4. Environmental and Social Consideration

4.1 Outline of Project Components causing Environmental and Social Impact

4.1.1 Outline of Project Components causing Environmental and Social Impact

(1) Project Name

Preparatory Survey on the Matarbari Port Development in the People's Republic of Bangladesh

(2) Outline of the Project

The objective of the Project is to strengthen the port logistics capacity of Bangladesh by constructing a deep sea port at Matarbari area in Chittagong Division, thereby contributing to acceleration of logistics with neighboring countries.

1) Civil Works for Construction of multipurpose terminal (approx. 12ha, length 300m) and a container terminal (approx. 20ha, length 460m)
2) Procurement of Equipment (3 units of Quay Gantry Crane)
3) Tug-boat, Pilot-boat, lighthouse
4) Access road (Temporary 2-lanes, approx. 25.7km), north-south connecting road of port (approx. 1.6km)
5) Consulting Services (Review of F/S, Detailed design, Tender Assistance, Construction supervision, Facilitation of implementation of Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP), Technology transfer)

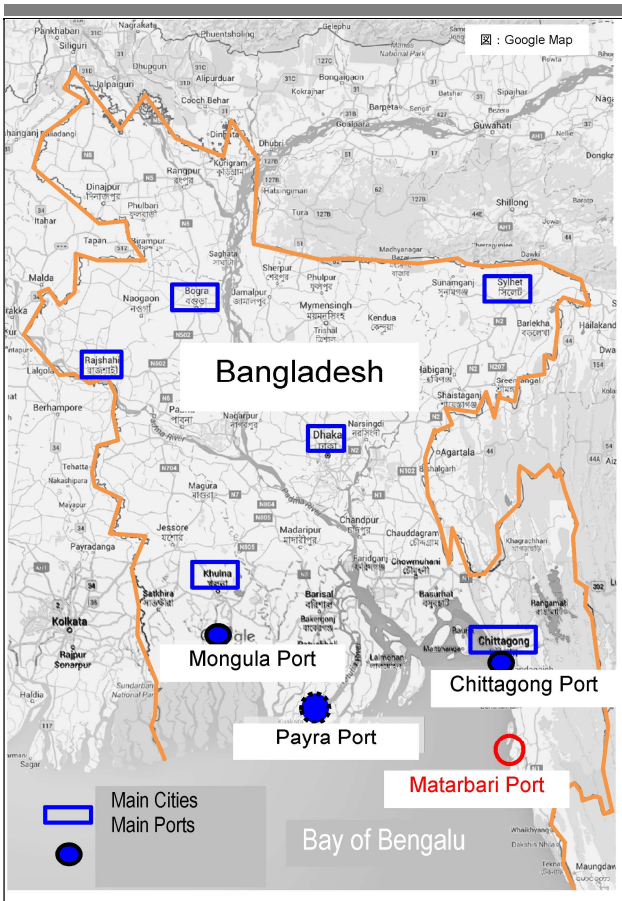
The outline and location of the port facilities are shown below.

Table 4.1-1 Outline of Port Facilities

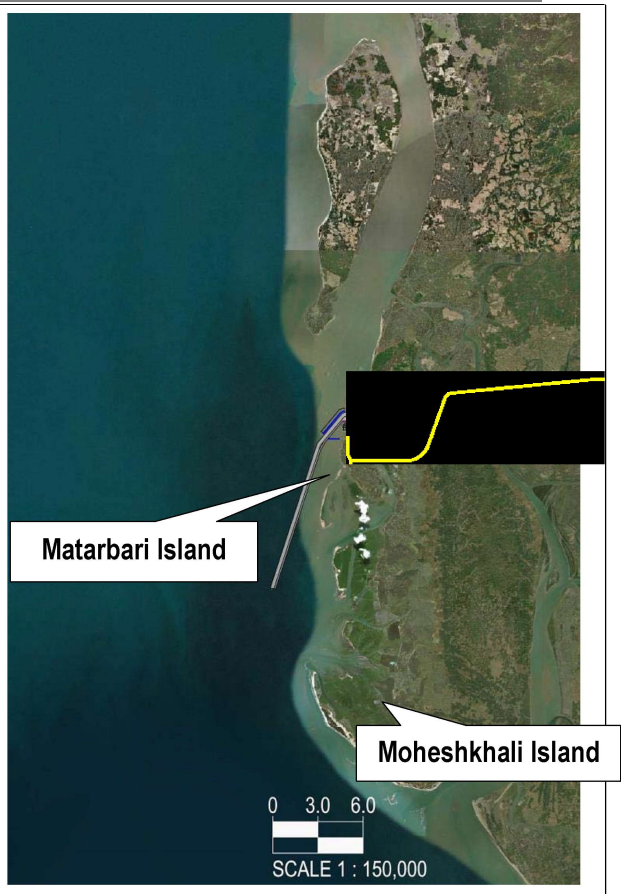
Facilities	Size	Max Vessel Size	Cargo & Capacity	Remarks
Container Terminal	L=460m, D= CDL-16m Area=20ha	8,000 TEU Type 150 TEU (Feeder)	Container 700,000 TEU	Full size berth x1, Feeder berth x1
Multi-purpose Terminal	L=300m, D=CDL-16m Area 12ha	70,000 DWT	General Cargo 1.5 m.t. Bulk Cargo 0.6 m.t. Automobile: 100,000	General cargo ships, Panamax bulker, and Automobile carrier
Breakwater (being coordinated as a scope of the Adjacent Project)	North L=2,150m South L=670m	-	-	
Navigation Channel Turning Basin (being coordinated as a scope of the Adjacent Project)	W=350m, L=11km Turning Basin=75ha	100,000 DWT (8,000-8,200 TEU)	-	

Note: m.t. stands for million tons

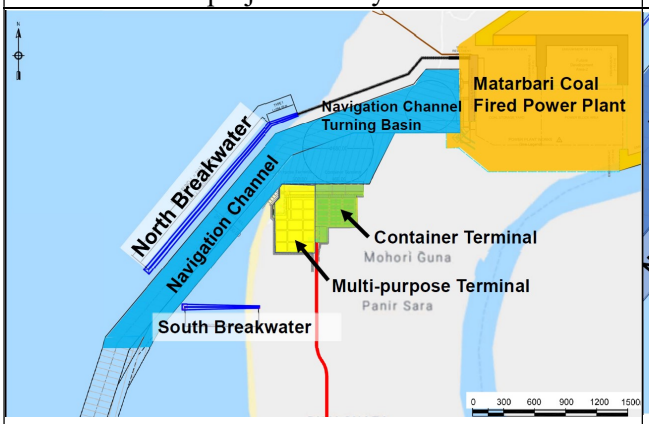
Source: JICA Survey Team



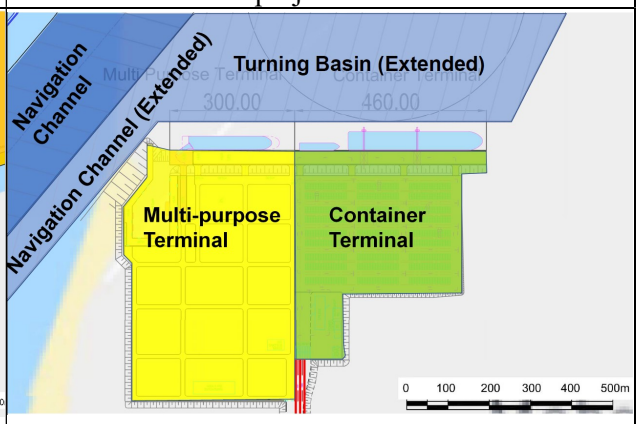
The project country and area



The project location



Outline of port facilities



Port facilities

Figure 4.1-1 Project Location (port)

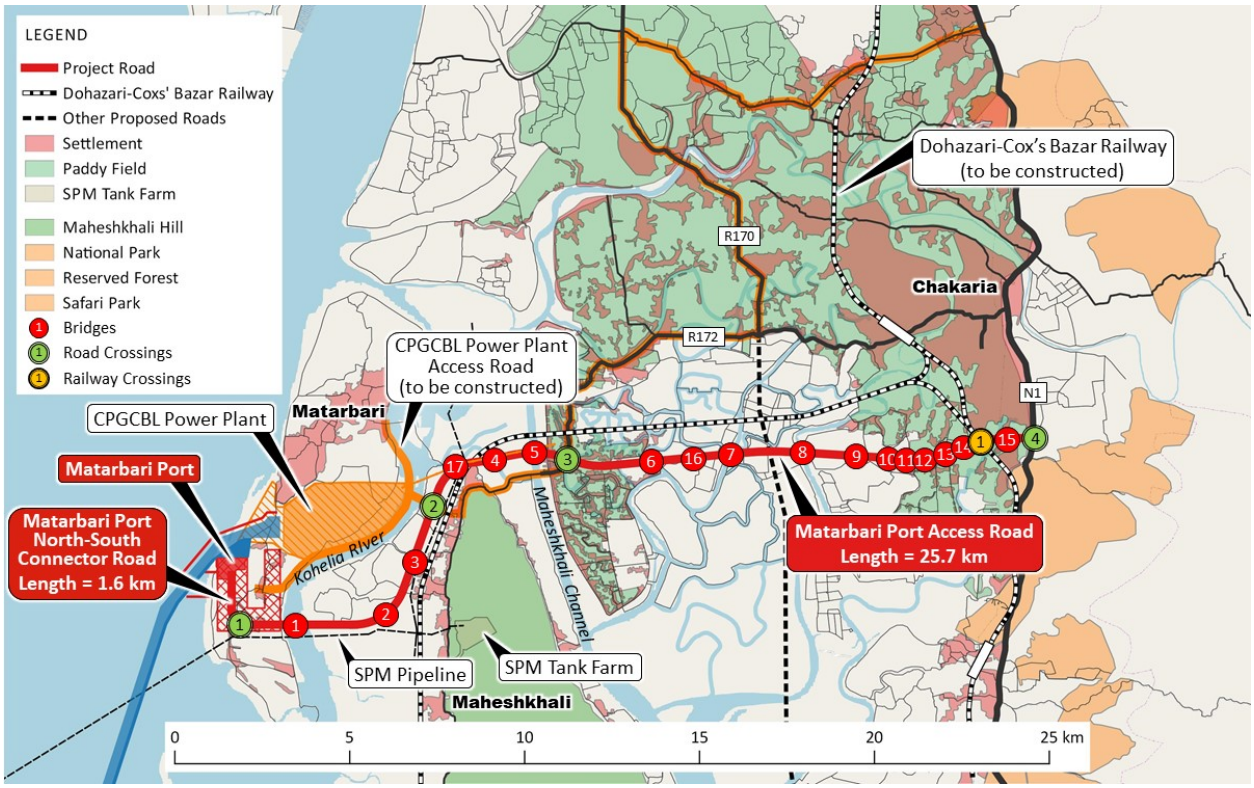
Source: JICA Survey Team, The upper right map is made by JICA Survey Team from Google Earth

Outline of access road and bridges is as follows.

Table 4.1-2 Outline of access road

Facilities	Size
North-south connecting road at port	Embankment: ROW-90m, L=1.6km (4 lanes)
Access road (From Matarbari port to National Route 1)	Embankment: ROW=80m、L=18.7km Bridge: ROW=25.6m、L=7.0km Total: 25.7km (The target of the project is only 2 lanes. The road will be upgraded to 4 lanes in the future.)

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.1-2 Project Location (access road)

(3) Category of the Survey

Feasibility Study

(4) Category of Environment

Category: A

Reason of Categorization: The project falls into the port sector located in a sensitive area and is likely to have significant adverse impact due to its characteristic under the JICA guidelines for environmental and social considerations (April 2010).

(5) Executing Agency

- Port：Chittagong Port Authority (CPA)
- Access Road: Roads and Highways Department, Ministry of Road Transport and Bridges (RHD)

4.1.2 Adjacent Project

The Matarbari port is to be developed through utilizing access channel for coal-handling port developed by the Matarbari Coal Fired Power Plant (CFPP) (appraised in 2014). The port and channel will be commonly used by the port and CFPP after completion of their construction. EIA of CFPP itself has been completed. Cumulative environmental impact, mainly about commonly used facilities, will be mentioned in Section 4.5 of this Chapter.

(1) Outline of the Adjacent Project

The project consists is "to construct high efficiency coal-fired power plant, Transmission Line/Substation and port facilities for handling coal", consisting of the following components.

1) Construction of the following facilities
   1) coal-fired power plant with ultra super critical technology (boilers, steam turbines, generators and auxiliaries), related facilities (water treatment plant, flue gas treatment system, electric facilities, coal handling system, ash handling system, circulating water system, training facilities, trial run): approx. 378 ha
   2) transmission facilities (400kV transmission line, towers): approx. 92km
   3) port facilities for handling coal: approx. 77 ha
   4) access road: partial rehabilitation and repair of the existing road (approx. 5km), construction of new road (approx. 7.4km) , construction of new bridge (approx. 675m)
   5) Electrification of surrounding area (132kV transmission line: approx. 25km, 132/33kV and 33/11kV substation, 33/11/6.35/0.4 kV distribution facilities)
2) Consulting services (detailed design, tender assistance, construction supervision, Facilitation of implementation of Environmental Management Plan (EMP) Environmental Monitoring Plan (EMoP) and resettlement)

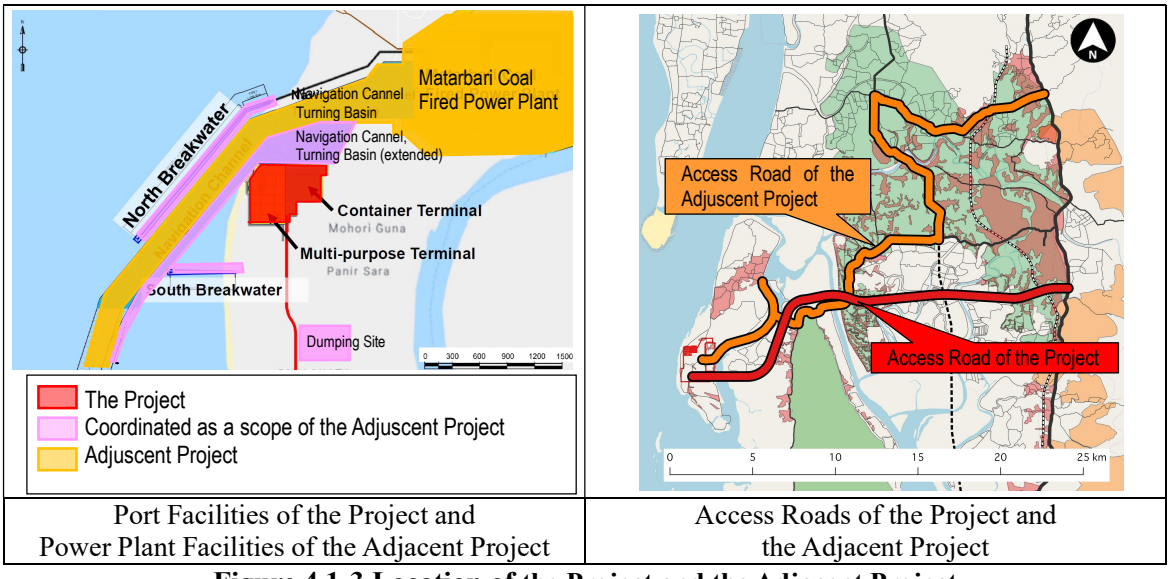


Figure 4.1-3 Location of the Project and the Adjacent Project

(2) Common facilities with the Project

1) Generation facilities

There are no facilities to be used commonly with the Project.

2) Transmission facilities

There are no facilities to be used commonly with the Project.

3) Port facilities for handling coal

Access channel including extended area be commonly used. Extended channel and basin, breakwater and training dike, related facilities and equipment (Tug-boat, Pilot-boat, lighthouse) to be developed by the port project will be commonly used. Environmental impact will be comprehensively assessed in the Project though extended channel and basin, breakwater and training dike are being coordinated as a scope of the Adjacent Project.

4) Access road

Access road will not be commonly used. "The existing regional highways to be improved by the CFPP project (R170, 172 and Z1125), function not only to cater local traffic generated in this area but also to support local activities for school, commercial, social exchange, children playing, etc. It is not suitable to invite many cargo trucks into the local roads in terms of traffic safety and freight transport planning. In order to provide safe and smooth traffic condition for long-distance freight transport, port access roads should have limited access for separation of freight transport and local traffic physically.

5) Electrification of surrounding area

There are no facilities to be used commonly with the Project

4.2 Baseline Data of the National and Socio-economic Environment

4.2.1 Natural Environment

(1) Climate

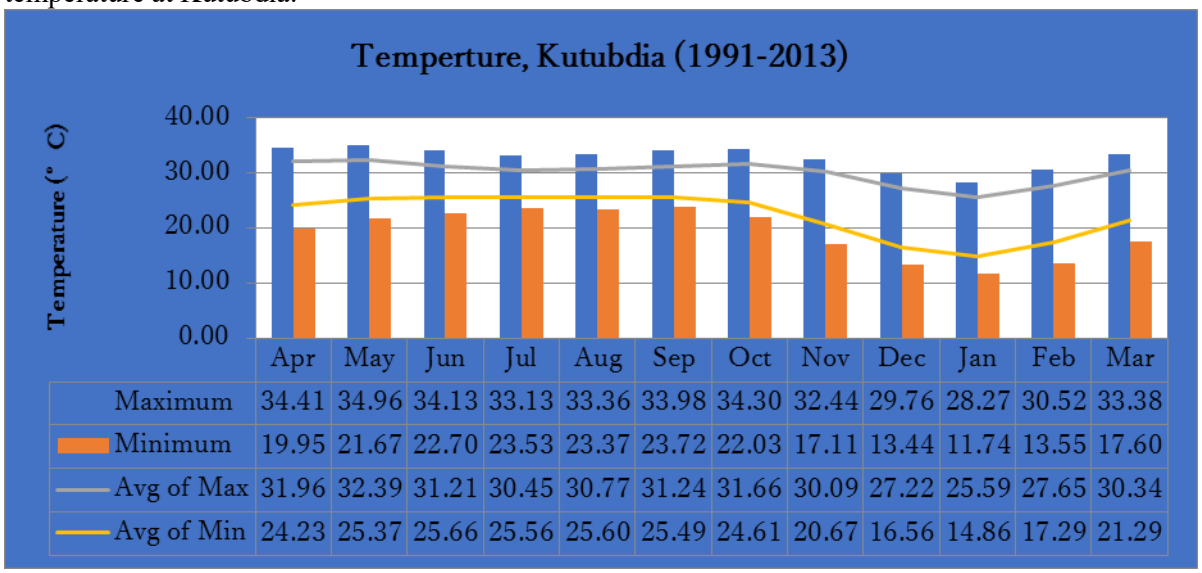
The proposed port area is located in the southeastern climate zone of Bangladesh and is under tropical climate. Weather data for the past 30 years, one of the station at Kutubdia island (BMD Station ID: 11925) by Bangladesh Mereological Department (BMD) is located a few kilometers north-west of the Planned port, and it is appropriate to obtain the climatic conditions of the study area.

In Köppen climate classification, it falls into the category of the tropical monsoon climate (Am). The surrounding average temperature in the surveyed area is 19 ° C - 20 ° C in winter and 27 ° C - 28 ° C in summer. The annual average rainfall in this area is within the range of 2,500 mm to 3,000 mm, which is relatively higher than in the western part of the Cox Bazaar Division. Southwest monsoon occurs from June to September. During this period, torrential rains accompanied by tidal flats and coastal floods occur in the project area.

From April to June in the summer, toward further 12 months from September, tropical cyclones are generated. These cyclones occur almost every year in the Chittagong coastal area.

(2) Temperature

Ambient temperature of Kutubdia Station is recorded for this project study Area. Data of last 23 years (1991-2013) shows that the monthly maximum temperature varies from 29.7°C to 34.9°C and May is the warmest month in pre-monsoon period. The monthly minimum temperature varies within a range of 11.7°C to 23.7°C and January is the coldest month. The highest recorded maximum temperature during last 23 years is 34.9°C occurred in May, 1994 and the lowest ever recorded minimum temperature was in January, 1994. The monthly maximum and minimum temperature of last 23 years (1991-2013) are given in figures below that show the trend of annual maximum and minimum temperature at Kutubdia.



	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Maximum	34.41	34.96	34.13	33.13	33.36	33.98	34.30	32.44	29.76	28.27	30.52	33.38
Minimum	19.95	21.67	22.70	23.53	23.37	23.72	22.03	17.11	13.44	11.74	13.55	17.60
Avg of Max	31.96	32.39	31.21	30.45	30.77	31.24	31.66	30.09	27.22	25.59	27.65	30.34
Avg of Min	24.23	25.37	25.66	25.56	25.60	25.49	24.61	20.67	16.56	14.86	17.29	21.29

Figure 4.2-1 Monthly maximum and minimum Temperatures (Source: BMD 2013)

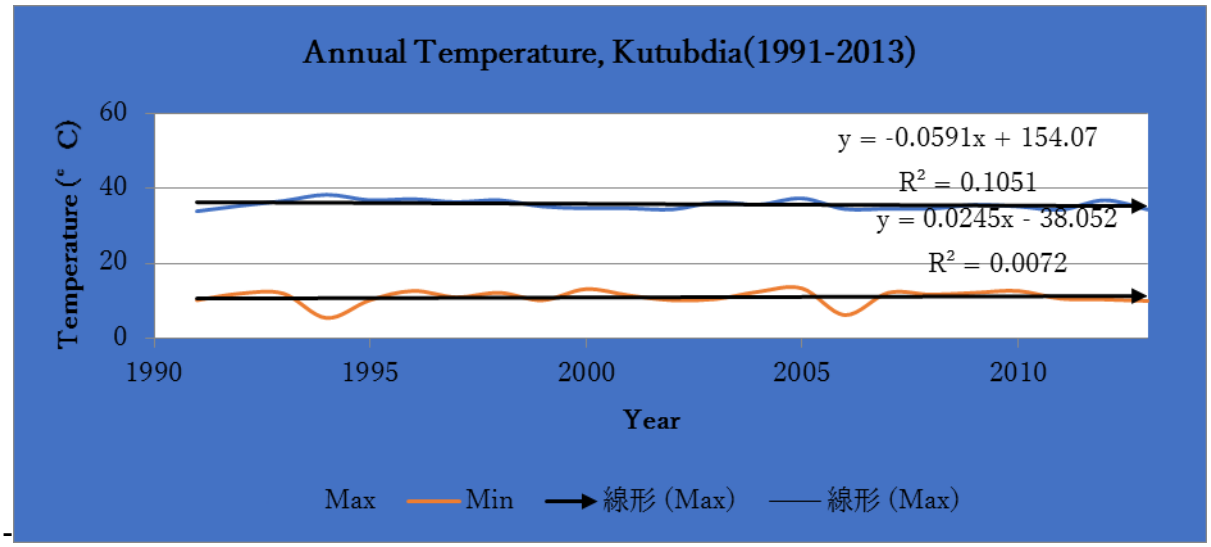
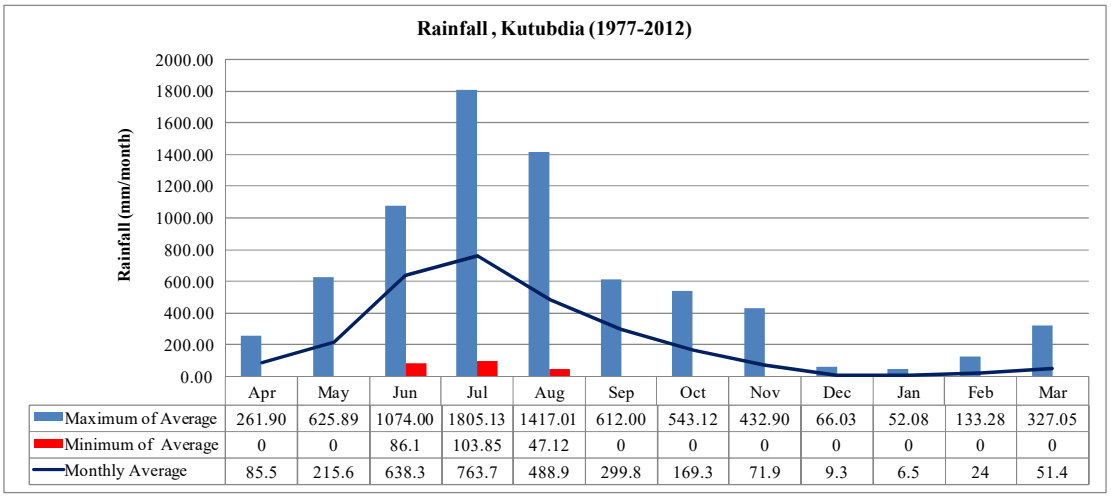


Figure 4.2-2 Trend of annual maximum and minimum Temperature (Source: BMD 2013)

(3) Perspiration

The last 35 years data of Kutubdia BMD station (Station ID: 11925) shows that the annual average rainfall is recorded as 2824.2 mm/yr, according to the data analyzed monthly average maximum

rainfall occurred in July (approximately 763.7mm/month) and monthly average minimum rainfall occurred in winter season (December to February) which indicates that the rainy season is very prominent in this region. The ever maximum daily rainfall recorded is 422mm in the 16th July 1998 and ever maximum annual rainfall was recorded as 4587 mm in the year of 1998. It is also observed that, the annual rainfall in this area is gradually decreasing at a rate of 10.8 mm/year. Average monthly rainfall of thirty years is presented by graphs below which shows that the Monsoon period (June to September) has maximum rainfall of the year. On the contrary, December to February shows negligible amount of rainfall. For this analysis time series rainfall data of Kutubdia station (BMD station ID: 11925) has been used.



	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Maximum of Average	261.90	625.89	1074.00	1805.13	1417.01	612.00	543.12	432.90	66.03	52.08	133.28	327.05
Minimum of Average	0	0	86.1	103.85	47.12	0	0	0	0	0	0	0
Monthly Average	85.5	215.6	638.3	763.7	488.9	299.8	169.3	71.9	9.3	6.5	24	51.4

Figure 4.2-3 Average monthly maximum and minimum Rainfall (1977-2012)

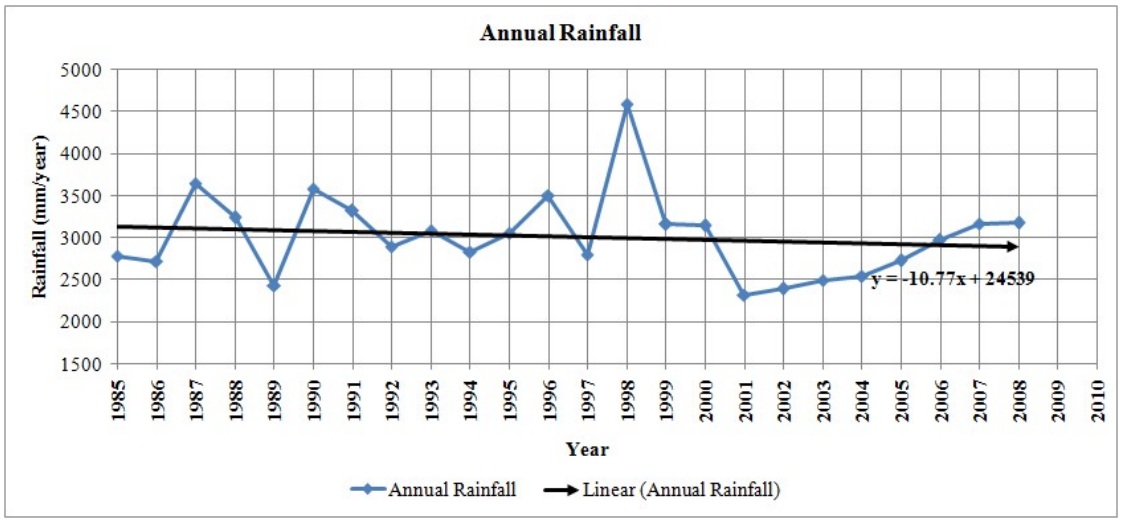
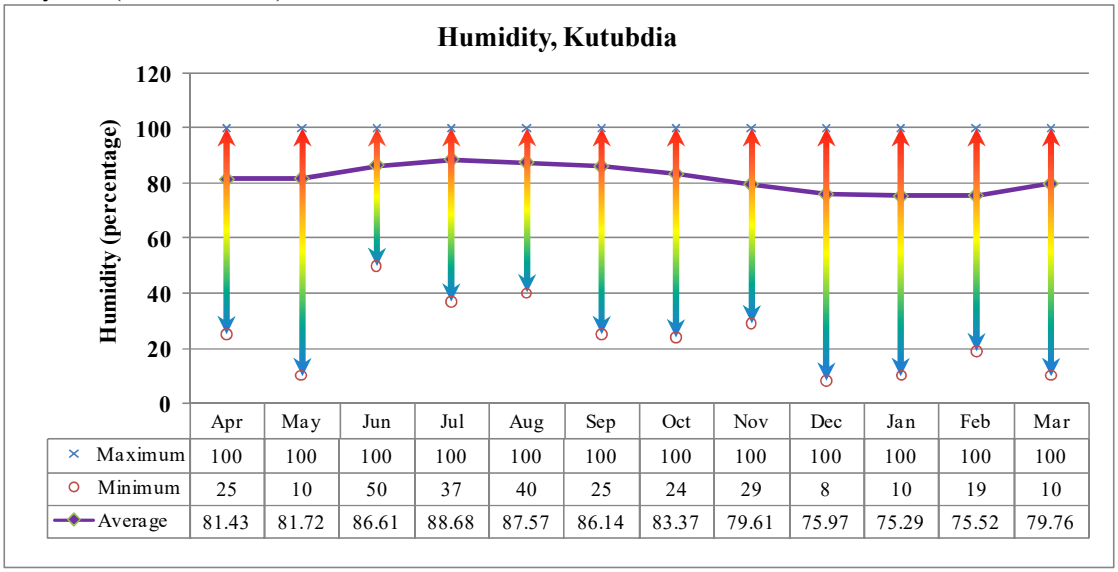


Figure 4.2-4 Trend of annual maximum and minimum Rainfall

(4) Humidity

Humidity is directly related with temperature fluctuation of a region. The atmosphere of coastal zone is always enriched with humidity because of high evaporation over the sea surface. Kutubdia BMD Station has been selected in order to delineate the situation of humidity of the study area. The monthly average relative humidity near the Kutubdia station varies seasonally from 76% to 89%. Monsoon

period (June to September) is the most humid month while during winter season i.e. December to February it remains lower. Next Figure shows monthly maximum, minimum and average humidity of last 28 years (1985 to 2013) of Kutubdia station.



	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Maximum	100	100	100	100	100	100	100	100	100	100	100	100
Minimum	25	10	50	37	40	25	24	29	8	10	19	10
Average	81.43	81.72	86.61	88.68	87.57	86.14	83.37	79.61	75.97	75.29	75.52	79.76

Figure 4.2-5 Average of monthly maximum and minimum humidity (1985-2013)

(5) Land use and Forest

Where there is a harbor planned place is located at Dhalgata Union, one of Union which is the smallest unit of municipality. In this area, wetlands account for the majority. Among the total area 19.8 km 2, the total wetland area is 8.5 km 2, 8.3 km 2 for aquaculture, and 8.3 km 2 shrimp farms out of them. Other land use consists of 4.3 km 2 of mangrove forest, other forests, and water systems.

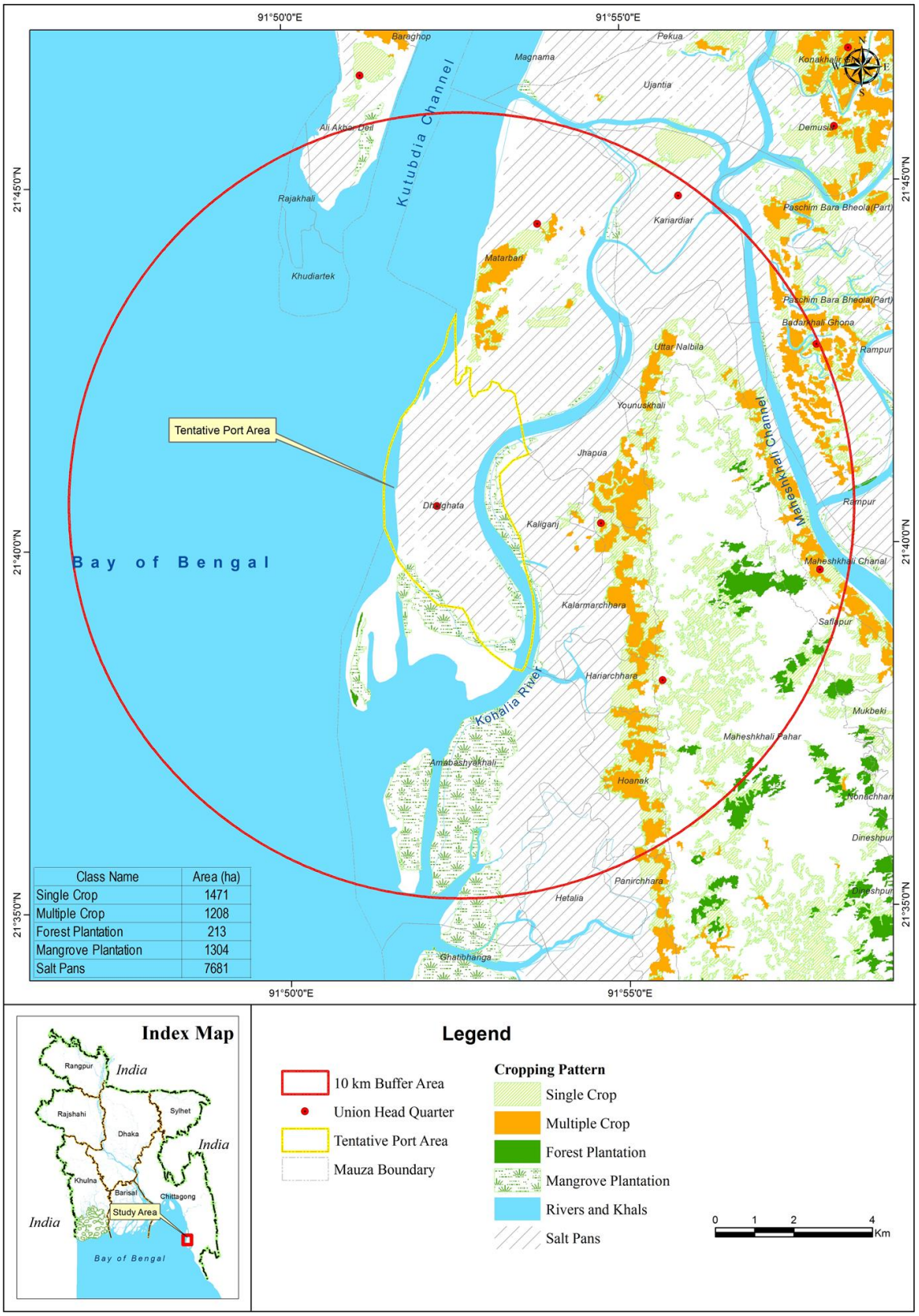


Figure 4.2-6 Land use patterns of the Moheshkhali Upazila

(6) Reserved forest and Ecologically critical area (ECA)

The planned site of this project is not a protected area under international law or domestic law of Bangladesh. Also, information that is an important habitat for species that is considered endangered in the IUCN Red List in the planned area is not recognized and therefore it is not an important natural habitat.

