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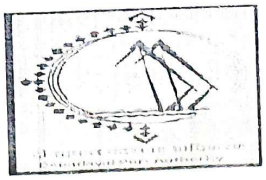

Office of the Dy.CE & EMC (i/c),
ANNEX, Administrative Office
Gandhidham - Kutch
Pin – 370 201.

ISO 9001 – 2015 &
ISO 14001 –2015 Certified Port

****

EG/WK/4751/Part (Revamping – EC onwards /19

Dated03/02/2025

To,
Director (Environment) & Member Secretary
Gujarat Coastal Zone Management Authority,
Forest & Environment Department,,
Govt. of Gujarat,,
Block No.14, 8th floor,
Sachivalaya, Gandhinagar – 382 010.

Sub: "Augmentation of Liquid Cargo Handling Capacity from 8 MMTPA to 23.8 MMTPA Through Modernisation of Existing Pipeline Network at Oil Jetty Area, Deendayal Port Trust, Kandla – **Pointwise Compliances of the conditions stipulated in CRZ recommendation.**

Ref.:
1. CRZ Recommendation letter issued by the Director (Environment) & Member Secretary, GCZMA, Forest & Environment Department, GoG dated 25/08/2022
2. DPA letter no. EG/WK/4751/Part (Revamping – EC onwards /101 dated 29/07/2024

Sir,

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

In this connection, it is to state that, the Gujarat Coastal Zone Management Authority vide above referred letter dated 25/8/2022 had recommended the subject of Deendayal Port Authority. Subsequently, the MoEF&CC, GoI had accorded the Environmental & CRZ Clearance vide letter dated 01/01/2024 for the above, project activities recommended by the GCZMA.

Now, Environmental and CRZ Clearance has been accorded by the MoEF&CC, GOI vide letter dated 01/01/2024 as per the recommendation of the GCZMA.

In the said clearance letter in the Para B. Sub IX Miscellaneous under condition no. iv MoEF&CC, GOI has stipulated the condition that, " *The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal*"

Further, in the said clearance letter in the Para A in specific conditions mentioned at Sr no. ii it is mentioned that "*All the recommendations and conditions specified by the Gujarat State Coastal Zone Management Authority (GCZMA) vide letter No ENV-10-2021-41-T dated 25th August, 2022 shall be complied with*"

Accordingly, point wise compliance of the conditions stipulated in the GCZMA recommendation has been prepared for onward submission.

.....Cont.....

Additionally, compliance report of the stipulated conditions mentioned in the EC & CRZ Clearance granted by the MoEF & CC, GOI dated 01/01/2024 (Period up to September , 2024) is uploaded in the PARIVESH 2 PORTAL of the MoEF&CC,GoI along with the point wise compliance of the conditions stipulated in the GCZMA .

Further, we are submitting herewith soft copy of the point wise compliance of the conditions stipulated in the GCZMA through e-mail in ID: gczma.crz@gmail.com

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

Yours faithfully,

Encl.: As above

Dy. Chief Engineer & EMC(I/c)
Deendayal Port Authority

Copy, to:

1)Shri Amardeep Raju,
Scientist E Ministry of Environment, Forest and Climate Change,
& Member Secretary (EAC – Infra 1),
Indira Paryavaran Bhawan,
3rd Floor, Vayu Wing, Jor Bagh Road,
Aliganj, New Delhi- 110 003;
E-mail: ad.raju@nic.in

COMPLIANCE REPORT (for the period up to September 2024)

Subject: Status of Compliance with the conditions stipulated By Gujarat State Coastal Zone Management Authority, Gandhinagar, in CRZ Recommendation Letter granted for "**Augmentation of liquid handling capacity from 8 MMTPA to 23.8 MMTPA through modernization of existing pipeline network at oil jetty area of Deendayal Port Trust** ".

CRZ Recommendations: Letter No. ENV-I0-2021-41-T dated 25 August 2022, of Director (Environment) & Member Secretary, GCZMA, Forest & Environment Department, GoG.

