate the details of various measures are taken and proposed to be taken for appropriate management of the environment of Deendayal Port Authority.

It identifies the principles, approach, procedures and methods that will be used to control and minimize the environmental and social impacts of all construction and operational activities associated with the port. An EMP is a required part of environmental impact assessment of a new port project but could also be evolved for existing ports. It is useful both during the construction and operational phases of the new port but only for operation of existing ports to ensure the effectiveness of the mitigation measures and to give guidance as to the most appropriate way of dealing with any unforeseen effects.

In view of the above, Gujarat Environment Management Institute (GEMI) has been awarded with the work "**Preparing and Monitoring of Environmental Monitoring and Management Plan for Deendayal Port Authority at Kandla and Vadinar for a period of 3 years**" vide letter No. EG/WK/EMC/1023/2011/III/239 dated: 15/02/2023 by DPA. It is extremely essential that port and harbour projects should have an environmental management plan (EMP), which incorporates monitoring of air, marine water, soil, sediment quality along with the collection of online meteorological data throughout the life of the project. This documents presents the environmental monitoring plan for Kandla and Vadinar. An EMP is a essentially a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation

1.4 Objectives and scope of the Study

In line with the work order, the key objective of the study is "Preparing and Monitoring of Environmental Monitoring and Management Plan at Kandla and Vadinar"

The scope of work includes:

1. To review the locations of Ambient Air, Ambient Noise, Drinking water, and Marine Water, Soil and Sediments monitoring stations within the impacted region in and around DPA establishment, in view of the developmental projects.
2. To assess the Ambient Air quality, quality at 6 stations at Kandala and two at Vadinar in terms of gases and particulate matter.
3. To assess the DG stack emissions (gases and particulate matter).
4. To assess Drinking water quality at twenty stations in terms of Physical, Chemical and Biological parameters viz., color, odor, turbidity, conductivity, pH, Total Dissolved Solids, chlorides, Hardness, total iron, sulfate, NH_4, PO_4, and bacterial count on a monthly basis.
5. To assess the Marine water quality in terms of aquatic Flora and Fauna and Sediment quality in terms of benthic flora and fauna.
6. To assess Marine Water Quality and sediment in term of physical and chemical parameter.
7. To assess the trends of water quality in terms of Marine ecology by comparing the data collected over a specified time period.
8. Every week a sample (Treated wastewater) of the Sewage Treatment Plant (STP) shall be analyzed to see the water quality being discharged by DPA.
9. Noise monitoring will be carried out twice a day at the representative stations for a period of 24 hours.
10. Meteorological parameters are very important from air pollution point of view and precise and continuous data collection is of utmost importance. The data collected is analyzed as per the standards. Meteorological data on wind speed, wind direction, temperature, relative humidity, solar radiation and rainfall will be collected from one permanent station at DPA and one permanent station at Vadinar.
11. To suggest incorporates, mitigation measures, based on the findings of this study and also check compliance with Environmental quality standards, green port initiatives, MIV 2030, and any applicable Statutory Compliance.
12. To recommend Environment managment plans on Monitoring programme based on findings of study.

1.5 Study Area:

Under the study, the locations specified by Deendayal Port Authority for the areas of Kandla and Vadinar would be monitored. The details of the two ports of DPA, i.e. Kandla and Vadinar have been dicussed hereunder:

a. Kandla:

Kandla is a village where Deendayal Port Authority is an Organization, a seaport in Kutch District of Gujarat state in western India, near the city of Gandhidham located at 23.03°N and 70.22°E. Located on the Gulf of Kutch, it is one of major ports on west coast. Kandla was constructed in the 1950s as the chief seaport serving western India. Deendayal Port Authority is situated in the Kandla Creek and the creek system consists of 3 main creeks the Nakti, the Kandla and the Hansthal, and the Little Gulf of Kutch interconnecting through many other big and small creeks, all along the coast. Very few rivers drain into the Gulf and they carry only a small quantity of freshwater, except during the brief monsoon. It is a protected natural harbour. Today, the Port of Kandla is India's hub for exporting grains and importing oil and one of the highest-earning ports in the country. Major imports entering the Port of Kandla are petroleum, chemicals, and iron and steel and iron machinery, but it also handles salt, textiles, and grain.

The Marine water of Gulf of Kutch and its creeks like Kandla creek, Nakti creek and Khori creek are providing the suitable habitat for marine vegetation. The Gulf abounds in marine wealth and is considered as one of the biologically rich marine habitat along the west coast of India.

Climatic conditions of Kandla: Kandla has a semi-desert climate. The average annual temperature is 24.8 °C. The average rainfall is 410 mm, most of which occurs during the monsoon from June to September. Temperature varies from 25°C to 44°C during summer and from 10°C to 25°C during winter.

b. Vadinar:

Vadinar is located at West Coast India in India at coordinates N 22° 27' 16.20" - E 069° 40' 30.01". The Deendayal Port Authority had commissioned the Off-shore Oil Terminal facilities at Vadinar in the year 1978, for which M/s. Indian Oil Corporation Limited (IOCL) provided Single Bouy Mooring (SBM) system, having a capacity of 54 MMTPA. The locations of Kandla Port and Vadinar port have been depicted in the **Map 1** as follows:

Map 1: Map of Kandla and Vadinar Ports

Chapter: 2
Methodology adopted for the study

2.1 Introduction:

The aim of the project management methodology is to allow the control of the whole process of management through effective decision-making and problem solving. The methodology adopted for the present study is as follows in figure 1:

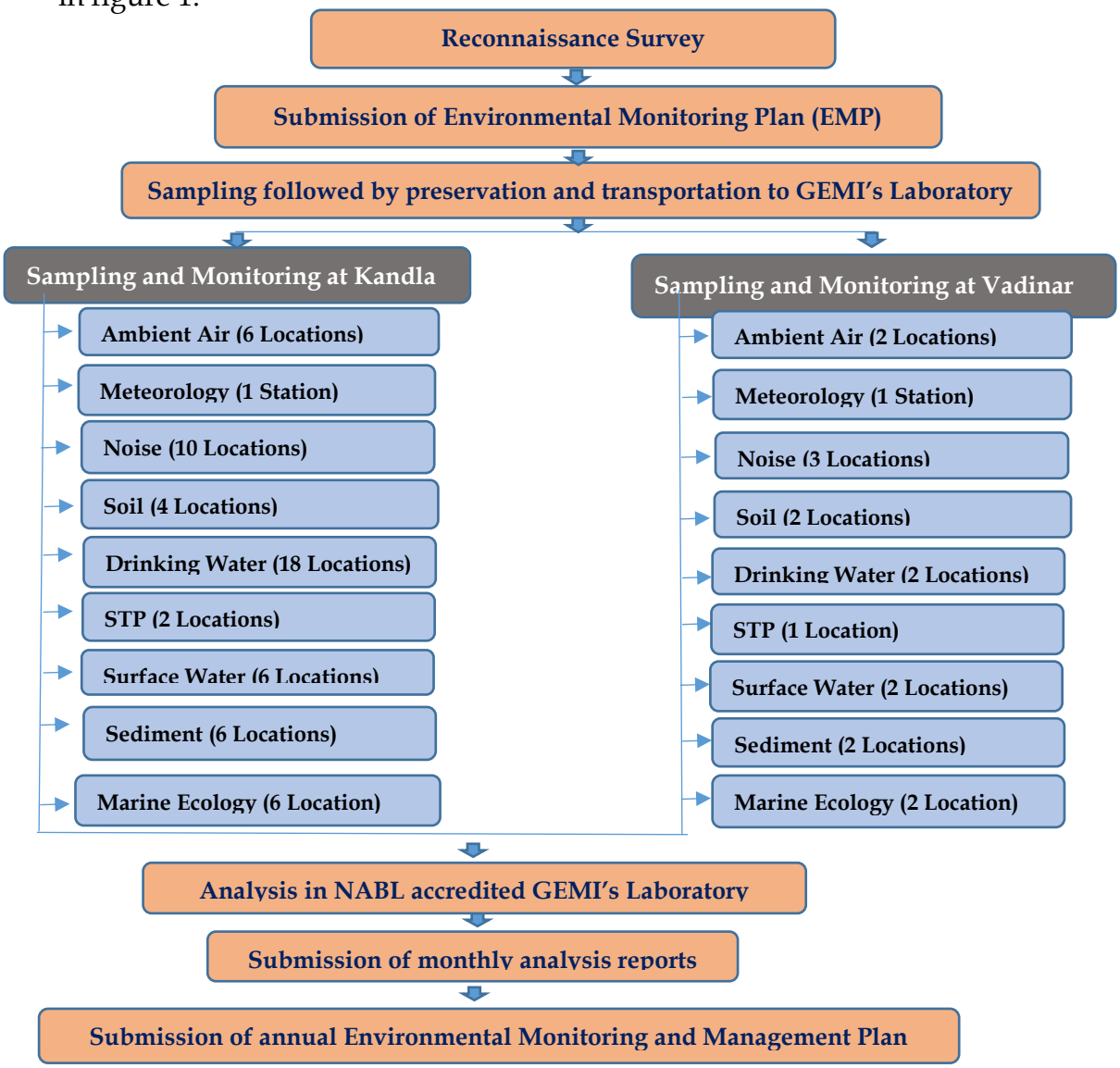

Figure 1: Methodology adopted for the study

2.2 Preliminary site survey:

With an aim of finalizing the monitoring locations at Kandla, the preliminary site visit was conducted on 24th January 2023 by the officials of GEMI accompanied by the monitoring team. Based on the said site visit, the monitoring locations as well as the frequency of the parameters was finalized. The few photographs of the monitoring locations visited and finalized during the preliminary site survey are depicted as **Figure 2:**

Figure 2: Environmental Monitoring locations at Kandla

2.3 Sample collection, preservation, storage and transportation to GEMI's Laboratory

GEMI has framed its own protocols for sampling of water, wastewater and soil. Whereas, for the other components of environment such as Ambient Air, Noise, Marine Ecology, Marine Water and Sediments the other sampling and monitoring guidelines/manuals brought out by CPCB shall be followed. The sampling is carried out by GEMI's trained manpower and timely calibrated instruments. The details of the environmental samples and its respective standards are summarized in **Table 1:**

Table 1: Details of the sampling collection by GEMI

Sr. No.	Type of sample		Manual/ Standards and Protocols
1.	**Ambient Air**	PM_{10}	IS 5182 (Part 23): 2006-
		$PM_{2.5}$	IS:5182 (Part:24):2019
		SO_x	IS:5182 (Part-2):2001
		NO_x	IS:5182 (Part-6):2006
		Carbon Monoxide	GEMI/SOP/AAQM/11; Issue no 01, Issue date 17.01.2019: 2019
		Benzene	IS 5182 (Part 11): 2006
		VOC	IS 5182(Part 17): 2004
		PAH	IS 5182 (Part 12): 2004
		Non-Methane VOC	IS 5182 (Part 11): 2001
2.	**DG Stack**		IS: 11255 and USEPA Method
3.	**Meteorological data**		Installation of Automatic Weather Stations so as to get the periodic Meteorological data as per the requirement
4.	**Water** **(Drinking Water, Surface Water and Sewage Effluent)**		• Guidelines on Water Quality Monitoring, 2017 by Central Pollution Control Boards

		• Sampling Protocol for Water & Wastewater approved by the Government of Gujarat vide letter no. ENV-102013-299-E dated 24-04-2014 under the provision of Water (Preservation and Control of Pollution) Act 1974.
5.	**Soil and Marine Sediments**	Soil Sampling Manual by GEMI published in November 2016
6.	**Noise**	IS 9989:2014
7.	**Marine Ecology**	Technical guidance book – An introduction to aquatic Bio-monitoring using Macro-invertebrates, 2021 by CPCB

2.4 Testing and Analysis at GEMI's Laboratory

GEMI's Laboratory is National Accreditation Board for Testing & Calibration Laboratories (NABL) accredited for Physical, Chemical, and Microbiological and Air parameters. It has been recognized as 'State Water Lab', 'State Air Lab' and "Environmental Laboratory" under the provisions of Water Act 1974, Air Act 1981 and Environment Protection Act 1986 respectively.