In the vicinity of this project planned area, there are the Moheshkhali hills area and forest reserve, Fasiakhari wildlife reserve, Medha Kachhapia National Park. In these protected areas, land creation, deforestation, trapping and collection of animals and plants are prohibited, and it is desirable to avoid them.

The Sonadia Ecological Critical Area has the sighting information of rare species, which is about 15 km from the planned project sit. According to IUCN's hearing, sighting information of CR (endangered IA species) sighting information is reported in the IUCN Red List. It is known mainly in six places in Sonadia (Chowdhury 2011, IUCN 2017, 2018). Two of them are judged to be important habitats for species with limited endemic species and / or distribution areas, since they are considered internationally important Spoonbilled sandpiper observation site values. According to IUCN, the number of individuals seen in 2017 exceeds 3% of the number confirmed worldwide, which exceeds the 1% population standard of the Ramsar Convention, and it is considered as the area that supports worldwide important aggregates of migratory species/ flocking species. Based on the above results, Sonadia island is judged to be the important natural habitat.

(7) Flora and fauna, ecosystem

In the vicinity of the project site, habitat of the sea turtles are confirmed in the southern part of Dhalgata. Also, in the ongoing natural condition survey, birds, dolphins and the like are expected to live. Wildlife reserves and national parks exist in the range of several kilometers of the planned project site. Among them it is the Sonadia Ecological Critical Area (ECA) that shows particularly important ecosystems. This ECA is under the jurisdiction of the Environment Agency (DoE), and the following activities are prohibited within this area.
1.Destroying and sampling of natural forests and plants, 2. Hunting, killing of wildlife, 3. Capture or collection of clams, coral, turtles and other wild animals, 4. All of the activities that destroy the habitat of plants and animals, 5 All activities to destroy the natural environment of soil and water, 5. Establishment of industries and facilities that generate soil / water / air / noise pollution, 6. Activities that harm fish and other aquatic animals

Table 4.2-1 Administered Agency and Law of ECA

Category	Administered Agency	Law
Ecological Critical Area	DoE	Environmental Conservation Act

Source: JICA Survey Team

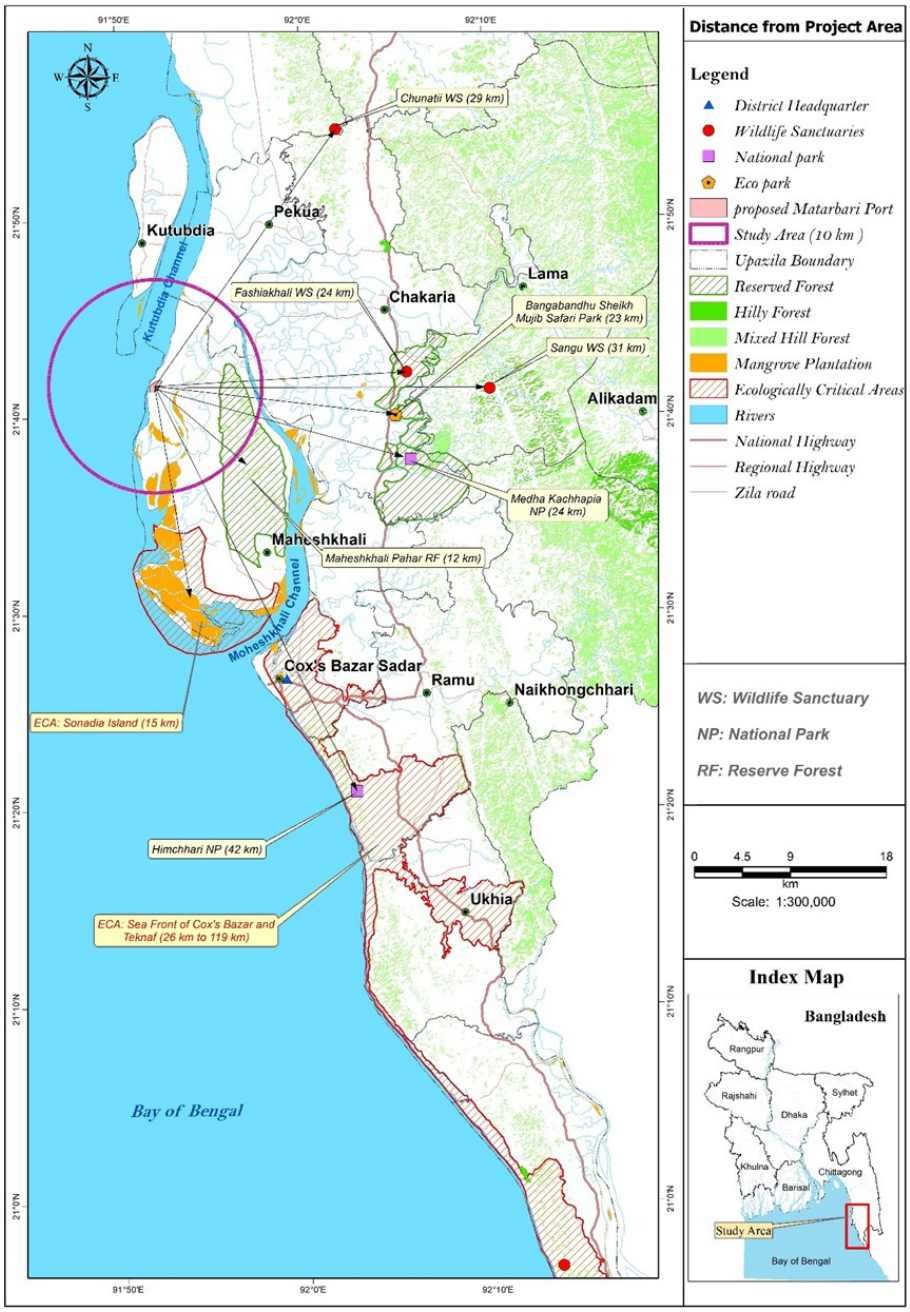
The Sonadia ECA has confirmed the presence of animals and plants listed in the IUCN Red List. The table shows the rare species seen in the ECA. In the EIA of the adjacent "Matarbari coal powerplant project (2013)", the habitats and breeding grounds of some animals and plants in this table have been

confirmed. Therefore, when developing the Matarbari port, habitat confirmation and special consideration are necessary. In addition, since this development is in the coastal area, consideration must be given to both terrestrial and aquatic species.

Table 4.2-2 Rare Species found in Sonadia ECA

Species	**Global Status (IUCN Red List)**	**Status on Sonadia Island**
BIRDS		
Spoon-billed Sandpiper Eurynorhynchus pygmeus	**Critically Endangered**	**Regular in W**
Spotted Greenshank Tringa guttifer	**Endangered**	**Regular in W**
Great Knot Calidris tenuirostris	**Endangered**	**Regular in W & S**
Black-tailed Godwit Limosa limosa	**Near Threatened**	**Rare in W & S**
Bar-tailed Godwit Limosa lapponica	**Near Threatened**	**Regular in W & S**
Eurasian Curlew Numenius arquata	**Near Threatened**	**Regular in W & S**
Asian Dowitcher Limnodromus semipalmatus	**Near Threatened**	**Rare in W**
Red Knot Calidris canutus	**Near Threatened**	**Regular in W**
Red-necked Stint Calidris ruficollis	**Near Threatened**	**Regular in W**
Curlew Sandpiper Calidris ferruginea	**Near Threatened**	**Regular in W & S**
Black-headed Ibis Threskiornis melanocephalus	**Near Threatened**	**Regular in W & S**
SEA TURTLES		
Hawksbill Turtle Eretmochelys imbricate	**Critically Endangered**	**Rare**
Green Turtle Chelonia mydas	**Endangered**	**Regular nest in W**
Olive Ridley Turtle Lepidochelys olivacea	**Vulnerable**	**Regular nest in W**
CETACEANS		
Finless Porpoise Neophocaena phocaenoides	**Vulnerable**	**Rare in channels & offshore**
Irrawaddy Dolphin Orcaella brevirostris	**Endangered**	**Regular in channels & offshore**

Source： Made by JICA Survey team based on DoFo
Note： CR=Critically Endangered, EN=Endangered, NT=Near Threatened, VU=Vulnerable



Source: JICA Survey Team

Figure 4.2-7 Comparative Position of ECA and WS

4.2.2 Social Environment

The project site is located in Cox's Bazar District, Chittagong Division in south east Bangladesh. Cox's Bazar was established as a sub-division of Chittagong Division in 1854 when it was under Bengal Presidency of British India and upgraded to a district in 1984. In the present time, Cox's Bazar District consists of eight Upazilas, 71 unions (administrative areas) and 182 mauzas (communities).

The planned port site is located in Dhalghata Union, Moheshkhali Upazila. The planned access road passes through six unions in two Upazilas, namely Dhalghata Union and Kalarmarchara Union in Moheshkhali Upazila, Badarkhali Union, Saharbil Union, Chiringa Union and Fasiakhali Union in Chakaria Upazila.

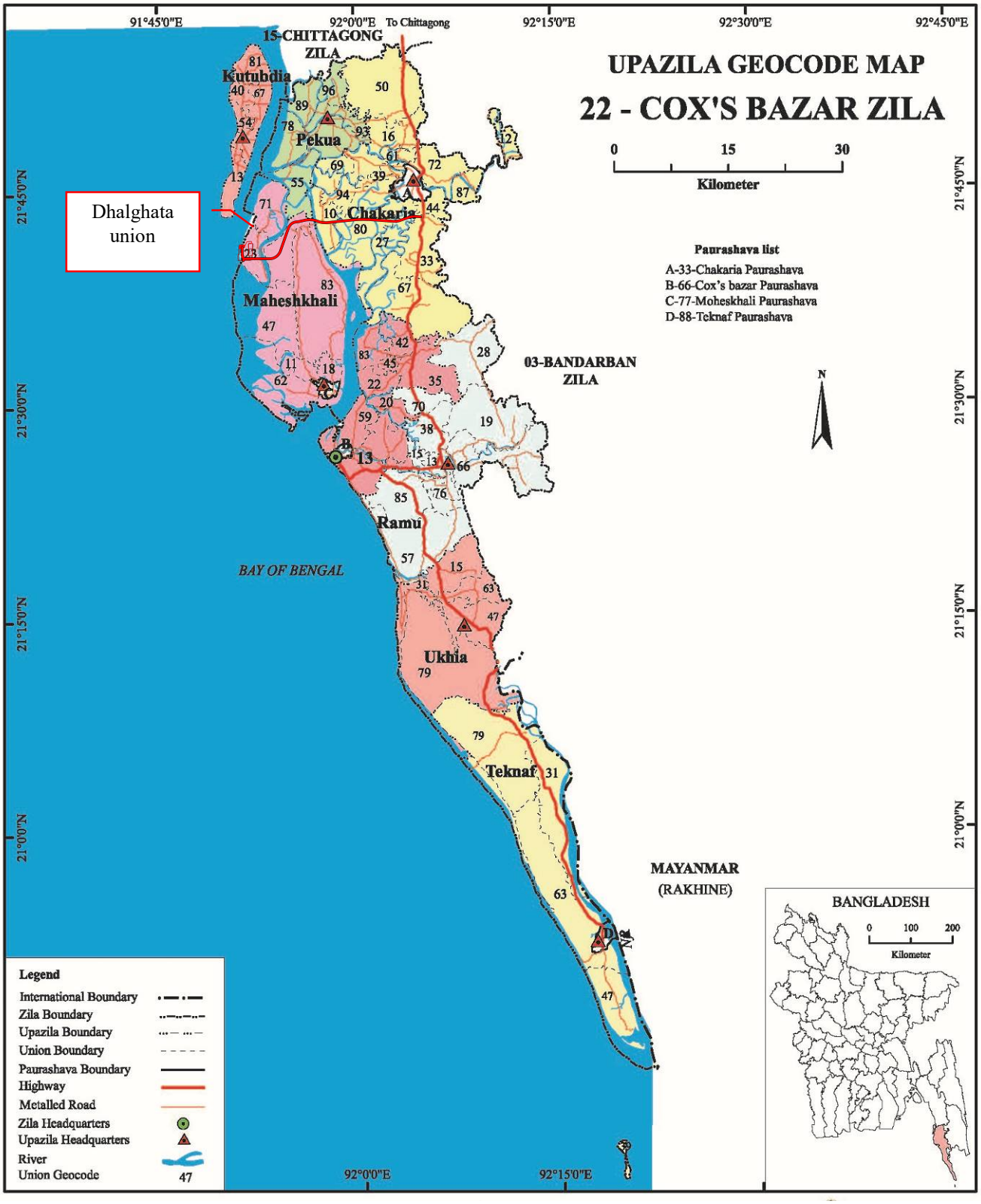
The Upazilas, unions and mauzas affected by the project area are shown in the table and the figures below.

Table 4.2-3 Project Affected Unions and Mouzas

Division	District	Upazila	Union	Mouza	Component
Chittagong	**Cox's Bazar**	**Moheshkhali**	23 Dhalghata	160 Dhalghata	Port and road
			59 Kalarmarchara	577 Kaliganj 545 Kalarmarchhara 513 Jhapua 449 Younuskhali 994 Uttar Nalbila	Road
		Chakaria	10 Badarkhali	015 Badarkhali	Road
			80 Saharbil	857 Rampur	Road
			27 Chiringa	734 Palakata (Part)	Road
			44 Fasiakhali	321 Fasiakhali	Road

Note : The numbers attached to unions and mouzas are "Geo Code", which is correspondence with map shown in the next page.

Source: JICA Survey Team based on BBS "Population & Housing Census -2011 Community Report: Cox's Bazar"



Source : Prepared by JICA Survey Team based on BBS "Small Area Atlas Bangladesh"

Figure 4.2-8 Map of Cox's Bazar and Project Area

Source : Prepared by JICA Survey Team based on BBS "Small Area Atlas Bangladesh"

Figure 4.2-9 Unions in Moheshkhali and Chakaria Upazila, Project Affected Unions

(1) Area and Population

Total area of Cox's Bazar District where the project site is located is 2,492 km^2 of which 941 km^2 is a forest area. The number of households is 415,954 and the average number of people per household is 5.51. The population in 2011 is 2,289,990, the population growth rate in 10 years from 2001 is 29.11 % and the average annual population growth rate is 2.55 %.

Moheshkhali Upazila is a peninsula-shaped upazila located along the northeastern coast of Cox's Bazar District. Total area is 362 km^2 of which 57 km^2 is a forest area. The number of households in 2011 is 58,177 and the average number of people per household is 5.52. The population is 321,218, the population growth rate in 10 years from 2001 is 25.21 % and the average annual population growth rate is 2.24 %.

Chakaria Upazila is the biggest upazila in Cox's Bazar District in terms of both area and population. Total area is 504 km^2 of which 208 km^2 is a forest area. The number of households in 2011 is 88,391 and the average number of people per household is 5.36. The population is 474,465, the population growth rate in 10 years from 2001 is -5.75 % and the average annual population growth rate is -0.58 %, which shows a decreasing trend in contrast with Cox's Bazar District as a whole and Moheshkhali Upazila described above.

Table 4.2-4 Demographic Data of the Project Area (in 2011)

Administrative Unit	Area (km^2)	Household	Population			Population Density (km^2)
			Total	Male	Female	
Bangladesh	**147,569**	**32,173,630**	**144,043,697**	**72,109,796**	**71,933,901**	**976**
Chittagong Division	**33,909**	**5,626,310**	**28,423,019**	**13,933,314**	**14,489,705**	**838**
Cox's Bazar District	**2,492**	**415,954**	**2,289,990**	**1,169,604**	**1,120,386**	**919**
Moheshkhali Upazila	**362**	**58,177**	**321,218**	**165,693**	**155,525**	**887**
Dhalghata Union	2	2,250	12,877	6,688	6,189	6,441
Kalarmarchara Union	29	8,930	49,268	25,615	23,653	1,697
Chakaria Upazila	**504**	**88,391**	**474,465**	**239,198**	**235,267**	**942**
Badarkhali Union	18	5,947	30,964	15,677	15,287	1,747
Saharbil Union	41	3,419	19,880	10,125	9,755	479
Chiringa Union	32	2,759	15,745	7,955	7,790	497
Fasiakhali Union	18	4,528	25,137	12,588	12,549	1,410

Source : BBS "Population & Housing Census -2011 Community Report : Cox's Bazar"

In Cox's Bazar District, Muslims have the greatest majority of 94.0 %. They are followed by Hindus (4.3 %), Buddhists (1.7 %) and Christians (0.1%). The tendency is the same in Moheshkhali Upazila and Chakaria Upazila, however, in the eastern part of Chakaria Upazila, namely, in Fasiakhali Union where the end point of the access road is located, the ratio of Muslims is somewhat lower at 88.1 while the ratio of Hindus is somewhat higher at 10.8 %.

Table 4.2-5 Religious Belief of the Project Area (in 2011)

(persons)

Administrative Unit	Pop. Total	Muslim	Hindu	Christian	Buddhist	Others
Cox's Bazar District	**2,289,990**	**2,151,958**	**97,648**	**1,503**	**37,822**	**1,059**
		94.0%	**4.3%**	**0.1%**	**1.7%**	**0.0%**
Moheshkhali Upazila	**321,218**	**301,858**	**16,647**	**6**	**2,682**	**25**
		94.0%	**5.2%**	**0.0%**	**0.8%**	**0.0%**
Dhalghata Union	12,877	12,687	190	0	0	0
		98.5%	1.5%	0.0%	0.0%	0.0%
Kalarmarchara Union	49,268	47,386	663	2	1,214	3
		96.2%	1.3%	0.0%	2.5%	0.0%
Chakaria Upazila	**474,465**	**442,799**	**26,142**	**1,265**	**4,207**	**52**
		93.3%	**5.5%**	**0.3%**	**0.9%**	**0.0%**
Badarkhali Union	30,964	30,755	198	0	11	0
		99.3%	0.6%	0.0%	0.0%	0.0%
Saharbil Union	19,880	18,620	1,259	0	1	0
		93.7%	6.3%	0.0%	0.0%	0.0%
Chiringa Union	15,745	15,486	259	0	0	0
		98.4%	1.6%	0.0%	0.0%	0.0%
Fasiakhali Union	25,137	22,146	2,722	7	262	0
		88.1%	10.8%	0.0%	1.0%	0.0%

Source : BBS "Population & Housing Census -2011 Community Report : Cox's Bazar"

In Cox's Bazar District, 14.511 residents accounting for 0.6 % of the population belong to ethnic minorities. 8,058 residents accounting for approximately 55.4 % of ethnic minorities, are Rakhine people who are Buddhists originating in Myanmar. The Rakhine people reside also in Moheshkhali Upazila, however their residential areas are concentrated in southern part of Moheshkhali Upazila. Rakhine people in Saflapur Union are not to be Project Affected Persons. 35 people of 154 households of ethnic minorities reside in Fasiakhali Union in Chakaria Upazila where the end point of the access road is located. In these unions, the access road will not interfere with villages therefore the ethnic minorities are not to be Project Affected Persons.

Table 4.2-6 Ethnic Minorities of the Project Area (in 2011)

Administrative Unit	Total		Ethnic Minorities					
	HHs	Pop.	HHs	Population				
				Total	Rakhine	Tanchaynga	Chakma	Others
Cox's Bazar District	**415,954**	**2,289,990**	**2,920**	**14,551**	**8,058**	**3,866**	**686**	**1,941**
			0.7%	**0.6%**	**0.4%**	**0.2%**	**0.0%**	**0.1%**
Moheshkhali Upazila	**58,177**	**321,218**	**267**	**1,403**	**1,395**	**0**	**3**	**5**
			0.5%	**0.4%**	**0.4%**	**0.0%**	**0.0%**	**0.0%**
Dhalghata Union	2,250	12,877	0	0	0	0	0	0
			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Kalarmarchara Union	8,930	49,268	0	0	0	0	0	0
			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Chakaria Upazila	**88,391**	**474,465**	**566**	**2,783**	**1,156**	**0**	**93**	**1,534**
			0.6%	**0.6%**	**0.2%**	**0.0%**	**0.0%**	**0.3%**
Badarkhali Union	5,947	30,964	0	0	0	0	0	0
			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Saharbil Union	3,419	19,880	0	0	0	0	0	0
			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Chiringa Union	2,759	15,745	0	0	0	0	0	0
			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fasiakhali Union	4,528	25,137	35	154	0	0	0	154
			0.8%	0.6%	0.0%	0.0%	0.0%	0.6%

Source: BBS "Population & Housing Census -2011 Community Report: Cox's Bazar"

(2) Socio-economic Conditions

1) Literacy rate

Literacy rate in Cox's Bazar District is 39.3 %. Literacy rate is 40.3 % for male and 38.2 % for female, which shows the tendency that it is slightly lower for female. Whereas relatively high literacy rate (47.6 %) is marked in Chakaria Upazila which is the biggest Upazila in Cox's Bazar District, in Moheshkhali Upazila where the port and the starting point of the access road will be located, a value below the average literacy rate in Cox's Bazar District (30.8 %) is marked.

Table 4.2-7 Distribution of Population aged 7 years and above by Literacy, Sex (in 2011)

Administrative Unit	Literate (can write a letter)		
	Both	Male	Female
Cox's Bazar District	**39.3%**	**40.3%**	**38.2%**
Moheshkhali Upazila	**30.8%**	**30.5%**	**31.1%**
Dhalghata Union	31.7%	29.8%	33.8%
Kalarmarchara Union	33.1%	32.2%	34.1%
Chakaria Upazila	**47.6%**	**47.9%**	**47.4%**
Badarkhali Union	40.2%	39.1%	41.2%
Saharbil Union	51.6%	50.7%	52.4%
Chiringa Union	43.0%	41.2%	44.9%
Fasiakhali Union	44.7%	44.8%	44.6%

Source: BBS "Population & Housing Census -2011 Community Report: Cox's Bazar"

2) Enrollment ratio

The enrollment ratio of children aged 6 to 10 in Cox's Bazar District is 70.1 % for male and 73.0 % for female. While relatively high enrollment ratios (78.4 % for male and 81.0 % for female) are shown in Chakaria Upazila, significantly lower values than the average enrollment ratios in Cox's Bazar District (60.4 % for male and 65.2 % for female) are shown in Moheshkhali Upazila, which indicates a certain correlation with the above mentioned literacy rate. Moreover, comparing the enrollment ratio of male children aged 6 to 10 and those aged 11 to 14, they decreases drastically from 60.4% to 51.2% (while female increases), which is understood as a consequence of starting work.

Table 4.2-8 Distribution of Population aged 3-14 years by Age groups, School attendance (in 2011)

Administrative Unit	Population aged 6-10 years				Population aged 11-14 years			
	Attending school		Not attending school		Attending school		Not attending school	
	Male	Female	Male	Female	Male	Female	Male	Female
Cox's Bazar District	**70.1%**	**73.0%**	**29.9%**	**27.0%**	**62.9%**	**73.9%**	**37.1%**	**26.1%**
Moheshkhali Upazila	**60.4%**	**65.2%**	**39.6%**	**34.8%**	**51.2%**	**72.8%**	**48.8%**	**27.2%**
Dhalghata Union	61.1%	67.4%	38.9%	32.6%	47.1%	78.1%	52.9%	21.9%
Kalarmarchara Union	64.7%	70.8%	35.3%	29.2%	54.3%	77.4%	45.7%	22.6%
Chakaria Upazila	**78.4%**	**81.0%**	**21.6%**	**19.0%**	**71.2%**	**83.7%**	**28.8%**	**16.3%**
Badarkhali Union	70.7%	74.4%	29.3%	25.6%	64.1%	83.9%	35.9%	16.1%
Saharbil Union	86.5%	87.1%	13.5%	12.9%	71.0%	88.9%	29.0%	11.1%
Chiringa Union	77.2%	80.7%	22.8%	19.3%	70.9%	82.3%	29.1%	17.7%
Fasiakhali Union	78.5%	80.1%	21.5%	19.9%	71.3%	82.9%	28.7%	17.1%

Source: BBS "Population & Housing Census -2011 Community Report : Cox's Bazar"

3) Industries

In Cox's Bazar District, 49.7% nearly half of the total population engages agriculture. It is followed by service industry at approximately 40 % and manufacturing industry stays at less than 10 %.

Table 4.2-9 Industry of the Project Area (in 2011)

Administrative Unit	Employed population			
	Total	Agriculture	Industry	Service
Cox's Bazar District	603,046	299,765	47,163	256,118
		49.7%	7.8%	42.5%

Source: BBS "Population & Housing Census -2011 Community Report : Cox's Bazar"

The economy of Cox's Bazar is predominantly agricultural, including local and HYV rice, wheat, vegetables, spices, cash crops, pulses, betel leaves and others. Various fruits like banana, jackfruit, guava, coconut, etc. are grown. Fish of different varieties abound in this district which enjoys the advantages of marine fishing. Moreover, varieties of fish are caught from rivers, tributary channels and creeks and even from paddy field during rainy season. Prawn is abundantly available in the district. Prawn farming and salt production in the coastal area of the district are the most important economic activities of the area. Dry fish is an important source of income to the fishermen especially in the islands. The district is also very rich in forest resources. Various valuable timber and forest trees are abundantly grown in this district. Apart from all these, the sea beach of Cox's Bazar is the most attractive place in the country to the tourists who like to visit the place throughout the year.

4) Monthly Income of the Household

In the table below income pattern of the household is shown. According to "Data Collection Survey on the Matarbari Port Development in the People's Republic of Bangladesh" conducted in 2017, income of 100 households, more than 40% of entire households is below Tk.15,000. According to BBS, approximately 30% of entire households is regarded as poverty in Cox Bazar, while 40% is regarded as poverty in Moheshkhali.

Table 4.2-10 Average Monthly Income of the household Income (in 2017)

Income Level	No. of Household	%
Tk. 1000 - Tk. 5000	0	0.00
> Tk. 5000 - Tk. 10000	19	19.00
> Tk. 10000 - Tk. 15000	21	21.00
> Tk. 15000 - Tk. 20000	15	15.00
> Tk. 20000 - Tk. 25000	17	17.00
Tk. Above 25000	28	28.00
Total:	**100**	**100.00**

Source: Data Collection Survey on the Matarbari Port Development in the People's Republic of Bangladesh, 2017

Table 4.2-11 Households below Poverty Line (in 2010)

Administrative Unit	below Upper Poverty Line	below Lower Poverty Line
Cox's Bazar District	16.2%	32.7%
Moheshkhali Upazila	21.4%	40.2%
Chakaria Upazila	13.2%	28.5%

(Note) Poverty line is based on basic needs cost.
Source: BBS "Bangladesh Poverty Maps (Zila Upazila) – 2010"

5) Type of Structure and Housing Tenancy

In Cox's Bazar District, 6.2% general household live in pucca house made of solid and permanent materials, 11.6% in semi-pucca house made of solid and natural materials, 68.9% in kutcha house made of natural material and the remaining 13.3% live in jhupri, made of temporary materials.

In Moheshkhali Upazila, 2.8% general household live in pucca house, 5.8% in semi-pucca house, 77.9% in kutcha house and the remaining 13.5% live in jhupr; ratio of kutcha house made of natural material is relatively high. In Dhalghata Union where the port is planned, ratio of Jhupri made of temporary material is prominently high, exceeding 80%.

In Chakaria Upazila, 6.5% general household live in pucca house, 11.9% in semi-pucca house, 70.1 % in kutcha house and the remaining 11.5% live in jhupri; almost consistence with tendency of whole Cox's Bazar district.

Table 4.2-12 Percentage Distribution of Households by Type of Structure and Housing Tenancy Status (in 2011)

Administrative Unit	Type of Structure (%)				Housing Tenancy (%)		
	Pucka	Semi-pucka	Kutcha	Jhupri	Owned	Rented	Rent free
Cox's Bazar Zila	**6.2**	**11.6**	**68.9**	**13.3**	**88.4**	**6.2**	**5.4**
Moheshkhali Upazila	**2.8**	**5.8**	**77.9**	**13.5**	**90.5**	**1.3**	**8.2**
Dhalghata Union	0.5	0.8	16.0	82.7	98.4	0.6	1.0
Kalarmarchara Union	2.6	5.3	80.5	11.6	95.2	0.9	3.9
Chakaria Upazila	**6.5**	**11.9**	**70.1**	**11.5**	**91.9**	**4.2**	**3.9**
Badarkhali Union	5.3	10.9	64.9	18.9	95.2	4.2	0.6
Saharbil Union	6.3	13.6	66.5	13.6	97.7	1.6	0.6
Chiringa Union	4.6	13.5	72.1	9.8	98.9	0.2	0.9
Fasiakhali Union	2.9	13.4	63.4	20.3	97.4	1.3	1.2

Note: *Pucka*: Made of solid and permanent materials such as brick and concrete, etc.
Semi-pucka: Made of mix with solid and natural materials such as steel houses, wooden houses, etc.
Kutcha: Made of totally natural materials such as bamboo houses, mud houses, jute stick and catkingrass houses, etc.
Jhupri: Made of temporary materials. Often called 'shanties'.
Source: BBS "Bangladesh Poverty Maps (Zila Upazila) – 2010"

6) Toilet Facility, Source of Drinking Water and Electricity Connection

In Cox's Bazar District, 14.3% general household use sanitary latrine, 37.6 % non-sanitary latrine and the remaining 36.5% have no toilet facility. 88.4% general household get the facility of drinking water from tube-well, 2.3% from tap and the remaining 9.3 % household get water from other sources. A total of only 32.1% general household reported to have electricity connection in the entire upazila in 2011.

In Moheshkhali Upazila, 28.0% general household use sanitary latrine, 52.1 % non-sanitary latrine and the remaining 19.9% have no toilet facility; ratio of households with non-sanitary latrine and no toilets is higher than whole Cox's Bazar. 89.5% general household get the facility of drinking water from tube-well, 0.4% from tap and the remaining 10.1 % household get water from other sources. All the 8 unions of the upazila have brought under the Rural Electrification Program. However, a total of only 25.6% general household reported to have electricity connection in the entire upazila in 2011 as against 13.3% in 2001. In Dhalghata Union, ratio of households with non-sanitary toilet, using tube-well, and without electricity connection is prominently high.

In Chakaria Upazila, 56.2% general household use sanitary latrine,3 7.7% non-sanitary latrine and the remaining 6.1 % have no toilet facility. 90.8% general household get the facility of drinking water from tube-well, 1.4% from tap and the remaining 7.8% household get water from other sources. All

the 18 unions of the upazila have brought under the Rural Electrification Program. However, a total of only 37.3% general household reported to have electricity connection in the entire upazila in 2011 as against 12.4% in 2001.

Table 4.2-13 Percentage Distribution of Households by Toilet Facility, Source of Drinking Water and Electricity Connection (in 2011)

Administrative Unit	Toilet Facility (%)				Source of Drinking Water (%)			Electricity Connection (%)
	Sanitary (water -sealed)	Sanitary (non water-sealed)	Non-sanitary	None	Tap	Tube-Well	Other	
Cox's Bazar Zila	**14.3**	**37.6**	**36.5**	**11.6**	**2.3**	**88.4**	**9.3**	**32.1**
Moheshkhali Upazila	**3.4**	**24.6**	**52.1**	**19.9**	**0.4**	**89.5**	**10.1**	**25.6**
Dhalghata Union	1.4	21.7	69.6	7.3	0.5	92.3	7.2	18.4
Kalarmarchara Union	1.5	16.3	60.4	21.8	0.2	82.7	17.1	22.2
Chakaria Upazila	**11.5**	**44.7**	**37.7**	**6.1**	**1.4**	**90.8**	**7.9**	**37.3**
Badarkhali Union	6.5	36.5	51.4	5.6	0.0	97.2	2.8	23.1
Saharbil Union	2.5	54.5	38.5	4.6	0.2	91.3	8.5	40.9
Chiringa Union	7.2	38.5	49.6	4.7	1.0	85.6	13.4	16.6
Fasiakhali Union	5.9	45.0	43.9	5.2	0.4	90.7	8.9	45.2

Source: BBS "Population & Housing Census -2011 Community Report : Cox's Bazar"

(3) Cultural Heritages

There is no World Heritage Site registered by UNESCO in Cox's Bazar District. As for the sites of cultural and historical importance, there is Adinath Temple, a Hindu temple located in the south of Moheshkhali Upazila, which is approximately 20 km apart from the project area.

4.3 Environmental and Social Consideration Laws and Institutions

4.3.1 Laws and Standards related to Environmental and Social Considerations

(1) Laws and Standards

1) National Conservation Strategy (NCS) 1992

In 1987, the National Conservation Strategy (NCS) was formulated by the Bangladesh Agricultural Research Council in cooperation with the IUCN. The NCS was drafted in late 1991 and submitted to the government in early 1992. It aims to:

- assess the usage patterns of natural resources and the future needs and possibilities of major development activities to set a feasible and sustainable strategy to conserve limited natural resources; and
- reconcile development and the environment to ensure the sustainable use of resources, species and ecosystems in the future. In particular, it underlines the importance of ecosystems in coastal areas, hilly forests and the Sundarban wetland.

2) National Environmental Management Action Plan (NEMAP) 1995

The NEMAP is a wide ranging and multi-faceted plan, which builds on and extends the statements set out in the national environmental policy. NEMAP was developed to address issues and management requirements for a period from 1995 to 2005 and sets out the framework within which the

recommendations of the NCS are to be implemented.
NEMAP has the broad objectives of:

- Identification of key environmental issues affecting Bangladesh;
- Identification of actions necessary to halt or reduce the rate of environmental degradation;
- Improvement of the natural and built environment;
- Conservation of habitats and biodiversity;
- Promotion of sustainable development; and
- Improvement in the quality of life of the people.

To attain the above-mentioned objectives, the plan groups all the relevant necessary actions under four headings, namely: institutional, sectoral, location-specific and long-term issues.
The institutional aspects reflect the need of inter sectoral cooperation to tackle environmental problems which need new and appropriate institutional mechanisms at national and local levels. The sectoral action reflects the way the ministries and agencies are organized and makes it easier to identify the agency to carry out the recommended actions. The location-specific action focuses particularly on acute environmental problems at local levels that need to be addressed on a priority basis. The long-term actions include environmental degradation to such degree that might become even more serious and threatening, if cognizance is not taken immediately.
One of the key issues in NEMAP regarding the energy sector has been that "energy conservation awareness is generally low throughout the country". NEMAP did not recognize mineral resources as an important sector and there is no separate discussion on this.