**Note: Based on the recommendation of* the GCZMA, MoEF&CC, GoI *had accorded Environmental & CRZ Clearance vide letter dated 01/01/2024*

Sr. No.	Conditions in CRZ Recommendation Letter	Compliance
	Specific Conditions	
1	Project proponent unit shall scrap of existing 125 pipelines and remaining 42 pipelines may be maintain while 84 new pipeline will be laid.	It is assured that due care is being taken while scrapping of existing 125 pipelines.
2	Project proponent shall carry out proposed activities, replacement & revamping of existing pipeline network at oil jetty area and no new land shall be use.	Activities of replacement & revamping is being carried out at the existing oil jetty area and no new land is used.
3	Project proponent shall obtain consent to establish for their proposed expansion from 8 MMTPA to 23.08 MMTPA from GPCB.	The Consent to Establish (CTE) from the GPCB had already been obtained vide CTE amendment (CTE 115467) granted by the GPCB vide letter no. PC/CCA-KUTCH-812(5)/GPCB ID 28494/609592 dated 23/12/2021 with a validity period 11/2/2026 A copy of same had already been submitted along with compliance report submitted on 29/07/2024.
4	Project proponent shall not carry out any construction activities or any activities till obtaining CRZ Clearance from MoEF&CC, new Delhi	DPA has already received CRZ recommendation from GCZMA vide letter no. ENV-10-2021-41-T cell dated 25/08/2022. Additionally, DPA has also received EC and CRZ clearance from MoEF&CC vide file no. letter F. No. 10-26/2018-IA-III dated 01/01/2024.
5	Project Proponent shall adhere to all recommendation given by MECON Ltd. Ranchi, Jharkhand.	It is assured that, recommendation given by MECON Ltd. Ranchi, Jharkhand is being adhered to
6	Project Proponent shall adhere to undertaking dated 25.01.202	It is assured that, undertaking dated 25/01/202 being adhered to.
7	Project Proponent shall carry out Mangrove Plantation in 50 Ha area with consultant of concern District Forest Office of District and Gujarat Ecology commission. Necessary report in this regard may be submitted periodically to this office.	DPA has assigned the work for the "Mangrove Plantation in an area of 50 Ha for the Deendayal Port Authority to GUIDE, bhuj vide work order dated 10/06/2024. A copy of inception report is attached herewith as **Annexure A** Additionally, as per the As per the directions of the GCZMA and MoEF&CC GoI, to date, DPA has undertaken a Mangrove Plantation in an area of 1600 Hectares since the year 2005
8	Project Proponent shall strictly adhere to all conditions of Terms of Reference issued by MoEF&CC, GOI vide F.No. 10-26/2018-IA-III dated 14/06/2018.	DPA has already received the EC and CRZ clearance from MoEF&CC vide file no. letter F. No. 10-26/2018-IA-III dated 01/01/2024. A copy of same had already been submitted along with compliance report submitted on 29/07/2024
9	Project Proponent shall strictly adhere to all conditions of Amendment Terms of Reference issued by MoEF&CC, GOI vide F.No. 10-26/2018-IA-III dated 11/06/2020.	

ANNEXURE A
Inception Report – mangrove Plantation
50 Ha

INCEPTION REPORT

For the Project entitled

Mangrove Plantation in an area of 50 Hectares for Deendayal Port Authority, Kandla

(As per EC & CRZ Clearance Dt.01.01.2024. Annexure-B, Specific condition No.7)

DPA Work order No. EG/WK/4751/Part (Revamping-EC onwards)/69. Dt. 10.06.2024

Submitted by

Gujarat Institute of Desert Ecology

Mundra Road, Bhuj-370 001

Dist: Kachchh, Gujarat

Submitted to

DEENDAYAL PORT AUTHORITY
KANDLA

Deendayal Port Authority

Gandhidham, Dist: Kachchh, Gujarat-370201

August-2024

Dr. V. Vijay Kumar
Director

Gujarat Institute of Desert Ecology

Certificate

This is to state that the **Inception report** of the work entitled, **"Mangrove Plantation in an area of 50 Hectares for Deendayal Port Authority, Kandla"** has been prepared in line with the Work order issued by DPA vide No. EG/WK/4751/Part (Revamping-EC onwards)/69. Dt. 10.06.2024 as per the EC & CRZ Clearance accorded by the MoEF & CC, GoI dated 01.01.2024, Specific Condition No. vii.