The samples are collected, appropriately preserved & transported to GEMI's Laboratory for further analysis. The analysis is carried out by proficient and trained laboratory scientists using modern analytical instruments as shown in **Figure-3**.

Figure 3: GEMI's state of the art laboratory equipped with modern analystical Instrument

All the test procedures adopted to analyze the physico-chemical and biological parameters are as per the Standard Methods along with various Standard methods adopted from Indian Standards (IS), EPA, ICAR, etc.

Chapter: 3
Environmental Monitoring at Kandla and Vadinar

3.1 Introduction

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

Environmental Monitoring Plan (EMP) comprises of monitoring of the various aspects of the environment such as Ambient Air, Noise, Meteorology, Surface Water, Marine water and sediments as well as Marine Ecology. The environmental monitoring is carried out taking into consideration the following objectives:

1. Verify effectiveness of planning decisions;
2. Measure effectiveness of operational procedures;
3. Confirm statutory and corporate compliance; and
4. Identify unexpected changes.

The environmental impacts of various activities in port and harbour principally concern coastal and estuarine water quality, contamination of soil, degradation in sediment quality, air quality, noise generation beyond the permissible limits and generation of various types of wastes. There is always apprehension that the contaminants in both water and air affect marine and coastal life, crops, trees, wild animals and their habitats. Human health is also affected directly or indirectly. Samples of different environment, i.e. Water, Sediment, Air and Noise have been collected to study the status of pollution arising due to various increased activities at the Kandla and Vadinar Port.
Under the present study, the various sectors of Environment are proposed to be monitored, which are as follows:

3.1.1 Ambient Air:

Ports require air quality monitoring to have information about the current air quality of their port and surrounding area. To improve air quality, ports need to know the cause of pollution. Once the source is identified, ports can then develop a strategy to reduce pollution.

As defined in the scope by Deendayal Port Authority (DPA), the Air monitoring shall be carried out at eight locations, six at Kandla and two at Vadinar. The monitoring cycle at all eight monitoring stations is twice in a week for a period of 24 hours. Sampling for PAH and Non-methane VOC monitoring will be done for once in a month. The details of the locations to be monitored is as mentioned in **Table 2:**

Table 2: Details of monitoring locations of Ambient Air for Kandla and Vadinar

Sr. No.	Location Name		Location Code	Latitude	Longitude
1.	Kandla	Oil Jetty No. 1	A-1	23.027580N	70.219992E
2.		Oil Jetty No. 7	A-2	23.043538N	70.218617E
3.		Kandla Port Colony	A-3	23.019797N	70.213536E
4.		Marine Bhavan	A-4	23.007653N	70.222197E
5.		Coal Storage Area	A-5	23.000190N	70.219757E
6.		Gopalpuri Hospital	A-6	23.081506N	70.135258E
7.	Vadinar	Admin Building	A-7	22.441806N	69.677056E
8.		Vadinar Colony	A-8	22.401939N	69.716306E

The map depicting the locations of Ambient Air to be monitored in Kandla and Vadinar have been mentioned in **Map 2 and 3** as follows:

Map 2: Monitoring locations for Ambient Air at Kandla

Map 3: Monitoring locations for Ambient Air at Vadinar

The list of parameters to be monitored under the projects for the Ambient Air been mentioned in **Table 3** as follows:

Table 3: List of parameters along with the instrument used for monitoring of Ambient Air

Sr. No.	Parameters	Reference method	Instrument
1.	PM_{10}	IS 5182 (Part 23): 2006	Respirable Dust Sampler (RDS) conforming to IS:5182 (Part-23): 2006
2.	$PM_{2.5}$	IS:5182 (Part:24):2019	Fine Particulate Sampler (FPS) conforming to IS:5182 (Part-24): 2019
3.	Sulphur Dioxide	IS 5182 (Part:2): 2001	Gaseous Attachment conforming to IS:5182 Part-2
4.	Oxides of Nitrogen	IS:5182 (Part-6): 2006	Gaseous Attachment conforming to IS:5182 Part-6
5.	Carbon Monoxide	GEMI/SOP/AAQM/11; Issue no 01, Issue date 17.01.2019: 2019	Sensor based Instrument
6.	Benzene	IS 5182 (Part 11): 2006 RA: 2017	Low Volume Sampler
8.	PAH	IS: 5182 (Part 12): 2004	Respirable Dust Sampler (RDS) conforming to IS:5182 (Part-12): 2004
9.	Non-methane VOC	IS 5182(Part 11): 2006	Respirable Dust Sampler (RDS) conforming to IS:5182 (Part-11): 2006
10.	VOC	IS 5182(Part 17): 2004	Respirable Dust Sampler (RDS) conforming to IS:5182 (Part-17): 2004

3.1.2 Drinking Water:

In India, for checking drinking water quality, IS has specified standards (IS 10500:2012) to provide safe drinking water to the people. It is necessary that drinking water sources should be tested regularly to know whether water is meeting the prescribed standards for drinking. Monitoring the drinking water quality is essential to protect human health and the environment.

As defined in the scope by Deendayal Port Authority (DPA), the Drinking Water sampling and analysis shall be carried out once a month at twenty locations i.e, eighteen at Kandla and two at Vadinar. The details of the locations to be monitored are mentioned in **Table 4** as follows:

Table 4: Details of Sampling Locations for Drinking Water

Sr. No.	Location Name		Location Code	Latitude	Longitude
1.	Kandla	Oil Jetty 7	DW-1	23.043527N	70.218456E
2.		Port & Custom Building	DW-2	23.009033N	70.222047E
3.		North Gate	DW-3	23.007938N	70.222411E
4.		Workshop	DW-4	23.009372N	70.222236E
5.		Canteen Area	DW-5	23.003707N	70.221331E
6.		West Gate 1	DW-6	23.006771N	70.217340E
7.		Sewa Sadan -3	DW-7	23.009779N	70.221838E
8.		Nirman Building	DW-8	23.009642N	70.220623E
9.		Custom Bulding	DW-9	23.018930N	70.214478E
10.		Port Colony Kandla	DW-10	23.019392N	70.212619E
11.		Wharf Area/ Jetty	DW-11	22.997833N	70.223042E
12.		Hospital Kandla	DW-12	23.018061N	70.212328E
13.		A.O. Bulding	DW-13	23.061914N	70.144861E
14.		School Gopalpuri	DW-14	23.083619N	70.132061E
15.		Guest House	DW-15	23.078830N	70.131008E
16.		E- Type Quater	DW-16	23.083306N	70.132422E
17.		F- Type Quater	DW-17	23.077347N	70.135731E
18.		Hospital Gopalpuri	DW-18	23.081850N	70.135347E
19.	Vadinar	Near Vadinar Jetty	DW-19	22.440759N	69.675210E
20.		Near Port Colony	DW-20	22.401619N	69.716822E

The map depicting the locations of Drinking Water to be sampled and analysed in Kandla and Vadinar have been mentioned in **Map 4 and 5** as follows:

Map 5: Sampling and Monitoring locations for Drinking Water at Kandla

Map 4: Sampling and Monitoring locations for Drinking Water at Vadinar

The list of parameters to be monitored under the projects for the Drinking Water has been mentioned in **Table 5** as follows:

Table 5: List of parameters to be monitored for the Drinking Water at Kandla and Vadinar

Sr. No.	Parameters	Reference method	Instrument
1.	pH	APHA, 23rd Edition (Section-4500-H+B):2017	pH Meter
2.	EC	APHA, 23rd Edition (Section-2510 B):2017	Conductivity Meter
3.	TDS	APHA, 23rd Edition (Section-2540 C):2017	Vaccum Pump with filtration assembly and Oven
4.	Chloride	APHA, 23rd Edition (Section-4500-Cl-B):2017	Titration Apparatus
5.	Total Hardness	APHA, 23rd Edition (Section-2340 C):2017	Titration Apparatus
6.	Ca Hardness	APHA, 23rd Edition (Section-3500-Ca B):2017	Titration Apparatus
7.	Mg Hardness	APHA, 23rd Edition (Section-3500-Mg B):2017	Titration Apparatus
8.	Turbidity	APHA, 23rd Edition (Section -2130 B):2017	Nephlo Turbidity Meter
9.	Fluoride	APHA, 23rd Edition (Section-4500-F-D):2017	UV- Visible Spectrophotometer
10.	Sulphate	APHA, 23rd Edition (Section 4500-SO4-2-E):2017	UV- Visible Spectrophotometer
11.	Sodium	APHA, 23rd Edition (Section-3500-Na-B):2017	Flame Photometer
12.	Potassium	APHA,23rd Edition, 3500 K-B: 2017	Flame Photometer
13.	Nitrate	APHA, 23rd Edition, 4500 NO3- B: 2017	UV- Visible Spectrophotometer
14.	Nitrite	APHA, 23rd Edition, 4500 NO2-B: 2017	UV- Visible Spectrophotometer
15.	Manganese	APHA,23rd Edition, ICP Method 3120 B: 2017	ICP-OES
16.	Mercury	EPA 200.7	ICP-OES
17.	Salinity	APHA, 23rd Edition (section 2520 B, E.C. Method)	Salinity /TDS Meter
18.	Free Residual Chlorine	APHA 23rd Edition, 4500	Titration Apparatus
19.	Lead	APHA ICP 23rd Edition (Section-3120 B):2017	ICP-OES
20.	Cadmium	APHA ICP 23rd Edition (Section-3120 B):2017	ICP-OES

Sr. No.	Parameters	Reference method	Instrument
21.	Iron	APHA ICP 23rd Edition (Section-3120 B):2017	ICP-OES
22.	Total Chromium	APHA ICP 23rd Edition (Section-3120 B):2017	ICP-OES
23.	Hexavalent Chromium	APHA, 23rd Edition, 3500 Cr B: 2017	UV- Visible Spectrophotometer
24.	Copper	APHA,23rd Edition, ICP Method 3120 B: 2017	ICP-OES
25.	Zinc	APHA ICP 23rd Edition (Section-3120 B):2017	ICP-OES
26.	Arsenic	APHA ICP 23rd Edition (Section-3120 B):2017	ICP-OES
27.	Colour	APHA, 23rd Edition, 2120 B:2017	Color Comparator
28.	TSS	APHA, 23rd Edition, 2540 D: 2017	Vaccum Pump with filtration assembly and Oven
29.	Micro (MPN)	IS 15185: 2016	LAF/ Incubator

3.1.3 Noise Level Monitoring:

The noise monitoring at Port is aimed to understand the source and intensity of port-related noises and respond to community concerns regarding noise. An effective noise monitoring is helpful to identify noise limits exceedings of the port areas and will assist to formulate a plan incorporating the mitigation measures if needed. The sources of noise at the port may vary according to daily activities. The sources may be domestic, natural (shores, birds/animal shouts, wind movement, sea tide movement, waterfalls etc.), commercial (automobiles, aeroplanes, machinery etc.), industrial (generator sets, boilers, plant operations, trolley movement, transport vehicles, pumps, motors etc.).