3) Seventh Five-Year Plan (2016-2020)

This is the last five-year plan of the country. The PSMP 2010 includes coal-fired power plant projects (both domestic and imported) totaling around 20,000 MW. Given the present status of domestic coal, the implementation of these projects will require imported coal for fuel. The total coal requirement would be approximately 60 million ton per year. Handling this massive volume of coal import will require huge port, rail transport and coal stocking infrastructure. However, so far there is only one on-going deep-sea port project in Matarbari island which will be able to cater ships having 80,000 tons capacity. This is currently dedicated for Matarbari Ultra Super Critical Coal-fired Power Plant, one of the six national high prioritized projects under Prime Minister's direct supervision. In the near future, however, the Government intends to expand this deep-sea port and develop a coal Centre as "An Energy Hub" for the whole country. The coal Centre will be carried out through PPP (Public Private Partnership) scheme.
The development of port facilities for coal imports will be given top priority in order to support the power generation plan. The 1200 MW Matarbari Ultra Super Critical Coal-fired Power Plant project funded by Government of Japan contains the important component: the deep-sea port for the coal import, which will provide the opportunity for generation companies planning to develop the coal-fired power plants to procure the international coal in relatively cheaper price compare to the individual purchased coal from foreign countries. JICA is also examining the possibility to set up the large coal transshipment terminal at the Matarbari port to cater the demand of nearly 3,500MW of power generation by 2020. The Matarbari deep sea port and the associated transshipment terminal are

critically linked to the Government's successful implementation of the power generation plan and would have the highest priority in the public investment Programme for transport infrastructure during the Seventh Plan.

The present Seventh Plan's articulation of a sustainable development strategy involves a large array of actions under three key themes: (i) Climate Change Management and Resilience (comprised of adaptation and mitigation) (ii) Environmental Management; and (iii) Disaster Management. These actions are aligned with the overall framework and strategies of National Sustainable Development Strategy (NSDS) and are broadly consistent with the scope of the post-2015 Sustainable Development Goals (SDGs). Some of the objectives and activities that were considered under the Sixth Plan but were not addressed or implemented have also found consideration under Seventh Plan, provided they have an instrumental role in aiding the key objectives of the Plan. This chapter is focused on Climate Change Management and Resilience and Environmental Management mostly. The detail of Disaster Management is discussed in Chapter 14 of Part 2 as the Ministry of Disaster Management and Relief is within the purview of Social Welfare and Security sector.

SEA issues are articulated in the 7th Five Year Plan at Sector 8: Environment and Climate Change, Chapter 8-Sustainable Development: Environment and Climate Change (Page(s)-485-486), and 8.6 Internal Environment Management. SEA Activities are proposed under 7th Five Year Plan for Environment Management such as in Issue 3: Strengthening EIA system as environment management Tool. Under ECA'95, EIA has been accepted as a mandatory tool to identify and predict impacts and undertake proper mitigation measures in a project scale. There is another concern that, most of the developing Ministries and agencies escape the process. There is also a need for introducing strategic EIA as a planning tool for sectoral level planning.

- Strengthening the EIA processing & implementation through institutional capacity building.
- Issuance of location clearance after approval of EIA report for Red category projects.
- No land development activity to take place prior to environment clearance.
- Gazetting and publicizing EIA guidance manual & sectoral EIA guideline prepared.
- Enlistment of competent EIA consulting firms by the DoE for conducting EIA.
- Immediate framing of detailed rules on EIA as mandated in section 12 of BECA
- Strategic EIA/SEA for all sectoral planning including for exclusive economic zones.
- Achieving compliance to EIA practices by all development Ministries & agencies.
- Public consultation on EIA report of Red category projects

4) National Forest Policy (NFP) (1994)

The NFP of 1994 is the amended and revised version of the NFP of 1977 in the light of the National Forestry Master Plan (NFMP). The major target of the policy is to conserve the existing forest areas and bring about 20% of the country's land area under the forestation program and increase the reserve forest land by 10% by the year 2015 through coordinated efforts of governmental-NGOs and active participation of the people.

Amendments of the existing laws (acts, rules and regulations) relating to the forestry sector and

creation of new laws for sectoral activities have been recognized as important conditions for achieving the policy goals and objectives. The forestry policy also recognizes the importance of fulfilling the responsibilities and commitments under International Conventions, Treaties and Protocols (ICTPs).

5) The Bangladesh Forestry Act 1927

The Bangladesh Forestry Act (BFA) of 1927 provides for reserving forests over which the government has an acquired property right. This act has made many types of unauthorized uses or destruction of forest produce punishable. The government may assign any village community its right to or over any land, which constitutes a reserved forest.

Other Forest Acts

The supplementary rules of 1959 empower the concerned governmental bodies to restrict totally and for a specified period, the shooting, hunting or catching of various birds, animals and reptiles in the controlled and vested forests. The private forest ordinance of 1959 provides for the conservation of private forests and for the forestation, in certain cases, of wastelands in Bangladesh.

6) National Industrial Policy (1999)

The National Industrial Policy (NIP)of 1999 aims to ensure a high rate of investment by the public and private sectors, a strong productive sector, direct foreign investment, development of labour intensive industries, introduction of new appropriate technology, women's participation, development of small and cottage industries, entrepreneurship development, high growth of export, infrastructure development and environmentally sound industrial development.

World Trade Organization (WTO) guidelines were proposed to be followed in the NIP. Guidelines for mitigating eventual conflicts of intellectual property rights are absent in the policy document. No specific guidelines are given for sustainable extraction and utilization of raw materials for different industries.

One of the 17 objectives of the policy (Section 2.12; Chapter II) is "To ensure a process of industrialization which is environmentally sound and consistent with the resource endowment of the country". However, none of the 24 strategies of the policy relate to the environment.

This Project under consideration fulfils entirely the requirements and objectives of this policy.

7) National Water Policy (1999)

The National Water Policy (NWP) of 1999 was passed to ensure efficient and equitable management of water resources, proper harnessing and development of surface and ground water, availability of water to all concerned and institutional capacity building for water resource management. It has also addressed issues like river basin management, water rights and allocation, public and private investment, water supply and sanitation and water need for agriculture, industry, fisheries, wildlife, navigation, recreation, environment, preservation of wetlands, etc.

The NWP, however, fails to address issues like consequences of trans-boundary water disputes and watershed management.

8) National Tourism Policy (1992)

One of the aims of the National Tourism Policy (NTP) of 1992statement is "Development of tourism resources of the country and their maintenance". Two special sections of the policy focus on 'archaeological and historical sites' and 'conservation of wildlife'.

9) National Energy Policy (1995)

The National Energy Policy (NEP) of 1995 provides for utilization of energy for sustainable economic growth, supply to different zones of the country, development of the indigenous energy sources and environmentally sounds sustainable energy development programs. The NEP highlights the importance of protecting the environment by requiring an EIA for any new energy development project and introducing economically viable and environmentally friendly technology.

One of the seven objectives (Section 1.2) addresses the environment and states, "(vi) to ensure environmentally sound sustainable energy development programs causing minimum damage to the environment".

Seven specific policy recommendations are listed under Chapter 1.9. Of those, the following three are relevant to the present Project:

- Environmental impact assessment should be made mandatory and should constitute an integral part of any new energy development project;
- Use of economically viable environment friendly technology is to be promoted; and
- Public awareness is to be promoted regarding environmental conservation.

10) Bangladesh National Environmental Policy (1992)

Bangladesh National Environmental Policy (BNEP) of 1992 sets out the basic framework for environmental action, together with a set of broad sectoral action guidelines. The BNEP provides the broader framework of sustainable development in the country. It also states that all major undertakings, which will have a bearing on the environment, (including setting up of an industrial establishment) must undertake an IEE / EIA before they initiate the Project.

The BNEP delineates the DoE, as the approving agency for all such IEE / EIA's to be undertaken in the country.

Policies of fifteen sectors are described in the BNEP. Under the energy and fuel sector, the use of fuel that has the least environmental impact is encouraged in Section 3.4.1. conservation of fossil fuel is stressed in Section 3.4.5 and the need for conducting EIA's before implementation of projects for fuel and mineral resources is stressed in Section 3.4.6.

Under the Environmental Action Plan (EAP) Section of the BNEP and sub-section 'Fuel and Energy', it is suggested that:

- The use of gas, coal, kerosene and petrol as fuel will be expanded in the rural areas, so that fuel wood, agricultural residues, and cow dung is conserved. This will help the use of agricultural residues, and cow dung etc. as manure; and
- Appropriate measures will be taken to ensure that extraction; distribution and use of natural resources such as oil, gas, coal, peat etc. do not adversely affect air, water, land, the hydrological balance and the ecosystem.

Section 3.7 "Forest, Wildlife and Biodiversity" requires:

- Conserve wildlife and biodiversity strengthen related research and help dissemination and exchange of knowledge in these areas; and
- Conserve and develop wetlands and protection of migratory birds.

11) Bangladesh National Environmental Policy (2017)

National Environmental Policy-2017 has been placed to the Honorable Prime Minister for Approval. This policy has stated the following points regarding the SEA.

- All the fields required confirmation of the execution of Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA)
- Environmental Policy
    - Land Resources Management
        - Ecosystem and Regional-Ecosystem based land zoning have to be planned and Regional-Ecosystem based SEA execution should be ensured.
    - Organizational Set-up
        - Relevant all ministries and offices shall formulate SEA on their sectoral policy, plan and program.
    - National Environment Policy Compliance
        - Accommodation, Housing and Urbanization
            - EIA and SEA should be carried out before formulation of all National Regional Projects and Master Plan proposed for housing and urbanization
            - For the separation of residential, commercial and industrial areas, the zoning should be made through SEA. Preparation and implementation of environmentally-friendly and regional urban planning.
            - In order to set up industrial establishments in a planned manner, SEA guided land zoning would be required for building the subject based industrial Area. Restricted establishment of industrial factories in residential areas and Transfer existing industrial factories of the residential areas to the scheduled areas.

12) Bangladesh Wildlife Preservation Act (1973; Amended in 1974)

The Bangladesh Wildlife Preservation Act (BWPA) of 1973 provides for the preservation, conservation and management of wildlife in Bangladesh. The earlier laws on wildlife preservation, namely, the elephant preservation act of 1879, the wild bird and animal's protection act of 1912, and the rhinoceros preservation act of 1932 have been repealed and their provisions have been suitably incorporated in the BWPA.

The BWPA encompasses a range of different activities including hunting and fishing although the provisions of greatest significance relate to the establishment of national parks, wildlife sanctuaries and game reserves by the MoEF. Such designations have enormous significance for the types of developments that may take place.

This legislation does not provide scope for creation of a strong organization, which can adopt appropriate measures to protect wildlife. The importance of wildlife could have been highlighted in the legislation, which it does not do. Punitive provisions are not readily usable. The types of endangered and ecologically valuable animals/birds could have been highlighted in the legislation. It should have asked for active participation and specific action from local administration to protect wildlife. It also does not prescribe seasons when certain animal/birds cannot be hunted or captured.

An executive order issued in June 1998, in relation to the Bangladesh Wildlife Preservation Order (BWPO) of 1973 has imposed a ban for the next five years on hunting of any form of wildlife.

13) Environmental Conservation Act (1995, Amended in 2000, 2002 and as amended till October 5,

2010)

The Bangladesh Environment Conservation Act (ECA) of 1995 is currently the main legislation in relation to environment protection in Bangladesh. The ECA is promulgated for environment conservation, environmental standards development and environment pollution control and abatement. It has repealed the environment pollution control ordinance of 1977.

The main objectives of ECA are:

Conservation and improvement of the environment; and

- Control and mitigation of pollution of the environment.

The main strategies of the ECA can be summarized as:

- Declaration of ecologically critical areas and restriction on the operations and processes, which can or cannot be carried/initiated in the ecologically critical areas;
- Regulations in respect of vehicles emitting smoke harmful for the environment;
- Environmental clearance;
- Regulation of the industries and other development activities' discharge permits;
- Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes;
- Promulgation of a standard limit for discharging and emitting waste; and
- Formulation and declaration of environmental guidelines.

Before any new project can go ahead, as stipulated under the rules, the project promoter must obtain environmental clearance from the DG. An appeal procedure does exist for those promoters who fail to obtain clearance. Failure to comply with any part of this Act may result in punishment to a maximum of 3 years imprisonment or a maximum fine of Tk. 300,000 or both. The DoE executes the ECA under the leadership of the DG.

The amendments (2000, 2002 and as amended till October 5, 2010) of the ECA focus on:

- Ascertaining responsibility for compensation in cases of damage to ecosystems;
- Increased provision of punitive measures both for fines and imprisonment; Fixing authority on cognizance of offences;
- Restriction on polluting automobiles;
- Restriction on the sale and production of environmentally harmful items like polythene bags;
- Assistance from law enforcement agencies for environmental actions; and
- Break up of punitive measures and (5) authority to try environmental cases.

14) Environmental Conservation Rules (1997)

These are the first set of rules, promulgated under the ECA of 1995 (so far there have been three amendments to this set of rules - February and August 2002 and April 2003). The Environment Conservation Rules (ECR) of 1997 has provided categorization of industries and projects and identified types of environmental assessments needed against respective categories of industries or projects.

Among other things, these rules set (i) the National Environmental Quality Standards for ambient air, various types of water, industrial effluent, emission, noise, vehicular exhaust etc., (ii) the requirement for and procedures to obtain environmental clearance, and (iii) the requirement for IEE/ EIA's according to categories of industrial and other development interventions.

The Rules are not explicit for various oil and gas exploration interventions. Rather, this is covered under the broader heading of "exploration, extraction and distribution of mineral resources" under the Red Category projects.

The proposed Project, according to the DoE, is considered under the Red Category of the ECR (Item 65: Exploration, extraction and distribution of mineral resources) [Page 3122 of the Bangladesh Gazette of 28 August 1997].

(2) International Treaty related to this project

Regarding the Marpol Treaty, all of I to VI have been concluded by 1983-2005. This Convention is to be managed by the Ministry of Shipping. CPA has been managing marine pollution by the Article 41B of the CPA Ordinance (Chittagong Port Authority Ordinance) 1976 before the conclusion of the treaty. According to this ordinance, fines that will cause water bodies and pollution of ports shall be punished by minor fines of a total of 100,000 takas. This penalty is suitable for preventing small scale violations, but because the prevention of large scale oil pollution is not appropriate, the Ministry of Shipping will manage it under the Marpol Treaty.
Concerning ocean dumping, it is a non-signatory state of the London Dumping Convention and relevant national regulations (Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972, and the Amendments Adopted in 1978 and 1980) . The ocean dumping is managed by DoE. CPA is conducting ballast water management under the aforementioned CPA ordinance. The country has signed the IMO Ballast Water Management Convention in 2017 and manages the ballast water of ships according to the criteria prescribed in this.
This Convention is managed by Mercantile Marine Department, a marine mercantile ship marine vessel in Chittagong (a subordinate office of Shipping ministry that manages ship operations under the marine and coastal shipping rules of maritime vessels since 1983).
Ships are required to have methods to kill harmful aquatic organisms and pathogens contained in ballast water, mainly by approved ballast water treatment equipment. Specifically, it is the following two criteria.

Regulation D-1 Ballast Water Exchange Standard - The D-1 standard requires ships to conduct an exchange of ballast water such that at least 95% of water by volume is exchanged far away from the coast.
(Before 2017: ships to exchange their ballast water in open seas, away from coastal areas. Ideally, this means at least 200 nautical miles from land and in water at least 200 metres deep. By doing this, fewer organisms will survive and so ships will be less likely to introduce potentially harmful species when they release the ballast water.)

Regulation D-2 Ballast Water Performance Standard – The D-2 standard specifies that ships can only discharge ballast water that meets the
following criteria
 less than 10 viable organisms per cubic metre which are greater than or equal to 50 micrometres in minimum dimension;
 less than 10 viable organisms per millilitre which are between 10 micrometres and 50 micrometres in minimum dimension;
 less than 1 colony-forming unit (cfu) per 100 mililitres of Toxicogenic Vibrio cholerae;
 less than 250 cfu per 100 millilitres of Escherichia coli; and
 less than 100 cfu per 100 milliliters of Intestinal Enterococci.
(Ships conducting ballast water management shall discharge less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension and less than 10 viable

organisms per milliliter less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations.)

Table 4.3-1 Project Relevant International Treaties and Conventions

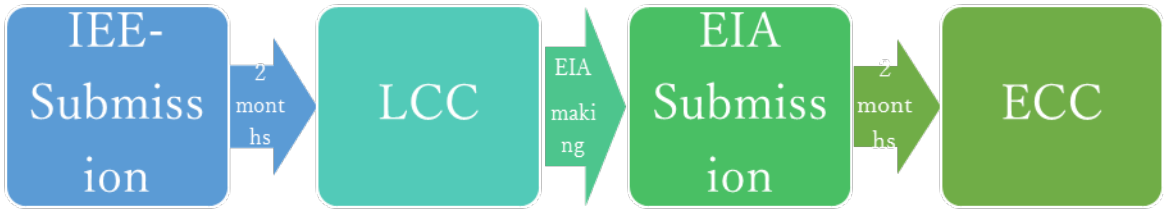
Environment related International convention and Treaties	Status
International Plant Protection Convention (Rome, 1951.)	01.09.78 (ratified)
International Convention for the Prevention of Pollution of the Sea by Oil (London, 1954 (as amended on 11 April 1962 and 21 October 1969.)	28.12.81 (entry into force)
Plant Protection Agreement for the South East Asia and Pacific Region (as amended) (Rome, 1956.)	04.12.74 (accessed) (entry into force)
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Brussels, 1969.)	04.02.82 (entry into force)
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971) ("Ramsar Convention").	20.04.92 (ratified)
Convention Concerning the Protection of the World Cultural and natural Heritage (Paris, 1972.)	03.08.83 (accepted)03.11.83 (ratified)
Convention on International Trade in Endangered Species of Wild Fauna and flora (Washington, 1973.) ("CITES Convention")	18.02.82 (ratified)
United Nations Convention on the Law of the Sea (Montego Bay, 1982.)	10.12.82 (ratified)
Vienna Convention for the Protection of the Ozone Layer (Vienna, 1985.)	02.08.90 (accessed) 31.10.90 (entry into force)
Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal 1987.)	02.08.90 31.10.90 (accessed) (entry into force)
London Amendment to the Montreal Protocol on substances that Deplete the Ozone Layer (London, 1990)	18.03.94 (accessed) 16.06.94 (entry into force)
Copenhagen Amendment to the Montreal protocol on Substances that Deplete the Ozone Layer, Copenhagen, 1992	27.11.2000 (accepted) 26.2.2001 (entry into force)
Montreal Amendment of the Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1997	27.7.2001 (Accepted) 26.10.2001 (Entry into force)
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel, 1989.)	01.04.93 (accessed)
International Convention on Oil Pollution Preparedness, Response and Cooperation (London, 1990.)	30.11.90 (signed) In the process of ratification
United Nations Framework Convention on Climate Change, (New York, 1992.)	09.06.92 (signed) 15.04.94 (ratified)
Convention on Biological Diversity, (Rio De Janeiro, 1992.)	05.06.92 (signed) 03.05.94 (ratified)
International Convention to Combat Desertification, (Paris 1994.)	14.10.94 (signed) 26.01.1996 (ratification) 26.12.1996 (entry into force)
Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, (Geneva, 1976.)	03.10.79 (accessed) (entry into force)
Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (New York, 1994.)	28.07.96 (signed)
Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (Paris, 1993.)	14.01.93 (signed)
Convention on persistent Organic Pollutants, Stockholm	23.5.2001 (signed) 12.03.2007 (ratified)
Kyoto protocol to the United Nations Framework Convention on Climate Change	21.8.2001 (accessed)
International Convention for the Prevention of Pollution from Ships (MARPOL)	Adoption: 1973 (Convention), 1978 (1978 Protocol), 1997 (Protocol - Annex VI); Entry into force: 2 October 1983 (Annexes I and II)
Ballast Water Management Convention	2017

Source: DOE

(3) Environmental Clearance

According to Environmental Conservation Regulation (ECR) Article 7 (4), regarding the industries and projects that belong to the categories of Orange A, Orange B, and Red, firstly the location clearance certificate (LCC) is issued, then the Environmental Clearance Certificate (ECC) should be issued. Submission of IEE is required to obtain this location clearance. In addition, EIA submission is required to obtain environmental clearance certificate (ECC). IEE and EIA must be submitted to DoE and approval process takes time. In the port project., IEE exemption application was submitted by CPA in the late November of 2017 and approved in January 2018. In February 2018, and the road portion was submitted to DoE by RHD for IEE exemption application and it was approved in March 2018.

Regarding the IEE exemption procedure, it is described again in Article 7 (4). However, if the Director of the Environment Bureau thinks that it is appropriate to issue a certificate of location clearance when applying for projects, firstly it states that the ECC can be issued without issuing an LCC (location clearance certificate), which means that EIA can be pursued without submitting IEE. Below is the diagram of procedures for IEE and IEE exemption. Approvals of IEE and EIA take about two months each, but if IEE exemption is done, it is possible to speed up the process.



Or

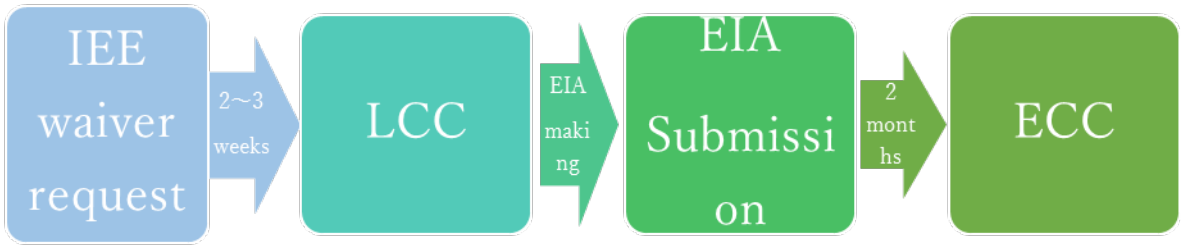


Figure 4.3-1 Process image to acquire Environmental Clearance Certificate in Bangladesh

Source: JICA Survey Team based on ECR and local hearings

Table 4.3-2 Gaps between Relevant Regulations in Bangladesh and JICA Guidelines considering Environmental Assessment (EA)

Sl. No.	Features	JICA Guidelines	Government Laws	Gaps
1.	Objectives	To ensure transparency, predictability, and accountability in its support for an examination of Environmental and social considerations.	To make decisions in respect to the following: i) Whether site clearance could be given to the project, given the residual significant project impacts on the various environmental components (physical, biological, and socio-economic); and, ii) Which conditions may be prescribed for compliance by the project proponents during design, construction, and operation of the project.	The governmental laws pay less attention to transparency, predictability, and accountability. Because the EIA is conducted within the framework of the Environmental Clearance Certificate (ECC), the EIA tends to be accepted due to its consistency with the ECC.
2.	Procedure of EA	JICA supports and examines appropriate environmental and social considerations undertaken by project proponents etc. to avoid or minimize development projects' impacts on the environment and local communities, and to prevent the occurrence of unacceptable adverse impacts. (1.4).	An EIA is conducted within the framework of the Environmental Clearance Certificate (ECC). The project proponent's application of ECC initiates the EA process.	Although overt classification used to screen the development projects exists, the procedure of EA is relatively vague because it is conducted within the framework of ECC issuance.
3.	Criteria of EA	"Environmental and social considerations" means considering environmental impacts including air, water, soil, ecosystem, flora, and fauna, as well as social impacts including involuntary resettlement, respect for the human rights of indigenous people, and so on.(1.3.1) JICA confirms that projects comply with the laws or standards related to the environment and local communities in the central and local governments of host countries; it also confirms that projects conform to those governments' policies and plans on the environment and local communities. (2.6.2) JICA confirms that projects do not deviate significantly from the World Bank's Safeguard Policies, and refers as a benchmark to the standards of international financial organizations; to internationally recognized standards, or international standards, treaties, and declarations, etc.; and to the good practices etc. of developed nations including Japan, when appropriate. (2.6.3)	i) Are the beneficial and adverse impacts properly explained? ii) What are the risks (probability of occurrence and magnitude of consequences) of adverse impacts; are they properly evaluated? iii) What impacts would the project have on environmentally sensitive areas, endangered species and their habitats, and recreational as well as aesthetic areas? iv) Is the "No Project" scenario acceptable? v) Are any of the alternative sites that are suggested in the report considered suitable from an environmental angle, though it may increase the cost of the project? vi) Did similar projects implemented earlier cause significant adverse impacts and, if so, have the present proposals incorporated adequate measures to minimize adverse impacts at the proposed site? vii) Which are the unavoidable adverse impacts? viii) Are the concerns expressed by likely affected people	Less focus is placed on social consideration.

Sl. No.	Features	JICA Guidelines	Government Laws	Gaps
			genuine, and has the EIA/Initial Environmental Examination (IEE) project addressed these concerns adequately? ix) Are the mitigation measures, as proposed, reasonably feasible, and are they likely to be implemented (particularly those which have to be implemented during the operational phase)? x) What are the parameters that need to be monitored during project construction and operation so that the state of the environment can be studied throughout the project life?	
4.	EA Instruments	JICA conducts an environmental review in accordance with the project category, and refers to the corresponding environmental checklists for each sector when conducting that review as appropriate.	The required documents include: feasibility report, IEE report, EIA report, Environmental Management Plan (EMP), No Objection Certificates (NOC), emergency plan, and relocation/rehabilitation plan.	No significant gaps were identified between JICA Guidelines and governmental laws.
5.	Environmental Screening	Category A: Project proponents etc. must submit EIA reports. JICA publishes the status of host countries' submission of major documents on environmental and social considerations on its website. Prior to its environmental review, JICA also discloses the following: (1) EIA reports and environmental permit certifications, (2) RAPs for projects that will result in large-scale involuntary resettlement, and (3) IPPs for projects that address issues of indigenous people. Specifically, JICA discloses EIA reports 120 days prior to concluding agreement documents. JICA undertakes its environmental reviews based on the EIA and other documents submitted by project proponents etc. Category B: The scope of environmental reviews for Category B projects may vary from project to project, but it is narrower than that of Category A projects. JICA discloses the following: (1) EIA reports and environmental permit certifications, (2) RAPs for projects, and (3) IPPs for projects that will require measures for indigenous people, when these documents are submitted by project proponents etc. Category C: For projects in this category, environmental review will not	Industrial projects have been divided into four categories: Green, Orange-A, Orange-B, and Red, according to the environmental significance and the location of proposed development. Green projects do not require either an IEE or an EIA. At the other extreme are the Red category projects, for which both IEE and EIA are necessary.	The category equivalent to the JICA's FI Category does not exist in governmental legislation.

Sl. No.	Features	JICA Guidelines	Government Laws	Gaps
		proceed after categorization. Category FI: JICA examines the related financial intermediary or executing agency to see whether appropriate environmental and social considerations as stated in the guidelines are ensured for projects in this category.		
6.	EA for Special Project Types	JICA examines the related financial intermediary or executing agency to see whether appropriate environmental and social considerations as stated in the guidelines are ensured for projects in this category. JICA also examines institutional capacity in order to confirm environmental and social considerations of the financial intermediary or executing agency, and, if necessary, requires that adequate measures be taken to strengthen capacity. The financial intermediary or executing agency examines the potential positive and negative environmental impacts of sub-projects and takes the necessary measures to avoid, minimize, mitigate, or compensate for potential negative impacts, as well as measures to promote positive impacts if any such measures are available. (3.2.1(4)) Measures Taken in an Emergency. In an emergency-which means a case that must be dealt with immediately, such as restoration after natural disasters or post-conflict restoration-when it is clear that there is no time to follow the procedures of environmental and social considerations mentioned in the guidelines, JICA reports at an early stage to the Advisory Committee for Environmental and Social Considerations on categorization, judgment of emergency, and procedures to follow, and discloses a result. JICA asks advice from the Advisory Committee when it is necessary.	No specification	No specification is identified under Bangladeshi law.
7.	Institutional Capacity	JICA provides support for and examinations of the environmental and social considerations that project proponents etc. implement in accordance with Sections 2 and 3 of the guidelines, depending on the nature of cooperation projects. (1.5)	Department of Environment (DOE) has the responsibility of conducting EA within the frame of an ECC issuance.	No indication of request for external resources has been noted in the Governmental Laws.

Sl. No.	Features	JICA Guidelines	Government Laws	Gaps
8.	Public Consultation	Project proponents etc. consult with local stakeholders through means that induce broad public participation to a reasonable extent, in order to take into consideration the environmental and social factors in a way that is most suitable to local situations, and in order to reach an appropriate consensus. JICA encourages project proponents etc. to publicize in advance that they plan to consult with local stakeholders, with particular attention to directly affected people, in order to have meaningful meetings. In the case of Category A projects, JICA encourages project proponents etc. to consult with local stakeholders about their understanding of development needs, the likely adverse impacts on the environment and society, and the analysis of alternatives at an early stage of the project, and assists project proponents as needed. (2.4) Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared. (Appendix 2) In the case of Category B projects, JICA encourages project proponents etc. to consult with local stakeholders when necessary. (2.4)	Although providing information to local residents, community consultation, and public involvement has been recognized as important in major documents, specific legislation to implement such processes is yet to be enacted.	Significant gaps are found.
9.	Disclosure	Information about the environmental and social considerations of their projects. JICA encourages project proponents etc. to disclose and present information about environmental and social considerations to local stakeholders. Project proponents etc. disclose information well in advance when they have meetings with local stakeholders in cooperation with JICA. On these occasions, JICA supports project proponents etc. in the preparation of documents in an official or widely used language and in a form understandable by local people. (2.1/1, 6,7) For Category A project, JICA publishes the	No overt requirements of information disclosure, let alone public hearings or comments. GoB passed the Environment Court Act, 2000 (Act No. 11 of 2000) to allow appeals to be made by the public on non-compliance with the ECA (1995) and ECR (1977).	No legal requirements on disclosure of information are present in government laws, while others set clear recommendations/ requirements for information disclosure; significant gaps are identified.

Sl. No.	Features	JICA Guidelines	Government Laws	Gaps
		status of host countries' submission of major documents on environmental and social considerations on its website. Prior to its environmental review, JICA also discloses EIA reports and environmental permit certifications 120 days prior to concluding agreement documents. JICA discloses a translated version of EIA reports, subject to approval by project proponents etc. For Category B project, JICA discloses EIA reports and environmental permit certifications, when these documents are submitted by project proponents etc. (Sec.3/3.2/3.2.1/(1), (2))		
10.	Monitoring Implementation	JICA confirms with project proponents etc. the results of monitoring the items that have significant environmental impacts. This is done in order to confirm that project proponents etc. are undertaking environmental and social considerations for projects that fall under Categories A, B, and FI. The information necessary for monitoring confirmation by JICA must be supplied by project proponents etc. by appropriate means, including in writing. When necessary, JICA may also conduct its own investigations. JICA discloses the results of monitoring conducted by project proponents etc. on its website to the extent that they are made public in project proponents etc. (3.2.2/1, 2, 7)	There is a process of ECC renewal that requires monitoring and assessment. DOE has the responsibility of following up and monitoring ECC conditions. DOE makes the proponent compliance reports available to the public on its website. There are no formal provisions to obtain independent assessment of EIA reports if found necessary. There is also no formal mechanism or programme at DOE that conducts an independent audit of approved projects. Third-party monitoring is recommended through approved laboratories.	No legal requirements on monitoring are present in government laws, while others define monitoring as a part of their assessment activities.

(4) Cutting Forest and Hill areas

According to amendment of the Bangladesh Environment Conservation Act (Amendment) 2010, logging in hilly areas is not permitted. Below is the relevant part of the law.

The Bangladesh Environment Conservation Act (Amendment) 2010

"6B. Restriction on cutting hill. it is prohibited to cutting and/ or razing of hill and tilla by person or institution of government or semi.government or personal or autonomous organization or occupied or personal acquisition: Provided that such direction, It will be possible to cut or raze hill or tilla with respect to clearance certificate from the Department in case of necessity of national interest.

This project respected such policies of hill protection in Bangladesh and avoided division of hills by access road.

4.3.2 Relevant Organizations

1) Ministry of Environment and Forest

The Ministry of Environment and Forest (MoEF) is the key government institution in Bangladesh for matters relating to national environmental policy and regulatory issues. Realizing the ever-increasing importance of environmental issues, the MoEF was created in 1989 and is presently a permanent member of the executive committee of the National Economic Council (NEC). This group is the major decision-making body for economic policy and is also responsible for approving public investment projects. The MoEF oversees the activities of the following agencies:

- Department of Environment (DoE);
- Department of Forest (DoFo);
- Forest Industries Development Corporation (FIDC);
- Bangladesh Forest Research Institute (BFRI) and Institute of Forestry (IoF);
- Forestry division of the Bangladesh Agricultural Research Council (BARC); and
- National Herbarium.

Of the above agencies a precise description of the first two departments including other pertinent ones are presented below as considered relevant.