This work order is for a period of Nine months (10.06.2024 – 09.03.2025) for the above-mentioned study.

Authorized Signatory **Institute Seal**

PO. Box No. 83, Opp. Changleshwar Temple, Mundra Road, Bhuj (Kachchh) - 370 001, Gujarat (India)
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Project Team

Project Coordinator: Dr. V. Vijay Kumar, Director

Project Personnel

Principal Investigator

Dr. B. Balaji Prasath, Senior Scientist

Co-Investigator

Dr. Kapilkumar Ingle, Project Scientist-II

Team Members

Dr. Durga Prasad Behera, Scientist

Dr. L. Prabha Devi, Advisor

Mr. Dayesh Parmar, Senior Scientific Officer

Ms. Muskan Karamchandani, Junior Research Fellow

Mr. Jayanti Barot, Lab- Cum-Field Assistant

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1. Background of the study

Mangroves are among the productive ecosystems that provide different ecosystem services and resources to the ocean environment and humankind. This unique type of ecosystem occurs in the tropics and subtropics where land meets oceans, and bordering the estuaries and backwaters. Mangrove forests can rise upward in place or move landward or seaward in response to sea level changes (Woodroffe *et al*. 2016). Mangroves grow on wet muddy substrate with little water fluctuations namely the mudflat region of tropical and sub-tropical regions. These are thick forests of trees and shrubs tolerant to salt, which usually flourish in tidal areas. According to FSI (2019), mangrove cover is about 14.79 million hectares globally with Asia (5.55 million hectares) followed by Africa (3.24 million hectares), North and Central America (2.57 million hectares), and South America (2.13 million hectares). The South Asia has the highest mangrove area which is about 6.8% of the world's total mangrove cover area. Anthropogenic pressures have reduced global range of these forests to less than even half of their original total cover throughout the globe as mentioned by Ragavan *et al.* (2016) while Singh (2020) observed that almost 75% of the tropical coast has been taken up by mangrove forests.

The importance derived from these forests is critical, including coastal protection, biodiversity conservation, and climate change mitigation. All mangroves produce fertilizer from rotting litter fall and root growth deceiving ambient water sediment. Mangroves build the natural buffers against coastal erosion storm surges and tsunamis being a significant concern worldwide. Mangrove ecosystems support various plant and animal species, breeding, nursery and feeding grounds for numerous marine and terrestrial organisms. Despite their ecological importance, mangrove forests face different threats such as deforestation, pollution, and climate change. Specific measures have been taken towards conserving these valuable ecosystems including them into biosphere reserves and Ramsar sites. In India, mangrove occupies an area of about 4,992 km^2 which accounts for approximately 0.15 % of country's geographical area.

1.1. Mangrove status in Gujarat and Gulf of Kachchh

Gujarat state has the longest coast (1650 km^2) with largest coastal area (28,000 km^2) under cover of mangroves. Gujarat mangrove ecosystem is the second largest after Sundarbans in West Bengal (ISFR 2019). Though contentious, around 15 mangrove species are reported from 13 coastal districts of Gujarat. Of these, the southern coast of Gulf of Kachchh and South Gujarat coast are important for mangrove diversity. The species *Avicennia marina* is the most populous along the Gujarat coast. Along the coastal stretch of Gulf of Kachchh (GoK) has the most considerable mangrove extent of 986 km^2 out of 1140 km^2. Kachchh district, constituting the northern coast (northern shore) of GoK alone has 798 km^2 of mangroves constituting 70% of the whole Gujarat mangroves. Waterlogged mud with low oxygen levels supports such vegetation in tropical and subtropical regions. In the Kachchh coast has various habitats such as expansive mudflats and small sandy beaches with different physico-chemical variables like extreme salinity temperature inundation factor. This vibrating ecosystem can allow the species to thrive and exhibit many adaptive modifications. The biodiversity-oriented planting schemes such as one enhancing species richness through continuous plantation and monitoring activities. The restoration of the mangroves with the most dominant species *Avicennia marina* long with *Avicennia corniculatum, Ceriops tagal* and *Rhizophora mucronata* are essential to enhance the species diversity and to derive their ecological services by increase the coastal biodiversity and the socio-economic status of the coastal dependent community.