As defined in the scope by Deendayal Port Authority (DPA), the Noise Monitoring shall be carried out at total thirteen locations, i.e., 10 at Kandla and 3 at Vadinar. The Noise will be monitored once in a month at all the locations for a period of 24 hours. Data will be recorded using automated Sound Level Meter conforming to **IEC 61672-1(Latest)/ IS:15575/(Pt1 & Pt2) with category Class-I.** The intensity of sound will be measured in sound pressure level (SPL) and common unit of measurement is decibel (Db). The details of the Noise Monitoring are as mentioned in **Table 6**:

Table 6: Details of locations for Noise Monitoring at Kandla and Vadinar

Sr. No.	Location Name		Location Code	Latitude	Longitude
1.	Kandla	Oil Jetty 7	N-1	23.043527N	70.218456E
2.		West Gate No.1	N-2	23.006771N	70.217340E
3.		Canteen Area	N-3	23.003707N	70.221331E
4.		Main Gate	N-4	23.007980N	70.222525E
5.		Main Road	N-5	23.005194N	70.219944E
6.		Marin Bhavan	N-6	23.007618N	70.222087E
7.		Port & Custom Building	N-7	23.009033N	70.222047E
8.		Nirman Building	N-8	23.009642N	70.220623E
9.		ATM Building	N-9	23.009985N	70.221715E
10.		Wharf Area/ Jetty	N-10	22.997833N	70.223042E
11.	Vadinar	Near Main Gate	N-11	22.441544N	69.674495E
12.		Near Vadinar Jetty	N-12	22.441002N	69.673147E
13.		Port Colony Vadinar	N-13	22.399948N	69.716608E

The map depicting the locations of Noise Level Monitoring at Kandla and Vadinar have been depicted in **Map 6 and 7** as follows:

Map 6: Locations for Noise Monitoring at Kandla

Map 7: Locations for Noise Monitoring at Vadinar

The details of Noise Monitoring to be carried out under the study has been mentioned in **Table 7** as follows:

Table 7: Details of the Noise Monitoring to be carried out at Kandla and Vadinar

Sr. No.	Parameters	Units	Reference Method	Instrument
1.	Leq(Day)	dB	IS 9989: 2014	Noise Level Meter (Class-I)
2.	Leq(Night)	dB		

3.1.4 Soil Quality Monitoring:

The purpose of soil quality monitoring is to track changes in the features and characteristics of the soil, especially the chemical properties of soil occurring at specific time intervals under the influence of human activity Soil quality assessment helps to determine the status of soil functions and environmental risks associated with various practices prevalent at the location.

As defined in scope by Deendayal Port Authority (DPA), Soil Quality Monitoring shall be carried out at Six locations, four at Kandla and two at Vadinar. Sampling will be done once in a month at all stations in Kandla and Vadinar. The details of the locations to be monitored is mentioned in **Table 8:**

Table 8: Details of the Soil quality monitoring locations

Sr. No.	Location Name		Location Code	Latitude	Longitude
1.	**Kandla**	Oil Jetty 7	S-1	23.043527N	70.218456E
2.		IFFCO Plant	S-2	23.040962N	70.216570E
3.		Khori Creek	S-3	22.970382N	70.223057E
4.		Nakti Creek	S-4	23.033476N	70.158461E
5.	**Vadinar**	Near SPM	S-5	22.400026N	69.714308E
6.		Near Vadinar Jetty	S-6	22.440759N	69.675210E

The map depicting the locations of Soil Quality Monitoring to be monitored in Kandla and Vadinar have been mentioned in **Map 8 and 9** as follows:

Map 8: Sampling location for Soil Quality Monitoring at Kandla

Map 9: Sampling location for Soil Quality Monitoring at Vadinar

The list of parameters to be monitored under the projects for the Soil Quality Monitoring heen mentioned in **Table 9** as follows:

Table 9: List of parameters to be monitored for Soil Quality at Kandla and Vadinar

Sr. No.	Parameters	Reference method	Instruments
1.	TOC	Methods Manual Soil Testing in India January, 2011, 09. Volumetric method (Walkley and Black, 1934)	Titration Apparatus
2.	Organic Carbon		Titration Apparatus
3.	Inorganic Phosphate	Practical Manual Chemical Analysis of Soil and Plant Samples, ICAR-Indian Institute of Pulses Research 2017 Determination of Available Phosphorus in Soil	UV-Visible Spectrophotometer
4.	Texture	Methods Manual Soil Testing in India January 2011,01	Hydrometer
5.	pH	IS 2720 (Part 26): 1987	pH Meter
6.	Conductivity	IS 14767: 2000	Conductivity Meter
7.	Particle size distribution & Silt content	Methods Manual Soil Testing in India January 2011	Sieves Apparatus

8.	SAR	Procedures for Soil Analysis, International Soil Reference and Information Centre, 6th Edition 2002 13-5.5.3 Sodium Absorption Ratio (SAR), Soluble cations	Flame Photometer
9.	Water Holding Capacity	NCERT, Chapter 9, 2022-23 and Water Resources Department Laboratory Testing Procedure For Soil & Water Sample Analysis	Muffle Furnace
10.	Aluminium	EPA Method 3051A	ICP-OES
11.	Chromium	EPA Method 3051A	ICP-OES
12.	Nickel	EPA Method 3051A	ICP-OES
13.	Copper	Methods Manual Soil Testing in India January, 2011, 17a	ICP-OES
14.	Zinc	Methods Manual Soil Testing in India January, 2011, 17a	ICP-OES
15.	Cadmium	EPA Method 3051A	ICP-OES
16.	Lead	EPA Method 3051A	ICP-OES
17.	Arsenic	EPA Method 3051A	ICP-OES
18.	Mercury	EPA Method 3051A	ICP-OES

3.1.5 Sewage Treatment Plant (STP) Monitoring:

The principal objective of wastewater treatment is generally to allow human and industrial effluents to be disposed off without danger to human health or unacceptable damage to the natural environment. As defined in the scope by Deendayal Port Authority (DPA), Kandla, the Sewage Water Treatment Plant Monitoring as to be carried out at three locations, one at Kandla, one at Gopalpuri and one STP at Vadinar. The samples each from the treated wastewater of the STP have to be collected weekly. The details of the locations of Sewage Treatment Plants to be monitoried for Kandla and Vadinar are as mentioned in **Table 10** as follows:

Table 10: Details of the monitoring locations of Sewage Water Treatment PlantTable:.

Sr. No.	Location Name	Location Code	Latitude	Longitude
1.	STP Kandla	STP-1	23.021017N	70.215594E
2.	STP Gopalpuri	STP-2	23.077783N	70.136759E
3.	STP at Vadinar	STP-3	22.406289N	69.714689E

The map depicting the locations of Sewage Water Treatment Plant Monitoring to be monitored in Kandla and Vadinar have been mentioned in **Map 10 and 11** as follows:

Map 10: Sampling location for Sewage Water Treatment Plant Monitoring: Kandla

Map 11: Sampling location for Sewage Water Treatment Plant Monitoring: Vadinar

The list of parameters to be monitored under the projects for the Sewager Water Treatment Plants have been mentioned in **Table 11** as follows:

Table 11: List of parameters to be monitored for Treated Wastewater of STP's at Kandla and Vadinar

Sr. No.	Parameters	Reference method	Instruments
1.	pH	APHA, 23rd edition, 4500- H^+ B, 2017	pH Meter
2.	TDS	APHA, 23rd Edition, 2540 C: 2017	Vaccum Pump with filtration assembly and Oven
3.	TSS	APHA, 23rd Edition, 2540 D: 2017	Vaccum Pump with filtration assembly and Oven
4.	DO	APHA, 23rd Edition, 4500 C: 2017	Titration Apparatus
5.	COD	APHA, 23rd Edition, 5220 B: 2017	Titration Apparatus plus Digester
6.	BOD	IS-3025, Part 44, 1993	BOD Incubator plus Titration Apparatus
7.	SAR	IS 11624: 2019	Flame Photometer
8.	Total Coliforms	IS 1622: 2019	LAF/ Incubator

3.1.6 Marine Water:

Major water quality concerns at ports include wastewater and leaking of toxic substances from ships, stormwater runoff. This oily wastewater, combined with other ship wastes, including sewage and wastewater from other on-board uses, is a serious threat to the water quality as well as to the marine life. As defined in the scope by Deendayal Port Authority (DPA), the Marine Water sampling and analysis as to be carried out at total eight locations, six at Kandla and two at Vadinar. The marine water samping will be carried out with the help of Niskin Sampler. It is a device used to take water samples at a desired depth without the danger of mixing with water from other depths. The details of the locations to be monitored is as mentioned in **Table 12:**

Table 12: Details of the sampling locations for Marine water

Sr. No.	Location Name		Location Code	Latitude	Longitude
1.	Kandla	Near Passenger Jetty One	MW-1	23.017729N	70.224306E
2.		Kandla Creek (near to KPT Colony)	MW-2	23.001313N	70.226263E
3.		Near Coal Bearth	MW-3	22.987752N	70.227923E
4.		Khori Creek	MW-4	22.977544N	70.207831E
5.		Nakti Creek (near to Tuna Port)	MW-5	22.962588N	70.116863E
6.		Nakti Creek (near to NH - 8A)	MW-6	23.033113N	70.158528E
7.	Vadinar	Near SPM	MW-7	22.500391N	69.688089E
8.		Near Vadinar Jetty	MW-8	22.440538N	69.667941E

The map depicting the locations of Marine Water to be sampled and analysed in Kandla and Vadinar have been mentioned in **Map 12 and 13** as follows:

Map 12: Sampling location for Marine Water at Kandla

Map 13: Sampling loaction for Marine Water at Vadinar

The list of parameters to be monitored under the projects for the Marine water Sampling and monitoring been mentioned in **Table 13** as follows:

Table 13: List of parameters to be monitored for Marine Water at Kandla and Vadinar

Sr. No.	Parameters	Reference method	Instrument
1.	Electrical Conductivity	APHA, 23rd Edition (Section-2510 B):2017	Conductivity Meter
2.	DO	APHA, 23rd Edition, 4500 O C, 2017	Titration Apparatus
3.	pH	APHA, 23rd Edition (Section-4500-H^+B):2017	Ph meter
4.	Color	APHA, 23rd Edition, 2120 B: 2017	Color comparator
5.	odour	IS 3025 Part 5: 2018	Heating mantle & odour bottle
6.	Turbidity	IS 3025 Part 10: 1984	Nephlo Turbidity Meter
7.	Total Dissolved Solids	APHA, 23rd Edition (Section-2540 C):2017	Vaccum Pump with Filtration Assembly and Oven
8.	Total Suspended Solids	APHA, 23rd Edition, 2540 D: 2017	Vaccum Pump with filtration assembly and Oven
9.	Particulate Organic Carbon	APHA, 23rd Edition, 2540 D and E	TOC analyser
10.	COD	IS-3025, Part- 58: 2006	Titration Apparatus plus Digester