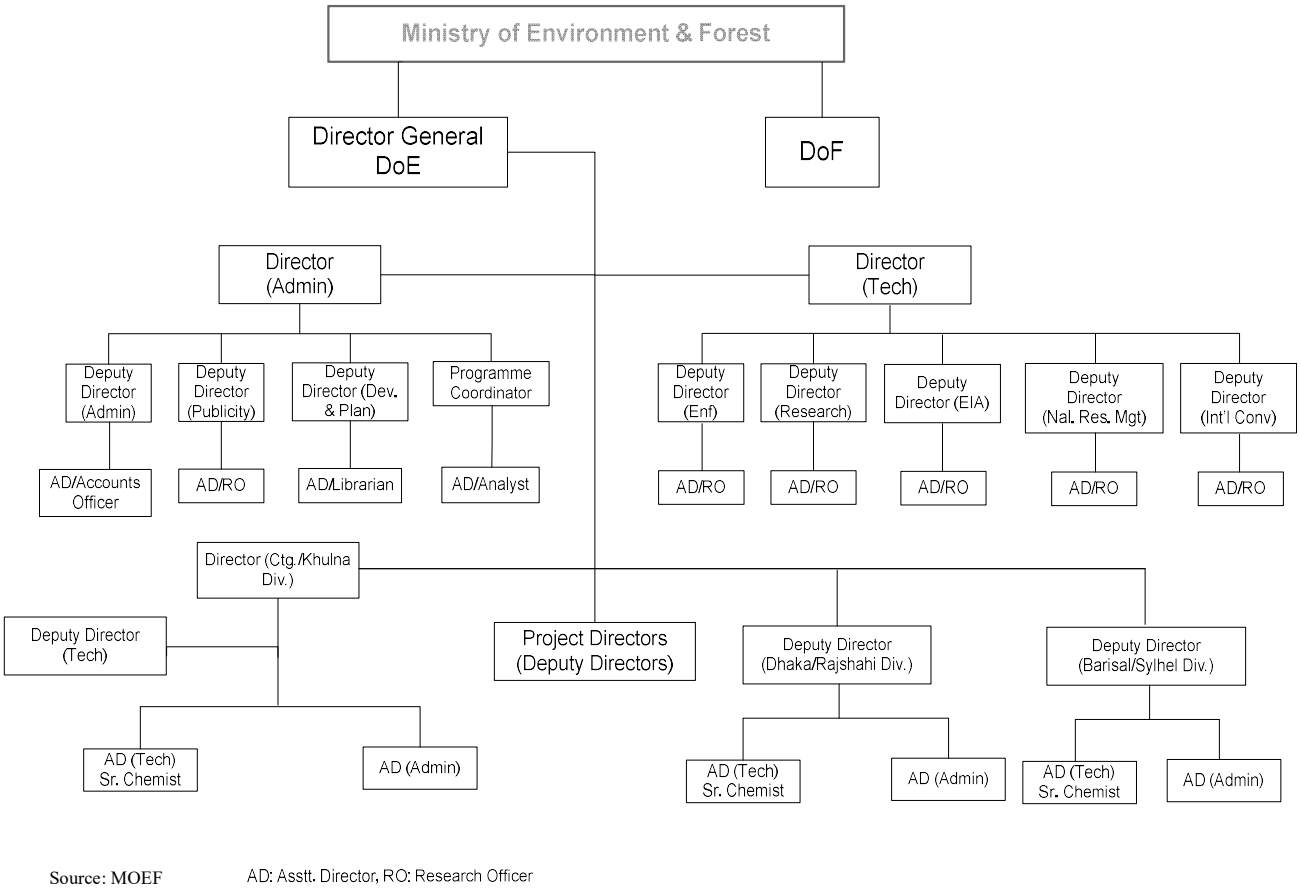
2) Department of Environment

The Department of Environment (DoE), established in 1989 under the jurisdiction of the MoEF, is the executing agency for planning and implementing environmental issues including, but not limited to, the following activities:

- Reviewing environmental impact assessments and issuing environmental clearance where appropriate;
- Implementing environmental monitoring programs and enforcement measures;
- Developing and maintaining environmental data bases; and

- Coordinating international events with the MoEF (e.g., representing Bangladesh in international seminars, workshops, etc.).

The DoE is headed by a Director General (DG) who is supported by a team of directors, deputy directors, assistant directors, engineers, and other technical staff (e.g., chemists and laboratory technicians). The DoE has regional offices, monitoring stations and several laboratories. Figure below shows the organizational set-up of DoE.



Source: MOEF AD: Asstt. Director, RO: Research Officer

Figure 4.3-2 Organizational Setup of DOE

3) Department of Forest

The Department of Forest (DoFo), under the MoEF, is responsible for protection and management of the reserve forests in the country. The department manpower extends down to union levels in areas where reserve forest exists. Officers of the DoFo are responsible for protection of wildlife in these forest areas.

4) Ministry of Land - Land Reform and Land Acquisition Directorate

The Ministry of Land (MoL) manages revenue generation for government-owned land (called khas), excluding agency-owned lands controlled by the BWDB, roads and highways, etc. The MoL controls open water bodies (rivers, beels, haors) above a specified size, except for those that were transferred to the Ministry of Fisheries (MoF) and livestock under the new fisheries management policy.

The MoL approves the process where the government acquires private land with regard to private development program.

4.3.3 Gender-related Laws and Policies

(1) General Law and Policies

1) Constitution

In article 27 of the Constitution of Bangladesh says that, "all citizens are equal before law and are entitled to equal protection of law". The article 28(1) says, "the State shall not discriminate against any citizen on grounds religion, race, caste, sex and place of birth" The article 28(2) says, "women shall have equal rights with men in all spheres of the state and public life."

2) National Women Development Policy (2011)

To ensure women development and empowerment, the National Women Development Policy was formulated in 2011. The objectives of National Women Development Policy are as follows;

1. To establish equal rights of men and women in areas of state and public life in the light of the constitution of Bangladesh.
2. To ensure security and safety of women in all areas of state, social and family life.
3. To ensure the socio-economic, political, administrative and legal empowerment;
4. To establish human rights of women.
5. To ensure full and equal participation of women in the mainstream socio-economic development.
6. To bring up women as educated and skilled human resources.
7. To deliver the women from the curse of poverty.
8. To remove existing male-female disparities.
9. To give appropriate recognition to women's contribution in socio-economic areas.
10. To eliminate all forms of abuse of women and female children.
11. To eliminate discrimination to women and female children.
12. To establish gender equality in politics, administration, other areas of activity, socio-economic activity, education, culture, sports and in all areas of family life.
13. To innovate and import technology favoring the interest of women and prohibit anti-women technologies.
14. To ensure taking appropriate steps to ensure sound health and nutrition of the women.
15. To ensure priority of women in provision for proper shelter and housing;
16. To arrange rehabilitation of the women affected in natural calamities and armed conflicts.
17. To extend overall assistance to ensure rights of the disabled women and women belonging to the smaller ethnic groups.
18. To arrange safety of the widow, aged, guardianless, husband abandoned, unmarried and childless women.
19. To reflect gender perspective in the mass media including positive image of the women and female children.
20. To assist in flowering of Talented, genius women of their creative potentials.
21. To provide necessary support services for development of women.
22. To provide overall assistance in ensuring the growth of women entrepreneurs

(2) Policy in Transport Sector

1) National Integrated Multimodal Transport Policy (2013)

The major objective of the policy is to make the transport system more affordable, efficient, and environmentally friendly through reducing transport cost and creating mechanisms for reducing accidents. The policy is also expected to enhance competitiveness and help develop service industries.

It focuses on the development of roads, rails, domestic river ports, seaports, as well as on human resource development that prioritizes rail and river communication. The policy highlights mass transport system including the urban transport and promotes the increasing participation of the private sector.
One of the four "Integration Strategies" is "Integration with policies for education, health, economic growth, gender and social equity and poverty reduction: To ensure that transport helps to make a fairer, more inclusive society". One of the policy emphases is "Meeting the transport needs of women and girl-children." One of the investment criteria in "4. Cross cutting issues" says "Social inclusion-meeting the needs of women, the elderly and physically challenged and providing accessibility to basic health and education facilities.". Gender-related approaches in "social inclusion" are;

4.4 Women, the Elderly and Physically Challenged and Transport
4.4.2 Improving the quality of the pedestrians environment, e.g., making it easier for women, children, the elderly and the physically challenged to move;
4.6 Social Equity and Poverty Reduction
4.6.2 Transport facilities and services will be designed in future to take into account the special needs of women, children, elderly and physically challenged people;
4.6.3 Programs will be developed to ensure that professionals, administrators and decision-makers in all transport sectors, deliver services that are attractive and usable by women and girl-children;

2) Seventh Five Year Plan FY2016 – FY2020
The Seventh Five Year Plan has development strategies in the below 13 sectors.

Sector 1 and 2: General Public Services and Public Order and Safety.
Sector 3: Industrial and Economic Services
Sector 4: Agriculture
Sector 5: Power and Energy
Sector 6: Transport and Communication
Sector 7: Local Government and Rural Development
Sector 8: Environment and Climate Change
Sector 9: Housing and Community Amenities
Sector 10: Health
Sector 11: Education and Technology
Sector 12: Recreation, Culture and Religion
Sector 13: Social Protection

The gender vision of the 7th Five Year Plan is that of establishing "a country where men and women will have equal opportunities and rights and women will be recognized as equal contributors in economic, social and political development". While the underlined 10 sectors out of the above 13 sectors refer to gender issue, strategy of "Sector 6: Transport and Communication" does not have any reference to it. However, there is a brief description about transport in "Sector 13: Social Protection" as follows;

> Infrastructure and support services are key to increase women's participation in public spheres. Safe and affordable transport system is necessary to increase women's mobility. …Road safety would be ensured through enforcement of traffic rules and laws. Cleaning of foot paths, compulsory use of over bridges for road crossing, increased public transports are some other measures to support women's mobility.

(3) Relevance to the Project

Gender policy in transport sector mentioned in "National Integrated Multimodal Transport Policy

(2013)" and "Seventh Five Year Plan FY2016 – FY2020" mainly focuses on public transport services while its reference to development of physical infrastructures like roads or ports is limited. The Objectives of National Women Development Policy, however, could have strong relevance to gender-related issues of the Project including 1) equal opportunities of employment between male and female in construction and operation, 2) compensation to widow or female-headed PAHs, 3) fair distribution of compensation within HHs and 4) participation of female PAPs into public consultations. 1) is to be mentioned in "4.9 Environmental Management and Monitoring Plan," 2) 3) in "4.12.4 Compensation and Assistance Policy" and 4) in "4.12.10 Public Consultations."

4.4 Analysis of the Alternatives (Including "without Project")

4.4.1 Port

In this chapter, we will explore the Port in Section 4.4.1 and the alternative access plan for the access road in Section 4.4.2. In each of them, alternative proposals are compared, but in "4.4.1 port" the "without project" refers to the case where both the port and the access road are not implemented. For the implementation plan (drafts 1 to 4), consideration of the access road is required.

(1) Outline of the Alternatives

In the port portion of this survey, the four options were compared and examined. Table below shows feature comparison and map comparison of port development options. The project target year is 2026, looking at the overall picture including the different expansion schedule. In addition, the dredged soil of each option was marked with a red circle as the land dumping place. Regarding ocean dumping, a common place is determined for the 4 options shown in the figure below.

Table 4.4-1 Outline of Four Options

Options	Option Description
without Project	No construction of port in this area, increased cargo will be handled at the expansion to Chittagong Port and increases to Payra Port.
Option1	Development of port by using the Kohelia river in the southern Dhalghata.
Option2	Separation from the Kohelia River in the southern Dhalghata and develops a port in the Dhalghata district.
Option3	CPGCBL dredge the route from the coal port to the Kohelia river to develop the new port.
Option4	CPGCBL dredge to the south from coal port to develop ports. (It does not connect to the Kohelia River.)

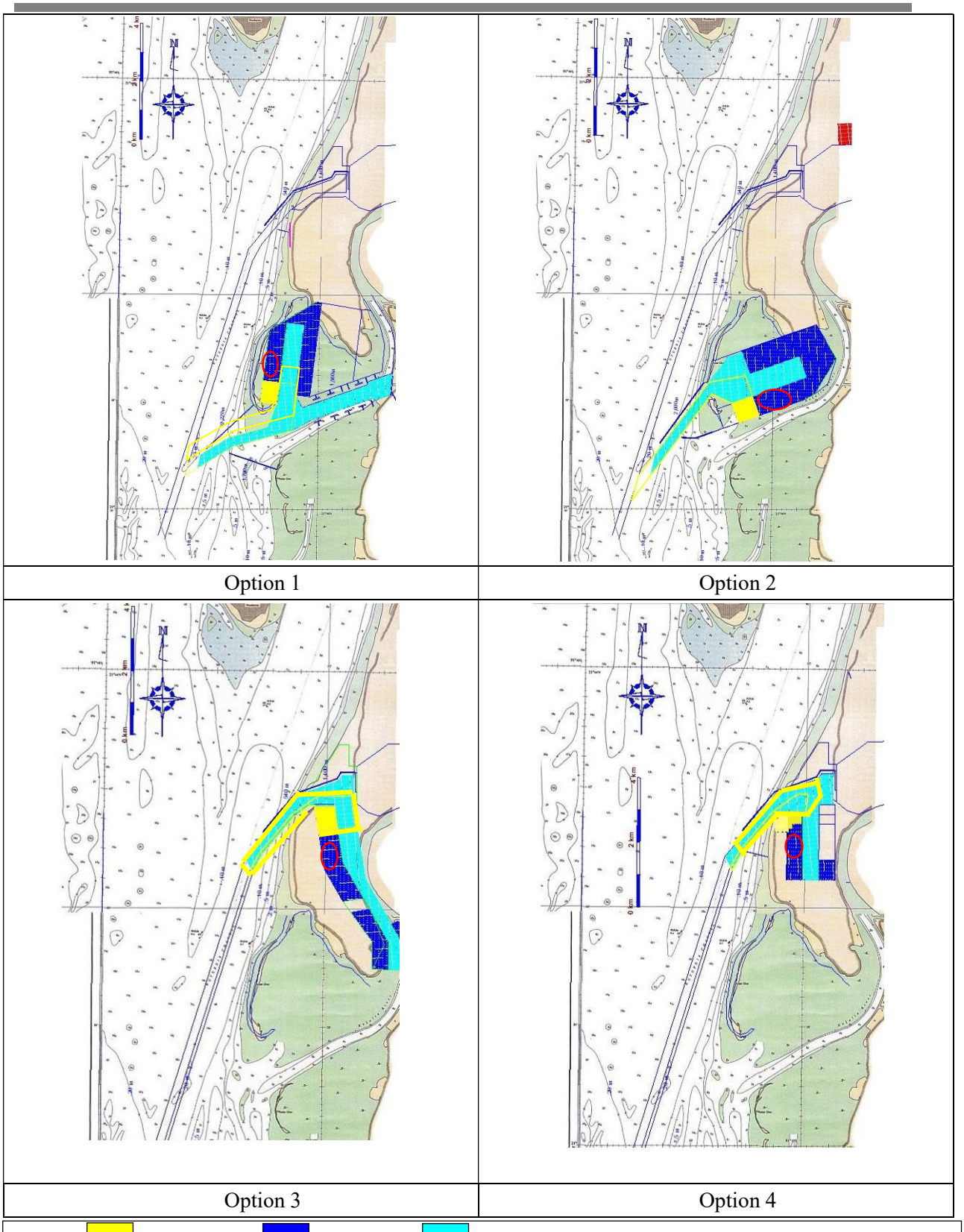
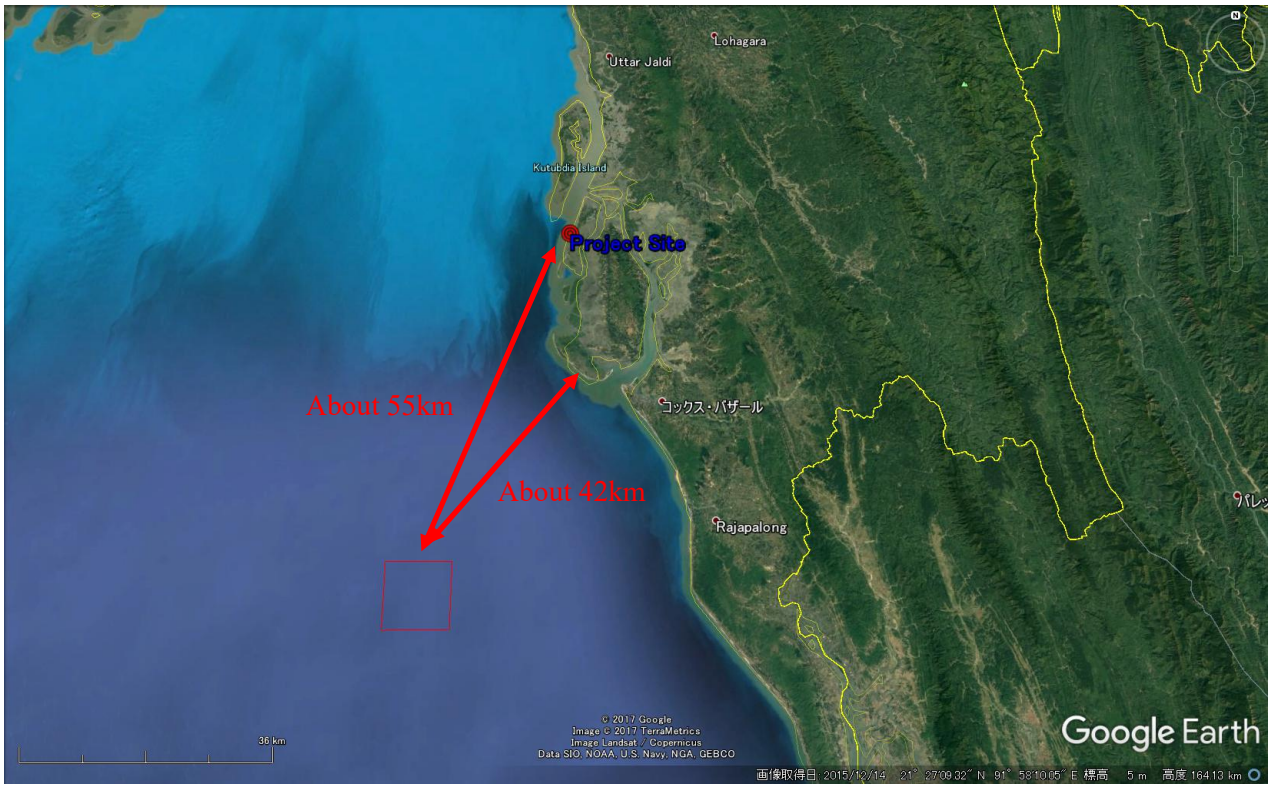


Figure 4.4-1 Plans of Four Options

Note: The timing of completion in the future expansion differs for each option.
Source：JICA Survey Team



Source： JICA Survey Team made from GOOGLE EARTH

Figure 4.4-2 The location for Dredge Soil Ocean Dumping（A common place for four Options）

(2) Comparison of the Alternatives

Table 4.4-2 Analysis of Options

Option Plans	Without Project	**Option No.1**	**Option No.2**	**Option No.3**	**Option No.4**
Summary of Options	No construction of the new port in this area, increased cargo will be handled at the expansion to Chittagong Port and increases to Payra Port.	Development of port by using the Kohelia river in the southern Dhalghata.	Separation from the Kohelia River in the southern Dhalghata and develops a port in the Dhalghata district.	CPGCBL dredge the route from the coal port to the Kohelia river to develop the new port.	CPGCBL dredge to the south from coal port to develop ports. (It does not connect to the Kohelia River.)
Impact on the natural environment	A: Additional impact is minimal.	D: Since it is the mouth of the Kohelia River, it has an influence on the natural environment. Disappearance of sandbars in the planned area (2.8 ha), disappearance of mangrove forest (9.28 ha).	D: It is separated from the Kohelia River, but it is affected because it is near the estuary. There is disappearance of sandbars in the planned area (6.4 ha) and disappearance of mangrove forest (15.0 ha).	C: The port facility was developed in the middle of the Kohelia River, the influence on hydrology, the disappearance of sandbar and salt pond (1.4 ha, 80.2 ha, 2.0 ha each) are seen.	A: Disappearance of sandbars and salt fields slightly (1.3 ha, 1.4 h each) are observed, but the influence on the natural environment is relatively small.
Pollution	C: There is a possibility that industrial development will expand to the port area	D: Turbidity spread and the influence on the coastline are large because there are two routes of coal port for ports and routes for this project.	D: Turbidity spread and the influence on the coastline are large because there are two routes of coal port for ports and routes for this project.	A: Since the existing routes are shared, the influence on water quality is small compared to 1 and 2.	A: Since the existing routes are shared, the influence on water quality is small compared to 1 and 2.
Impact on social environment	B: Resident relocation · Land acquisition does not occur in this project, but marine transportation of	B: Employment of ports and peripheral location industries is created. Relocation number is	B: Employment of ports and peripheral location industries is created. The number of relocations is	D: Employment of ports and surrounding local industries is created but passes through large-scale	B: Employment of port related and surrounding site industries was created, and relocation number is

Option Plans	Without Project	**Option No.1**	**Option No.2**	**Option No.3**	**Option No.4**
	peripheral industries is not secured, and the development of the area is delayed.	relatively small. (20 households or less)	small. (20 households or less)	settlements, with the largest relocation (Several hundred households)	relatively small (50 households)
Technical challenges	A: There are no technical problems.	C: A new route will be established	C: A new route will be established	B: It is possible to expand the coal port and use the route. The soil drains from Kohelia river to Matarbari Port.	B: It is possible to expand the coal port and use the route.
Cost	D: Construction / maintenance cost at other ports may increase.	D: Large-scale investment with breakwaters and dredging the route	D: Large-scale investment with breakwaters and navigation dredging	B: Medium-sized investment due to widening of the route and extension of the route to the Kohelia River	A: Investment in the widening of the navigation route and the dredging of the night area is relatively small
Ocean dumping	A: The surrounding natural environment including Sonadia is preserved	B: Ocean dumping is predicted to be minor in the area about 40 km away from Sonadia.	B: Ocean dumping is predicted to be minor in the area about 30 km away from Sonadia.	B: Ocean dumping is predicted to be minor in the area about 30 km away from Sonadia.	B: Ocean dumping is predicted to be minor in the area about 30 km away from Sonadia.
Disposal position of dredged soil	A: There is no dumping on land	C: Scheduled for expansion of the port area (north side of the current project site). Dust and the like are predicted and appropriate measures are required.	C: Scheduled for expansion of the port area (east of this project site). Dust and the like are predicted, and appropriate measures are required.	C: Scheduled for expansion of the port area (south of this project site). Dust and the like are predicted, and appropriate measures are required.	C: Scheduled to be on the south side avoiding the residential area at the port expansion site. Dust and the like are predicted, and appropriate measures are required.

Option Plans	Without Project	**Option No.1**	**Option No.2**	**Option No.3**	**Option No.4**
The effect of the project (this time)	D: Does not correspond to increasing cargo at other ports.	D: The access is less convenient than other options while the periphery is not developed yet.	D: The access is less convenient than other options while the periphery is not developed yet.	C: Need bridge for access. The access is not as good as option 4.	B: Access to main road is relatively good.
The effect of the project (Including extended part)	D: If no port in this area, there is no regional economic development, so future development and development will be limited because it expands the Chittagong Port and cargo that increases to Payra Port. Congestion at Chittagong Port is not alleviated. Trade in Bangladesh is restricted.	D: Kohelia river in southern part of Dhalghata is used to develop ports, so we have a dedicated port easy to use in the surrounding industrial areas. It flows to the mouth of the Kohelia River, which may cause problems	D: Since it separates from the Kohelia River in the southern part of Dhalghata and develops a port in Dhalghata district, there is no deposition than Option 1.	C: Dredging the routes from the "CPGCBL coal port" to the Kohelia river to develop the port. Develop a port channel connecting BPDB power plant and "CPGCBL coal port". Part of the river is used as a passage in the port and close to the planned special economic zone on the west bank.	B: Dredge in southward from CPGCBL coal port to the south and develop a port without connecting with the Kohelia River. Short construction period. Coal to the BPDB power plant is supplied from the CTT on the east side of this commercial port via a belt conveyor, cargo of the special economic zone heading from the port access road to the port.
Overall evaluation	B	D	D	C	A
Comment	There is a limit to expansion of Chittagong Port, and it is assumed that Payra Port cannot accept large container ships, so it cannot cope with increasing	Large initial investment Destruction of mangrove forest Relatively close to Sonadia Ecological critical area	Large scale initial investment	C: Bridges are necessary, transportation is not convenient.	Residents' relocation and impact on the natural environment are small, and it is possible to open with relatively small investment.

Option Plans	Without Project	**Option No.1**	**Option No.2**	**Option No.3**	**Option No.4**
	cargo volume.				

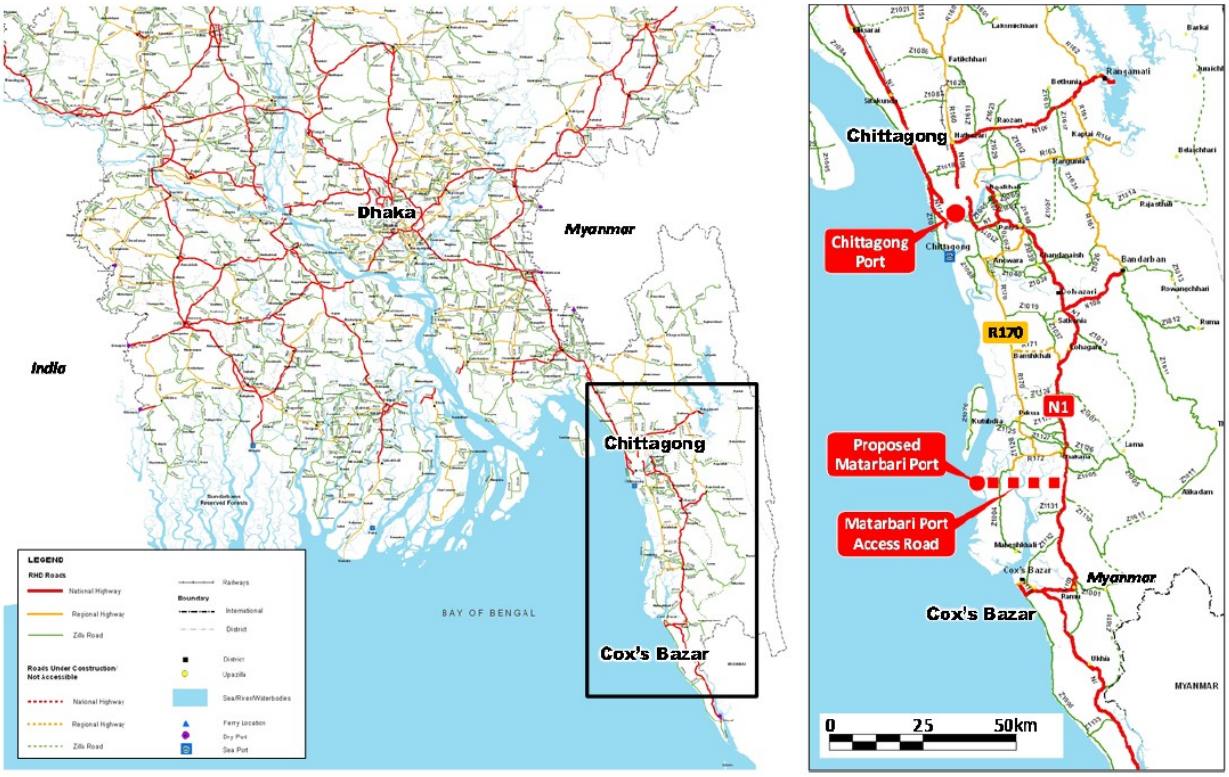
Source: JICA Survey Team

(Note) A: The highest evaluation, B: Good, C: Other options can be desirable, D: Shall be avoided

4.4.2 Access Road

(1) Outline of Alternatives

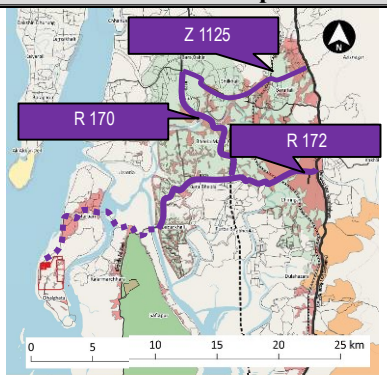
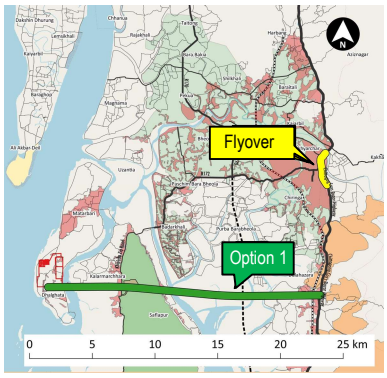
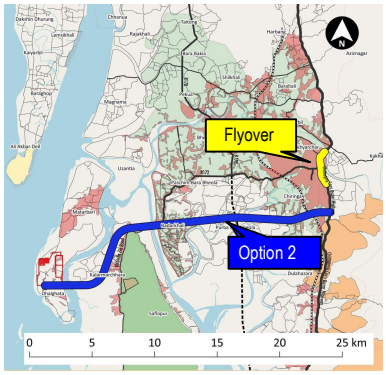
Matarbari port will be located in south Chittagong region and approximately 80km south to Chittagong and 25 km from Cox's Bazar. As this discussed in Chapter 3, the Matarbari Port Access Road should be connected with N1 for ensuring smooth freight transport route in the Region. Alternatives of access road are summarized as follows.

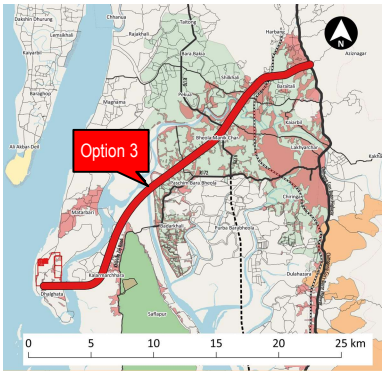


Source: Bangladesh RHD Road Network

Figure 4.4-3 Road Network in Bangladesh

Table 4.4-3 Overview of Alternatives (Step 1)

Alternatives	Location map	Features of the alternative plan
Without Project: To utilize the existing roads ("R172 - R170 - Z1125" or "R172")		・Concept: To utilize the existing roads "Regional Highway No. 172 (R172) - Regional Highway No. 170 (R170) - District Road No. 1125 (ZR1125)" or "R 172" ・Project features: No road nor land acquisition is required.
Option 1: Shortest route		・Concept: To connect to N1 by the shortest route ・Project features: Construction of a new road of approximately 22 km. Traversing Moheshkhali Hills, it connects the Port to N 1 in almost due west. In order to secure the accessibility to Chittagong direction, a flyover is required where N1 passes through the density area of Chakaria Paurashava. As most of the section passes through salt farms and shrimp farms, the section passing through residential area is rather short.
Option 2: Eastward route with avoiding Moheshkhali Hills		・Concept: To avoid Moheshkhali Hills while minimizing the section passing through private land and residential area ・Project features: Construction of a new road of approximately 25 km. Although it avoids Moheshkhali Hills, it passes through a village at the north foot of the Hills and a market after crossing the river. In order to secure the accessibility to Chittagong direction, construction of a flyover is required where N1 passes through the density area of Chakaria Paurashava. As most of the section passes through salt farms and shrimp farms, the section passing through residential area is rather short.

Alternative plan	Location map	Features of the alternative plan
Option 3: Route connecting to Chittagong direction with avoiding Moheshkhali Hills		・Concept: To avoid Moheshkhali Hills, extend to the northeast and connect to N1 in the direction of Chittagong ・Project features: Construction of a new road of approximately 30 km. It excels in the accessibility to the Chittagong and flyover of N1 in the section passing through Chakaria density area is not required by the Project. The route passes through three Upazilas, namely Moheshkhali, Pekua and Chakaria. Mainly salt farms and shrimp farms stretch in the section of Moheshkhali and Pekua, while paddy fields and residential areas stretch in Chakaria, meaning that long extended section passes through private land.

* Legend of the above location maps are as follows.

settlement　agricultural/ paddy field　hills　natural park, reserved forest
salt farm, shrimp farm

Source: JICA Survey Team

(2) Comparison of Alternatives (Step 1)

Comparison of alternatives and evaluation were made as follows. Route of north-south connecting road near port facility was determined in Option 1 -Option 3 to connect port facility to main route of access road and not to cause additional resettlement.

Table 4.4-4 Comparison of Alternatives and the Evaluation (Step 1)

Option	Without Project	Option 1	Option 2	Option 3
Overview of alternative plans	Without Project: To utilize the existing roads ("R172 - R170 - Z1125" or "R172")	Plan with the shortest route	Eastward route with avoiding Moheshkhali Hills	Route connecting to Chittagong direction with avoiding Moheshkhali Hills
Impact on natural environment	**A:** Additional impact is minimal	**D:** Passes through the hills and the reserved forests for which additional permission is required for cutting by the law of Bangladesh	**B:** Does not pass through the section where there is serious concern about impact on the natural environment	**B:** Does not pass through the section where there is serious concern about impact on the natural environment
Pollution	**D:** There is concern about traffic congestion and air pollution by utilizing community roads for freight transportation.	**B:** Although there is concern about certain amount of air pollution and noise during the construction, they can be minimized by appropriate mitigation measures.	**B:** Although there is concern about certain amount of air pollution and noise during the construction, they can be minimized by appropriate mitigation measures.	**B:** Although there is concern about certain amount of air pollution and noise during the construction, they can be minimized by appropriate mitigation measures.
Impact on social environment	**A:** Resettlement and land acquisition will not be required with this plan.	**B:** The number of residents to be resettled is minimum among the plans with project implementation (affected houses and shops: approx. 150). **B:** The section passing through private land is short (estimated 10 km) therefore there is less land to be acquired while there is concern on certain impact on salt and shrimp farm even in government land. **C:** It is likely that ethnic minorities reside on the hills where the road passes through.	**D:** The number of residents to be resettled is large (affected houses and shops: approx. 250 - 350). **B:** The section passing through private land is short (estimated 15 km) therefore there is less land to be acquired while there is concern on certain impact on salt and shrimp farm even in government land. **B:** It is not likely that ethnic minorities are included in the people subject to resettlement.	**D:** The number of relocated residents is large (affected houses and shops: approx. 200-300). The road passes through many villages. **D:** The section passing through private land is long (estimated 20 km) therefore there is more land to be acquired. Since the road passes through many residential areas, there is concern about community severance and it is difficult to take mitigation measures. **B:** It is not likely that ethnic minorities are included in the people subject to resettlement.

Option	Without Project	Option 1	Option 2	Option 3
Technical issues	**A:** No technical issues	**B:** No major technical issues	**B:** No major technical issues	**B:** No major technical issues
Project Cost	**A:** No additional costs are incurred.	**B:** Total length is short therefore expenses are low.	**B:** Total length is short therefore expenses are low.	**C:** Total length is long therefore expenses are high. Since there is much private land, cost for land acquisition becomes high.
Traffic Safety	**D:** It is not suitable to invite many cargo trucks into the local roads in terms of traffic safety and freight transport planning.	**A:** Safe and smooth traffic condition for freight transport can be provided through separating freight transport from local traffic.	**C:** Though freight transport can be separated from local traffic, traffic safety cannot be secured as the route passes through densely populated village.	**C:** Though freight transport can be separated from local traffic, traffic safety cannot be secured as the route passes through many villages.
Project Effect	**D:** There is no passable road for large vehicles at Moheshkhali Upazila side, which makes smooth freight transportation impossible. Smooth freight transport cannot be secured also in Chakaria as many cargo trucks will be invited into the local roads Effect of the port will be limited as it would be difficult to widen the route into 4 lanes.	**C:** Having good accessibility to Matarbari Port. Accessibility to CPGCBL's Power Plant is not good. (Additional flyover will be required at Chakaria on N1 for securing accessibility to Chittagong.)	**A:** Having good accessibility to both Matarbari Port and CPGCBL's Power Plant. Additional flyover at Chakaria on N1 will secure the accessibility to Chittagong.	**C:** Having good accessibility to Chittagong. Good accessibility to both Matarbari Port and CPGCBL's Power Plant. By taking much time for land acquisition, it is very likely that the road is not opened in time for the opening of the port and cannot provide smooth freight transport.
Total evaluation (Ranking)	**D-**	**D**	**B**	**C**
	There is no passable road for large vehicles at Moheshkhali Upazila side, which makes smooth freight transportation impossible. As for utilization of local and district roads at Chakaria Upazila side as well, which means freight traffic such as trucks passing through community roads, it is not desirable from traffic safety as well as freight transportation planning points of view.	Although it is the shortest route and the negative impact on social environment seems to be minimum among the plans with project implementation, this plan is not desirable because it interferes with Moheshkhali Hills and forests and also because ethnic minorities are likely to subject to resettlement.	Since the road circumvents Moheshkhali Hills and forests, concern about natural environment is significantly mitigated. Although there are fewer private properties, it passes through the village on the northmost part of Moheshkhali Hills and there is concern about many relocated residents. Though relocation of additional 50 shops will be required, high project	There are long extensions of the sections passing through private properties, therefore there is concern about a lot of land acquisition, resettlement and community severance. By taking much time for land acquisition, it is very likely that the road is not opened in time for the opening of the port, therefore this plan is undesirable.