Mangrove biodiversity seeks attention towards such spots on the Kachchh coast, which require supplementation of plant cover at selected sites. For instance, although successful efforts at restoring mangroves exist, the presence of *A. marina* alone in most parts corroborates the role of high salinity of the water because of limited fresh water influx annually. The arid coastal conditions lack of continuous freshwater flow through the river inhibits the spread and growth of mangroves which are constantly exposed to tidal inundation. The plantation of mangroves as well as creation of awareness regarding the importance of mangrove and their ecosystem services are the crucial tasks to avoid such loss.

1.2. Rationale of the project

Deendayal Port Authority (DPA) has been one of India's largest ports in terms of cargo volume handled. Being located in Gujarat state on the northwest coast of India, the port is one of the biggest creek-based ports in India. In India, it is one among twelve major ports and situated at Gulf of Kachchh's tail end, Gujarat's western part. The greatest advantage of this location is a high semi-diurnal tidal range of about 6 to 7 meters which allows for sufficient draft in the dredged channels at the Port. DPA has been and still is undergoing continuous development and expansion particularly over recent times and is located in the creek environment encompassing mangroves (193.1 km^2) and mudflats (312.9 km^2).

Over the last seven decades, it should be noted that due to these vast resources available at its doorstep; the port authorities have a desire to conserve, protect and enhance these coastal habitats. The coastal belt in and around Kandla region is characterized by a network of creek systems and mudflats which are covered by sparse halophytic vegetation like scrubby to dense mangroves, creek water and salt encrusted land mass which forms the major land component. The surrounding environment in a radius of 10 km from the Port is mostly built-up areas consisting salt works, human habitations and Port related structures on west and north, creek system, mangrove formations and mudflats in the east and south.

Deendayal Port as part of the expansion of the infrastructure facility has significant movements of materials and people within the area and construction activities as well. These developments have resulted in the changes in the local ecological composition of the area. To minimise the environmental degradation to further extend and to avoid the severity of the implications, extensive green belt development in the premises have been undertaken. Similar efforts towards conserving and preserving mangrove cover in the prospective areas have been implemented by the Deendayal Port Authority (DPA) to maintain numerous unheralded ecological services by these marine plants. Total mangrove plantation till date by DPA through several implementing agencies at Sat Saida Bet, Nakti Creek and Kantiyajal. Additionally, as part of the mandates towards "Green Port" initiative in line with all port's environmental policy intended to accomplish 50 ha mangrove plantation and the task is entrusted with the Gujarat institute of Desert ecology, Bhuj, Kachchh district.

2. Objectives

Within the overall objective of mangrove plantation in the DPA port limits the following activity wise objectives are envisaged.

- Assess the technical suitability of the proposed land for mangrove plantation
- Assess the physico-chemical properties of soil and nearby water and tidal pattern in the proposed plantation site.
- Formulate site specific plantation strategy and execute it with the adopting appropriate techniques.

3. Study Area

The tentative location for mangrove plantation is shows in Figure 1, however, DPA should confirm these locations or any other suitable location for the plantation. While confirming to GUIDE, the DPA should accord that the locations are not owned by or planted by DPA or any other agencies currently or previously in order to avoid disputes. The sites will be then visited by GUIDE team with the officials from DPA authorities for the assessment of their suitability. The site/ location characteristics, soil and water quality, nature of the intertidal fauna, presence of risk factors such as grazing by cattle, camels or cutting for fodder, availability of propagules, signs of natural regeneration etc. will be considered to fix the potential site for plantation. Based on the prevailing water quality criteria as per the earlier studies, it is recommended to choose sites as shown in Figure 1, for the plantation of mangrove species, *A. marina*. The salinity levels at this entire area are generally ranging between 35 - 40 ppt which is suitable for the selected species. The pH of pour water is recorded to be in the range of 6.0 - 8.5. In addition to the above said criteria, plantation in general should be established in Intertidal areas where a good tidal flushing is happening atleast 15 days in a month.

Figure.1 Proposed locations for Mangrove plantation activities at DPA area

4. Methodology

4.1. Field Studies

4.1.1. Site Overview:

- The inspection will provide an overall understanding of the site, not only for the plantation but also for potential risks (such as camel or cattle grazing).
- Accessibility for post-plantation monitoring will be evaluated to ensure ease of assessment.