11.	BOD	IS-3025,Part 44,1993,	BOD Incubator plus Titration apparatus
12.	Silica	APHA, 23rd Edition, 4500 C, 2017	UV- Visible Spectrophotometer
13.	Phosphate	APHA,23rd Edition, 4500 P-D: 2017	UV- Visible Spectrophotometer
14.	Sulphate	APHA, 23rd Edition, 4500 SO4-2 E : 2017	UV- Visible Spectrophotometer
15.	Nitrate	APHA, 23rd Edition, 4500 NO3-B : 2017	UV- Visible Spectrophotometer
16.	Nitrite	APHA, 23rd Edition, 4500 NO2- B: 2017	UV- Visible Spectrophotometer
17.	Sodium	APHA,23rd Edition, 3500 Na- B : 2017	Flame photometer
18.	Potassium	APHA,23rd Edition, 3500 K-B: 2017	Flame photometer
19.	Manganese	APHA,23rd Edition, ICP Method 3120 B: 2017	ICP-OES
20.	Iron	APHA,23rd Edition, ICP Method 3120 B: 2017	ICP-OES
21.	Total Chromium	APHA, 23rd Edition, 3500 Cr B: 2017	ICP-OES
22.	Hexavalent Chromium	APHA, 23rd Edition, 3500 Cr B: 2017	UV- Visible Spectrophotometer
23.	Copper	APHA, 23rd Edition, ICP Method 3120 B: 2017	ICP-OES
24.	Cadmium	APHA, 23rd Edition, ICP Method 3120 B: 2017	ICP-OES
25.	Arsenic	APHA, 23rd Edition, ICP Method 3120 B: 2017	ICP-OES
26.	Lead	APHA, 23rd Edition, ICP Method 3120 B: 2017	ICP-OES
27.	Zinc	APHA,23rd Edition, ICP Method 3120 B: 2017	ICP-OES
28.	Mercury	EPA 200.7	ICP-OES
29.	Floating Material (Oil grease scum, petroleum products)	APHA, 23rd Edition, 5520 C: 2017	Soxhlet Assembly
30.	Total Coliforms (MPN)	IS 1622: 2019	LAF/ Incubator

3.1.7 Marine Sediment Monitoring:

The unconsolidated materials derived from pre-existing rocks or similar other sources by the process of denudation are deposited in water medium is known as sediment. For a system, like a port, where large varieties of raw materials and finished products are handled, expected sediment contamination is obvious. The materials or part of materials spilled over the water during loading and unloading operations lead to the deposition in the harbor water along with sediment and thus collected as harbour sediment sample. These loose materials serve as receptor of many trace elements, which are prone to environment impact. In this connection it is pertinent to study the concentration and distribution of environmentally sensitive elements in the harbour sediment.

As defined in the scope by Deendayal Port Authority (DPA), the Marine Sediment sampling carried out once in a month at total eight locations, six at Kandla and two at Vadinar. The samping at the locations of the Marine Sediment will be carried out with the help of Van Veen Grab Sampler. A Van Veen grab is an instrument to sample (disturbed) sediment up to a depth of 15 cm in the seafloor. While letting the instrument down on the seafloor, sediment can be extracted. The details of the locations to be monitored is as mentioned in **Table 14** as follows:

Table 14: Details of the sampling locations for Marine water

Sr. No	Location Name		Location Code	Latitude	Longitude
1.	Kandla	Near Passenger Jetty One	MS-1	23.017729N	70.224306E
2.		Kandla Creek (near to KPT Colony)	MS-2	23.001313N	70.226263E
3.		Near Coal Bearth	MS-3	22.987752N	70.227923E
4.		Khori Creek	MS-4	22.977544N	70.207831E
5.		Nakti Creek (near to Tuna Port)	MS-5	22.962588N	70.116863E
6.		Nakti Creek (near to NH - 8A)	MS-6	23.033113N	70.158528E
7.	Vadinar	Near SPM	MS-7	22.500391N	69.688089E
8.		Near Vadinar Jetty	MS-8	22.440538N	69.667941E

The map depicting the locations of Marine Sediment samplingp in Kandla and Vadinar have been mentioned in **Map 14 and 15** as follows:

Map 14: Locations for Marine Sediment Sampling at Kandla

Map 15: Locations of Marine Sediment sampling at Vadinar

The list of parameters to be monitored under the projects for the Marine Sediment sampling been mentioned in **Table 15** as follows:

Table 15: List of parameters to be monitored for Sediments at Kandla and Vadinar

Sr. No.	Parameters	Reference method	Instruments
1.	Texture	Methods Manual Soil Testing in India January 2011,01	Hydrometer
2.	Organic Matter	Methods Manual Soil Testing in India January, 2011, 09. Volumetric method (Walkley and Black, 1934)	Titration apparatus
3.	Inorganic Phosphates	Practical Manual Chemical Analysis of Soil and Plant Samples, ICAR-Indian Institute of Pulses Research 2017	UV- Visible Spectrophotometer
4.	Silica	EPA METHOD 6010 C & IS : 3025 (Part 35) – 1888, part B	UV- Visible Spectrophotometer
5.	Phosphate	EPA Method 365.1	UV- Visible Spectrophotometer
6.	Sulphate as SO4- (Available Sulphur)	IS : 2720 (Part 27) - 1977	UV- Visible Spectrophotometer
7.	Nitrite	ISO 14256:2005	UV- Visible Spectrophotometer
8.	Nitrate	Methods Manual Soil Testing in India January, 2011, 12	UV- Visible Spectrophotometer
9.	Calcium as Ca (Exchangeable)	Methods Manual Soil Testing in India January 2011, 16.	Titration Apparatus
10.	Magnesium as Mg (Exchangeable)	Method Manual Soil Testing in India January 2011,	Titration Apparatus
11.	Sodium	EPA Method 3051A	Flame Photometer
12.	Potassium	Methods Manual Soil Testing in India January, 2011	Flame Photometer
13.	Aluminium	EPA Method 3051A	ICP-OES
14.	Chromium	EPA Method 3051A	ICP-OES
15.	Nickel	EPA Method 3051A	ICP-OES
16.	Zinc	EPA Method 3051A	ICP-OES
17.	Cadmium	EPA Method 3051A	ICP-OES
18.	Lead	EPA Method 3051A	ICP-OES
19.	Arsenic	EPA Method 3051A	ICP-OES
20.	Mercury	EPA Method 3051A	ICP-OES

3.1.8 Monitoring of Meteorological Parameters

Meteorological parameters are very important from air pollution point of view and precise and continuous data collection is of utmost importance. The data collected is analyzed as per the standards. The data shall be collected by Installation of Automatic Weather Stations so as to get the periodic Meteorological data as per the requirement. Meteorological data such as wind speed, wind direction, temperature, relative humidity, solar radiation and rainfall will be collected from one permanent station at Kandla and one at Vadinar installed by GEMI.

The details of the Meteorological data to be monitored at Kandla and Vadinar have been mentioned in **Table 16**: as follows:

Table 16: Details of Meteorological Parameters to be monitorred at Kandla and Vadinar

Sr. No.	Details of Meteorological Data	Unit of Measurement
1.	Wind Direction	degree
2.	Wind Speed	m/sec
3.	Rainfall	mm/hr
4.	Relative Humidity	% RH
5.	Temperature	^{o}C
6.	Solar Radiation	W/m^2

3.1.9 Monitoring of DG Sets

DG sets at the Deendayal Port Authority (DPA) are generally utilized as a secondary power source. The sampling and monitoring of the DG sets are proposed to be monitored as and when required, specifically once a month. The monitoring of the DG Set will be carried out with the help of Handy Sampler for the following parameters mentioned in **Table 17** as follows:

Table 17: List of parameters to be monitored for DG Emissions at Kandla and Vadinar

Sr. No.	Parameters	Reference method
1.	Particulate matter	IS: 11255 Part I
2.	Sulphur Dioxide	USEPA Method 6C: 2017
3.	Oxides of Nitrogen	USEPA Method 7E: 2019
4.	Carbon Monoxide	USEPA Method 10: 2017
5.	Carbon Dioxide	USEPA Method 3A: 2019

3.1.10 Marine Ecological Monitoring

The monitoring of the biological and ecological parameters is important to assess the marine environment. Marine environmental monitoring is undertaken to provide evidence that environmental management targets are being met. Deendayal Port and its surroundings have mangroves, mudflats and creek systems as major ecological entities.

As defined in the scope by Deendayal Port Authority (DPA), the Marine Ecological Monitoring shall be carried out once in a month specifically at eight locations, six at at Kandla and two at Vadinar. The sampling of the Benthic Invertebrates will be carried out with the help of D-frame nets, whereas the sampling of zooplankton and phytoplankton shall be carried out with the help of Plankton Nets (60 micron and 20 micron). The details of the locations to be monitored is as mentioned in **Table 18** as follows:

Table 18: Details of the sampling locations for Marine Ecological Monitoring

Sr. No.	Location Name		Location Code	Latitude	Longitude
1.	Kandla	Near Passenger Jetty One	ME-1	23.017729N	70.224306E
2.		Kandla Creek (near to KPT Colony)	ME-2	23.001313N	70.226263E
3.		Near Coal Bearth	ME-3	22.987752N	70.227923E
4.		Khori Creek	ME-4	22.977544N	70.207831E
5.		Nakti Creek (near to Tuna Port)	ME-5	22.962588N	70.116863E
6.		Nakti Creek (near to NH - 8A)	ME-6	23.033113N	70.158528E
7.	Vadinar	Near SPM	ME-7	22.500391N	69.688089E
8.		Near Vadinar Jetty	ME-8	22.440538N	69.667941E

The map depicting the locations of Marine Ecological monitoring in Kandla and Vadinar have been mentioned in **Map 16 and 17** as follows:

Map 16: Locations for Marine Ecological Monitoring at Kandla

Map 17: Locations of Marine Ecolgical Monitoring at Vadinar

The various parameters to be monitored under the study for Marine Ecological Monitoring are mentioned in **Table 19** as follows:

Table 19: List of parameters to be monitored for Marine Ecological Monitoring at Kandla and Vadinar

Sr. No.	Parameters
1.	Productivity (Net and Gross)
2.	Chlorophyll-a
3.	Pheophytin
4.	Biomass
5.	Relative Abundance, species composition and diversity of phytoplankton
6.	Relative Abundance, species composition and diversity of zooplankton
7.	Relative Abundance, species composition and diversity of benthic invertebrates (Meio, Micro and macro benthos)
8.	Particulate oxidisable organic carbon
9.	Secchi Depth

Chapter 4
Deliverables of the study

The deliverables of the study are as follows:

1. Submission of the monthly sampling and analysis report to Deendayal Port Authority.
2. Preparation and submission of Annual Environmental Management Plan (EMP) with an aim of identification and prediction of impacts and suggestive mitigation measures for prevention of environmental aspects.