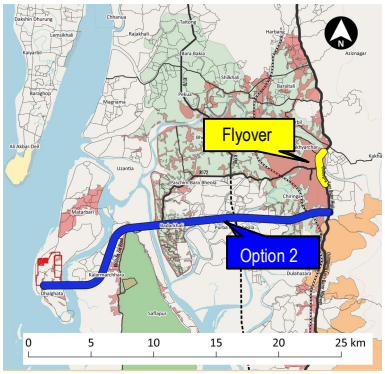
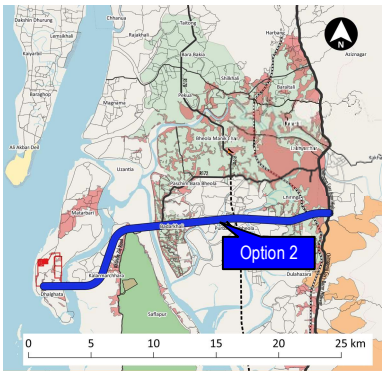
Option	Without Project	Option 1	Option 2	Option 3
			effect can be expected by securing smooth traffic to Chittagong.	

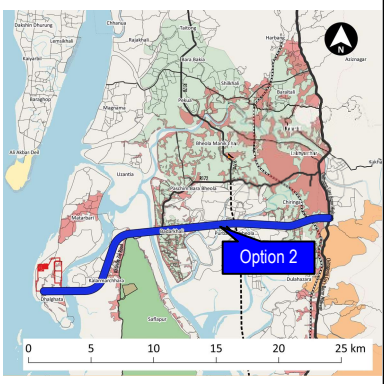
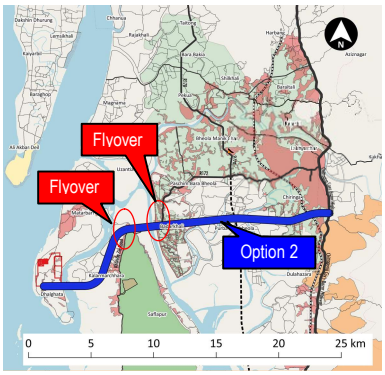
Source: JICA Survey Team

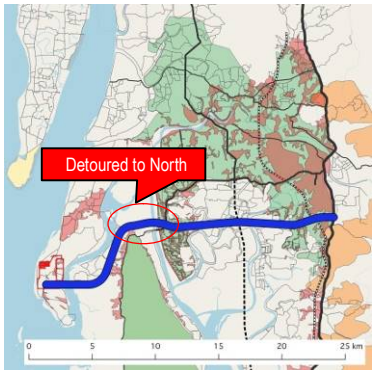
(Note) A: The highest evaluation, B: Good, C: Other options can be desirable, D: Shall be avoided

After selecting the route, comparison of 1) option with/without flyover in Chakaria and 2) avoidance of settlement area in the north of Moheshkhali and bazar in Badarkhali were made as follows.

Table 4.4-5 Overview of Alternatives (Step 2)

Contents of consideration	Alternatives	Location map	Features of the alternative plan
Necessity of flyover	Option 2-a: Eastward route with avoiding Moheshkhali Hills (With a flyover in Chakaria)		・Concept: To avoid Moheshkhali Hills while minimizing the section passing through private land and residential area. A flyover will be constructed in Chakaria. ・Project features: Construction of a new road of approximately 25 km. Although it avoids Moheshkhali Hills, it passes through a village at the north foot of the Hills and a market after crossing the river. In order to secure the accessibility to Chittagong direction, a flyover will be constructed where N1 passes through the density area of Chakaria Paurashava. As most of the section passes through salt farms and shrimp farms, the section passing through residential area is rather short.
	Option 2-b: Eastward route with avoiding Moheshkhali Hills (Without a flyover in Chakaria)		・Concept: To avoid Moheshkhali Hills while minimizing the section passing through private land and residential area. A flyover is not constructed in Chakaria. ・Project features: Construction of a new road of approximately 25 km. Although it avoids Moheshkhali Hills, it passes through a village at the north foot of the Hills and a market after crossing the river. A flyover in Chakaria can be constructed in a separate project in the future while this project aims at connection to N1. As most of the section passes through salt farms and shrimp farms, the section passing

			through residential area is rather short.
Avoidance of village and market	Option 2-1: Eastward route with avoiding Moheshkhali Hills. (Without avoidance for village at the north foot of the Hills in Moheshkhali and a market in Badarkhali)		・Concept: To avoid Moheshkhali Hills while minimizing the section passing through private land and residential area. ・Project features: Construction of a new road of approximately 25 km. Although it avoids Moheshkhali Hills, it passes through a village at the north foot of the Hills and a market after crossing the river. A flyover in Chakaria can be constructed in a separate project in the future while this project aims at connection to N1. As most of the section passes through salt farms and shrimp farms, the section passing through residential area is rather short.
	Option 2-2: Eastward route with avoiding Moheshkhali Hills. (With viaducts at sections passing through a village at the north foot of the Hills and a market in Badarkhali)		・Concept: To avoid Moheshkhali Hills while minimizing the section passing through private land and residential area. The sections passing through a village at the north foot of Moheshkhali hills and a market at Badarkhali are elevated in order to minimize the impact. ・Project features: Construction of a new road of approximately 25 km. A flyover in Chakaria can be constructed in a separate project in the future while this project aims at connection to N1. There is no land acquisition and resettlement in Chakaria as no flyover will not be constructed in Chakaria density area. As most of the section passes through salt farms and shrimp farms, the section passing through residential area is rather short. By elevating the section of village at the north foot of the Moheshkhali Hills, the number

			of residents subject to resettlement is reduced. By elevating the section passing through the southmost part of the Badarkhali market, the number of shops subject to relocation is reduced and the north-south passage is secured.
	Option 2-3: Eastward route with avoiding Moheshkhali Hills. (With detouring village at the north foot of Moheshkhali and a market in Badarkhali)		・Concept: To avoid Moheshkhali Hills while minimizing the section passing through private land and residential area. Detouring village at the north foot of Moheshkhali and a market in Badarkhali. ・Project features: Construction of a new road of approximately 25 km. A flyover in Chakaria can be constructed in a separate project in the future while this project aims at connection to N1. As most of the section passes through salt farms and shrimp farms, the section passing through residential area is rather short. By detouring village at the north foot of Moheshkhali and a market in Badarkhali, number of households to be displaced will be reduced.

* Legend of the above location maps are as follows.

settlement　agricultural/ paddy field　hills　natural park, reserved forest
salt farm, shrimp farm

Source: JICA Survey Team

(3) Comparison of Alternatives (Step 2)

Comparison and evaluation of alternatives was made as follows. At the moment of initial comparison, combination of option 2-a (With a flyover in Chakaria) and Option 2-2 (With viaducts at sections passing through a village at the north foot of the Hills and a market in Badarkhali) were selected as the recommended option. After traffic demand forecast, however, Option 2-b without the flyover in Chakaria was selected assuming that the flyover could be constructed in another project in the future. Moreover, regarding sections passing through a village at the north foot and Moheshkhali and a market, Option 2-3 (With detouring the village and the market to the north) was selected based on consultation with residents.

Table 4.4-6 Comparison of Alternatives and the Evaluation (Step 2)

Alternatives	Necessity of flyover		Workaround of village and market		
	Option 2-a	Option 2-b	Option 2-1	Option 2-2	Option 2-3
Overview of alternative plans	Eastward route with avoiding Moheshkhali Hills. (With a flyover in Chakaria)	Eastward route with avoiding Moheshkhali Hills. (Without a flyover in Chakaria)	Eastward route with avoiding Moheshkhali Hills. (Without avoidance for village at the north foot of the Hills in Moheshkhali and a market.)	Eastward route with avoiding Moheshkhali Hills. (With viaducts at sections passing through a village at the north foot of the Hills and a market)	Eastward route with avoiding Moheshkhali Hills. (With detouring a village at the north foot of Moheshkhali hill and a market to north direction)
Impact on natural environment	**B**: Does not pass through the section where there is serious concern about impact on the natural environment	**B**: Does not pass through the section where there is serious concern about impact on the natural environment	**B**: Does not pass through the section where there is serious concern about impact on the natural environment	**B**: Does not pass through the section where there is serious concern about impact on the natural environment	**B**: Does not pass through the section where there is serious concern about impact on the natural environment
Pollution	**B**: Although there is concern about certain amount of air pollution and noise during the construction, they can be minimized by appropriate mitigation measures.	**B**: Although there is concern about certain amount of air pollution and noise during the construction, they can be minimized by appropriate mitigation measures.	**B**: Although there is concern about certain amount of air pollution and noise during the construction, they can be minimized by appropriate mitigation measures.	**B**: Although there is concern about certain amount of air pollution and noise during the construction, they can be minimized by appropriate mitigation measures.	**B**: Although there is concern about certain amount of air pollution and noise during the construction, they can be minimized by appropriate mitigation measures.
Impact on social environment	**D**: The number of residents to be resettled is large (affected houses and shops: approx. 350)	**C**: The number of residents to be resettled is smaller than Option 2-a (affected houses and shops: approx.	**C**: The number of relocated residents is the largest among three options (affected houses	**B**: The number of residents to be resettled is smaller than Option 2-1 (affected houses and shops: approx.	**A**: The number of residents to be resettled is smaller than Option 2-1 and 2-2 (affected houses and shops:

Alternatives	Necessity of flyover		Workaround of village and market		
	Option 2-a	**Option 2-b**	**Option 2-1**	**Option 2-2**	**Option 2-3**
	C: The section passing through private land is short (estimated 15 km) therefore there is less land to be acquired while there is concern on certain impact on salt and shrimp farm even in government land. **B**: It is not likely that ethnic minorities are included in the people subject to resettlement.	300). **C**: The section passing through private land is short (estimated 15 km) therefore there is less land to be acquired while there is concern on certain impact on salt and shrimp farm even in government land. **B**: It is not likely that ethnic minorities are included in the people subject to resettlement.	and shops: approx. 300). **C**: The section passing through private land is short (estimated 15 km) therefore there is less land to be acquired while there is concern on certain impact on salt and shrimp farm even in government land. **B**: It is not likely that ethnic minorities are included in the people subject to resettlement.	200) **C**: The section passing through private land is short (estimated 15 km) therefore there is less land to be acquired while there is concern on certain impact on salt and shrimp farm even in government land. **B**: It is not likely that ethnic minorities are included in the people subject to resettlement.	approx. 150). **C**: The section passing through private land is short (estimated 15 km) therefore there is less land to be acquired while there is concern on certain impact on salt and shrimp farm even in government land. **B**: It is not likely that ethnic minorities are included in the people subject to resettlement.
Technical issues	**B**：No major technical issues	**B**：No major technical issues	**B**：No major technical issues	**B**：No major technical issues	**C**：There is possibility to alter the part of road plan for crossing railroad in the future.
Project Cost	**B**：Total length is short therefore expenses are low.	**A**：Total length is short therefore expenses are low. Additional construction cost for the flyover is not required.	**A**：Total length is short therefore expenses are low. Additional construction cost for the flyover is not required.	**A**：Total length is short therefore expenses are low. Additional construction cost for the flyover is not required. Additional construction cost for the viaduct is required in the sections passing through a village and market.	**A**：Total length is short therefore expenses are low. Additional construction cost for the flyover is not required. To extend approximately 300m for avoiding a village and market, this plan is a little more expensive than Option 2-2
Traffic Safety	**C**: Although freight transport can be separated from local traffic, this plan is not desirable on the traffic safety because it passes through densely populated village.	**C**: Although freight transport can be separated from local traffic, this plan is not desirable on the traffic safety because it passes through densely populated village.	**C**: Although freight transport can be separated from local traffic, this plan is not desirable on the traffic safety because it passes through densely populated village.	**A**: Freight transport can be separated from local traffic. Traffic safety can be secured as the section will be elevated where it passes through densely populated village.	**A**: Freight transport can be separated from local traffic. Traffic safety is high because it doesn't pass through densely populated village.

Alternatives	Necessity of flyover		Workaround of village and market		
	Option 2-a	**Option 2-b**	**Option 2-1**	**Option 2-2**	**Option 2-3**
Project Effect	**A**:Having good accessibility to both Matarbari Port and Electric Power Plant. Additional flyover at Chakaria on N1 will secure the accessibility to Chittagong.	**B**:Having good accessibility to both Matarbari Port and Electric Power Plant. Accessibility for freight transport to Chittagong can be limited by traffic congestion in Chakaria on N1.	**B**:Having good accessibility to both Matarbari Port and Electric Power Plant. Accessibility for freight transport to Chittagong can be limited by traffic congestion in Chakaria on N1.	**B**:Having good accessibility to both Matarbari Port and Electric Power Plant. Accessibility for freight transport to Chittagong can be limited by traffic congestion in Chakaria on N1.	**B**:Having good accessibility to both Matarbari Port and Electric Power Plant. Accessibility for freight transport to Chittagong can be limited by traffic congestion in Chakaria on N1.
Total evaluation (Ranking)	**B**	**A**	**C**	**B**	**A**
	Since the road circumvents Moheshkhali Hills and forests, concern about natural environment is significantly mitigated. Although there are fewer private properties, it passes through the village on the northmost part of Moheshkhali Hills and there is concern about many relocated residents. Though relocation of additional 50 shops will be required without construction the flyover of the sections passing through Chakaria city on N1, high project effect can be expected by securing smooth traffic to Chittagong.	Since the road circumvents Moheshkhali Hills and forests, concern about natural environment is significantly mitigated. Although there are fewer private properties, it passes through the village on the northmost part of Moheshkhali Hills and there is concern about many relocated residents. Without construction the flyover of the sections passing through Chakaria city on N1, additional resettlement can be avoided. In the future, another project for flyover is required for securing accessibility to Chittagong.	Since the road circumvents Moheshkhali Hills and forests, concern about natural environment is significantly mitigated. Although there are fewer private properties, it passes through the village on the northmost part of Moheshkhali Hills and there is concern about many relocated residents. Without construction the flyover of the sections passing through Chakaria city on N1, additional resettlement can be avoided. In the future, another project for flyover is required for securing accessibility to Chittagong	Since the road circumvents Moheshkhali Hills and forests, concern about natural environment is significantly mitigated. There are fewer private properties and the scale of resettlement is reduced by elevating the section passing through the village on the northmost part of Moheshkhali Hills. Without construction the flyover of the sections passing through Chakaria city on N1, additional resettlement can be avoided. In the future, another project for flyover is required for securing accessibility to Chittagong	Since the road circumvents Moheshkhali Hills and forests, concern about natural environment is significantly mitigated. There are fewer private properties and the scale of resettlement is greatly reduced by circumventing the village on the northmost part of Moheshkhali Hills. Without construction the flyover of the sections passing through Chakaria city on N1, additional resettlement can be avoided. In the future, another project for flyover is required for securing accessibility to Chittagong

Source: JICA Survey Team

(Note) A: The highest evaluation, B: Good, C: Other options can be desirable, D: Shall be avoided

4.5 Cumulative Impact

4.5.1 Background

This project is a new cooperative port for the commercial use and it uses the coal port for ports by ODA loan "Matarbari Coal Fired Power Plant Development (hereinafter referred to as " Powerplant Project")" (approved in 2014). After construction of this port, the Project plan to jointly use some port facilities with the Powerplant.

Based on the above background, this section summarizes the policy concerning the handling of the cumulative impact with the thermal power generation project in the environmental social impact assessment of this project.

4.5.2 Concept of Cumulative Impact

(1) Concept of JICA guidelines

With reference to the International Finance Corporation (IFC) Performance Standard, ""cumulative impact" caused by development or specifically development occurring or planned at the point in time when the risk and impact identification process is implemented (for example, at the time of scoping), or other accumulation of additional impacts on areas and resources, directly affected by the projects covered by JICA at a rational level (Quoted from JICA "Environmental and Social Consideration Guidelines Frequently Asked Questions" (July 20, 2011, revised February 5, 2016)) page 18)

(2) Approach in Bangladesh

Regarding cumulative impact assessment, there are no specific provisions under the Bangladesh legal system. After the submission of IEE or IEE exemption, the EIA TOR is presented from the Department of Environment (DoE). If DoE make an instruction to consider the cumulative impact in the EIA TOR, it is necessary to consider the cumulative impact.

4.5.3 The method of cumulative impact in this project

(1) Recommendations from the Bangladesh side

DOE did not require cumulative impact consideration for both Port and Road EIAs.

(2) Cumulative impact of this survey

In this survey, the cumulative influence is considered in the following methods for the following fields.

1) Pollution control

a) **Water Quality and Waste**

For water quality and waste, the cumulative impact of waste due to water quality and dredged sediment during construction due to dredging construction is considered, using the results of the pollution diffusion prediction model.

b) **Atmosphere, soil, noise and vibration**

Regarding air, soil, noise and vibration, comparison and confirmation of each forecast value of this project with domestic standards based on the numerical value of the thermal power plant alone.

2) Natural environment

a) **Topography / Geology**

Regarding the topography and geology, the Project consider the cumulative impact at the time of service using the results of the coastal deformation prediction model.

b) **Ecosystem**

Regarding ecosystems, hearing from local experts and environmental NGOs are pursued cumulative impacts on endangered species.

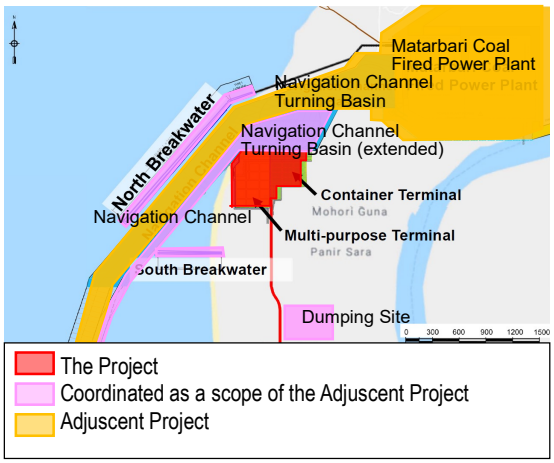
3) Social Environment

a) **Local Economy such as Employment and Livelihood, etc.**

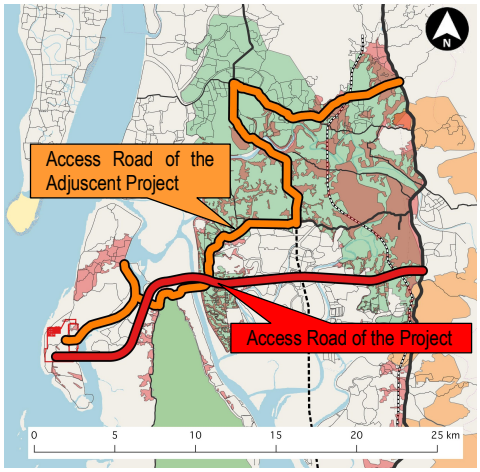
Cumulative impact on livelihood, especially on fishery, will be concerned. The location of the fishing ground, shrimp farm and project affected area were to be confirmed to survey physical loss of fishing ground and shrimp farm. The possibility of decrease of catch due to water pollution and influx of hot water was to be considered. In case that it is assumed that impact of water pollution and hot water inflows are not minor even with mitigation measures, compensation were to be considered through monitoring where the catch before the project implementation is regarded as baseline.

b) **Local Communities and Decision-making Institutions**

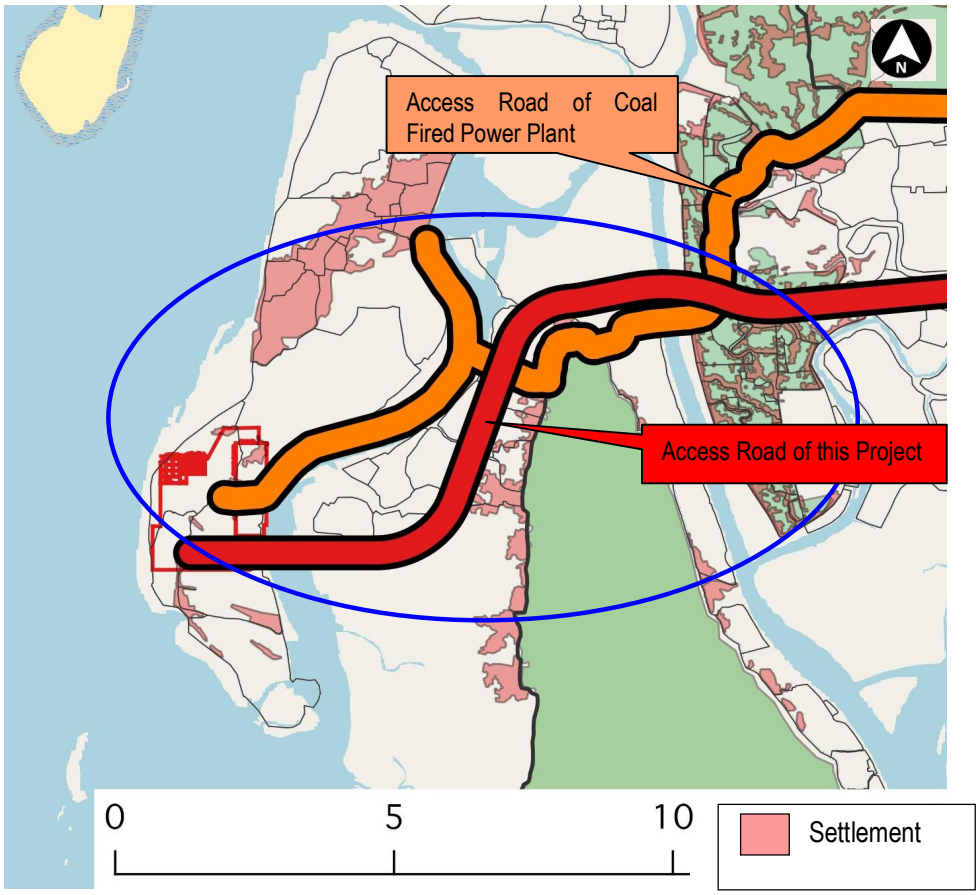
In case that the access roads in both projects are constructed by embankment, north-south passage could be blocked for the area indicated by the circle in the figure 4.5-1, which might cause severance of the existing community. Location of market, residential area and two access roads was to be confirmed to consider the cumulative impact due to block of passage by the roads.



Port Facilities of the project and adjacent project, Power plant of the adjacent project



Access roads of the project and adjacent project



Access roads of the project and adjacent project (starting point)

Figure 4.5-1 Location of the Project and the Adjacent Project

4.6 Scoping and TOR of Environmental and Social Consideration Survey

In this chapter we will scoping to determine the extent of the environmental and social consideration items considered important and important and the investigation method.

4.6.1 Scoping (Port)

Based on the field survey and the survey results of existing related materials, the environmental impact assumed in connection with port maintenance is examined. The results were organized as the scoping plan including the reason for evaluation.

Table 4.6-1 Scoping Matrix (port)

Item	No.	Impact	Rating		Results
			Pre- / construction Phase	Operation Phase	
Pollution Control	1	Air Quality	B-	B-	**Construction phase:** Production of dust is expected from land preparation and other construction work, but the impact will be temporary. **Operation phase:** Air pollution is predicted caused by exhaust gas generated from the vessels using the port. Dust is also predicted, produced from loading-unloading. Some cumulative impact will be seen.
	2	Water Quality	B-	A-	**Construction phase:** Turbid water is expected to be produced from the dredging activity. Also, concrete wastewater and oil-containing wastewater are expected to have an effect. **Operation phase:** Turbid water is expected to be produced from the maintenance dredging of the navigation channel. Ballast water should be properly managed and need the adequate treatment. Water pollution is also expected from the wastewater discharged from vessels using the port. Some cumulative impact will be seen.
	3	Waste	B-	A-	**Construction phase:** In order to make the water way, beach sand will be dredged. dredged materials will be ocean dumping and land dumping. General waste and hazardous waste will be generated by the construction work, but the impact will be temporary. **Operation phase:** Dredging will be periodically conducted because of maintenance of the water way. The disposal area of the dredged material is not determined yet, either onshore or offshore. Waste will be generated from the vessels using the port. Some cumulative impact will be seen.
	4	Soil Contamination	B-	B-	**Construction phase:** Occurrence of construction waste and waste materials is assumed. **Operation phase:** Pollutants are assumed to be generated from ships entering and leaving ports.
	5	Noise and Vibration	B-	B-	**Construction phase:** Impact of noise and vibration from the construction work is predicted but will be temporary. **Operation phase:** Impact of noise and vibration from the loading-unloading is predicted.
	6	Subsidence	C	C	**Construction and Operation phases:** The impact is unknown.

	7	Odor	D	D	**Construction and Operation phases:** No usage of substances that may be a potential source of foul odors is anticipated.
	8	Sediment	B-	B-	**Construction Phase**: The dredged sediment ocean dumping place may be affected. The influence on the benthos organisms in the area where the dredging route is conducted is predicted. **Operation phase:** Because of maintenance dredging, influence is assumed.
Natural Environment	9	Protected Areas	D	D	**Construction and Operation phases:** The protected areas are not existent in the Project area.
	10	Ecosystem	B-	B-	**Construction Phase**: The sandy beach of the intertidal zone of that part disappears for the construction of the port facility. Impacts on the surrounding ecosystems (birds, sea turtles, dolphins) by construction activities are assumed. **Operation phase:** Birds, sea turtles, dolphins and the like are expected to be inhabited. It is assumed that the influence of the ship of a large ship on the shoreline of the drill wave is assumed. Cumulative effects on the ecosystem due to surrounding development are also conceivable.
	11	Hydrology	B-	B-	**Construction and Operation phases:** The construction of the port facility may alter the hydrology surrounding area. Some cumulative impact will be seen.
	12	Topography and Geology	B-	B-	**Construction and Operation phases:** The construction of the port facility may alter the geography and geology of the area around the proposed site and cause the natural seashore to disappear. Some cumulative impact will be seen.
Social Environment	13	Resettlement and Land Acquisition	A-	D	**Pre-Construction:** Approximately 28ha of private land including residential area need to be acquired. Approximately 50 HHs will be resettled. **Construction:** No impact is expected, as relocation will be completed before construction begins. **Operation:** No impact is expected, as relocation will be completed before construction begins.
	14	Poor Classes	B- /B+	B-/ B+	**Pre-Construction:** There are poor households among those to be resettled and/or lose their livelihood means. **Construction:** They will have job opportunities at the construction site. **Operation:** Resettled people may experience the deterioration of their household economies and loss of livelihood following relocation if appropriate measures are not taken. Positive impact will be expected due to improvement of local economy.
	15	Ethnic Minorities and Indigenous Peoples	C	C	**Pre-Construction:** There can be ethnic minority and indigenous people found in or around the project site. **Construction:** Livelihood of ethnic minority can be affected by employment in construction work if ethnic minority and indigenous people live in or around the project site. **Operation:** Livelihood of ethnic minority can be affected by employment in port operation if ethnic minority and indigenous people live in or around the project site.
	16	Local Economy such as Employment and Livelihood, etc.	B-/ B+	B-/ B+	**Pre-Construction:** Employers/ employees of salt farms, shrimp farms, fishermen, farmers and some ferry boat workers may lose their means of livelihood or their jobs. Fishing activities around the site will also be affected due to a rise of water temperature and restriction of fishing. Cumulative impact from the adjacent project will be expected. **Construction:** Local people will be employed for

					construction work. The sandy beach will disappear due to the dredging activities for the port's construction and maintenance, resulting in the loss of fishing ground. Cumulative impact from the adjacent project will be expected. **Operation:** There is the possibility of loss of means of livelihood in salt farming and shrimp farming. Cumulative impact from the adjacent project will be expected. The construction of port will benefit the lives of local people through improvement of marine transport.
	17	Land Use and the Utilization of Local Resources	A-	A-	**Pre-Construction/ Construction:** The implementation of this project will change the traditional land use pattern and utilization of local resources. **Operation:** Influx of port workers may change the traditional land use pattern and utilization of local resources.
	18	Water Usage and Water Rights	A-	B-	**Pre-construction:** No activities are expected to give any impact on water usage. **Construction phase:** Local economy may be affected by the turbid water discharged from the construction site. Outflows of street dust and oil while it rains, may also cause certain effects. **Operation phase:** Local economy may be affected by the discharged water into the sea.
	19	Existing Social Infrastructure and Services	B-	B-	**Pre-construction:** Some social infrastructure may subject to relocation. Access to social infrastructure and social service may be affected due to resettlement of project affected persons. **Construction:** Construction work may disturb access to existing social infrastructure and social services. **Operation:** Increased marine traffic may disturb the existing marine traffic (traffic of fishing boats).
	20	Local Communities and Decision-making Institutions	B-	D	**Pre-construction:** Partial **r**esettlement of existing local communities may affect the concerned local communities and decision-making institutions. **Construction:** No impact is expected as relocation will be completed before construction begins. **Operation:** No impact is expected as relocation will be completed before construction begins.
	21	Unequal Distribution of Benefits and Damages	B-	B-/ C	**Pre-Construction:** There may be feelings of resentment, because people living around the project site will benefit through the improvement of social infrastructure and services. People to be resettled and those who lose their means of livelihoods will receive certain damages. **Construction:** Local resident may not receive benefits if external workers are employed at construction site. **Operation:** Local resident may not receive benefits if external workers are employed at port facility.
	22	Local Conflicts of Interest	B-	B-	**Pre-Construction:** Local conflicts of interest may occur between residents, and between local administration bodies and local political leaders. **Construction:** Conflicts between local residence and external workers may occur because of changes in local customs if the external workers cannot understand local customs. **Operation:** Conflicts between local residence and external

					port workers may occur because of changes in local customs if the external port workers cannot understand local customs.
	23	Cultural Heritage	C	C	**Pre-Construction/ Construction:** There can be historical, cultural and archaeological properties and heritage sites existing at the site, which will be confirmed through survey. **Operation:** There can be historical, cultural and archaeological properties and heritage sites existing near the site, which will be confirmed through survey.
	24	Landscape	B-	D	**Pre-construction:** No activities are expected to give any impact on landscape. **Construction:** Landscape will be affected during construction. **Operation:** No significant impact will be expected as there is no scenic spot near the site.
	25	Gender	B-	B+/ B-	**Pre-construction:** Unequal distribution of compensation can be occurred within households. **Construction:** Unequal employment opportunity can be provided at construction site. **Operation:** Improvement of local economy will give positive impact. Unequal employment opportunity can be provided at port facility
	26	Children's Rights	B-	B+/ B-	**Pre-construction phase:** There are children among households to be resettled and/or lose their livelihood means. Children from households losing their land or jobs may suffer from adverse impact on their household economy, such as dropping-out of school. **Construction phase:** Children's ability to go to school may further deteriorate if access way to their school is physically blocked by the construction site. Child labour can be provoked at the construction site because of the huge demand for unskilled workers. **Operation phase:** Improvement of local economy will give positive impact. Child labour can be provoked at the port facility.
	27	Infectious Disease such as HIV/AIDS	B-	B-	**Pre-construction:** No impact is expected as no influx of migrant labor is expected at this phase. **Construction:** A temporary influx of migrant labor during the construction period may increase the risk of infectious diseases. **Operation:** Influx of migrant port worker may increase the risk of infectious diseases.
	28	Work Environment (Including Work Safety)	B-	B-	**Pre-construction:** No activities are expected to give any impact on work environment. **Construction phase:** Accidents may be caused by construction work. **Operation phase:** Accidents may be caused by the entry and departure of vessels and loading-unloading of cargo.
Others	29	Accidents	B-	B-	**Pre-construction:** No activities are expected to cause accidents. **Construction phase:** Accidents may be caused by construction work. **Operation phase:** Accidents may be caused by increased marine traffic.

	30	Cross-boundary Impact and Climate Change	C	C	**Construction phase:** CO_2 will be produced from construction work, but the impact on climate change will be checked. **Operation phase:** CO_2 will be produced by entry and departure of vessels, but the impact on climate change will be checked.

Note: A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C: Possibility, degree or extent of impact is unknown. (Further examination is needed.)

D: No impact is expected.

Source: JICA Study Team

4.6.2 Scoping (Access Road)

Based on the field survey and the survey results of existing related materials, the possible environmental impacts associated with access road improvement is examined. The results were organized as the scoping draft including the reason for evaluation.

Table 4.6-2 Scoping Matrix (Access Road)

Item	No.	Impact	Rating		Results
			Pre- / construction Phase	Operation Phase	
Pollution Control	1	Air Quality	B-	B-	**Construction phase:** Production of dust is expected from land preparation and other construction work, but the impact will be temporary. The Emission of atmospheric pollutants (SOx, NOx, etc.) by heavy machinery and trucks is considered, but the influence range due to discharge is limited to the vicinity of the construction site. **Operation phase:** Air pollution is predicted caused by exhaust gas generated from the vessels using the port.
	2	Water Quality	B-	B-	**Construction phase:** Turbid water is expected to be produced from the dredging activity. Also, concrete wastewater and oil-containing wastewater are expected to have an effect, **Operation phase:** It is assumed that the exposed soil flows into the river with surface water.
	3	Waste	B-	D	**Construction phase:** General waste and hazardous waste will be generated by the construction work. **Operation phase:** No solid waste will be generated.
	4	Soil Contamination	B-	B-	**Construction phase:** There is a possibility of soil contamination due to leakage of fuel oil and lubricant from construction vehicles and construction machinery. **Operation phase:** Salt pans and paddy fields soil may be affected by traffic.
	5	Noise and Vibration	B-	B-	**Construction phase:** Although the effects of noise and vibration are assumed due to the operation of heavy machinery and trucks, the influence range is limited to the vicinity of the construction site. **Operation phase:** Impact of noise and vibration from the vehicles is predicted.
	6	Subsidence	C	C	**Construction Phase:** The impact will occur if the soft ground is

					existing. **Operation phases:** Same as above.
	7	Odor	D	D	**Construction and Operation phases:** No usage of substances that may be a potential source of foul odors is anticipated and the impact is temporary.
	8	Sediment	B-	D	**Construction phase:** Some negative influences due to disturbing river mud at the time of bridge construction can be considered. **Operation phase:** No effect or minor. no discharge or disposal will be necessary.
Natural Environment	9	Protected Areas	D	D	**Construction and Operation phases:** The protected areas are not existent in the Project area.
	10	Ecosystem	B-	B-	**Construction Phase:** There are mangrove forests by afforestation or natural forest along the river. If there is construction in the vicinity of the surrounding reserve, there are effects on animals and plants. **Operation phase:** When passing through neighboring protected areas, there are effects on animals and plants.
	11	Hydrology	C	B-	**Construction phase:** The influence is seen depending on the type of bridge construction on the river. **Operation phases:** Depending on the type of bridge, there are negative impacts. Due to the embankment of the road, it is expected that changes of the flood-affected area will occur at the time of monsoon, so countermeasures such as drainage are required.
	12	Topography and Geology	B-	B-	**Construction phase:** The embankment and cutting may influence the topography and geology, but significant impacts are not assumed as the embankment is used as most of the project planning area is flat. **Operation phases: The** erosion of the slope is assumed, but the influence is minimized by revetment construction.
Social Environment	13	Resettlement and Land Acquisition	A-	D	**Pre-Construction phase:** Approximately 55ha of private land including residential area need to be acquired. Approximately 150 HHs will be resettled. **Construction:** No impact is expected, as relocation will be completed before construction begins. **Operation:** No impact is expected, as relocation will be completed before construction begins.
	14	Poor Classes	B-/ B+	B-/ B+	**Pre-Construction phase:** There are poor households among those to be resettled and/or lose their livelihood means. **Construction phase:** They will have job opportunities at the construction site. **Operation phase:** Resettled people may experience the deterioration of their household economies and loss of livelihood following relocation if appropriate measures are not taken. Positive impact will be expected due to improvement of local economy.
	15	Ethnic Minorities and Indigenous Peoples	C	C	**Pre-Construction:** There can be no ethnic and indigenous people found in or around the project site. **Construction:** Livelihood of ethnic minority can be affected by employment in construction work if ethnic minority and indigenous people live in or around the project site.