4.1.2. Geographical Patterns:

- Existing mangrove species in the area will be studied to understand their presence and distribution.
- Geographical patterns will be analyzed to identify suitable locations for planting mangroves.

4.1.3. Landscape Assessment:

- Rainwater runoff into the creeks and the influencing zones will be observed to assess its impact on the mangrove ecosystem.
- The stability of the root system of existing mangroves will be examined.
- Sources of freshwater within the area will also be considered.

4.2. Plantation Techniques

Three methods preferred for the sake of mangrove plantation which will be as follows in this study period:

4.2.1. Raised bed method (Otla method)

- This is popular method of mangrove plantation in Gujarat useful for a few species such as *A. marina* and provide better result compare to other methods.
- In this method, earthen mounts of a specific height will be made which support to plant 15 to 30 seeds/ propagules.
- This method is suitable in the areas where the current of water is low and moderate (Plate 1).

Plate 1: Otla bed raised method (example photo)

4.2.2. Transplantation of nursery raised saplings (Poly bag method).

- This technique has higher success rate unlike other methods and therefore, nursery of the various species is required to grow the saplings (Plate 2).
- This technique is time consuming and laborious compared to direct dibbling and raised bed methods.
- On the open intertidal mudflats, the saplings will be grown in polythene bags through sowing the matured seeds or propagules.
- The saplings will be nurtured 3-4 months before transplantation and after attaining a height 30-45 cm in polythene bags.
- Site specific conditions will determine the number of saplings to be transplanted, however, 2500 saplings per ha is generally followed.
- In some occasions also nursery raised saplings will be used for gap filling and thereby increasing the survival rate of the plants table1.

Plate 2: Nursery method (example photo)

Table 1: Seed/propagule collection information*

Species	Seed availability period	Maximum storage period of seed/propagule
Avicennia marina	July – October	10 days
Rhizophora mucronata	June- October	10 days

*Information from Training Manual for mangrove plantation in Gujarat, GEC-ENVIS

After being successfully raised in the nursery, saplings between 30 and 45 cm tall should be chosen at different times to be transplanted at the intended location. Below are the specifics of the plantation's sapling height and germination period (plate 3).

Table 3: Appropriate height of sapling for plantation

Species	Germination period (days)	Germination percentage	Height (cm)of saplings
Avicennia marina	6-10	70-80	30-45
Rhizophora mucronata	30-35	50-60	60

Plate 3: Species of mangroves selected for plantations *Avicennia marina* and *Rhziphora mucronata* (left hand side plants and right hand side seeds; examples photo)

4.2.3. Direct propagule dibbling (Seed sowing method)

- In this method, the propagules will be directly dibbled in the site selected for the plantation, so it can save time and labor costs etc.
- Although it is cost effective and cheap method, the initial survival is generally low in this method.
- The mangrove species generally show vivipary and produce longer propagules can be planted by this method more effectively.
- This method will be used for *Rhziphora mucronata* in the gap filling if necessary (plate 4).

Plate 4: Direct dibbing method (example photo)

5. Site visit

Before the initiation of mangrove plantation activity, a through pre-project survey was conducted to examine the proposed plantation site. In this survey, the crucial technical factors like land elevation, tidal pattern, physical and chemical properties of soil and water (by laboratory analysis), access to the site, level of protection such as cattle grazing, human disturbance and other potential risks, etc. were observed. This survey helps to decide the suitability of site for mangrove plantation in DPA port limit.

5.1. On-site observations

- The indicators of regular flooding of site by tide water was observed in on-site visit. The site area was wet and with plenty of mud which is required for plantation.
- There was no presence of very hard, dried soil surface in the site was observed anywhere.
- The presence of a few natural mangrove (*A. marina*) trees was observed around and in the plantation site which denotes the site is suitable for the plantation.
- The presence of crab holes and mudskippers holes is the indicator that the soil of the site is soft and regularly get wet due to tides.
- The pneumatophores of nearby mangroves were found in the nearby area which indicate that there is no sediment deposition and buried pneumatophores in this area.
- Nearby area also shows the presence of halophytic/ salt marsh plants such as *Sesuvium* and also *Salicornia* nearby creek.
- The *Sesuvium* leaves were green and fresh, also not thicker which represent the good condition of the site.
- The presence of sub-creek system may ensure the availability of tidal water which will be primary need of the plantation.
- A few natural regeneration plants were also observed in the site.
- The presence of the jackal foot marks observed which denotes the overall area have a good ecosystem and where the jackal food (crabs) sources are available.