   The Environmental Management plan (EMP) is a site specific plan developed to ensure that the project is implemented in an environmentally sustainable manner and understand the potential environmental risks arising from the allied activities. The EMP also comprises of implementing the appropriate mitigation actions to minimize the identified risks to reduce adverse environmental impacts. The annual EMP formulated under the study shall comprise of the following:

a. Various statutary and legal compliance regarding the port
b. Current Environment Management Policy of DPA and its implemetations
c. Study on the environmental conditions of the Kandla and Vadinar Ports and its compliance in line with the regulatory requirnment. Findings based on the styding the primary as well as secondary data and their significant Impact on the Environmental Conditions due to port and its allied activities.
d. Data collected shall be reviewed for identification of the data gaps, which shall be subsequently filled up during the field study.
e. The collected data shall be analysed and the same shall be interpreted by the means of Statistical, graphical, numerical modelling, etc to arrive at a meaningful information/interpretation.
f. The collected Environmental data (Air, Water, Soil, noise, etc.) shall be compared with the relevant/latest National/International norms/standards.
g. Review of status and trend of environmental factors against which the impacts shall be identified.
h. Gaps with respect to the relevant norms/standards and further analysing the significance of such gaps by suitable statistical tools.
i. Environment Management Plan consists of below components and its current status and mitigation measures conforming to applicable environmental norms/standards.

   Ambient Air Quality ,Drinking Water Monitoring, Sewage Treatment Plant Monitoring Meteorological Parameters, Marine Sediment Quality, Ecological Monitoring,Noise Monitoring, DG Emissions (if any)
j. Recommendations of Best Management practices/policy interventions.

Chapter 5
Detailed Monitoring Plan

As per scope specified by DPA, the detailed monitoring plan to be implemented for the study is mentioned in **Table 19** as follows:

Table 20: Detailed monitoring plan

Sr. No.	Parameter	No. of locations	Frequency	Parameters to be monitored	Submission of Reports
1.	Ambient Air Quality Monitoring (8 Locations)	6 at Kandla and 2 at Vadinar	Twice a week	PM_{10}, $PM_{2.5}$, Sulphur Dioxide, Oxides of Nitrogen, Carbon Monoxide, Benzene, Volatile Organic Compound	Monthly (15th of every month for the preceding month)
			Once in a month	PAH	
				Non-methane VOC	
2.	Drinking Water Monitoring (20 Locations)	18 at Kandla and 2 at Vadinar	Once in a month	Odour, Color, pH, Turbidity, TDS, TSS, Conductivity, Chloride, Calcium as Ca, Magnesium, Total Hardness, Sulphate as SO4-, Nitrate as NO3, Nitrite as No2, Fluoride as F, Sodium as Na, Iron as Fe, Potassium as K, Manganese, Total Chromium, Hexavalent Chromium, Copper Cadmium, Arsenic, Lead, Zinc, Mercury, Salinity, Free Residual Chlorine, Micro (MPN)	Monthly (15th of every month for the preceding month)
3.	Noise level Monitoring (13 Locations)	10 at Kandla & 3 at Vadinar	24 hrs period once in a month	Leq(Day) & Night	Monthly (15th of every month for the preceding month)

4.	Soil Quality Monitoring (6 Locations)	4 at Kandla and 2 at Vadinar	Once in a month	Total Organic Matter, Organic Carbon, Inorganic Phosphate (Ortho), Texture, pH, Conductivity, Particle size distribution & Silt content, SAR, Water Holding Capacity, Aluminium, Chromium, Nickel, Copper, Zinc, Cadmium, Lead, Arsenic, Mercury	Monthly (15th of every month for the preceding month)
5.	Sewage Treatment Plant Monitoring (3 Locations)	2 at Kandla and 1 location in Vadinar	Once in a week for inlet and outlet	pH, TDS, TSS, DO, COD, BOD, SAR, Microbiological (MPN) (TC)	Monthly (15th of every month for the preceding month)
6.	Meteorological Data Monitoring (2 Locations)	1 at Kandla and 1 location in Vadinar	Daily	Wind Speed , Wind Direction, Rainfall, Relative Humidity, Temperature, Solar Radiation	Monthly (15th of every month for the preceding month)
7.	Marine Water Quality (8 Locations)	6 Stations in Kandla and 2 stations at Vadinar	Once in a month	Odour, Color, pH, Turbidity, TDS, TSS, Conductivity, DO, Particulate Organic Carbon, COD, BOD, Silica, Phosphate, Sulphate as SO4-, Nitrate as NO3, Nitrite as No2, Sodium as Na, Potassium as K, Manganese, Iron as Fe, Total Chromium, Hexavalent Chromium, Copper, Cadmium, Arsenic, Lead, Zinc, Mercury, Floating Material (Oil grease scum, petroleum products), Microbiological (MPN), Density	Monthly (15th of every month for the preceding month)
8.	Marine Water Quality for Biological Monitoring	6 Station in Kandla and 2 station at Vadinar	Once in a month	Productivity (Net and Gross), Chrlorophyll-a, Pheophytin, Biomass, Relative Abundance, species composition and diversity of phytoplankton, Relative	Monthly (15th of every month for the preceding month)

	(8 Locations)			Abundance, species composition and diversity of zooplankton, Relative Abundance, species composition and diversity of benthic invertebrates (Meio, Micro and macro benthos), Particulate oxidisable organic carbon Secchi Depth	
9.	Sediments Quality (8 Locations)	6 Stations in Kandla and 2 stations at Vadinar	Once in a month	Texture, Organic Matter, Inorganic Phosphates, Silica Phosphate, Sulphate as SO4-, Nitrite, Nitrate, Calcium as Ca, Magnesium as Mg, Sodium, Potassium, Aluminium, Copper, Chromium, Nickel, Zinc, Cadmium, Lead, Arsenic, Mercury	Monthly (15th of every month for the preceding month)

The detailed monthly monitoring plan under the study has been prepared for the months of April and May for the locations of Kandla and Vadinar have been mentioned in figures 4 to 7 as follows:

Figure 4: Detailed Monitoring plan for Kandla for the month of April 2023

Environmental Monitoring Plan for Kandla for April 2023

Project Start Date	4-10-23
Sampling and Monitoring Team	Mr. Pratap Vaja Mr. Jignesh Parmar Mr. Sunil Parmar Mr. Raj Patel Mr. Nikunj Choksi Mr. Deep Bakori Mr. Bhrugu Pandya Mr. Jaydeep Tadvi

Legends
Ambient Air Monitoring
Noise Monitoring
Drinking Water Monitoring
Soil Monitoring
Marine water and Sediment Monitoring
Marine Ecology Monitoring
STP Monitoirng

				Apr 10, 2023							Apr 17, 2023							Apr 24, 2023						
				10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TASK	Activity Start Date	Activity End Date	Days required	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
Environmental Monitoring scope																								
Drinking Water (18 Locations)	10 April 2023	10 April 2023																						
Noise Monitoring (1 Location)	10 April 2023	11 April 2023	2																					
Noise Monitoring (1 Location)	12 April 2023	13 April 2023	2																					
Noise Monitoring (1 Location)	14 April 2023	15 April 2023	2																					
Ambient Air (6 Locations)	17 April 2023	18 April 2023	2																					
Noise Monitoring (1 Location)	17 April 2023	18 April 2023	2																					
Noise Monitoring (1 Location)	18 April 2023	19 April 2023	2																					
Marine Water and Marine Sediments (6 Locations)	19 April 2023	19 April 2023	1																					
Noise Monitoring (1 Location)	19 April 2023	20 April 2023	2																					
Ambient Air (6 Locations)	20 April 2023	21 April 2023	2																					
Noise Monitoring (1 Location)	20 April 2023	21 April 2023	2																					
Sewage Treatment Plant (2 Locations)	21 April 2023	21 April 2023	1																					
Soil Monitoring (4 Locations)	21 April 2023	21 April 2023	1																					
Noise Monitoring (1 Location)	21 April 2023	22 April 2023	2																					
Ambient Air (6 Locations)	24 April 2023	25 April 2023	2																					
Noise Monitoring (1 Location)	25 April 2023	26 April 2023	2																					
Ambient Air (6 Locations)	27 April 2023	28 April 2023	2																					
Sewage Treatment Plant (2 Locations)	28 April 2023	28 April 2023	1																					
Noise Monitoring (1 Location)	28 April 2023	29 April 2023	2																					
Marine Ecology Monitoring (1 Location)	29 April 2023	29 April 2023	1																					

Figure 5: Detailed Monitoring Plan for Vadinar for the month of April 2023

Environmental Monitoring Plan for Vadinar for April 2023

Project Start Date	10-Apr-23
Sampling and Monitoring Team	Mr. Pratap Vaja
	Mr. Jignesh Parmar
	Mr. Sunil Parmar
	Mr. Raj Patel
	Mr. Nikunj Choksi
	Mr. Deep Bakori
	Mr. Bhrugu Pandya
	Mr. Jaydeep Tadvi

Legends	
Ambient Air Monitoring	
Noise Monitoring	
Drinking Water Monitoring	
Soil Monitoring	
Marine water and Sediment Monitoring	
Marine Ecology Monitoring	
STP Monitoirng	

				Apr 10, 2023							Apr 17, 2023							Apr 24, 2023						
				10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
TASK	Sctivity Start Date	Activity End Date	Days required	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
Environmental Monitoring scope																								
Drinking Water (2 Locations)	10 April 2023	10 April 2023	1																					
Noise Monitoring (1 Location)	11 April 2023	12 April 2023	2																					
Ambient Air (2 Locations)	11 April 2023	12 April 2023	2																					
Noise Monitoring (1 Location)	13 April 2023	14 April 2023	2																					
Ambient Air (2 Locations)	13 April 2023	14 April 2023	2																					
Sewage Treatment Plant (1 Locations) (Inlet & Outlet)	14 April 2023	14 April 2023	1																					
Ambient Air (2 Locations)	17 April 2023	18 April 2023	2																					
Sewage Treatment Plant (1 Locations) (Inlet & Outlet)	18 April 2023	18 April 2023	1																					
Marine Water and Marine Sediments (2 Locations)	19 April 2023	19 April 2023	1																					
Ambient Air (2 Locations)	20 April 2023	21 April 2023	2																					
Noise Monitoring (1 Location)	20 April 2023	21 April 2023	2																					
Ambient Air (2 Locations)	24 April 2023	25 April 2023	2																					
Sewage Treatment Plant (1 Locations) (Inlet & Outlet)	25 April 2023	25 April 2023	1																					
Marine Ecology Monitoring (1 Location)	26 April 2023	26 April 2023	1																					
Ambient Air (2 Locations)	27 April 2023	28 April 2023	2																					
Soil Monitoring (2 Locations)	28 April 2023	28 April 2023	1																					

Figure 6: Detailed monitoring plan for Kandla for the month of May 2023

Environmental Monitoring Plan for Kandla for May 2023

Project Start Date	1-May-23
Sampling and Monitoring Team	Mr. Pratap Vaja
	Mr. Jignesh Parmar
	Mr. Sunil Parmar
	Mr. Raj Patel
	Mr. Nikunj Choksi
	Mr. Deep Bakori
	Mr. Bhrugu Pandya
	Mr. Jaydeep Tadvi

Legends
Ambient Air Monitoring
Noise Monitoring
Drinking Water Monitoring
Soil Monitoring
Marine water and Sediment Monitoring
Marine Ecology Monitoring
STP Monitoirng
Submission of Monthly analysis reports