					Operation: Livelihood of ethnic minority can be affected by change of regional economy after road operation if ethnic minority and indigenous people live in or around the project site.
	16	Local Economy such as Employment and Livelihood, etc.	B-/B+	B-/B+	**Pre-Construction phase:** Employers/ employees of salt farms, shrimp farms, fishermen and farmers may lose their means of livelihood **Construction phase:** Local people will be employed for construction work. Access to market may be restricted. **Operation phase:** There is the possibility of reductions of means of livelihood in salt farming, shrimp farming and rice farming activities. The construction of road and bridges will benefit the lives of local people such as improvement of access to social services and opportunity of employment.
	17	Land Use and the Utilization of Local Resources	B-	D	**Pre-Construction/ Construction/ Operation phase:** There is the possibility of a change of traditional land use patterns and utilization of local resources **Operation:** No impact is expected, as activities requiring change of land use and utilization of local resources will be completed by the end of construction.
	18	Water Usage and Water Rights	B-	B-	**Pre-Construction/ Construction phase:** Salt farm/ paddy field may be affected by the turbid water discharged from the construction site. Outflows of street dust and oil while it rains, may also cause certain effects. **Operation phase:** Salt farm/ paddy field may be affected by the discharged water from the road.
	19	Existing Social Infrastructure and Services	B-	B+/ B-	**Pre-construction:** Some social infrastructure may subject to relocation. Access to social infrastructure and social service may be affected due to resettlement of project affected persons. **Construction:** Construction work may disturb access to existing social infrastructure and social services. **Operation:** Access to social infrastructure and services will be improved. Increased traffic volume may disturb the access.
	20	Local Communities and Decision-making Institutions	B-	B-	**Pre-construction:** Partial **r**esettlement of existing local communities may affect the concerned local communities and decision-making institutions. **Construction:** Community can be divided because passage is blocked by construction work. **Operation:** Community can be divided because passage is blocked by the access road.
	21	Unequal Distribution of Benefits and Damages	B-	B-	**Pre-Construction Phase:** There may be feelings of resentment, because people living around the project site will benefit through the improvement of social infrastructure and services. People to be resettled and those who lose their means of livelihoods will receive certain damages. **Construction phase:** Part of residents will have disadvantage because access is limited by construction work. **Operation:** People living around the road will benefit through the improvement of social infrastructure and services, but people living far from the road will not benefit much
	22	Local Conflicts of	B-	D	**Pre-Construction:** Local conflicts of interest may occur between residents, and between local administration bodies and

		Interest			local political leaders. **Construction:** Conflicts between local residence and external workers may occur because of changes in local customs if the external workers cannot understand local customs. **Operation:** No activity will be conducted to cause local conflict of interest.
	23	Cultural Heritage	C	C	**Pre-Construction/ Construction:** There can be historical, cultural and archaeological properties and heritage sites existing at the site, which will be confirmed through survey. **Operation:** There can be historical, cultural and archaeological properties and heritage sites existing near the site, which will be confirmed through survey.
	24	Landscape	B-	D	**Pre-construction:** No activities are expected to give any impact on landscape. **Construction:** Landscape will be affected during construction. **Operation:** No significant impact will be expected as there is no scenic spot near the site.
	25	Gender	B-	B+	**Pre-construction:** Unequal distribution of compensation can be occurred within households. **Construction:** Unequal employment opportunity can be provided at construction site. **Operation:** Improvement of local economy will give positive impact.
	26	Children's Rights	B-	B+	**Pre-construction phase:** There are children among those to be resettled and/or lose their livelihood means. Children from households losing their land or jobs may suffer from adverse impact on their household economy, such as dropping-out of school. **Construction phase:** Children's ability to go to school may further deteriorate if access way to their school is physically blocked by the construction site. Child labour can be provoked at the construction site because of the huge demand for unskilled workers. **Operation phase:** Children will have better access to social services throughout the year. Education opportunity can be improved.
	27	Infectious Disease such as HIV/AIDS	B-	B-	**Pre-construction:** No impact is expected as no influx of migrant labor is expected at this phase. **Construction phase:** A temporary influx of migrant labor during the construction period may increase the risk of infectious diseases. **Operation:** Improved mobility of local residents and influx of external residents may increase the risk of infectious diseases
	28	Work Environment (Including Work Safety)	B-	D	**Pre-construction:** No activities are expected to give any impact on work environment. **Construction phase:** Accidents may be caused by construction work. **Operation phase:** No work will be expected to affect work environment.
Others	29	Accidents	B-	B-	**Pre-construction:** No activities are expected to cause accidents. **Construction phase:** Accidents may be caused by construction

					work. **Operation phase:** Accidents may be caused by increased traffic. Flyover may hinder firefighting.
	30	Cross-boundary Impact and Climate Change	C	C	**Construction phase:** CO_2 will be produced from construction work, but the impact on climate change will be checked. **Operation phase:** CO_2 will be produced by entry and departure of vessels, but the impact on climate change will be checked.

Note: A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C: Possibility, degree or extent of impact is unknown. (Further examination is needed.)

D: No impact is expected.

Source: JICA Study Team

4.6.3 Survey TOR (Port)

(1) Survey Area

The coverage of the survey is the planned site of the port described previously and its surrounding area including spoil dumps, quarries, construction yards, workers' camps, approach roads for construction equipment and related infrastructures such as power distribution and water supply facilities. Moreover, as for the related infrastructures grasped at the moment, after their locations and scales are established, details of evaluation, mitigation measures and monitoring will be considered. In addition, also for the infrastructures which cannot be grasped, after the impact is established, locations and scales to reduce the impact are described and the mitigation measures and monitoring details thereafter are considered.

Table 4.6-3 Survey TOR (port)

Environmental Items	Survey Items	Survey Method
Air	Related environmental standards Current condition of air quality	Collection of air quality standards and exhaust gas standards Collect weather data (temperature, humidity, wind direction, wind speed, etc.) from nearby weather center. Measurement of air pollutants (SOx, NOx, PM10, CO, O3): Implemented during the dry season and rainy season to reflect seasonal changes. (Perform cumulative impact assessment at service)
Water	Related environmental standards Geological characteristics of rivers Current status of water quality	Collection of water quality standards Measure water depth Measurement of water quality Field survey: Transparency, color, water temperature, salinity (vertical), pH value, turbidity Laboratory analysis: Suspended substances, dissolved oxygen, COD, BOD 5, ammonia nitrogen (NH 4 - N), nitrate nitrogen (NO 3 - N), total nitrogen, phosphorus (PO 4 - P), total phosphorus, total E. coli, oil components, mercury , Arsenic, lead, chromium, cadmium, copper, nickel, zinc. Implemented in the dry and rainy season to reflect the seasonal change (Perform cumulative impact assessment during operations) For ballast water, investigation on international emission standards. examine measures to prevent invasive species from disturbing ecosystems · mitigation measures.

Environmental Items	Survey Items	Survey Method
Waste	Domestic and overseas emission standards regulations of waste and	Obtain standards for handling industrial waste and domestic waste.
Soil	Relevant environmental standards	- Related legal system and institutions, obtaining relevant treaties - Measurement of pollutants - Measures to prevent pollutant leakage
Noise and vibration	Relevant environmental standards	-Obtain noise standards
Subsidence	- Usage of ground water by project activity	- Checking the design of usage of ground water
Odor	Relevant environmental standards	-Waste generation estimate - estimate malodorous gaseous emissions
Sediment	- Relevant environmental standards -Usage of ground water by project activity Present conditions of bottom sediment	- Collecting the bottom sediment -Measurement of mud temperature, sulfide, heavy metals, etc.: Only once in the dry season - Benthic living organisms: Considering the seasonal change, conducted in the rainy season and dry season - Measures to prevent pollutant leakage
Protected areas	- Current habitat status of flora, mammals, birds, reptiles, amphibians, fish, tidal land organisms, rare species (migrant birds, sea turtles, dolphins)	- Survey the distribution of flora and fauna. - Survey the operation of large vessels.
Ecosystem	- Current habitat status of ecologically valuable habitats (coral reefs, mangrove forests, or tidal flats). - Current habitat status of flora, mammals, birds, reptiles, amphibians, fish, tidal land organisms, precious species (migrant birds, sea turtles, dolphins)	- Survey the distribution of flora and fauna.
Hydrology	- Sea bottom topography - Current status of tidal current	Water depth measurement Survey of tidal current (tidal direction, current speed): conducted in the rainy and dry seasons to reflect seasonal change.
Topography and Geology	Terrestrial topography Sea bottom topography Tidal current	- Acquisition of information about terrestrial topography - Water depth measurement - Survey of tidal current (tidal direction, current speed): conducted in the rainy and dry seasons to reflect seasonal change.
Resettlement and Land Acquisition	Residents affected by land acquisition and involuntary resettlement. Property of the affected residents. Lives and livelihoods of the affected residents.	- Relevant laws and regulations and case studies - Population census survey - Survey of assets inventory - Socioeconomic survey
Poor Classes	Poor households among the affected residents	- Relevant laws and regulations and case studies - Population census survey - Survey of assets inventory - Socioeconomic survey
Local Economy such as Employment and Livelihood, etc.	- Current status of occupation and livelihoods of the potentially affected households Local economic development plan	- Material on local peoples' employment and income - Interview the affected households - Local economic development plan

Environmental Items	Survey Items	Survey Method
Land Use and Utilization of Local Resources	Current land use Current status of occupation and livelihood of the potentially affected households	material on local peoples` employment and income Interview the affected households - Local economic development plan
Water Usage and Water Rights	Current condition of water usage and water rights	- Interview survey
Existing Social Infrastructure and Services	- Usage of existing road - access to market and school	- Survey the operation of large vessels.
Local Communities and Decision-making Institutions	- Existing decision-making Institutions	- Interview survey
Unequal Distribution of Benefits and Damages	- Occupation and livelihood of the potentially affected households	- Materials on local peoples` employment and income - Interview the affected households
Local Conflicts of Interest	- Occupation and livelihood of the potentially affected households	- Materials on local people's employment and income - Interview the affected households
Gender	- Gender of the affected people	- The relevant laws, regulations and case studies - Population census survey - Socioeconomic survey - Focused Group Discussion
Children's Rights	-Number of children among the affected people -Education rate -Access to medical facilities -Vaccination rate	- The relevant laws, regulations and case studies - Population census survey - Socioeconomic survey
Infectious Diseases such as HIV/AIDS	- Rate of diseases	- Existing documents - Socioeconomic survey
Work environment (including work safety)	- Law	- The relevant laws, regulations and case studies
Accidents	- None	- None

Source: JICA Survey Team

4.6.4 Survey TOR (Access Road)

(1) Survey Area

The coverage of the survey is the planned site of the access road described previously and its surrounding area including spoil dumps, quarries, construction yards, workers' camps, approach roads for construction equipment and related infrastructures such as power distribution and water supply facilities. Moreover, as for the related infrastructures grasped at the moment, after their locations and scales are established, details of evaluation, mitigation measures and monitoring will be considered. In addition, also for the infrastructures which cannot be grasped, after the impact is established, locations and scales to reduce the impact are described and the mitigation measures and monitoring details thereafter are considered.

(2) Survey TOR

Table 4.6-4 Survey TOR (access road)

Environmental Items	Survey Items	Survey Method
Air	Related environmental standards Current condition of air quality	Collection of air quality standards and exhaust gas standards Collect weather data (temperature, humidity, wind direction, wind speed, etc.) from nearby weather center. Measurement of air pollutants (SOx, NOx, PM10, CO, O3): Implemented during the dry season and rainy season to reflect seasonal changes. (Perform cumulative impact assessment at service)
Water	Related environmental standards Geological characteristics of rivers Current status of water quality	Collection of water quality standards Measure water depth Measurement of water quality Field survey: Transparency, color, water temperature, salinity (vertical), pH value, turbidity Laboratory analysis: Suspended substances, dissolved oxygen, COD, BOD 5, ammonia nitrogen (NH 4 - N), nitrate nitrogen (NO 3 - N), total nitrogen, phosphorus (PO 4 - P), total phosphorus, total E. coli, oil components, mercury , Arsenic, lead, chromium, cadmium, copper, nickel, zinc. Implemented in the dry and rainy season to reflect the seasonal change (Perform cumulative impact assessment during operations) For ballast water, investigation on international emission standards. examine measures to prevent invasive species from disturbing ecosystems · mitigation measures.
Waste	Domestic and overseas emission standards regulations of waste and	Obtain standards for handling industrial waste and domestic waste.
Soil	Relevant environmental standards	- Related legal system and institutions, obtaining relevant treaties - Measurement of pollutants - Measures to prevent pollutant leakage
Noise and vibration	Relevant environmental standards	-Obtain noise standards
Subsidence	- Usage of ground water by project activity	- Checking the design of usage of ground water
Odor	Relevant environmental standards	-Waste generation estimate - estimate malodorous gaseous emissions
Sediment	- Relevant environmental standards -Usage of ground water by project activity Present conditions of bottom sediment	- Collecting the bottom sediment -Measurement of mud temperature, sulfide, heavy metals, etc.: Only once in the dry season - Benthic living organisms: Considering the seasonal change, conducted in the rainy season and dry season - Measures to prevent pollutant leakage
Protected areas	- Current habitat status of flora, mammals, birds, reptiles, amphibians, fish, tidal land organisms, rare species (migrant birds, sea turtles, dolphins)	- Survey the distribution of flora and fauna. - Survey the operation of large vessels.
Ecosystem	- Current habitat status of ecologically valuable habitats (coral reefs, mangrove forests, or tidal flats). - Current habitat status of flora, mammals, birds, reptiles, amphibians, fish, tidal land organisms, precious species	- Survey the distribution of flora and fauna.

Environmental Items	Survey Items	Survey Method
	(migrant birds, sea turtles, dolphins)	
Hydrology	- Sea bottom topography - Current status of tidal current	Water depth measurement Survey of tidal current (tidal direction, current speed): conducted in the rainy and dry seasons to reflect seasonal change.
Topography and Geology	Terrestrial topography Sea bottom topography Tidal current	- Acquisition of information about terrestrial topography - Water depth measurement - Survey of tidal current (tidal direction, current speed): conducted in the rainy and dry seasons to reflect seasonal change.
Resettlement and Land Acquisition	Residents affected by land acquisition and involuntary resettlement. Property of the affected residents. Lives and livelihoods of the affected residents.	- Relevant laws and regulations and case studies - Population census survey - Survey of assets inventory - Socioeconomic survey
Poor Classes	Poor households among the affected residents	- Relevant laws and regulations and case studies - Population census survey - Survey of assets inventory - Socioeconomic survey
Local Economy such as Employment and Livelihood, etc.	- Current status of occupation and livelihoods of the potentially affected households Local economic development plan	- Material on local peoples' employment and income - Interview the affected households - Local economic development plan
Land Use and Utilization of Local Resources	Current land use Current status of occupation and livelihood of the potentially affected households	material on local peoples` employment and income Interview the affected households - Local economic development plan
Water Usage and Water Rights	Current condition of water usage and water rights	- Interview survey
Existing Social Infrastructure and Services	- Usage of existing road - access to market and school	- Survey the operation of large vessels.
Local Communities and Decision-making Institutions	- Existing decision-making Institutions	- Interview survey
Unequal Distribution of Benefits and Damages	- Occupation and livelihood of the potentially affected households	- Materials on local peoples` employment and income - Interview the affected households
Local Conflicts of Interest	- Occupation and livelihood of the potentially affected households	- Materials on local people's employment and income - Interview the affected households
Gender	- Gender of the affected people	- The relevant laws, regulations and case studies - Population census survey - Socioeconomic survey - Focused Group Discussion
Children's Rights	-Number of children among the affected people -Education rate -Access to medical facilities -Vaccination rate	- The relevant laws, regulations and case studies - Population census survey - Socioeconomic survey
Infectious	- Rate of diseases	- Existing documents

Environmental Items	Survey Items	Survey Method
Diseases such as HIV/AIDS		- Socioeconomic survey
Work environment (including work safety)	- Law	- The relevant laws, regulations and case studies
Accidents	- None	- None

4.7 Environmental Impact Assessment

The qualitative checklist was used to confirm the Environmental Impact Assessment.

4.7.1 Result of Impact Assessment (Port)

Table 4.7-1 Result of Impact Assessment (Port)

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
Pollution Control	1	Air Quality	B-	B-	B-	B-	**Construction phase:** - Prevention measures for dust dispersion will be taken by spraying water. - Maintenance of machinery will be conducted regularly, resulting in reducing exhaust gas emissions. **Operation phase:** Air pollution caused by exhaust gas generated from the vessels using the port is predicted. - Cumulative impacts are expected with the surrounding areas.
	2	Water Quality	B-	B-	A-	A-	**Construction phase:** - dredgers with less negative impacts will be used and anti-diffusion membrane will be installed to prevent diffusion of turbidity. - When excavating the land area, steel sheet piles will be installed for enclosure on the marine side before any excavation work. - Turbid water from the land will be treated with appropriate measures. **Operation phase:** - Dredging method and equipment will be selected to minimize turbidity. - Manage the ballast water drainage of the ship and take measures by paying attention to environmental standards.
	3	Waste	B-	B-	A-	A-	**Construction phase:** Sand and silt from dredging work of the navigation channel and the port will be re-used for land preparation of the port and others are disposed properly by sea and land dumping. **Operation phase:** - Dredged materials generated by maintenance of the port will be reused to the maximum extent around the project and residual material will be disposed of within the project site.

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
	4	Soil Contamination	B-	B-	B-	B-	**Construction phase:** Generation of the construction waste and waste materials is assumed. **Operation phase:** Some pollutants are assumed to be generated from vessels entering and leaving ports such as oil and chemical material spills.
	5	Noise and Vibration	B-	B-	B-	B-	**Construction phase:** - Construction machinery and vehicles will be maintained regularly - Low-noise/ low-vibration machinery will be used. - Noise levels generated from construction machinery will meet noise level standards at the nearest residential area (Max 119dB -> 73.2dB). **Operation phase:** - Construction machinery and vehicles will be maintained regularly. - Low-noise/ low-vibration machinery will be used. - Noise levels generated from construction machinery will meet noise level standards at the nearest residential area
	6	Subsidence	C	C	D	D	**Construction/Operation phase:** There is no groundwater use during construction/operation phase:
	7	Odor	D	D	D	D	**Construction/Operation phase:** There is no material creating odors during construction/operation phase:
	8	Sediment	D	D	B－	B－	**Construction phase:** Both in ocean dumping place of the dredged sediment and the route areas of dredging, there are some negative impacts on benthos. **Operation phase :** Because of the maintenance dredging, benthos are affected**.**
Natural Environment	9	Protected Areas	D	D	**D**	**D**	**Construction/Operation phase:** There is no protected area in the planned site
	10	Ecosystem	B-	B-	**B-**	**B-**	**Construction phase:** The sandy beach of the intertidal zone disappears for the construction of the harbor facility. Impacts on surrounding ecosystems (birds, sea turtles, dolphins) due to overseas line change and construction activities are assumed. **Operation phase:** There were no threatened species such as birds, sea turtles, and dolphins. However, maintenance dredging and the influence on the coastline of the drilling waves due to the navigation of large vessels gradually progresses, and adaptation of these changed is expected.
	11	Hydrology	B-	B-	**B-**	**B-**	**Construction/Operation phase:** It is assumed that changes in the hydrology will occur due to the addition of port facility. However, the cumulative effect from the surrounding facilities is rather smaller compared with the case of separate facility due to the joint use with the coal port.
	12	Topography and Geology	B-	B-	**B-**	**B-**	**Construction/Operation phase:** It is assumed that changes in the topography and Geology will occur due to the addition of port facility. However, the cumulative effect from the surrounding facilities is rather smaller compared with the case of separate facility due to the joint use with the coal port.

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
Social Environment	13	Resettlement and Land Acquisition	A-	D	A-	D	**Pre-Construction:** Approximately 56ha of private land including residential area and salt farm need to be acquired. 45 HHs will be resettled, which requires approximate resettlement assistance and/or compensation. **Construction:** No impact is expected, as relocation will be completed before construction begins. **Operation:** No impact is expected, as relocation will be completed before construction begins.
	14	Poor Classes	B-/B+	B-/B+	B-/B+	B-/B+	**Pre-Construction:** There are 40 poor households among those to be resettled and/or lose their livelihood means, which requires approximate resettlement assistance and/or compensation. **Construction:** They will have job opportunities at the construction site. **Operation:** Resettled people may experience the deterioration of their household economies and loss of livelihood following relocation if appropriate measures are not taken. Positive impact will be expected due to job opportunity at port facilities, improvement of local economy facilitated by livelihood of port workers.
	15	Ethnic Minorities and Indigenous Peoples	C	C	D	D	**Pre-Construction:** Neither ethnic minorities nor indigenous peoples live in the project affected area. **Construction:** Neither ethnic minorities nor indigenous peoples live in the project affected area. **Operation:** Neither ethnic minorities nor indigenous peoples live in the project affected area.
	16	Local Economy such as Employment and Livelihood, etc.	B-/B+	B-/B+	A-/B+	B-/B+	**Pre-Construction:** Employers/ employees of salt farms, shrimp farms, fishermen, farmers and some ferry boat workers may lose their means of livelihood or their jobs, which requires appropriate livelihood restoration assistance. **Construction:** Local people will be employed for construction work. The sandy beach will not additionally disappear due to the dredging activities for the port's construction and maintenance. Cumulative impact from the adjacent project on salt and shrimp farm will be expected. **Operation:** Means of livelihood in salt farming and shrimp farming could be lost. Cumulative impact from the adjacent project will be expected. The construction of port will benefit the lives of local people through job opportunity and improvement of local economy due to livelihood of port works.
	17	Land Use and the Utilization of Local Resources	A-	A-	A-	A-	**Pre-Construction/ Construction:** The implementation of this project will change the traditional land use pattern. Local resources can get stringent. **Operation:** Influx of port workers may change the traditional land use pattern and utilization of local resources.
	18	Water Usage and Water Rights	A-	B-	B-	B-	**Pre-construction:** No activities are expected to give any impact on water usage. **Construction phase:** Local economy may be affected by the turbid water discharged from the construction site. Outflows of

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
							street dust and oil while it rains, may also cause certain effects, which requires management plan for water quality. **Operation phase:** Local economy may be affected by the discharged water into the sea which requires management plan for water quality.
	19	Existing Social Infrastructure and Services	B-	B-	B-	B-	**Pre-construction:** Some social infrastructure may subject to relocation. Access to social infrastructure and social service may be affected due to resettlement of project affected persons. For mitigating this impact, appropriate resettlement assistance will be required. **Construction:** Construction work will not disturb access to existing social infrastructure and social services. **Operation:** Increased marine traffic may disturb the existing marine traffic (traffic of fishing boats).
	20	Local Communities and Decision-making Institutions	B-	D	B-	D	**Pre-construction:** Displacement may affect the existing network of local communities and decision-making institutions. For mitigating this, relocation site needs to be secured near the current residence. **Construction:** No impact is expected as relocation will be completed before construction begins. **Operation:** No impact is expected as relocation will be completed before construction begins.
	21	Unequal Distribution of Benefits and Damages	B-	B-/C	B-	B-	**Pre-Construction:** There may be feelings of resentment, because people living around the project site will benefit through the improvement of social infrastructure and services. People to be resettled and those who lose their means of livelihoods will receive certain damages, which requires appropriate resettlement assistance, compensation and livelihood restoration assistance. **Construction:** Local resident may not receive benefits if external workers are employed at construction site. For avoiding this, employment of local residents shall be considered. **Operation:** Local resident may not receive benefits if external workers are employed at port facility. For avoiding this, employment of local residents shall be considered.
	22	Local Conflicts of Interest	B-	B-	B-	B-	**Pre-Construction:** Local conflicts of interest may occur between residents, and between local administration bodies and local political leaders. **Construction:** Conflicts between local residence and external workers may occur because of changes in local customs if the external workers cannot understand local customs. Employment of local residents shall be considered. **Operation:** Conflicts between local residence and external port workers may occur because of changes in local customs if the external port workers cannot understand local customs. Employment of local residents shall be considered.
	23	Cultural Heritage	C	C	D	D	**Pre-Construction/ Construction:** There is no historical/ cultural/archaeological properties nor heritage sites at the project

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
							site. **Operation:** There is no historical/ cultural/archaeological properties nor heritage sites at the project site.
	24	Landscape	B-	D	D	D	**Pre-construction:** No activities are expected to give any impact on landscape. **Construction:** No significant impact will be expected as there is no scenic spot near the site. **Operation:** No significant impact will be expected as there is no scenic spot near the site.
	25	Gender	B-	B+/B-	B-	B+/B-	**Pre-construction:** Unequal distribution of compensation can be occurred within households. **Construction:** Unequal employment opportunity can be provided at construction site. Appropriate job opportunity for both male and female shall be considered. **Operation:** Improvement of local economy will give positive impact. Unequal employment opportunity can be provided at port facility. Appropriate job opportunity for both male and female shall be considered.
	26	Children's Rights	B-	B+/B-	B-	B+/B-	**Pre-construction phase:** There are children among households to be resettled and/or lose their livelihood means. Children from households losing their land or jobs may suffer from adverse impact on their household economy, such as dropping-out of school. **Construction phase:** Access way to their schools will not be physically blocked by the construction site. Child labour can be provoked at the construction site because of the huge demand for unskilled workers. **Operation phase:** Improvement of local economy will give positive impact. Child labour can be provoked at the port facility.
	27	Infectious Disease such as HIV/AIDS	B-	B-	B-	B-	**Pre-construction:** No impact is expected as no influx of migrant labor is expected at this phase. **Construction:** A temporary influx of migrant labor during the construction period may increase the risk of infectious diseases. For mitigating this risk, measure for prevention of infection shall be taken. **Operation:** Influx of migrant port worker may increase the risk of infectious diseases. For mitigating this risk, measure for prevention of infection shall be taken.
	28	Work Environment (Including Work Safety)	B-	B-	B-	B-	**Pre-construction:** No activities are expected to give any impact on work environment. **Construction phase:** Accidents may be caused by construction work. Measures for accident prevention shall be taken by contractors. **Operation phase:** Accidents may be caused by the entry and departure of vessels and loading-unloading of cargo.
Others	29	Accidents	B-	B-	B-	B-	**Pre-construction:** No activities are expected to cause accidents.

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
							Construction phase: Accidents may be caused by construction work. Measures for accident prevention shall be taken by contractors. **Operation phase:** Accidents may be caused by increased marine traffic. Measures for accident prevention shall be taken.
	30	Cross-boundary Impact and Climate Change	C	C	**D**	**B－**	**Construction phas**e: CO2 emissions due to construction activities is a temporary impact on climate change. **Operation phase:** CO2 emissions due to the operation of vessels entering and leaving port affects climate change in the long term, and adaptation measures are necessary.

Source: JICA Survey Team

Note: A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C: Impact is unknown. (Further examination is needed, and the impact may be clarified as the study progresses.)

D: No impact is expected.

4.7.2 Result of Impact Assessment (Access Road)

Table 4.7-2 Result of Impact Assessment (Access Road)

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
Pollution Control	1	Air Quality	B-	B-	B-	D	**Construction phase:** - Prevention measures for dust dispersion will be taken by spraying water. - Maintenance of machinery will be conducted regularly, resulting in reducing exhaust gas emissions. **Operation phase:** - Air pollution caused by exhaust gas generated from the vehicles using the port is predicted.
	2	Water Quality	B-	B-	B-	B-	**Construction/Operation phase:** Although turbidity increases due to construction around the river, the effect is temporary. For wastewater accompanying concrete construction and wastewater containing oil, the muddy stream caused by embankment at the time of rainy weather, measures are taken sufficiently by proper concrete use and greening.
	3	Waste	B-	D	D	D	**Construction phase:** - Waste containing hazardous materials will be generated by construction work, but it will be appropriately disposed. **Operation phase:** - No solid waste is expected.

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre-/ construction Phase	Operation Phase	Pre-/ construction Phase	Operation Phase	
	4	Soil Contamination	B-	B-	B-	D	**Construction phase:** Since there is a possibility of soil contamination due to leakage of fuel oil and lubricant from construction vehicles and construction machinery, appropriate measures are taken. **Operation phase:** Because salt farm and paddy field are affected by the new traffic, impacts on surrounding rural areas and farmland are occurred, but these impacts are limited.
	5	Noise and Vibration	B-	B-	B-	B-	**Construction phase:** - Construction machinery and vehicles will be maintained regularly. - Low-noise/ low-vibration machinery will be used. - Noise levels generated from construction machinery will meet noise level standards at the nearest residential area **Operation phase:** - Noise levels generated from construction machinery will meet noise level standards at the nearest residential area and will be limited to small amount.
	6	Subsidence	C	C	B-	B-	**Construction phase:** There are soft ground layers, but taking measures against ground subsidence **Operation phase:** same as above
	7	Odor	D	D	D	D	**Construction/Operation phase:** Little materials will cause the odors.
	8	Sediment	B-	D	B-	D	**Construction phase:** Negative impacts due to disturbing river mud at the time of bridge constructions can be considered. **Operation phase: -**
Natural Environment	9	Protected Areas	D	D	D	D	**Construction/Operation phase:** There is no protected area in the planned site.
	10	Ecosystem	B-	B-	B-	D	**Construction phase:** Since there are mangrove forests due to afforestation or natural forests along the river and canal, there are effects on animals and plants. **Operation phase:** Although there are slight effects on animals and plants in the adjacent area, the impacts are limited.
	11	Hydrology	C	B-	B-	B-	**Construction phase:** Individual hydrological conditions are altered by construction work such as embankment and soft ground improvement work. Although it is affected by bridge construction over rivers, appropriate measures are taken. **Operation phase:** Depending on the types of bridges, there are some negative impacts. It is predicted that the embankment of the road will cause changes in the flood expected area at the time of monsoon. For this reason, buffering measures such as draining will be taken.
	12	Topography and	B-	B-	B-	B-	**Construction phase:**

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
		Geology					Construction works such as filling embankments and measures against soft soils may affect the topography and geology. However, the impacts are limited because the levees are installed, and the majority of project planned places are flat. **Operation phase:** Although there is erosion on the embankment surface due to the occurrence of storm surge or flooding, the damages should be avoided before the disasters by constructing a protective surface protector.
Social Environment	13	Resettlement and Land Acquisition	A-	D	A-	D	**Pre-Construction:** Approximately 121ha of private land including residential area and salt farm need to be acquired. 219 HHs will be resettled, which needs approximate resettlement assistance and/or compensation. **Construction:** No impact is expected, as relocation will be completed before construction begins. **Operation:** No impact is expected, as relocation will be completed before construction begins.
	14	Poor Classes	B-/B+	B-/B+	B-/B+	B-/B+	**Pre-Construction:** There are poor households among those to be resettled and/or lose their livelihood means, which requires approximate resettlement assistance and/or compensation. **Construction:** They will have job opportunities at the construction site. **Operation:** Resettled people may experience the deterioration of their household economies and loss of livelihood following relocation if appropriate measures are not taken. Positive impact will be expected due to improvement of local economy facilitated by improved road network.
	15	Ethnic Minorities and Indigenous Peoples	C	C	D	D	**Pre-Construction:** Neither ethnic minorities nor indigenous peoples live in the project affected area. **Construction:** Neither ethnic minorities nor indigenous peoples live in the project affected area. **Operation:** Neither ethnic minorities nor indigenous peoples live in the project affected area.
	16	Local Economy such as Employment and Livelihood, etc.	B-/B+	B-/B+	A-/B+	B-/B+	**Pre-Construction:** Employers/ employees of salt farms, shrimp farms, fishermen, farmers and some ferry boat workers may lose their means of livelihood or their jobs, which requires appropriate livelihood restoration assistance. **Construction:** Local people will be employed for construction work. Access to market can be limited. **Operation:** Means of livelihood in salt farming and shrimp farming could be lost. The construction of road and bridges will benefit the lives of local people such as improvement of access to social services and opportunity of employment.
	17	Land Use and the Utilization of Local Resources	B-	D	B-	D	**Pre-Construction/ Construction:** The implementation of this project will change the traditional land use pattern. Local resources can get stringent. **Operation:** No impact is expected, as activities requiring change of land use and utilization of local resources will be completed by the end of construction.
	18	Water Usage and	B-	B-	B-	B-	**Pre-construction:** No activities are expected to give any impact

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
		Water Rights					on water usage. **Construction phase:** Local economy may be affected by the turbid water discharged from the construction site. Outflows of street dust and oil while it rains, may also cause certain effects on salt/shrimp farms and agricultures, which requires management plan for water quality. **Operation phase:** Local economy may be affected by the discharged water into salt/shrimp farms and agriculture farms which requires management plan for water quality.
	19	Existing Social Infrastructure and Services	B-	B+/ B-	B-	B+/ B-	**Pre-construction:** Some social infrastructure will subject to relocation. Access to social infrastructure and social service may be affected due to resettlement of project affected persons. For mitigating this impact, appropriate resettlement assistance will be required. **Construction:** Construction work will disturb access to existing social infrastructure and social services for mitigating this impact, passage shall be secured during construction. **Operation:** Access to social infrastructure and services will be improved. Increased traffic volume may disturb the access to existing social infrastructure and services. For mitigating this, passage needs to be secured.
	20	Local Communities and Decision-making Institutions	B-/D	B-	B-	B-	**Pre-construction:** Displacement may affect the existing network of local communities and decision-making institutions. For mitigating this, relocation site needs to be secured near the current residence. **Construction:** Community can be divided because passage is blocked by construction work. Cumulative impact from coal power plant will be concerned regarding community severance. Passage shall be secured especially within community. **Operation:** Community can be divided because passage is blocked by the access road. Cumulative impact from coal power plant will be concerned regarding community severance. Passage shall be secured especially within community.
	21	Unequal Distribution of Benefits and Damages	B-	B-	B-	B-	**Pre-Construction:** There may be feelings of resentment, because people living around the project site will benefit through the improvement of social infrastructure and services. People to be resettled and those who lose their means of livelihoods will receive certain damages, which requires appropriate resettlement assistance, compensation and livelihood restoration assistance. **Construction:** Part of residents will have disadvantage because access is limited by construction work. Local resident may not receive benefits if external workers are employed at construction site. For avoiding this, employment of local residents shall be considered. **Operation:** People living around the road will benefit through the improvement of social infrastructure and services, but people living far from the road will not benefit much.
	22	Local Conflicts	B-	D	B-	D	**Pre-Construction:** Local conflicts of interest may occur between

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
		of Interest					residents, and between local administration bodies and local political leaders. **Construction:** Conflicts between local residence and external workers may occur because of changes in local customs if the external workers cannot understand local customs. Employment of local residents shall be considered. **Operation:** No activity will be conducted to cause local conflict of interest.
	23	Cultural Heritage	C	C	D	D	**Pre-Construction/ Construction:** There is no historical/ cultural/archaeological properties nor heritage sites at the project site. **Operation:** There is no historical/ cultural/archaeological properties nor heritage sites at the project site. A mosque existing near the project site will not be physically affected.
	24	Landscape	B-	D	D	D	**Pre-construction:** No activities are expected to give any impact on landscape. **Construction:** No significant impact will be expected as there is no scenic spot near the site. **Operation:** No significant impact will be expected as there is no scenic spot near the site.
	25	Gender	B-	B+	B-	B+	**Pre-construction:** Unequal distribution of compensation can be occurred within households. **Construction:** Unequal employment opportunity can be provided at construction site. Appropriate job opportunity for both male and female shall be considered. **Operation:** Improvement of local economy will give positive impact on improvement of job opportunity and livelihood.
	26	Children's Rights	B-	B+	B-	B+	**Pre-construction phase:** There are children among households to be resettled and/or lose their livelihood means. Children from households losing their land or jobs may suffer from adverse impact on their household economy, such as dropping-out of school. **Construction phase:** Access way to their schools will be physically hindered by the construction site. For mitigating this impact, passage shall be secured. Child labour can be provoked at the construction site because of the huge demand for unskilled workers. **Operation phase:** Children will have better access to social services throughout the year. Education opportunity can be improved. Conversion of existing traffic to the access road will improve safety of children as pedestrian.
	27	Infectious Disease such as HIV/AIDS	B-	B-	B-	B-	**Pre-construction:** No impact is expected as no influx of migrant labor is expected at this phase. **Construction:** A temporary influx of migrant labor during the construction period may increase the risk of infectious diseases. For mitigating this risk, measure for prevention of infection shall be taken.