Plate 5: Site locations suitable for mangrove planting in DPA area. Location Selection for Planting based on mud/clay, sandy mud, creek and tidal pattern, protection from villagers and cattle grazing.

5.2. Analysis of water and sediment samples

5.2.1. Water analysis

The water samples were collected from the plantation site in pre-cleaned polyethene bottles and rinsed with sample water, and transported to the laboratory in icebox for further analysis such as pH analysis by pH meter, salinity was determined by refractometer. The pH of water sample was found 7.25 and salinity 18 psu. Although there is no domestic freshwater source, and tidal water salinity generally higher, due to the rainy season the salinity shows lower values. However, the lower salinity is also in favour of germination of mangrove seeds.

5.2.2. Sediment/ soil analysis

Sediment samples were collected by using a non-metallic plastic spatula from random locations; three from each transect to cover the whole study area. The collected samples were air-dried at room temperature (Jackson, 1958), homogenized using an agate mortar and pestle, sieved through a standard sieve of 2 mm mesh (Tandon, 2005). The particles with size less than 2mm were retained in pre cleaned plastic bottles for further analysis for various parameters. Total Organic Carbon (TOC), pH, texture, bulk density, etc were analysed.

- Texture of sediment: The texture of soil/sediment is one of the key factors when choosing a site for plantation mangroves. Generally, mangrove ecosystems typically have the types of soils which includes muds or clay or sandy mud, etc. The texture of soil significantly impacts the survival and growth of mangroves. The presence of clay texture which makes soil muddy may expected to offer a stable base for mangrove roots to flourish under tidal conditions. Thus, evaluating the soil conditions at the plantation site is crucial before starting mangrove planting activities. Here we collected 3 samples, and all shows good amount of clay percentage in them which may be favourable for the plantation.