TASK	Sctivity Start Date	Activity End Date	Days required
Environmental Monitoring scope			
Monthly submission of analysis report for May 2023	15 May 2023	15 May 2023	1
Ambient Air (6 Locations)	01 May 2023	02 May 2023	2
Noise Monitoring (1 Location)	01 May 2023	02 May 2023	2
Soil Monitoring (4 Locations)	03 May 2023	03 May 2023	1
Sewage Treatment Plant (2 Locations) (Inlet & Outlet)	03 May 2023	03 May 2023	1
Ambient Air (6 Locations)	04 May 2023	05 May 2023	2
Noise Monitoring (1 Location)	04 May 2023	05 May 2023	2
Ambient Air (6 Locations)	08 May 2023	09 May 2023	2
Noise Monitoring (1 Location)	08 May 2023	09 May 2023	2
Sewage Treatment Plant (2 Locations) (Inlet & Outlet)	09 May 2023	09 May 2023	1
Marine Water and Marine Sediments (6 Locations)	10 May 2023	10 May 2023	1
Marine Ecology Monitoring (6 Location)	10 May 2023	10 May 2023	1
Ambient Air (6 Locations)	11 May 2023	12 May 2023	2
Noise Monitoring (1 Location)	11 May 2023	12 May 2023	2
Drinking Water (18 Locations)	15 May 2023	15 May 2023	1
Ambient Air (6 Locations)	16 May 2023	17 May 2023	2
Noise Monitoring (1 Location)	16 May 2023	17 May 2023	2
Noise Monitoring (1 Location)	18 May 2023	19 May 2023	2
Ambient Air (6 Locations)	18 May 2023	19 May 2023	2
Sewage Treatment Plant (2 Locations) (Inlet & Outlet)	19 May 2023	19 May 2023	1
Ambient Air (6 Locations)	21 May 2023	22 May 2023	2
Noise Monitoring (1 Location)	21 May 2023	22 May 2023	2
Sewage Treatment Plant (2 Locations) (Inlet & Outlet)	23 May 2023	23 May 2023	1
Noise Monitoring (1 Location)	23 May 2023	24 May 2023	2
Ambient Air (6 Locations)	24 May 2023	25 May 2023	2
Noise Monitoring (1 Location)	24 May 2023	25 May 2023	2
Ambient Air (6 Locations)	28 May 2023	29 May 2023	2
Noise Monitoring (1 Location)	28 May 2023	29 May 2023	2
Sewage Treatment Plant (2 Locations) (Inlet & Outlet)	30 May 2023	30 May 2023	1

Figure 7: Detailed monitoring plan for Vadinar for the month of May 2023

Environmental Monitoring Plan for Vadinar for May 2023

Project Start Date	1-May-23
Sampling and Monitoring Team	Mr. Pratap Vaja
	Mr. Jignesh Parmar
	Mr. Sunil Parmar
	Mr. Raj Patel
	Mr. Nikunj Choksi
	Mr. Deep Bakori
	Mr. Bhrugu Pandya
	Mr. Jaydeep Tadvi

Legends
Ambient Air Monitoring
Noise Monitoring
Drinking Water Monitoring
Soil Monitoring
Marine water and Sediment Monitoring
Marine Ecology Monitoring
STP Monitoirng

Task	Activity Start Date	Activity End Date	Days required
Environmental Monitoring scope			
Ambient Air (2 Locations)	01 May 2023	02 May 2023	2
Noise Monitoring (1 Location)	01 May 2023	02 May 2023	2
Drinking Water (2 Locations)	02 May 2023	02 May 2023	1
Soil Monitoring (2 Locations)	03 May 2023	03 May 2023	1
Sewage Treatment Plant (1 Locations) (Inlet & Outlet)	03 May 2023	03 May 2023	1
Ambient Air (2 Locations)	04 May 2023	05 May 2023	2
Noise Monitoring (1 Location)	04 May 2023	05 May 2023	2
Marine Ecology Monitoring (1 Location)	05 May 2023	05 May 2023	1
Ambient Air (2 Locations)	08 May 2023	09 May 2023	2
Noise Monitoring (1 Location)	08 May 2023	09 May 2023	2
Sewage Treatment Plant (1 Locations) (Inlet & Outlet)	10 May 2023	10 May 2023	1
Ambient Air (2 Locations)	11 May 2023	12 May 2023	2
Ambient Air (2 Locations)	15 May 2023	16 May 2023	2
Marine Water and Marine Sediments (2 Locations)	17 May 2023	17 May 2023	1
Ambient Air (2 Locations)	18 May 2023	19 May 2023	2
Sewage Treatment Plant (1 Locations) (Inlet & Outlet)	19 May 2023	19 May 2023	1
Ambient Air (2 Locations)	21 May 2023	22 May 2023	2
Sewage Treatment Plant (1 Locations) (Inlet & Outlet)	23 May 2023	23 May 2023	1
Ambient Air (2 Locations)	24 May 2023	25 May 2023	2
Ambient Air (2 Locations)	28 May 2023	29 May 2023	2
Sewage Treatment Plant (1 Locations) (Inlet & Outlet)	29 May 2023	29 May 2023	1

May 1, 2023							May 8, 2023							May 15, 2023							May 22, 2023							May 29, 2023		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W

Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

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Annexure -C

Final Report

On

Greenbelt Development for the Deendayal Port Authority at Kandla Port

Submitted to

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Administrative Office Building
Post Box No.50, Gandhidham (Kachchh)
Gujarat-370201

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Final Report

on

Greenbelt Development for the Deendayal Port Authority at Kandla Port, Kandla

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Content

Sr. No	Title	Page No
1	Introduction	1
2	Rationale	3
3	Project Site	5
4	Scope of Work	5
5	Approach and Methodology for Greenbelt Development	5
6	Plantation techniques	7
7	Selection of plant species for plantation	8
8	Number of sapling	8
9	Management and Monitoring of Greenbelt	8

List of Table

Sr. No	Title	Page No
1	Time Schedule for Watering	9
2	List of Plants for Plantation at Site for Greenbelt Development	9

List of Figure

Sr. No	Title	Page No
1	Before Plantation	10
2	Map of Plantation Area	11
3	Digging Out Trench for Plantation	11
4	Transportation of Plants to Site	12
5	Fertile Soil for Better Survival of Plants	12

6	Plantation Pits of Soil Filling	12
7	Organic Manure for Better Growth and Survival	13
8	Regular Watering of the plants by tanker	13
9	Plantation in October 2022	14
10	Plantation in December 2022	15
11	Plantation in February 2023	16
12	Plantation in May 2023	17

Introduction

Green vegetation cover surrounding human environment is a vital entity for supply of oxygen, food, fodder and medicine for the survival of all living being, and also it has played an important role in maintaining ecological balance, climate regulation, biodiversity conservation, retention of soil moisture, control of soil erosion, increasing soil fertility, maintaining pleasant micro climate of the region, etc. In addition, vegetation cover also absorbs various pollutants from the environment and thus helps in effective pollution control. However, due to the various types and extent of economic development like industrialization, mining, infrastructural development, etc. has reducing and fragmenting natural vegetation cover day-by day all over the world. The infrastructural and industrial development leads to influence the life of all the living organisms in two directions: either upwards or downwards. In the upward mode, human being gets opportunities for luxuriant life with easy accessibility to the resources while in downward, the quality of ecosystem services gets affected. Most of the industrial and infra-structural developmental activities generate pollution of one or other types with varying magnitudes, which makes susceptible to all the organisms, nevertheless, the power of resistance of each organism helps themselves to overcome the hazards caused by such pollutants.

Therefore, development of green belts alongside of industries, mines, thermal power station, roadsides, and other development unit is an effective mechanism to rejuvenate vital vegetation cover for safeguarding health of human and other living being. Green belts in and around urban and industrial areas are important to the ecological health of any given region. Greenbelt is the raw of trees planted along the industrial units, mines, roadside for reducing the pollution originating from these operations (Flemming, 1967; Hanson and Throne, 1970; Warren, 1973; Ganguly, 1976). Greenbelt has developed considering following factors; (i) physical characteristics of the green belt eg. Distance from the source, width, and height and leaf surface area density (ii) aerodynamic properties eg. Wind speed through greenbelt and effective height of the incident air stream (iii) deposition velocity of the pollutant and (iv) atmospheric stability conditions (CPCB, 2000).

As per the National Forest Policy (NFP-1988), 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. NFP give emphasis on the green belt developments. It says – 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.

Green infrastructure serves to provide on ecological framework for social, economic and environmental health of the surroundings. The main components of this approach include storm water management, climate adaptation, less heat stress, more biodiversity, food production, better air quality, sustainable energy production, clean water and healthy soils, as well as the more anthropocentric functions such as increased quality of life through recreation and providing shade and shelter in and around infrastructure and industrial areas. Green infrastructure is thought to be effective in such scenarios, where green plants from a surface capable of absorbing air pollutants and act as a sink for pollutants. Leaves with their vast leaf area in the tree canopy, absorbs pollutants on their surface. Thus, effectively reduce their concentrations in the ambient air. Often the absorbed pollutants are incorporated in metallic streams and thus the air is purified. Plants grown in such a way as to function as pollutant sinks are collectively referred to as green infrastructure or green belts. Apart from functioning as a pollutant sink, green belts would also provide other benefits like aesthetic improvement and providing possible habitats for birds and animals along with maintain the soil moisture regime with the soil microorganisms and improve the Soil quality and ground water recharge. The greenbelts has helps in improving the ecology, maintenance of biodiversity, mitigation of dust pollution and fugitive emission, control of noise pollution, provide fresh air, mitigates soil erosion, increasing aesthetic values of an area and overall improvement of the landscape.

Rationale

Deendayal Port in Kachchh District of Gujarat State (formerly Kandla Port Trust), operated by Deendayal Port Authority (DPA), is a gateway Port to the hinterland in the western and northern states of India. It is one of the 11 major Ports of India situated at 22°59'39.77'' N latitude and; 70°13'20.14'' E longitude on Kandla creek at Gulf of Kachchh. The inclusion of Karachi Port in Pakistan after India's partition and heavy traffic congestion at the then Bombay Port gave impetus for promoting Deendayal Port during the year 1950s. In 1955, Deendayal Port acquired the status of a major Port in India. Because of its proximity to the Gulf countries, large quantities of crude petroleum and other assorted cargo are imported through Deendayal Port. The Port presently has 14 jetties, six oil terminals, and several allied facilities for handling dry and liquid cargo. Regular expansion/developmental activities such as the addition of jetties, allied Special Economic Zones (SEZ hereafter), industrial parks and ship bunkering facilities are underway to cope with the increasing cargo handling demands. Shri Mansukh Mandaviya, Minister of State for Ports, Shipping and Waterways (I/C) appreciated the efforts taken by Deendayal Port and added that it is indeed the major achievements in the challenging (COVID) times and it is significant indication that economy is bouncing back to achieve pre-COVID times.

Major commodities handled by the Deendayal Port are Crude Oil, Petroleum product, Coal, Salt, Edible Oil, Fertilizer, Sugar, Timber, Soya bean, Wheat. This major achievement can be attributed to the user-friendly approach of port with the Shipping fraternity / stakeholders and constant consultations with them to improve ease of doing business. An assortment of liquid and dry cargo is being handled at Deendayal Port. The dry cargo includes fertilizers, iron crap, steel, food grain, metal products, ores, cement, coal, machinery, sugar, wooden logs, salt extractions, etc. The liquid cargo includes edible oil, crude oil and other petroleum products. DPA created a new record by handling 127.10 million metric tonnes of cargo during FY 2021-22 compared to 117.566 MMT in FY 2020-21, with a growth of 8.11%. Incidentally, DPA is the only major Indian Port to handle more than 127 MMT cargo throughput, and it has also registered as the highest cargo throughput in its history. The Port has handled 3151 vessels during FY 2021-22 compared to 3095 vessels in FY 2019-20. While the Port has flagged off several projects related to infrastructure creation, DPA has successfully awarded the work of

augmentation of Liquid cargo handling capacity by revamping the existing pipeline network at the oil jetty area in September 2021. Deendayal Port is a natural harbour located on the eastern bank of North-South trending Kandla creek at an aerial distance of 145 km from the Gulf's mouth.