Item	No.	Impact	Scoping		Result of Assessment		Rationale
			Pre- / construction Phase	Operation Phase	Pre- / construction Phase	Operation Phase	
							Operation: Improved mobility of local residents and influx of external residents may increase the risk of infectious diseases. For mitigating this risk, measure for prevention of infection shall be taken.
	28	Work Environment (Including Work Safety)	B-	D	B-	D	**Pre-construction:** No activities are expected to give any impact on work environment. **Construction phase:** Accidents may be caused by construction work. Measures for preventing accidents shall be taken by contractors. **Operation phase:** No work will be expected to affect work environment.
	-	Sunlight	B-	B-	B-	B-	**Pre-construction:** No activities are expected to give any impact on sunlight. **Construction phase:** Sunlight may be hindered due to construction work of viaduct/ flyover. **Operation phase:** Sunlight may be hindered due to viaduct/ flyover.
Others	29	Accidents	B-	B-	B-	B-	**Pre-construction:** No activities are expected to cause accidents. **Construction phase:** Accidents may be caused by construction work. Measures for preventing accidents shall be taken by contractors. **Operation phase:** Accidents may be caused by increased traffic. Measures for preventing accidents shall be taken
	30	Cross-boundary Impact and Climate Change	C	C	**D**	**B－**	**Construction phas**e: CO2 emissions due to construction activities is temporary impact on climate change. **Operation phase:** CO2 emissions due to the vehicles that run by fossil fuels affects climate change in the long term, and adaptation measures are necessary.

Source: JICA Survey Team

Note: A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C: Impact is unknown. (Further examination is needed, and the impact may be clarified as the study progresses.)

D: No impact is expected.

4.8 Results of Environmental and Social Consideration Survey (Including Anticipated Impacts)

4.8.1 Port

(1) Impact on Natural Environment / Pollution

1) Air Quality

a) **Sampling point**

Residential areas nearby the proposed port project site was selected as sampling point for air quality measurement. The survey was conducted in the dry season (15 to 16 of February 2018) and in the wet season (08 to 09 of June 2018) to reflect the influence of precipitation in the fluctuation of air quality.

Source: Made from Google Earth

Figure 4.8-1 sampling points of air quality survey

Sampling Point	Latitude (North)	Longitude (East)
AQSP	21°41'27.44"N	91°52'1.84"E

b) **Results**

There is no industry in the Matarbari Island. Power plant construction activities are ongoing adjacent to the proposed port area. Matarbari Island has the agricultural and fishery activities, and it is not an industrial area. The air quality survey results indicated overall that the air quality in the rainy/wet season is much better than the Dry Season, with a slightly high concentration of dust (SPM) and a low concentration of SOx and NOx. The reasons of higher SPM concentration in the dry season is the ongoing construction activities of the Coal Power Plant project. But the concentration was lower than the standard. Concentration of PM_{10} & $PM_{2.5}$ are within the IFC and National Standards.

Table 4.8-1 Results of air quality survey

Parameter	Unit	Seasonal Results		Ambient Air Quality Standards	IFC EHS Guideline (General: 2007)
		Dry	Wet		
SPM	$\mu g/m^3$	110.0	88.9	200 (8hr)	-
PM_{10}	$\mu g/m^3$	43.2	24.5	150 (24hr) 50 (year)	150 (24hr) 70 (year)
$PM_{2.5}$	$\mu g/m^3$	32.1	10.9	65 (24hr) 15 (year)	75 (24hr) 35 (year)
SO_2	$\mu g/m^3$	<12	<12	365 (hr)	125 (24hr)
NO_2	mg/m^3	<0.057	0.057	100 (year)	200 (1hr) 40 (Year)
O_3	mg/m^3	0.0034	0.0032	0.235 (24hr)	160 (8hr)
CO	mg/m^3	<0.30	<0.30	40 (24hr)	

Source: JICA Survey Team

c) **GHG emissions estimates**

In this section, the number of entrance ships was calculated using representative types of vessels.

- Container ship: 52,900 GT (60,000 DWT),
- Load capacity: 4,400 TEU, captain: 294 m,
- Fees for loading and unloading with one call: 3,520 TEU

The CO_2 Emissions has been calculated for the port project by using the Cargo Shipping emissions calculator. Total cargo tonnages were calculated as per the nos. of ships annually travelling multiplying with its average sizes. In this case three types of vessels/ships are assuming to be travelled all over the year. The vessels would be container ships, cargo ships (steel) and Bulk ships (grain). The frame of Cargo Shipping emissions calculator is shown in Figure-1. The estimated total CO_2 emission per annum of the proposed port would be 3,741.00 Tones. Table below detailed out the estimated emissions of the proposed port project.

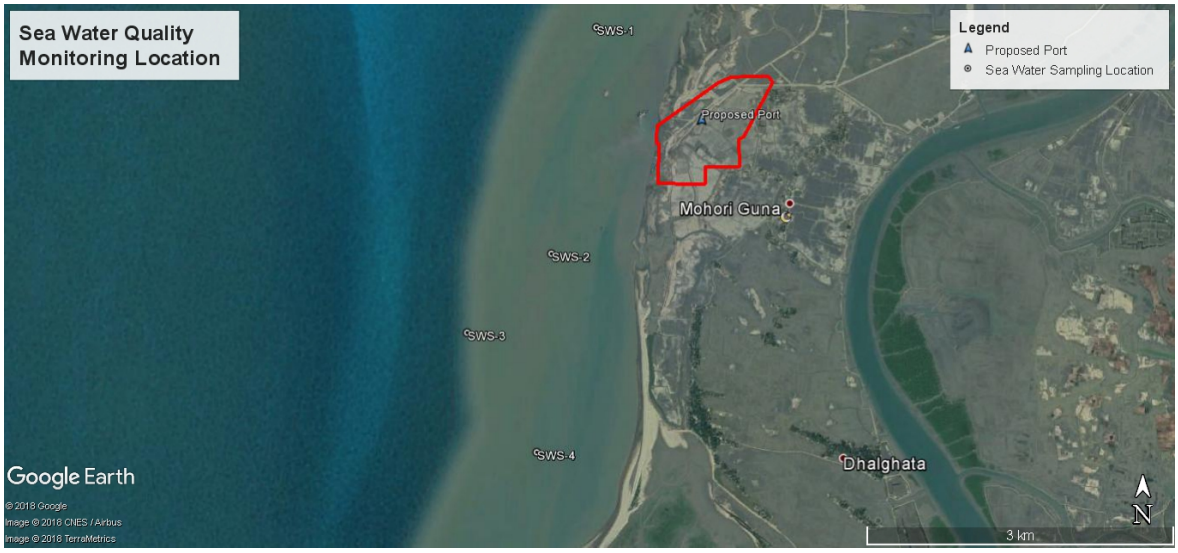
Table 4.8-2 Estimated CO_2 emissions of the proposed port project

Sl. No.	Type of Ship	No. of ships Per annum	Average mileage traveled to reach (origin of trip by %)	Average size (DWT)	Total Cargo (Tones)	Emissions (KgCO2)	Emissions (TonesCO2)
1	Container ships	230	10km	60,000	13,800,000.00	1,725,000.00	**1,725.00**
2	Cargo ships (Steel)	50	10km	30,000	1,500,000.00	178,500.00	**178.50**
3	Bulk ships (Grain)	210	10km	70,000	14,700,000.00	1,837,500.00	**1,837.50**
4					**Total Emissions**	**3,741,000.00**	**3,741.00**

Source: JICA Study Team

2) Sea water

Four sampling points were selected in the sea front area of the proposed p ort site in consideration of the navigation channel as well as its dredging activities. The sampling was conducted in three layers, Surface (0.5m), Middle (1/2 depth), and Bottom (1m up from the bottom) in consideration of submerged discharge of thermal wastewater. Also, the survey was conducted in the rainy season (18-19 of May 2018).



Source: Made from Google Earth

Figure 4.8-2 Sampling points of the sea water quality survey

Sampling Points	Latitude (North)	Longitude (East)
SWS-1	21°42'12.23"N	91°51'10.98"E
SWS-2	21°40'59.63"N	91°50'55.43"E
SWS-3	21°40'34.60"N	91°50'26.61"E
SWS-4	21°39'56.90"N	91°50'50.51"E

Source: JICA Survey Team

The water temperature was in the range of 26.6 - 30.5 °C, with the tendency of higher temperatures near the surface layer and lowering towards the deeper layer. The salinity was in the range of 28.0 – 28.75, tending to be lower in the surface layer and becoming higher toward the deeper layer. It should be noted that, according to the database of the Japan Oceanographic Data Center[1], salinity in the surface layer in the sea areas of 21-22°N and 91-92°E are within the range of 23.95 - 31.93. The salinity in the sea front area of the project site is assumed to be influenced by the Sangu River and other rivers. SS (suspended solids) concentration is very high (640 - 910mg/L) due to the strong effects of river water as well as the surface runoff of carrying loose soils from the hilly area. DO looks comfortable as per standard except two data. The average surface water DO level is 5.40. Concentration of heavy metals was not so high except the higher concentration of Iron (Fe)

[1] http://www.jodc.go.jp/index_j.html

Table 4.8-3 Results of the seawater

Parameter	Unit	SWS-1			SWS-2			SWS-3			SWS-4			Bangladesh Standards			IFC standards
		Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom	Surface	Middle	Bottom	Bottom Inland surface water	Public sewer	Irrigated land	
Depth	M	0.5			0.5			0.5			0.5			0.5			
pH	-	8.4	8.4	8.3	8.2	8.3	8.4	8.2	8.4	8.3	8.4	8.4	8.3	8.3	8.38	8.33	6 – 9
Salinity	-	27	28	28	28	28	28	28	29	29	29	29	30	28	28.5	28.75	
DO	mg/L	5.714	8.575	4.999	5.714	5.71	5.714	5.71	5.71	4.286	4.29	5	3.571	5.357	6.251	4.643	
Temperature	oC	29.8	29.7	29.5	30.1	29.8	29.1	30.1	29.8	29.2	29	29	29	29.75	29.575	29.2	
TDS	mg/L	3776	3823	3926	3632	3756	3901	3786	3856	3903	3701	3804	3956.5	29.31	29.22	31.23	
SS	mg/L	354.2	401.3	412.5	344	398.5	408.3	355	399.5	423.4	345	379.5	413.4	1.59	2.37	2.98	
As	mg/L	0.004	0.004	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.001	0.001	0.002	0.0025	0.0023	0.002	0.5
Cd	mg/L	0.0002	0.00019	0.0002	0.0002	3.00E-04	0.0003	3.00E-04	3.00E-04	0.0004	4.00E-04	4.00E-04	0.0004	0.000273	0.000303	0.000323	0.1
Cu	mg/L	0.26	0.26	0.26	0.26	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.263	0.26	
T-Cr	mg/L	0.107	0.112	0.121	0.118	0.126	0.13	0.228	0.234	0.24	0.692	0.749	0.758	0.2863	0.3053	0.3123	0.5
Fe	mg/L	2.19	2.62	2.46	1.82	2.12	0.65	1.08	0.75	1.95	0.13	3.38	3.79	1.305	2.218	2.213	1.0
Pb	mg/L	0.007	0.011	0.042	0.031	0.033	0.04	0.029	0.051	0.036	0.027	0.044	0.048	0.0235	0.0348	0.0415	0.5
Zn	mg/L	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.1	0.1	0.1	1.0

Notes: The Environmental Conservation Rules 1997.。 IFC General EHS Guideline

3) Surface water

a) **Sampling Points**

The river water quality of the river (Kohelia River) near the proposed port site was surveyed. The survey was conducted in the dry season in the end of 30th April 2018 and the rainy season in the 18th May 2018.

Sampling Point	Latitude (North)	Longitude (East)
Surface water	21°40'35.63"N	91°52'42.96"E

Source: Made from Google Earth

Figure 4.8-3 Sampling point of the surface water quality survey

b) **Results**

The results of the surface water quality survey are shown in Table below. The value of salinity suggests that the surveyed area has brackish water that is under the influence of sea water in the rainy season. SS and TDS show high concentration levels.

Table 4.8-4 Results of the surface water quality survey

Parameter	Unit	Results		Standards for Inland Surface Water						International Water Quality Guidelines for Ecosystems (IWQGES)	INDIA water Standard	Sri Lanka water standard	JAPAN MoE water Standard
		Rainy season: 18 May 2018	Dry Season: 30 April 2018	A	B	C	D	E	F				
Depth	M	0.5	0.5	-	-	-	-	-	-				
Temperature	₀C	30.5	25	-	-	-	-	-	-	生物によって異なる			
Salinity	-	26	36.89	-	-	-	-	-	-	N/A			N/A
pH	-	8.07	7	6.5-8.5	6.5-8.6	6.5-8.7	6.5-8.8	6.5-8.9	6.5-8.9	6.5-9.0	5.5 - 9.0	6.5-8.5	5.8-8.6
DO	mg/L	5.95	6.1	6 or above	5 or above	6 or above	5 or above	5 or above	5 or above	7.3-10.9	-		-
BOD	mg/ L	3	2	2 or less	3 or less	3 or less	6 or less	10 or less	10 or less	N/A	-		-
COD	mg/ L	6	8	-	-	-	-	-	-	N/A	-	10 以下	-
TDS	mg/ L	30,750	28,800	-	-	-	-	-	-	N/A	1000 以下	500 以下	500 以下
SS	mg/ L	19.5	22	-	-	-	-	-	-	N/A	100＊	-	200＊ (150/day)
Notes: Category of water body is as below. A: Potable water source supply after bacteria freeing only B: Water used for recreational purposes C: Potable water source supply after conventional processing D: Water used for pisciculture E: Industrial use water including chilling and other processes F: Water used for irrigation											＊は最も厳しい内陸っ表層水の排水基準抜粋		＊は排水基準より抜粋

4) Soil

a) **Soil properties**

Figure below shows properties of clay layers classified as groups A, B and C. Content of < silt + clay > fractions are mostly larger than 90%; on the contrary, average natural water content (Wn) for Groups A, B and C are 38%, 26% and 27%, respectively. It could be presumed that in the past, clay layer might have been desiccated and water content had been reduced; hence clay layer currently shows high-yield stress compared with current over-burden pressure.

Table 4.8-5 Soil properties for group A,B and C

Layer Name	Bor. No.	Depth (in CDL)	Sieve test result (%)		W_n (%)	Consistency (%)			γ (g/cm^3)	q_u (kPa)	Consolidation Index			
			sand	silt+ clay		W_L	P_L	I_p			e_0	P_c (kPa)	C_c	C_v (cm^2/day)
A (N<5)	8	1.8	9	91	33	58	17	41	1.8	28	1.20	100	0.35	83
	9	1.2	4	96	51	61	22	39	1.8	-	1.10	90	0.38	66
		-3.3	4	96	59	71	23	48	1.8	-	1.20	55	0.33	73
	10	0.5	18	82	41	59	20	39	1.9	13	1.10	110	0.31	99
	11	0.5	7	93	41	58	22	36	1.9	33	1.10	95	0.36	65
	14	1.2	8	92	36	55	18	37	2	44	0.80	85	0.28	121
	15	0.6	4	96	40	48	23	25	1.7	72	1.30	90	0.45	243
	16	1.4	8	92	37	61	27	34	1.7	41	1.10	110	0.18	226
	17	1.3	8	92	35	63	25	38	1.8	97	1.10	85	0.30	119
	19	1.1	1	99	36	48	19	29	1.8	-	1.10	70	0.39	125
Average A			**6**	**86**	**38**	**53**	**20**	**33**	**1.67**	**48**	**1.09**	**93.2**	**0.33**	**122**
5≦ N<15	12	-12.6	4	96	30	58	22	36	1.76	152	1.10	55	0.21	105
	15	-5.9	59	41	22	-	-	-	1.80	-	0.50	155	0.12	548
Average B			**32**	**69**	**26**	**58**	**22**	**36**	**1.78**	**152**	**0.80**	**105**	**0.17**	**327**
15≦N	7	-23.3	1	99	29	61	22	39	2	181	0.80	120	0.32	96
	8	-19.7	9	91	22	30	11	19	1.8	205	1.2	55	0.33	-
	12	-19.1	7	93	45	62	22	40	1.9	48	1	120	0.44	168
	13	-21.9	3	97	25	57	23	34	1.72	201	1.1	40	0.32	73
	14	-20.5	9	91	15	34	12	23	2.2	190	0.5	160	0.164	50
	17	19.2	14	86	32	71	21	49	1.9	164	0.9	70	0.17	122
	18	-25.0	9	91	20	59	17	42	1.8	-	1	25	0.3	57
Average C			**7**	**93**	**27**	**53**	**18**	**35**	**1.90**	**165**	**0.93**	**84**	**0.29**	**94**

Note(1); W_n; Natural water content, W_L;Liquid limit, I_p; Plastic limit,γ; Density of soil, e_o; Initial void ratio, q_u; unconfined compression test result, $C=q_u/2$, Pc; Consolidation yield stress, Cv; Consolidation coefficient, Cc; Compression index.

b) **Soil Particle Size and Settling Velocity**

According to the boring survey data, layered soil structures of sand and silty/clayey are found at the location of the dredging works. Taking account of this situation, dredging work of silty/clayey layer without sand inclusion is considered for the estimation of the SS at the source location as a safe side assumption. Particle size composition of 58% of silty material and 42% of Clayey material is considered as the representative values. Table below shows the representative particle size and settling velocity of silty and clayey material. Although the settling velocity of clayey and silty material are affected by the flocculation, Stokes formula for settling velocity of single particle is used to obtain the settling velocity because of the scarce information of the formation of floc and the resultant settling velocity of those floc.

Table 4.8-6 Representative Soil Particle Size and Settling Velocity of Considered Material for Turbidity Diffusion

Classification of soil	Particle size(mm)	Representative particle size (mm)	Settling velocity of representative soil particle (m/day)
Silt	0.005～0.075	0.0194	30.58
Clay	(0.001)～0.005	0.0022	0.39

Source: JICA Survey Team

5) Ground Water

a) **Sampling point**

The water quality of well water around the Proposed Port project site was surveyed. The survey was conducted in the rainy season (8th June 2018) and in the dry season (28th April 2018) to reflect the seasonal change of well water quality.

Sampling Point	Latitude (North)	Longitude (East)
Ground Water	21°41'38.50"N	91°51'42.40"E

Source: Made from Google Earth

Figure 4.8-4 Sampling point of the ground water quality survey

b) **Results**

The results of the ground water quality survey are shown in the next Table. The results of both the rainy and dry seasons satisfied most of the drinking water standards of Bangladesh except Mn and Color.

Table 4.8-7 Results of the ground water quality survey

Parameter	Unit	Results		Standards for Drinking Water
		Rainy season 09/ June/ 2018	Dry season 30/May/2013	
Temperature	$_{o}$C	28	25	20 – 30
pH	-	6.7	6.7	6.5 8.5
Chloride	mg/L	20	12	150 – 600
Nitrogen (NO_3)	mg/L	5.1	3.8	0.5
Iron (Fe)	mg/L	2.06	2.98	0.3 1.0
Odor	Odourless	0	0	Odorless
Arsenic (As)	mg/L	0.001	0.001	0.05
SS	mg/L	10	5	10
Coliform	N/100mL	0	0	0
Colour	Hazen	98.3	85	15
Lead (Pb)	mg/L	0.001	0.003	0.05
Manganese (Mn)	mg/L	0.21	0.23	0.1
Phosphate	mg/L	2.4	1.48	6
Total Dissolved Solid (TDS)	mg/L	104	150	1000
Barium (Ba)	mg/L	0.06	0.045	0.01
Cadmium (Cd)	mg/L	0.00015	0.00015	0.005

Source: JICA Survey Team

6) Noise and Vibrations

a) **Noise**

The residential areas within the site and in the corners of the site were selected as the sampling points for the noise survey. The survey was conducted in the dry season (15 to 16 of February 2018) and in the wet season (08 to 09 of June 2018) to reflect the seasonal changes of noise levels.

Noise Level Station	Category	Latitude (North)	Longitude
St-1	Rural	21°41'27.25"N	91°52'1.35"E
St-2	Community road	21°41'52.67"N	91°52'6.00"E
St-3	Sand Dunes	21°41'37.87"N	91°51'38.53"E
St-4	Sand Dunes	21°41'47.52"N	91°51'51.80"E

Source: Made from Google Earth

Figure 4.8-5 Noise Level Monitoring of the Port Area

The noise measurement results indicated that the day time noise level was above the environmental standards for residential areas consideration at two monitoring points. Adjacent to the proposed port area under the construction of Coal based power plant, therefore vehicles used for construction activities, local transportation were the noise sources. These vehicles are limited in sues at the night time, but the movement of local transportation naturally has increased which has increased the noise level in compare to the Residential area.

Table 4.8-8 Noise Level data of the Study Area

Season	Results				Standards for Noise (dB) (Day: 6AM-9PM) (Night: 9PM-6AM)				
	St-1	St-2	St-3	St-4	A	B	C	D	E
Rainy (Feb 2018)	49.3±2	47.8±3	57.8±1	52.7±4	Day: 45	Day: 50	Day: 60	Day: 70	Day: 70
	42.1±2	38.7±.2	44.5±2	45.1±2	Night: 35	Night: 40	Night: 50	Night: 60	Night: 70
Dry (Jun 2018)	58.8±4	59.1±5	57.3±3	59.1±4	Day: 45	Day: 50	Day: 60	Day: 70	Day: 70
	48.2±3	47.8±4	47.5±5	48.3±4	Night: 35	Night: 40	Night: 50	Night: 60	Night: 70

Notes: Category of areas is as below.
A: Silent zone
B: Residential area
C: Mixed area (mainly residential area, and also simultaneously used for commercial and industrial purposes)
D: Commercial area
E: Industrial area
Source: JICA Survey Team

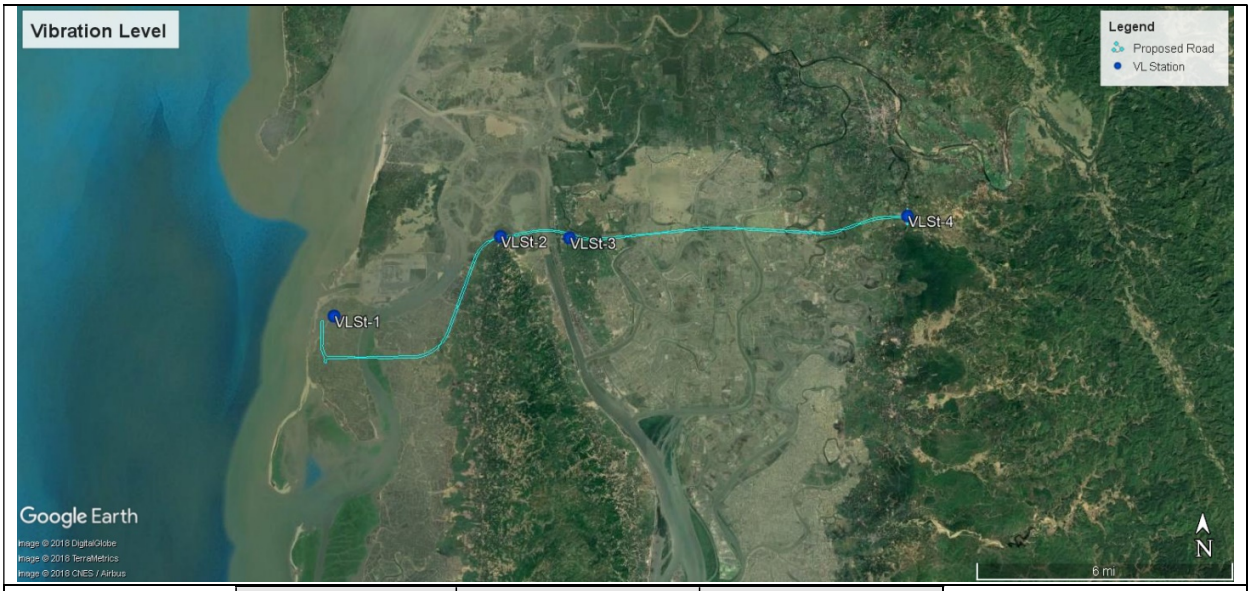
Reference: IFC/EHS guidelines

Receptor	Day 07:00-22:00	Night 22:00-07:00
Residential, institutional, educational area	55	45
Industrial, commercial area	70	70

(Source: IFC/EHS General Guidelines, 2007)

b) **Vibrations**

Vibration Level data was captured by the Equipment: Digital vibration meter (Model- C35 NVT).



Location Code	Latitude (North)	Longitude (East)
VLSt-1	21°41'25.90"N	91°52'0.79"E

Source: JICA Survey team

Figure 4.8-6 Location of Vibration Level Data

The frequency was in a range of 7-28 Hz. There is no vibration standard in Bangladesh, but the frequency value is popular in normal environment, and there were no significant sources of vibration.

Table 4.8-9 Description of Analysis:

VLSt-1
7-28

Source: JICA Survey team

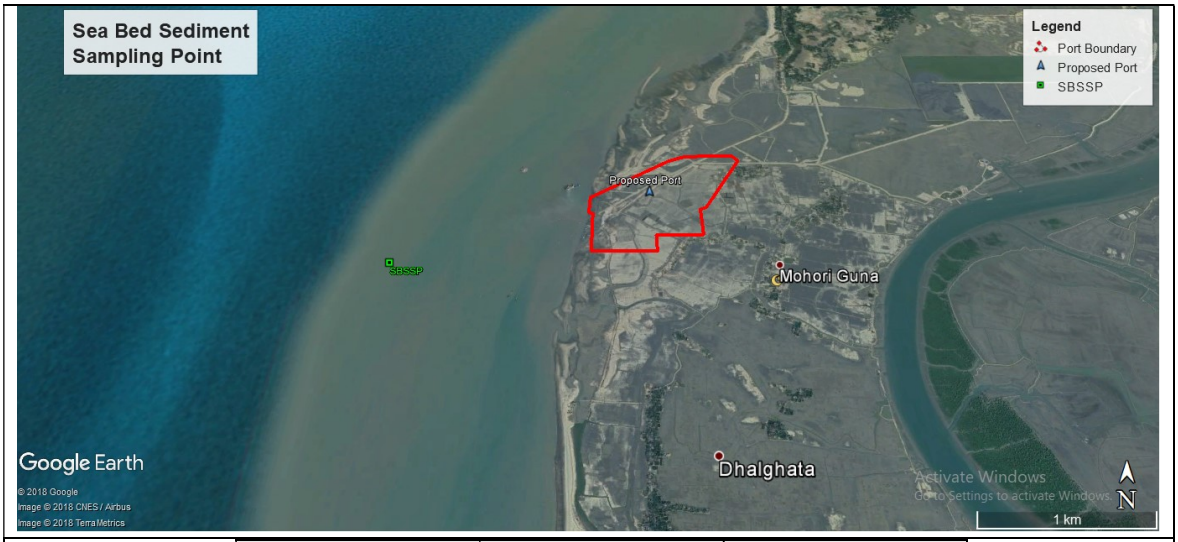
7) Land Subsidence

As the result of visual inspection and interview survey in the dry season and rainy season, in the surrounding area, underground water is not used even in the Coal Powerplant project. As there is no large

groundwater use causing ground subsidence, ground subsidence was not confirmed. Under this project as well, there is no use of groundwater during the construction period and operation period.

8) Heavy metals (Sea bottom sediment, Soil, Water, Quality Sediment)

The sampling point for the sea bottom sediment survey was established on the coastal side of SP-1 for the water quality survey, in consideration of sediment contamination resulting from dredging of the canal. Samples of bottom sediment has been taken from the sea bottom surface by the NIPPON KOEI and the sediment quality has been analyzed (19-03-2018 to 04-04-2018) from BRTC, BUET laboratory a reputed laboratory of Bangladesh. One sample has taken on the Route area for the depth of 0.5m, 0.5, 1, 5, 10m each.



Sampling Point	Latitude (North)	Longitude (East)
Sea bottom sediment	21°41'16.35"N	91°50'43.31"E

Source: Made from Google Earth

Figure 4.8-7 Sampling point of the sea bottom sediment survey

Bangladesh does not have standard values for heavy metals contained in sea bottom sediment. Globally, ERL (Effects Range-Low) and ERM (Effects Range-Median) are proposed by the NOAA (National Oceanic and Atmospheric Administration, U.S.) as the guidelines to help categorize the range of concentrations of heavy metals and organic chloride compounds in sediment which affect benthic organisms.

In a series of data of ascending levels of contaminants and their toxicity effects, the 10th percentile and the 50th percentile (median) of the effects database were identified for each substance. The 10th percentile values were named the "Effects Range-Low" (ERL), indicative of concentrations below which adverse effects rarely occur. The 50th percentiles values were named the "Effects Range-Median" (ERM) values, representative of concentrations above which various effects frequently occur. The EPA uses ERL and ERM values as a type of sediment "benchmark". They define a benchmark as a concentration that, when exceeded, has the potential to cause harm or significant risk to humans or animals in the environment. The results are listed in the table below. The result shows that all the parameters are within the NOAA guidelines standards and there is no sediment contamination in the project area.

Regarding pollutions of sea bottom sediment, soil, water, quality of the sediment, usually, if the site is a Brownfield such as former factory sites, it is necessary to investigate contaminations according to its use.

Since the site is greenfield this time, it is clear that it is only natural contamination, this survey is sufficient.

Table 4.8-10 Results of Sea bottom Sediment Survey (Heavy Metals) of the project study area

Parameters	Unit	Result (19-03-2018 to 04-04-2018)				Guideline of NOAA	
		0.5m depth	1mdepth	5m depth	10m depth	ERL	ERM
pH	-	7	7.5	7	7		
Arsenic (As)	mg/Kg	5.43	3.94	8.65	8.87	8.2	70
Copper (Cu)	mg/Kg	9.1	4	9.2	9.5	34	270
Zinc (Zn)	mg/Kg	41.2	23.5	26.3	41.7	410	410
Mercury (Hg)	mg/Kg	0	0	0	0	0.15	0.71
Chromium (Cr)	mg/Kg	25.3	11.70	13	21.1		
Lead (Pb)	mg/Kg	17.2	14.90	17.8	18.3	46.7	218
Nickel (Ni)	mg/Kg	16.2	8.8	9.4	16.4		
Cadmium (Cd)	mg/Kg	0.1	0.10	0	0	1.2	9.6
Iron (Fe)	mg/Kg	18400	15000	21000	32800	-	-
Organic Matter (Wet Combustion method)	%	2.4735	1.35	2.62	2.12		
Moisture Content	%	22.39 (28.86)	20.36 (25.57)	25.47 (34.18)	21.38 (27.19)		

Source: JICA Survey Team

9) Hydrology

The hydrology examined the data on the surroundings, considered the influence by the site visits. Many rivers at the project site and surroundings will carry freshwater from the eastern hilly areas and eventually pour into the Bay of Bengal. Many canals (Chorra) also overlap and encounter at the beginning in the hilly areas, and finally poured into the Bay of Bengal. These rivers, channels, and waterways carry considerable amounts of coarse sediments and deposit on rivers and offshore shelves.

Regarding connection of waterways, the tide of Bengal Bay periodically floods large amounts of lumps along the coastal side of the project area. During the dry season, the rainfall is small, and the salt concentration of surrounding rivers and waterways is high. In addition, the offshore area of the project is affected as an estuary environment. The Matamuhuri River and the Kohelia River are salt water, and finally pour into the Bengal Bay and Kutubdia Bay. The Matamuhuri River is located on the east side of the project area. The Kariadiarkhal waterway joins the Kohelia River starting from the Matamuhuri River. The Kohelia River goes through the Kutubdia Channel and pours into the Bay of Bengal.

The figure below shows the outline.