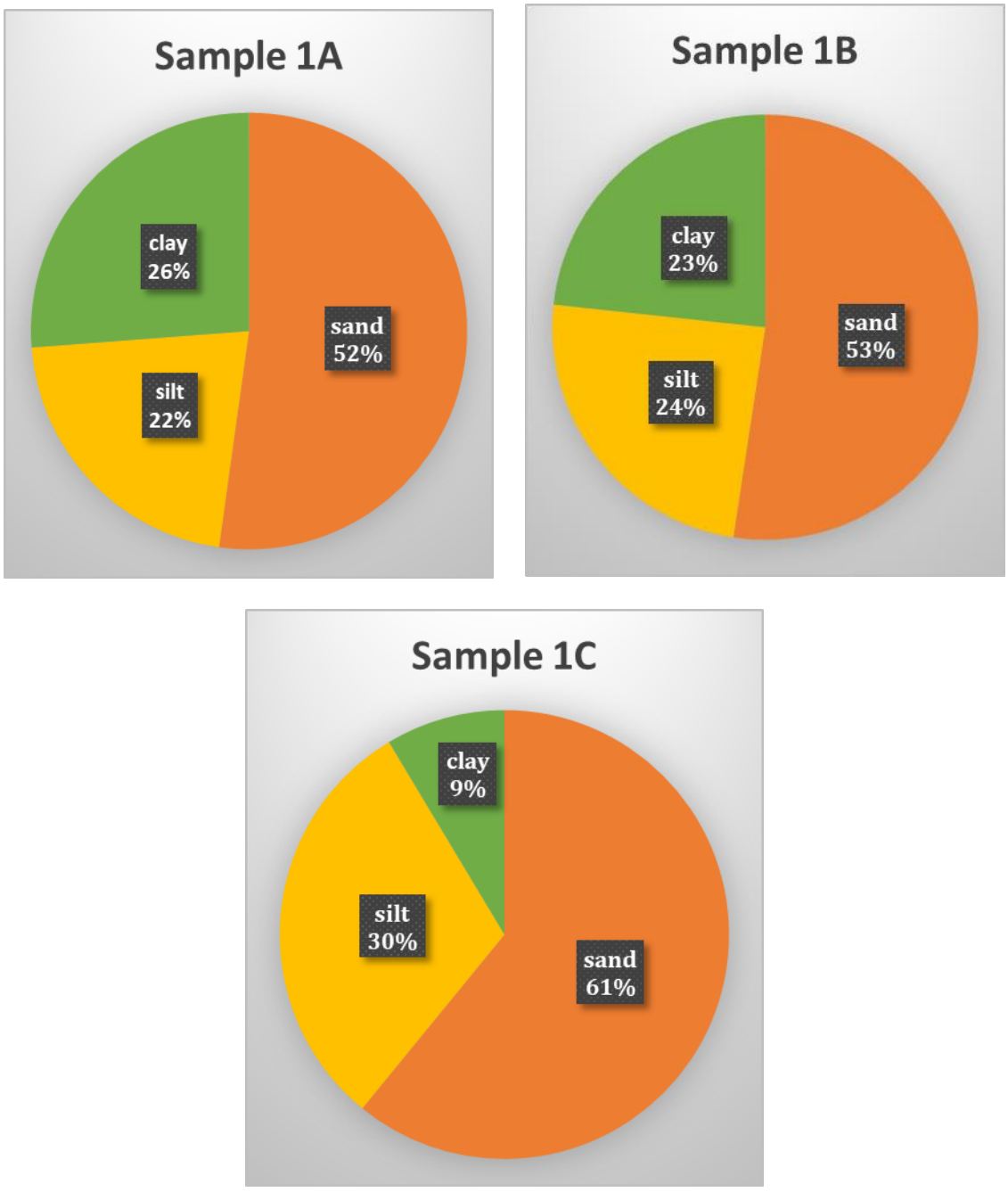

Figure 2: Soil texture in the sampling sites

- Bulk density of soil: It refers to the amount of soil organic matter within a given volume of soil. This property can vary significantly and is influenced by the soil's texture, structure, and organic matter content. Soils with high organic matter tend to have lower bulk density, while compacted soils exhibit higher bulk density.