Being located at the inner end of the Gulf of Kachchh (GoK), Deendayal Port has a fragile marine ecosystem with a vast expanse of mangroves, mudflats, creek systems and allied biota. The Port 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.

There are no perennial or seasonal rivers in Gandhidham taluka where the part is located. Total rainy days during the monsoon season is limited to only 15-20 days and used to be erratic. Freshwater input into the near coastal waters is relatively meagre and appears to have less influence on the ambient coastal water quality except during monsoon months, during which freshwater through flash floods get discharged in the near coastal waters. The annual average humidity is 60%, which increases to 80% during the southwest monsoon (June to September) and decreases to 50% during the months of November and December. The drought phenomenon is common with two drought years in a cycle of 5 years.

The coastal belt in and around the Kandla region is characterized by a network of creek systems and mudflats covered by sparse halophytic vegetation, creek water and salt-encrusted land mass, which forms the major land forms. The surrounding environment in a radius of 10 km from the Port is mostly built-up areas consisting of salt works, human habitations and Port related structures on the west and north, creek system, mangrove formations and mudflats on the east and south. The Deendayal Port and its surroundings have mangroves, mudflats and creek systems as major ecological entities.

DPA is committed towards environment protection since its establishment and has taken many initiatives towards increasing green cover and greenbelt development in various areas under DPA through intensive plantation activities and developing greenbelt around its established port and jetty areas and human habitations.

In order to enhance and strengthen Greenbelt Development, the DPA has approached GUIDE to develop the greenbelt area within the port area in phase wise manner. It was finalised to raise 5000 plants at a suitable site during the first phase.

Project Site

Based on observation made by the GUIDE Team and Officials from Deendayal Port Authority, a site at adjacent to Berth 11-12 (Wood log site) have been selected on the peripheral boundary of two sides.

The area proposed for green development of Deendayal Port is barren land without any vegetation. The soil of the area is black muddy highly saline soil and with saline ground water. The area is very dry and hot during the summer. The highest temperature used to be recorded in this area.

Scope of Works

The overall objective is to Development Greenbelt at Deendayal Port. The following activities of the Greenbelt development have been carried out:

1. To make an inventory of suitable sites for greenbelt development in and around the Deendayal Port at Kandla.
2. To carryout Soil and Moisture Conservation (SMC) of the selected sites.
3. Identification of suitable native species of plants for the greenbelt plantation.
4. Adopting plantation technique of plant saplings.
5. Regular monitoring (survival and growth) of the plantation.
6. Suggest measures for management and improvement of the greenbelt.

Approach and Methodology for Greenbelt Development

Following steps have been adopted for greenbelt development:

- Removal of exotic/unwanted plants plant species from the entire area demarcated for green belt development: The entire selected site have been cleared by removing

unwanted weeds and material such as stones, plastics etc.by JCB and also with labours.

- Landscaping of the area and land preparation Trench line of 2.5x 2.5 ft. have been dig out through JCB along the boundary adjacent to birth 11 & 12 wood log area up to approximately 5000 ft.
- Soil and moisture conservation work since the port area is highly saline, SMC work was very much essential for better survival of the plants. Eight dumper of fertile soil from the field have been added.

- Identification of native species of plants for plantation in greenbelt as per the site suitability the site was very challenging for greenbelt development since the water and soil is highly saline with the extreme climatic condition, the selection of plant species for plantation has been made very carefully. 40 % of plants have been selected as native species for plantation where as 60% species of *Conocarpus*.
- Procurement of sapling of identified species or Nursery management or seeding of tree/shrub species all the saplings were procured where of 3-4 ft. in height from reliable nursery. All saplings were of tree species.

- Installation of irrigation facilities was not feasible therefore activity was planned preferably through tankers. The watering of the plantation have been schedule as per the seasons which is given in table. Regular watering as per the scheduled have been provided by the water tanker under the supervision of team expert
- Use of Manure, preferably organic fertilizer for enhancing soil fertility best quality organic manure of 12,500 kg have been provided to the saplings for better growth and survival. Weed management and trench repairing have been carried out periodically also as and when it required.

- Regular monitoring and management of the saplings by a qualified team from GUIDE the selected site is wood log site hence, the wood log used to roll down on a path for water tanker while uploading and downloading the wood log. The regular visit to the site has been made for monitoring and clearing the road for water tanker for irrigation. Gap filling were also made during the period.

Plantation Techniques:

- Site development for a plantation includes clearance for weeds and it involves, bush cutting, soil and moisture conservation works in 'nalas', construction of bunds or check dams, marking of pits for planting of saplings etc.
- After clearing the land sites for digging of pits, plantation have been marked on ground using a measuring tape to ensure the desired spacing.
- Pits of the size 45 cm x 45 cm and 45 cm depth have been dug for tree plantation. Pits have been deep enough to ensure that the roots of the plants do not curl up once the planting material is placed in it.
- Since the soil is highly saline, a fertile soil around 6 dumper have been added for better survival of plants
- Organic manure around 12,500 kg. Have been given for better growth and survival.
- The pit have been filled a little above the ground level so that after the earth settles the upper surface of the pit is level to the ground thus avoiding any water logging.
- The plantation has been out in two phase since the some areas were blocked by wood logs.
- Around 4100 saplings have been planted during the month of September 2022 at available plantation area.
- The remaining and gap filling of 1500 saplings have been planted after the clearance of the area during the month of Feb.2023. A total number of 5000 plantations, were completed in the area.

Selection of Plant Species for Plantation:

Various indigenous tree species suitable for the area have been identified and selected for plantation in suitable areas based on the assessment of soil quality, available water facility, and other environmental parameters.

Number of Sapling:

Approximate numbers of saplings to be required for the greenbelt are as follows:

- Peripheral plantation adjacent to birth 11-12 (along the boundary of the wood log area both sides): 5000 saplings

Management and Monitoring of Greenbelt:

The plantation within the identified site have been managed and monitored for a period of one year from June 2022 to June 2023 The management of plantation includes appropriate irrigation of the plantation in regular intervals, during summer and winter periods and if required even during monsoon with dry spells.

Watering have been made through tanker service at given schedule during the different seasons. (Table 1)

The all plants are growing very well and reached more 4-6 ft. height. The survival of plants have been noted very high as 98% during June 2023.

Table: 1 Time Schedule for Watering

Sr. No.	Month & Year	Number of Time
1	September 2022	4 times/month
2	October 2022	5 times/ month
3	November 2022	8 times/ month
4	December 2022	8 times/ month
5	January 2023	8 times/ month
6	February 2023	8 times/ month
7	March 2023	12 times/ month
8	April 2023	12 times/ month
9	May 2023	12 times/ month
10	June 2023	2 times/ month (end of the project 4th June 2023

Table: 2 List of Plants for Plantation at Site for Greenbelt Development

SI. No.	Scientific Name	Local Name	No. of Plant
1	*Conocarpus lancifolius*	Conocarpus	3500
2	*Ficus religiosa*	Piplo	100
3	*Azadirachta indica*	Limblo	200
4	*Peltophorum pterocarpum*	Pletoforam	300
5	*Millettia pinnata*	Karanj	300
6	*Cassia fistula*	Garmalo	100
7	*Delonix regia*	Gulmahor	300
8	*Mimusops elengi*	Borssalii	200

Fig. 1 Before Plantation

Fig. 2 Map of Plantation Area

Fig. 3 Digging Out Trench for Plantation

Fig. 4 Transportation of Plants to Site

Fig. 5 Fertile Soil for Better Survival of Plants

Fig. 6 Plantation Pits of Soil Filling

Fig. 7 Organic Manure for Better Growth and Survival

Fig. 8 Regular Watering of the plants by tanker

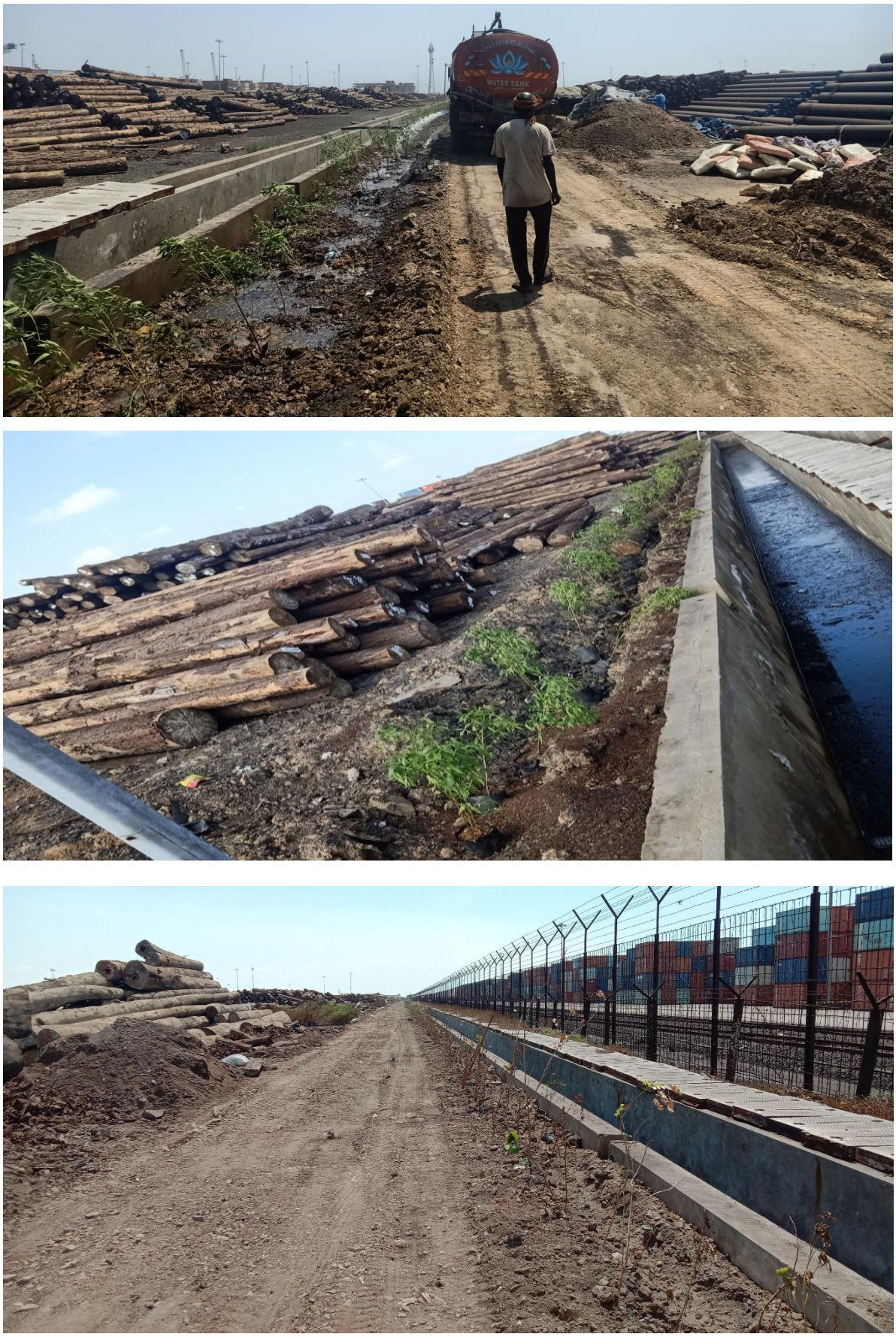

Fig. 9 Plantation in October 2022

Fig. 10 Plantation in December 2022

Fig. 11 Plantation in February 2023

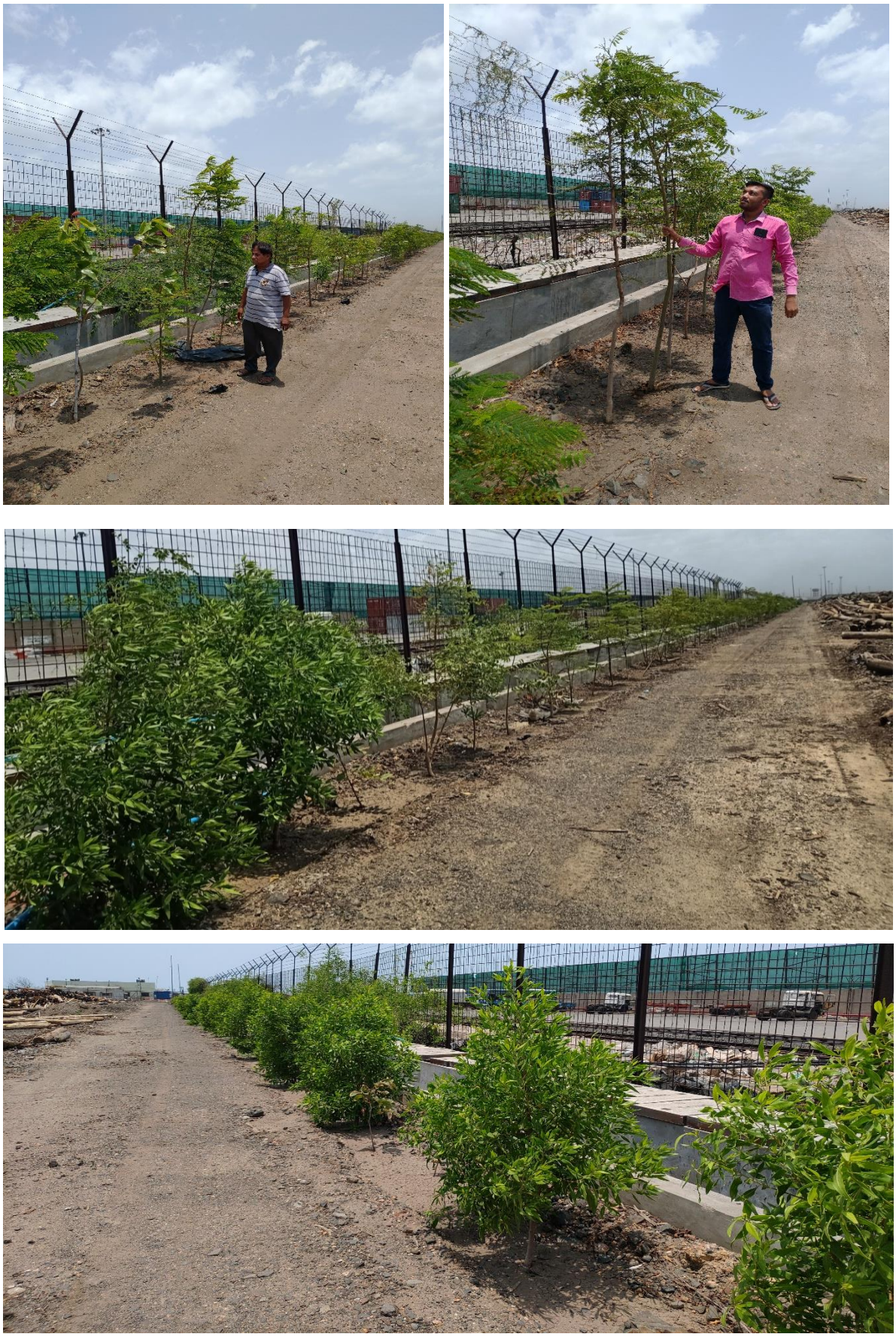

Fig. 12 Plantation in May 2023

Annexure -2

Annexure 2

Monitoring the implemental Safe guards
Ministry of Environment, Forests & Climate Change
Regional office, Gandhinagar
Monitoring Report (For the period up to May, 2023)

DATA SHEET

1. Project type: River valley/ Mining/Industry/ thermal/nuclear/Other (specify)	Infrastructure and Miscellaneous Projects + CRZ
2. Name of the project	Construction of 13th to 16th Cargo Berth at Kandla Port by M/s Deendayal Port Authority (Erstwhile: Deendayal Port Trust) (Under Ministry of Ports, Shipping & Waterways, GoI).
3. Clearance Letter (s). OM no and date	Environment Clearance issued by Govt. of India, Ministry of Environment & Forest – New Delhi vide letter No. 11-70/2006-IA-III Dated September 08. Further, Ministry of Environment & Forest – New Delhi, Govt. of India, extended the Environmental Clearances validity for five years i.e. up to 30/09/2018, vide letter No. F.NO.11 – 70/ 2006 – IA.III dated 7th February, 2014.
4. Location a) District (s) b) State (s) c) Location/latitude/longitude	 District: Kutch State : Gujarat Location: Deendayal Port Authority, 22°58'33.08"N and 70°13'16.28"E
5. 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)	Chief Engineer, Deendayal Port Authority, A.O. Building Post Box No.-50, Gandhidham- Kutch. Gujarat Pin – 370201 Tel: 02836-233192, Fax-02836-220050. Superintending Engineer (Harbour), Office of the Superintending Engineer (Harbour), Nirman Building, New Kandla (Kutch) Pin 370 210. Gujarat
6. Salient features of the project	All the 4 berths i.e. 13th to 16th Cargo berths are under operation. 13thCargo Berth:Under operation 15thCargo Berth: Under Operation 14th Cargo Berth:Under Operation 16th Cargo Berth:Under Operation 1. The dimension of each berth 300m x 55m consisting of quay and transit area resting on 1200mm and 1000mm R.C.C. bored cast-in situ piles. (Total 1200m x 55m wide

	for 4 berths). 2. The backup area of size 21.7 Hectares/berth for 13th, 14th, 15th&16th CB including all facilities roads, railways & other required infrastructure (Total area: 102.17 ha. + 42 Ha. (1200 m X 350 m) = 144.17 ha.) 3. The Capacity of each Berth is 4.5 MMTPA (As approved by Tariff Authority of Major Ports). 4. The drawing showing all berths viz. 13th to 16this already submitted with earlier compliance report.
b) Salient features of the Environmental management plan	NIOT, Chennai had already suggested Environmental Management Plan for both construction & operation phase of the project already cited in the EIA study report by NIOT, Chennai. A copy of the same has already been communicated with earlier compliance reports submitted.
7. Breakup of the project area a) Submergence area: forest & non-forest b) Others	 Nil Nil
8. Breakup of the project affected population with enumeration of those losing houses/dwelling units only agricultural land & landless labourers/artisen a) SC. ST/Adivasis b) Others (Please indicate whether these figures are based on any scientific and systematic survey carried out or only provisional figures, if a survey is carried out give details and years of survey).	 Nil Nil Nil It is based on the EIA report prepared by M/s NIOT, Chennai.
9. Financial details a) Project cost as originally planned and subsequent revised estimates and the year of prices reference. b) Allocation made for environmental management plans with item wise and year wise break-up c) Benefit cost ratio/Internal rate of Return and the year of assessment Whether (c) includes the cost of environmental management plans	 Block estimated cost of Rs. 442.90 crores (Dec. 2005) Revised Block estimated cost of Rs. 755.5 crores (Apr 2009). Estimated cost revised (Year 2017) for Berth No. 14 C. B: 253 Crore & Berth No. 16 C.B: 278 Crore. All the 4 berths are operated by the Deendayal Port Authority. The allocation made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" during BE 2023-2024 is Rs. 274 Lakhs. FIRR EIRR 13.61% 14.62% Berth No. 14 C.B.: 253 Crore

so far.	FIRR 15.32% EIRR 17.42% Berth No. 16 C.B.: 278 Crore FIRR 14.23% EIRR 16.17% Yes
d) Actual expenditure incurred on the project	BOT operator 13thC.B: 300.23 Crore BOT operator 15thC.B: 252.45 Crore Berth No. 14thC. B internal resources DPT: 138.28 Crore (Awarded cost berth & Back up area) Berth No. 16thC.B internal resources DPT: 149.56 Crore (awarded cost berth & back up area).
e) Actual expenditure incurred on the Environmental management plans so far.	The expenditure made under the scheme of "Environmental Services & Clearance thereof other related Expenditure" is Rs. 73.99 Lakhs from Dec, 2022 to May 2023.
10. Forest land requirement	Nil
a) The status of approval for diversion of forest land for non-forestry use	Not Applicable.
b) The status of clear felling	NIL
c) The status of compensatory aforestation, if any	**A) Mangrove Plantation Plan carried out:** 1) Year 2005-06 – 20 hectares 2) Year 2008-09 - 50 hectares 3) Year 2010-11 – 100 hectares 4) Year 2011-12 – 200 hectares 5) Year 2012-13 – 300 hectares 6) Year 2013 -14 – 330 hectares 7) Year 2015-17 - 300 hectares 8) Year 2018-19 - 50 hectares 9) Year 2019-20 – 50 Hectares 10) Year 2020-21– 100 Hectares 11) Year 2022-23- 100 Hectares **Total - 1600 hectares**
d) Comments on the viability &sustainability of compensatory a forestation programmed in the light of actual field experience so far	As per the directions of the GCZMA and MoEF&CC, GoI, till date, DPA has undertaken Mangrove Plantation in an area of 1500 Hectares since the year 2005. In addition to it, DPA has carried out mangrove plantation in an area of 100 Ha. in consultation with GEC vide Work Order No. DD/WK/3050/Pt-I/GIM/PC-44 dated 02/06/2022. Final Report submitted by GUIDE, Bhuj already

	submitted along with compliance report submitted during November, 2019. Subsequently, DPA awarded the work for monitoring of mangrove plantation to M/s GUIDE, Bhuj vide work order dated 3/5/2021 (Period 2021-2022). M/s GUIDE, Bhuj submitted its final report for the said project in May, 2022 and the copy has already been communicated with the last compliance report submitted. Moreover, 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.
11. The status of clear felling in non-forest areas (such as submergence area of reservoir, approach roads), if any with quantitative information.	Nil
12. Status of construction a) Date of commencement (Actual and/or planned) b) Date of completion (Actual and/or planned)	All the 4 berths are under operation. 13thCargo Berth: Under operation since 18/2/2013. 15thCargo 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.
13. Reasons for the delay if the Project is yet to start	All the 4 berths are under operation. 13thCargo Berth: Under operation. 15thCargo Berth: Under Operation. 14th Cargo Berth: Under Operation. 16th Cargo Berth: Under Operation.
Date of site visited a) The dates on which the project was monitored by the regional office on pervious occasion. if any b) The date site visit for this monitoring report	 29/12/2016 ------