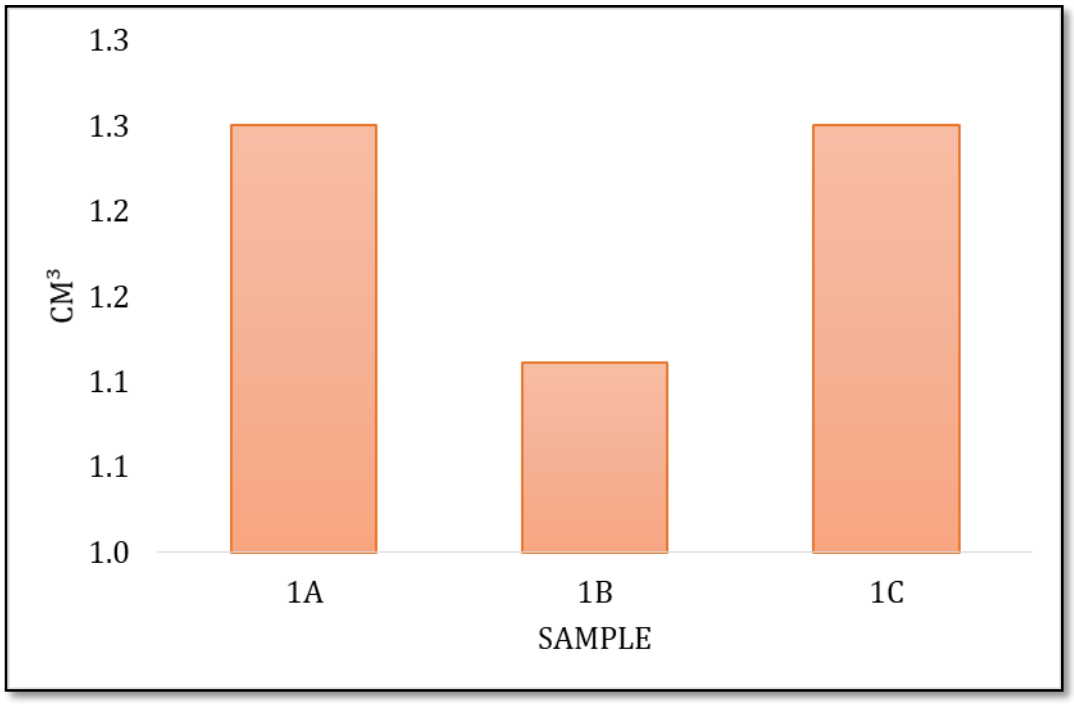

Figure 3: Bulk density of soil samples

- Total Organic Carbon: Organic carbon levels are influenced by living organisms, and the diversity of life forms in mudflats affects the total organic carbon (TOC) estimates. In all samples, the TOC percentage was ranged from 2.7 % to 2.85%

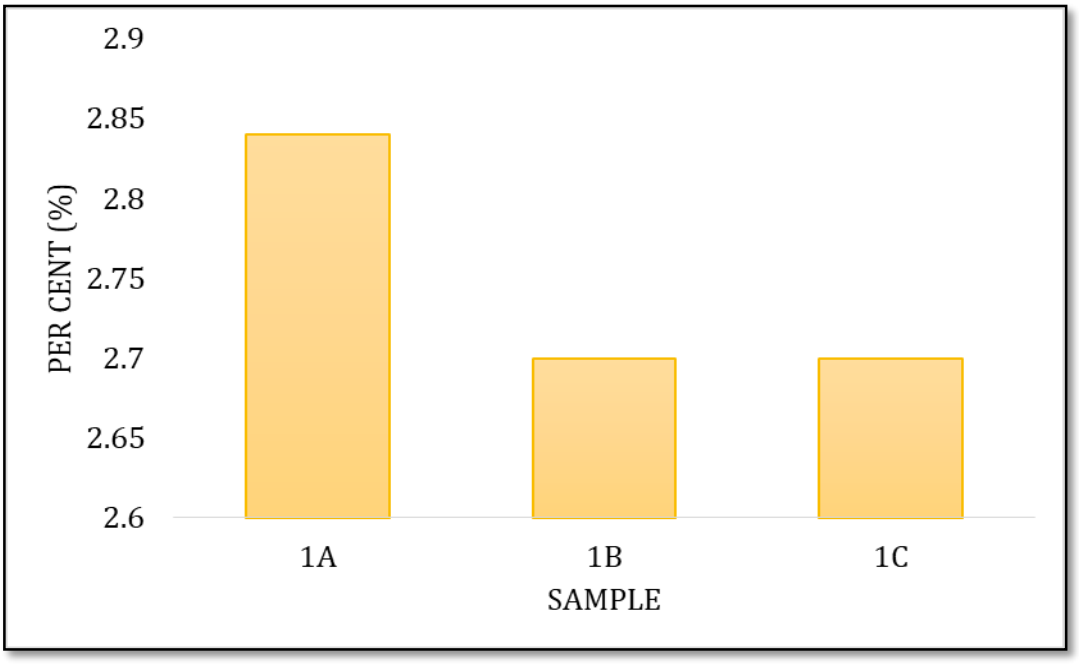

Figure 4: Total Organic Carbon of soil samples

Plate 6: Site sampling and field observation for potential for mangrove plantation.

6. Further work

The nursery raise samplings and otla raised bed plantation methods will be use for the entire plantation activity. The candidate species will be *Avicennia marina* due to the high adoptability to local environmental condition and further, gap filling using *Rhziphora mucronata* should be done based on the field survey. The nursery beds will be arranged on the intertidal in such a way that it regularly gets inundated by the incoming tidal waters at every tide. After two months period, the grow samplings with a height of around 45cm will be transplanted to the selected site. In raised otla method, circular/square earthen mounts of 10- 15 cm height will be raised and propagules will be dibbed on the surface of the mount. The tentative work schedule is as show in the table 3.

Table 3: Time for mangrove plantation activity

Activity	Month									
	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Site Identification and Planning										
Demarcation of Plantation Area										
Propagule Procurement										
Seed collection and Selection										
Onsite Nursery Preparation										
Maintenance of Plantation through Nursery										
Plantation of mangrove from nursery to Onsite										
Gap Filling										
Submission of Final Report for Comments and revisions, if any.										
Submission of Final Report										

7. References

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