Source: JICA Survey Team

Figure 4.8-8 Water system around the planned site

10) Topography and Geology

a) **Topography**

The project area falls under the Chittagong plain as per physiographical classification of Bangladesh (Rashid 1991). The coastal plain includes generally narrow strip of land between the Chittagong hills and the sea, together with the Halda, lower Karnaphuli and lower Sangu river floodplains, and the greater part of the off-shore islands. The unit consists of gently sloping, mainly loamy, alluvial flats adjoining the hills, and extensive level clay plains adjoining the three main rivers. Tidal clay plains occupy most of the off-shore islands in the south. Most of the area is subject to shallow flooding and to flash floods from the hills. It is also exposed to cyclone.

Considering the geology of the Chittagong Hill area in the southeastern part of Bangladesh from this background. Sediments exposed to this area are aged deposits of sandstone, silt, and limestone. Soil texture is determined by the relative proportions of sand, silt, clay and is very important for cultivation / crop production. Most of the area (both project and EIA survey area) is covered with clay-based soil. The figure below shows the soil organization chart of the project area and its surrounding area.

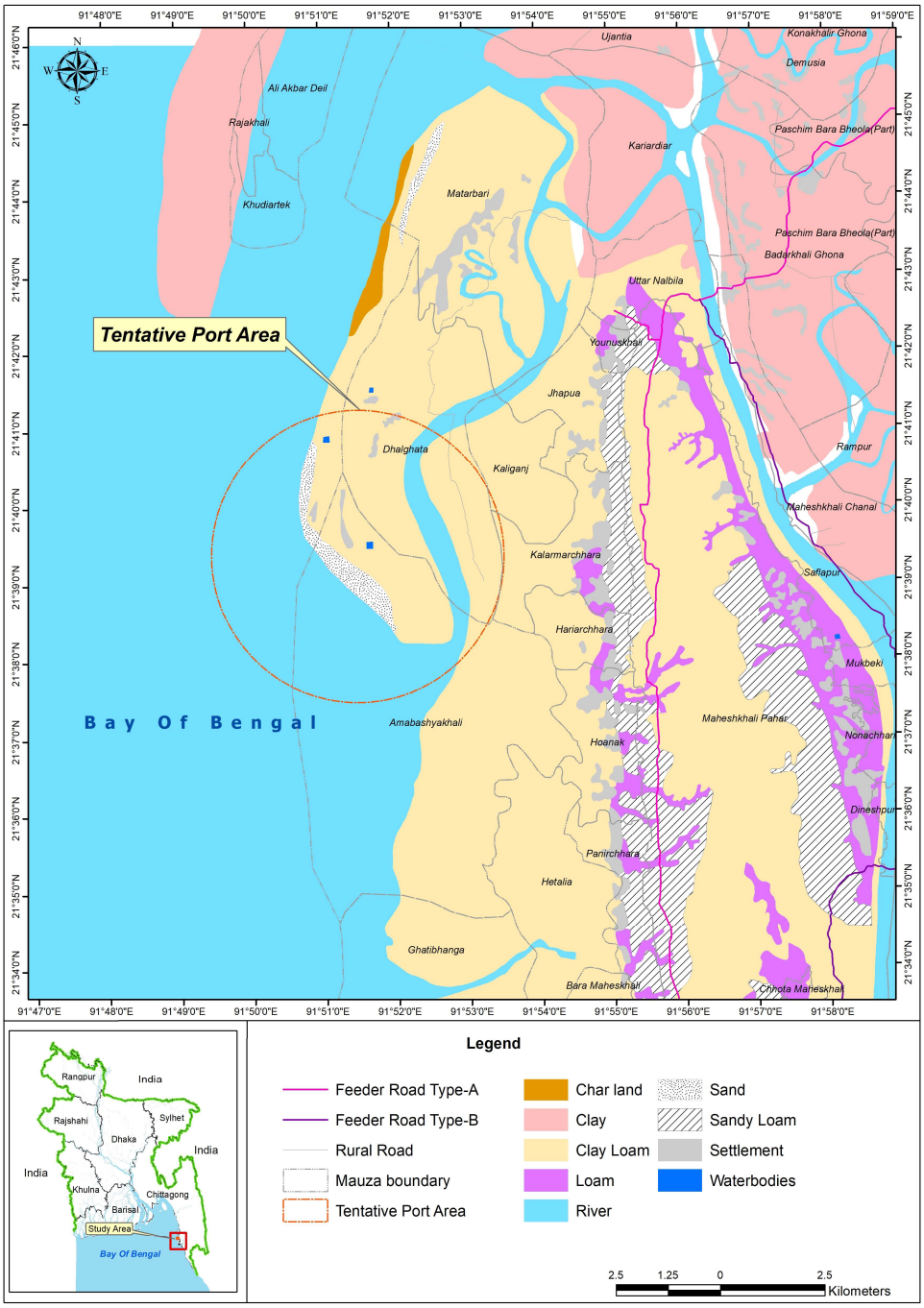
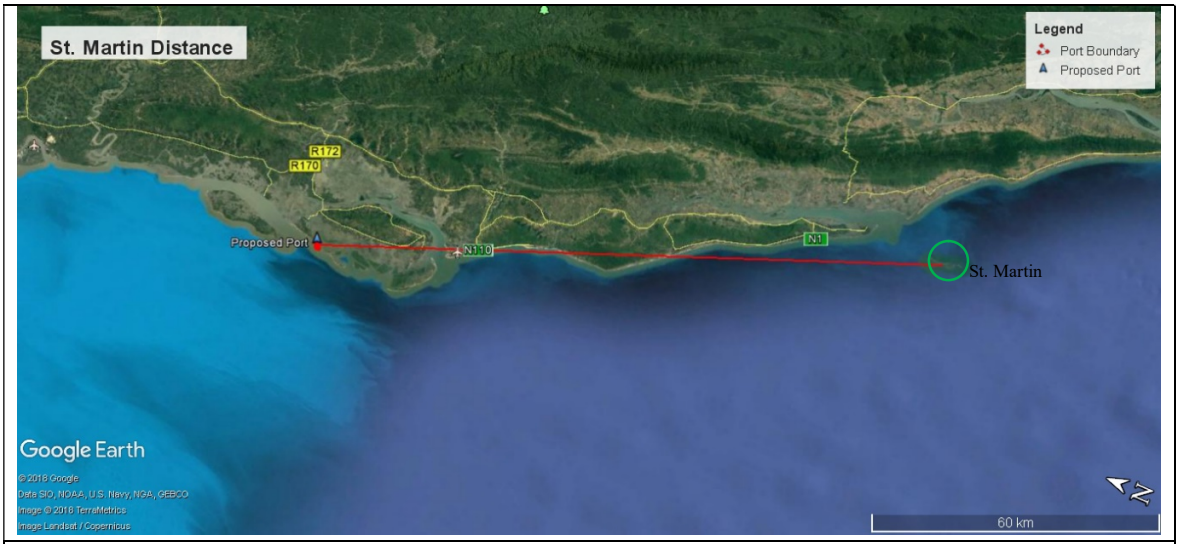


Figure 4.8-9 Typology

b) **Coral Reef**

Chief Scientific Officer of the Bangladesh Fisheries Research Institute in Cox's Bazar has informed that there is no coral reef habitat around the proposed port project site. The closest coral reef to the project site

is the St. Martins Island which is located approximately 120km from the proposed project site.



Source: Made from Google Earth

Figure 4.8-10 Project Site and St. Martins Island

11) ECA & Reserved areas

The Bangladesh Environment Conservation Act (BECA), 1995 has provision for Ecologically Critical Area (ECA) declarations by the Director General of the Department of Environment in certain cases where ecosystem is considered to be threatened to reach a critical state. On the Other hand, protected area like all sanctuaries, national parks, community conservation areas, safari parks, eco-parks, botanical gardens designated by Department of Forest under the wildlife order & forest act, 1927. A list of these protected areas with some information is presented in Table below.

Table 4.8-11 Protected and Significant Areas Located within the Study Area

Sl. No.	Name of the area	Type of forest	Upazila	Declared Year	Area * (sq.kilometer)
National Park					
1.	MedhaKachhapia	Dipterocarp forest in hillocks	Chakaria	2004	3.70
2.	Himchari	Mixed-evergreen forest in hills	Cox's Bazar Sadar	1980	0.23
Wildlife Sanctuary					
1.	Fasiakhali	Dipterocarp forest in hillocks	Chakaria	2007	11.78
2.	Chunati	Dwarf bambooand other vegetation	Pekua and Lohagar	1986	22.65
Safari Park					
3.	Dulahazara	Dipterocarp forest in hillocks	Cox's Bazar Sadar	1997	2.99
Ecologically Critical Area (ECA)					
(i)	Sonadia Island	Mangrove Forest	Moheshkhali	1999	74.59
(ii)	Cox'sBazar-Teknaf Peninsula	Mixed-evergreen Forest	Cox's Bazar Sadar	1999	72.26
Reserve Forest					

Sl. No.	Name of the area	Type of forest	Upazila	Declared Year	Area * (sq.kilometer)
1.	Garjania Khutakhali	Mixed-evergreen Forest	Chakaria	-	22.73
2.	Chakaria Sundarbans	Mixed-evergreen Forest	Chakaria		77.19
3.	Ringbhang	Mixed-evergreen Forest	Chakaria	-	12.28
4.	Harbang	Mixed-evergreen Forest	Pekua	-	5.68
5.	Nalbila	Mixed-evergreen Forest	Pekua	-	3.79
6.	Sonaichari	Mixed-evergreen Forest	Moheshkhali	-	3.15
7.	Boalkhali	Mixed-evergreen Forest			20.16
8.	Kakara	Mixed-evergreen Forest	Chakaria		1.20
9.	Chambi Rubber Estate	Mixed-evergreen Forest			0.003
10.	Toitang	Mixed-evergreen Forest			0.61
11.	Moheshkhali Hill Forest	Tropical and semi evergreen Forest		1953	72.40
* approximate area that falls within and upto study area boundary					

Source: JICA Survey Team

a) **Sonadia Island ECA**

Sonadia Island (in its entirety) is part of the adjacent Moheshkhali Island, fall under Kutubjum Union, Moheshkhali Upazilla. Species diversity varies season to season for various ecological and environmental factors. There is a large number of species which can be commercially exploited from this island. The Island lies between 21º28′ N to 21º33′ N latitude & 91º46′ E to 91º52′ E longitude. The Island lies between 21º41′ N to 21º44′ N latitude & 91º50′ E to 91º56′ E longitude.

Department of Environment declared Sonadia Island as an Ecologically Critical Area (ECA) in 1995. The total area of this island is 7 square km. There are 27 mangrove flora species, 35 sanddune species, 10 mamuls, 145 birds, 12 crabs, 13 amphibia, 7reptiles, 56 shell, 27 shrimp species etc found in this island. Endangered bird of Spoon bill sand piper found in this island.

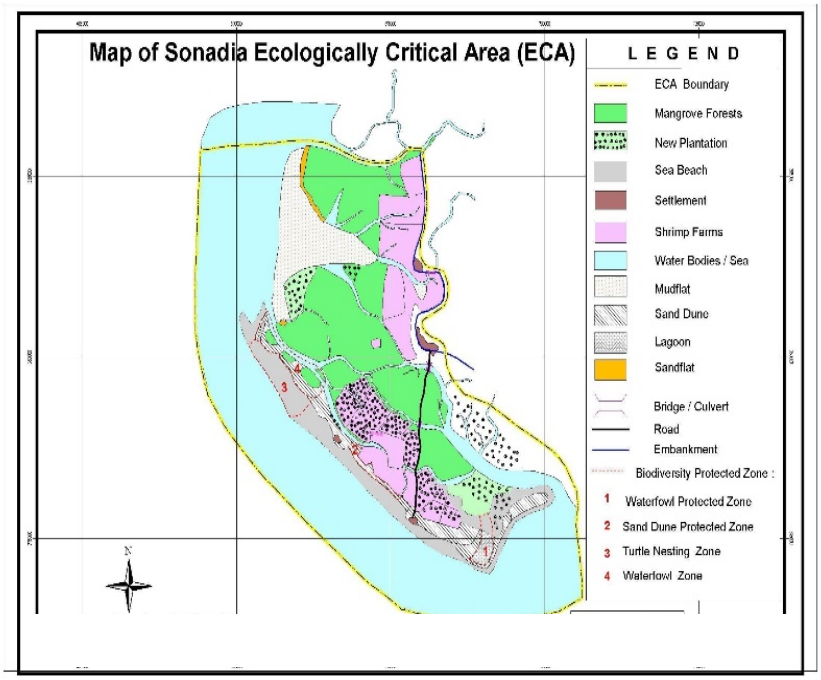


Figure 4.8-11 Map of Sonadia Ecollogically Critical Area(ECA)

Source: JICA Survey Team

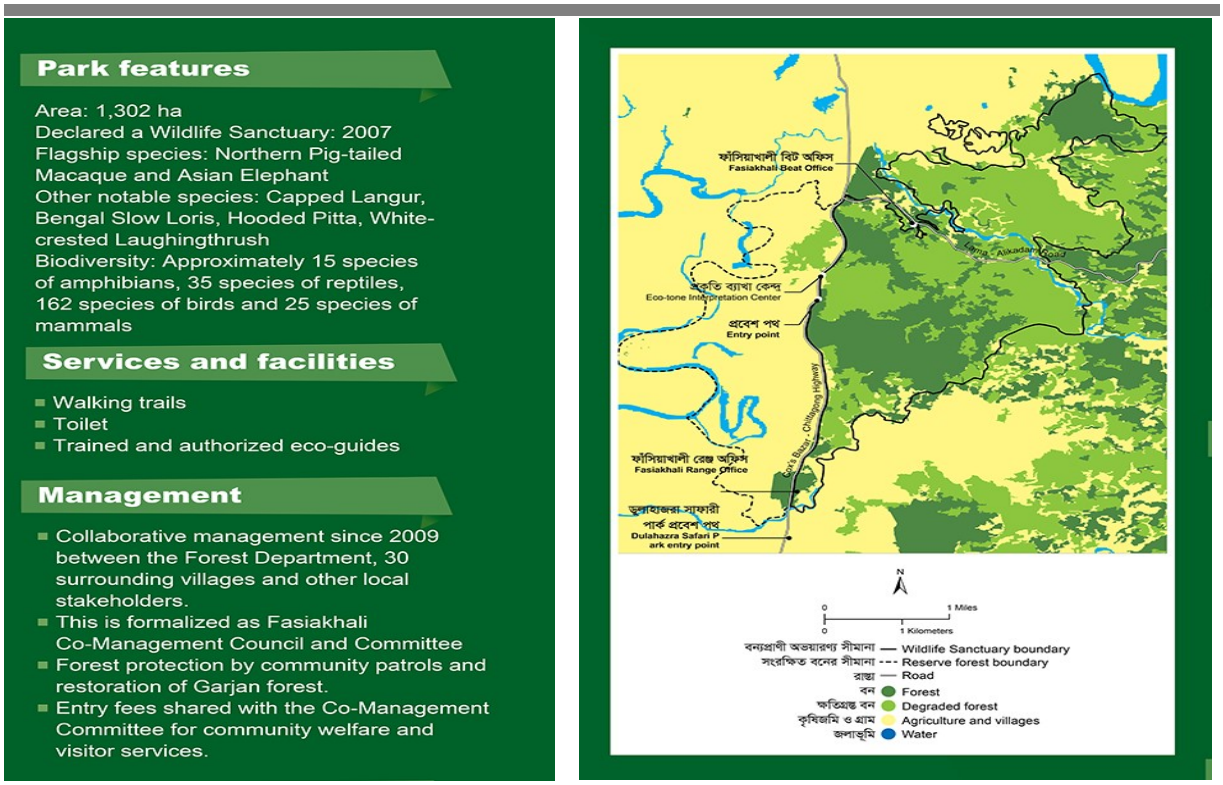
Sand dune in Sonadia

Carleo Bird of Sonadia Island

Mangrove Forest of Sonadia

b) **Fasiakhali Wildlife Sanctuary**

Fasiakhali wildlife sanctuary probably 47 KM Northern distance from world longest sea beach town Cox's Bazar. It`s stands on the east-west side of Chittagong-Cox's Bazar Highway and within the Fasiakhali and Dulhazara Union, Chakaria Upazilla, District Cox's Bazar. The Government Covered by the wildlife protection Act 1974 of this area. In the year of 2007 Bangladesh Government declared by the Gazette No PABAMSHAW/5/ 6785 dated 02/06/2007 named as a Fasiakhali Wildlife Sanctuary. Bangladesh Forest department, FKWS Co-management Committee maintaining their work within the 1302 hectors Reserve/Protected forests. There are 1537 Accor's Buffer Forest lands within the protected area. Flagship species are Northern Pig-tailed Macaque & Asian Elephant. There are approximately 25 mammals, 162 birds, 15 amphibian, 35 reptile's species etc. found in this island. Endangered bird of Spoon bill sand piper found in this island.

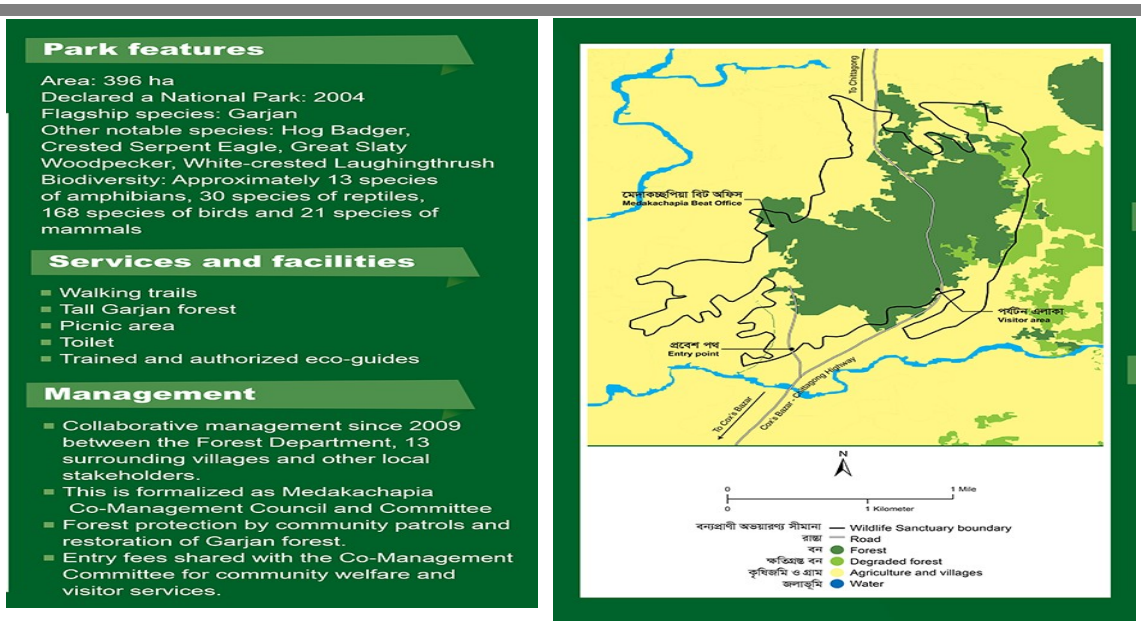


Source: Made from MoFo by JICA Survey Team

Figure 4.8-12 Map of Fasiakhali Wildlife Sanctuary

c) **Medhakacchapia National Park**

The Medhakacchapia National Park is generally tropical semi-evergreen forest of Bangladesh. It is situated around 50 km north of renowned tourist capital of Bangladesh-Cox's Bazar. The GPS location of the park is 21º40′ to 21º45′ N and 92º4′ to 92º8′ E. The park has covered on Khutakhali Union of Chakaria Upazila. The Government Covered by the wildlife protection Act 1974 of this area. In the year of 2004 Bangladesh Government declared by the Gazette No PABAM (SHAW-3)32/2003/356 dated 04/04/2004 named as a Medhakacchapia National Park. Total Area of this National Park is 396 hectares. Northern Pig-tailed Macaque (mammals), Asian elephants, and Hill Maina (birds) are existing. The major trees in the area is Dipterocarpus tarbinatus (Garjan).



Source: Made from MoFo by JICA Survey Team

Figure 4.8-13 Map of Medhakachapia National Park

d) **Moheshkhali Forest and Hills**

The Moheshkhari Forest is a land of 4142.8 ha, enacted by the Forestry Act (East Pakistan Era 1927) and is managed under the DoFo. In 1957, By No. 1222 - For dated 31-01 - 1957, it was shown as the reserved area. The hilly protected area almost overlaps with this area and is managed as a under the Environment Conservation Law by DoE. The range is known by the hilly areas of MOUZA (land use map of Bangladesh). In the site visit, the east and west traversing civil roads and private houses were found in everywhere. According to NGOs, FISHINGCAT (feline, Prionailurus viverrinus) of VU status is said to be seen. This forest is 12 km away from the planned site.

12) The trees lost in the private land

There are no rare species in the private trees lost.

(2) The impact for living environment

1) Waste

Regarding waste, the survey team examined on-site inspections, surrounding conditions, data on water quality, bottom sediments, etc., and considered the effects on disposal of dredged soil. There are no industrial zones in the vicinity, and most organic wastes are known to be generated from homes and small stores, but in the future, household waste from workers' accommodation facilities includes empty cans, bottles, garbage and so on. Failure to properly handle waste will cause pollution of seawater, river water, groundwater and hygiene problems.

As policy of the government, marine waste is treated as marine fisheries ordinance (MFO) (1983), solid waste is the Bangladesh Environmental Conservation Rules (1997) and national 3R strategy on waste disposal (2009 Year). Following these, sorting collection, recycling and promotion of reuse are carried out, and these waste that cannot be recycled or is disposed of in appropriate place. In order to reduce solid waste from workers due to construction work, minimization of living waste by hiring local residents should be pursued as much as possible. Through these measures, the project undermine the water pollution caused by waste and hygiene problems.

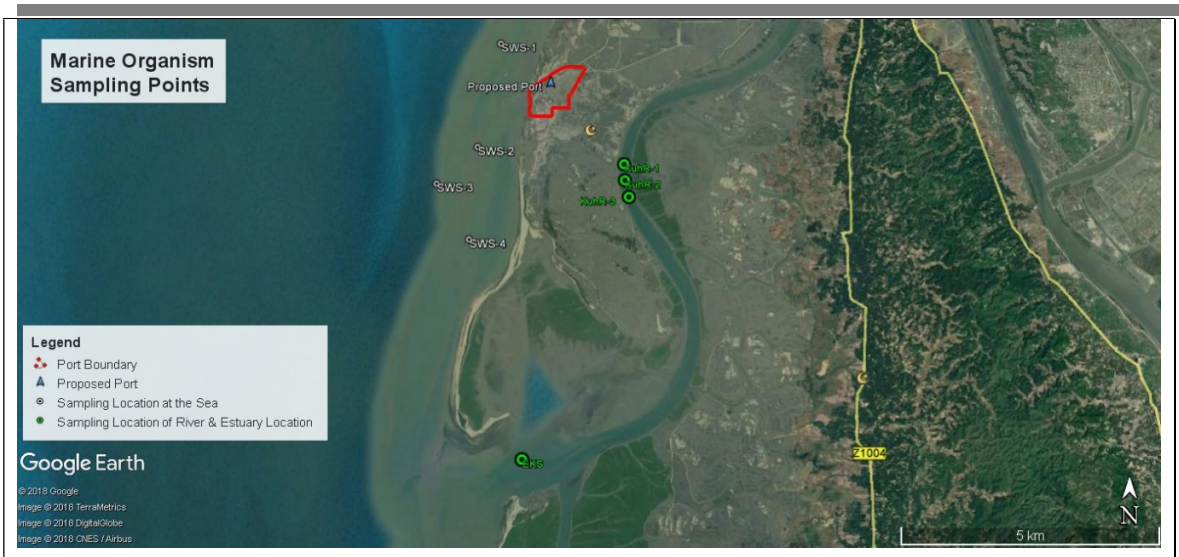
Waste management during the construction phase relates to all kinds of liquid and solid waste. Waste generated in construction can be metal pieces, waste plastic, wood chips, waste glass, waste oil, etc. The mission is considering the following as predicted values of the dredged soil.
Dredged soil at construction period: 14 million m3
· Utilizing 7 million m 3 (2.8 million m 3 = height 8 m x about 35 ha port project, 1.6 million m 3 = height 8 m x about 20 ha other development projects, the rest is utilized for roads)
· Disposal 7 million m 3 (of which 3.5 million m 3 is dumped in the ocean, the remaining 3.5 million m 3 = 8 m high by about 33 ha land dumped *) Based on the result of the turbid diffusion model that aims at both ocean dumping and dredging, it was confirmed that no water pollution occurred (increase of 2 mg / L against the SS concentration of 1000 mg / L)
Disposal on land is discarded inside a communicating road running north to south and also the area where there is no private house on the south.
Dumping of earth and sand by pumping is assumed by construction method. As the disposal sediment assumes viscous soil with a high water content ratio, it is unlikely that fine sediment will dry out, because it is dry for several years after dumping. Therefore, special measures are considered unnecessary. The monitoring plan will be modified when necessary during monitoring time so as to find out what kind of effect will occur after one year has elapsed.
As a management against ocean dumping, a series of activities will be controlled by the IMO Convention Act 2018 following the IMO standard. However, even if the response to this law is delayed, the construction contract of the contractor will clearly state they will be in accordance with the relevant laws and regulations of Bangladesh as well as the IMO International Treaty Standards administered by the Ministry of Shipping.

2) Odor

The odor was verified from the data of air, water quality, waste, and related laws and regulations. If the household waste from the worker 's accommodation is not properly handled during the construction period, there is a good possibility of causing odor. Prior to the start of construction, workers are instructed about waste separation, collection and illegal dumping prohibition. Daily wastes are treated regularly so as not to cause malodors due to rot. By implementing such measures, the occurrence of offensive odors is limited to minimum level.

3) Phyto-plankton

The phyto-plankton survey was conducted at eight sampling points, at three water layers, Surface (0.5m), Middle (1/2 depth), and Bottom (1m up from the bottom), as in the case of the sea water quality survey.



Source: Made from Google Earth

Figure 4.8-14 Marine Organizm Sampling Points

Water samples from different depths (pre-selected) were collected by using Nenson bottles and were immediately transferred to 24 commercially available plastic bottles as is the recommended method by Sourna (1978) to obtain an accurate depiction of the quantitative composition of phyto-plankton.

The collected samples were preserved with 3% neutralized formalin. Immediately after collection, the bottles were labeled and transferred to a laboratory for further analysis.

The dry season survey of the year 2018 has been conducted by the CPGCBL in the month of April and there the Phytoplankton the surface and the bottom of the River (Kohelia River) has been assessed.

Higher abundance of phytoplankton occurred in Kohelia River. Most of Kohelia river species are Aphanizomenon, Cochlodinium, Dynophysis, Planktothrix, Protoperidinium, Pseudo-nitzschia etc. Due to lake of transference (dredging fact) and excess rolling of the sea water the phytoplankton growth is minimum in sea site.
Two layers of results of the phyto-plankton has been observed from the field investigation. The Bottom Water phytoplankton abundance is zero as because of the lack of sunlight penetration to the bottom layers. It has evident that the phytoplankton does not grow in the bottom layer.

4) Aquatic Organism

a) **Seaweeds**

According to the Chief Scientific Research Officer of the Bangladesh Fisheries Research Institute (Cox Bazaar), seaweeds do not exist around the project area due to the low transparency of the seawater.

b) **Zoo-plankton**

The zoo-plankton survey was conducted about the same are as phytoplankton and three layers: surface (0.5 m), Middle and bottom (1m up from the bottom).

Zoo-plankton samples were collected from the subsurface water using a Zooplankton net with mesh size 300µm and metallic circular frame with a 25cm mouth opening. A flow meter (FMC-0.3) was used at the

mouth of the net to record the quantity of the water filtered through the net. Precaution was taken for clearing the net and bucket before every sampling to avoid any possible contamination. After collecting the samples, they were put into 200ml plastic jars and preserved with 5% formalin.

The dry season survey of the year 2018 has been conducted by the CPGCBL in the month of April and there the Zoo-plankton the surface and the bottom of the River (Kohelia River) has been assessed.

As for the Rainy season, Field Survey was pursued in June 2018. Seven species of zoo-plankton were observed, and *Copepod* was the largest in number of species. *Copepod* was the species that emerged most frequently, followed by *Sagitta (arrowworm)* species.

c) **Benthos (Sea bottom)**

Samples were collected from four sea stations within two categories sea bottom (4 locations) and mudflat in the Kohelia River.

For macro-benthos (0.5mm-1mm sea creatures), samples were collected at the selected points for bottom sediments. Samples for macrobenthos for bottom sediments were collected randomly using a grab sampler of 20cmX20cm with 10cm depth.

The collected sediments were then placed in plastic buckets and washed through a sieve of mesh size 0.5mm and 0.25 mm to retain all benthic fauna. The fauna from the sieves were preserved in a pre-labeled plastic container containing 5% formalin.

Regarding the wet season, population of high individuals observed Nuculidae (Molluska-280 individual/m2) in Kohelia river and Neridae (Annelida-58 individual/m^2) in sea site. Huge numbers of dead shell (211ind/m^2) also found in Kohelia river.

d) **Fish and Nekton**

Matarbari is the one of the coastal islands of Bangladesh located north-east part of the Bay of Bengal. Most of the fishermen of this island are engaged in offshore fishing with different gear and craft. Offshore fishing is mainly carried out by the seine net which is locally called vingijal (set bag net) and small mechanized boat. 8-10 fishermen are engaged in each boat with 5-10 vingijal. Besides, this another seine net like berjal and gill net (chandijal) also used to offshore fishing. Besides, this Kohelia River is rich in fish diversity. Fishermen are fishing in this river with the help of some selective fishing gear and craft. Berjal, chatjal, jhakijal, thela jal, netjal, line hook and chai (trap) are most commonly used in Kohelia River.

The fish samples were collected from set bag nets of the Kutubdia channel, Sonadia Island and Dhalghata Union of Matarbari Island. One sample was collected from a local fish farm (Ghona) of Matarbari Island.

The fish & Nekton survey were conducted at three points of Kohelia, Matamuhuri & Badarkhali Rivers and one sample was collected from local fish farm (Gona) of Dhalghata.

Source: made from GOOGLE Earth

Figure 4.8-15 Sampling points of fish and nekton

Sampling point	latitude	Longitude
FNS-Kohelia River	21°39'10.31"N	91°53'26.83"E
FNS-Estuaries	21°36'55.64"N	91°50'54.72"E

The Kutubdia Channel is situated in the south eastern part of the Bay of Bengal. It lies between 21º45′ N to 21º55′ N latitude and 91º53′ E to 91º55′ E longitude. Kutubdia Channel is an important spawning and nursery ground for several species of fin fish and shrimps.

Matarbari Island, where the project is located, is situated in the north western part of Moheshkhali Island. Many parts of this island are at stake because of unplanned shrimp farming and natural disasters. This island is rich in shrimp farming and solar salt pans. There are also many fish farms (local name: ghona) scattered on this island. The island lies between 21º41′ N to 21º44′ N latitude and 91º46′ E to 91º52′E longitude. The survey in front of the project site was conducted at 2 sampling points (Matarbari and Dhalghata).

Sonadia Island is an island situated in the northern part of Moheshkhali Island. It lies between 21º23′ N to 21º28′ N latitude and 91º48′ E to 91º52′ E longitude. Sonadia Island is a biodiversity hotspot and ecologically critical area as per DOE gazette.

Methods

The sampling gear of fish was an estuarine set bag net, locally known as "Behundi Jal". The set bag net is a fixed tapering net, resembling a trawl net, set in the tidal stream by attaching it to hold-fasts. It has a rectangular mouth kept open by two vertical bamboo poles. The net is held in a fishing position against the current by linking the extended sides of the net (wing tips) to hold-fasts by means of long bamboo poles and steel wires. The hold-fasts are two wooden stakes embedded some distance apart in the sea bed, so that the net is parallel to the direction of the current.

The set bag net catches species of fish which drift with the current or do not swim fast enough to stem the current and maintain a fixed position in relation to the sea bed. At each slack water period, the net comes to the surface (by means of the bamboo poles used for opening of the net, the bamboos serving as sweep lines) when it is emptied; it is then reversed in the opposite direction ready for fishing. The survey was conducted from high tide in one evening up to high tide in the morning of the following day. Set bag nets at every sampling point were set up at depths of 8 to 12 meters.

Results

The results are shown in the tables below from fish, nektons, crabs and shells. High abundant of fish species were found in Kohelia river while the species are low abundant in Badarkhali river. Badarkhali river have mangrove area which is fisheries nursery ground.

Table 4.8-12 Inventory of Fish Species in different zones of the study area

Sl. No.	Scientific Name	English Name	Local Name	Season (D/W)	Kohelia (Individuals)	Matamuhuri (Individuals)	Badarkhal (Individuals)
1.	*Terapon jarbua*	Crescent bass	Gogo mach	D & W	11	7	9
2.	*Liza sp.*	Greenback mullet	Lomba bata	D & W	7	5	2
3.	*Valamugil speigleri*	Speigler's mullet	Bata mach	D & W	5	4	6
4.	*Trypauchen vagina*	Burrowing goby	Lal chua	D & W	9	7	11
5.	*Pseudapocryptes elongatus*	Forktail large-eye bream	-	D & W	2	-	-
6.	*Odontamblyopus rubicundus*	Eel goby	-	D & W	1	1	-
7.	*Acanthopotamon martensi*	Padanian goby	-	D & W	11	4	2
8.	*Pisodonphis boro*	Rice-paddy eel	-	W	1	-	1
9.	*Glosogobius giuris*	Gobioid fish	Sada bele	D & W	15	11	12
10.	*Lates calcarifer*	Asian sea bass	Koral mach	D & W	2	-	-
11.	*Metapenaeus monoceros*	Gray shrimp	Horina chingri	D & W	68	34	39
12.	*Metapenaeus lysianassa*	Bird shrimp	Hanny chingri	D & W	30	21	-
13.	*Strongylura strongylura*	Spottail needle fish	Kakle mach	D & W	6	2	3
14.	*Loligo sp.*	Squid	Noinna	W	2	2	1
15.	-	Gastropod	Shamuk	D & W	31	23	13
16.	*Scatophagus argus*	Spotted scat	Bish tara	D & W	1	-	-
17.	*Exopaleomon styliferus*	Roshna prawn	Gura icha	D & W	143	123	112
18.	*Lutjanus johnii*	John's snapper	Ranga koi	D & W	1	-	-
19.	*Stelopherus tri*	Spined anchovy	Fulkra fasha	W	3	-	-
20.	*Ambassis sp.*	Glass fish	-	D & W	1	-	-
	Total				350	244	211

Source: JICA Survey Team

Table 4.8-13 Fish Species Survey in Dhalghata (Gona) & Badarkhali Gona)

Sl. No.	Scientific Name	English Name	Local Name	Season (D/W)	Dhalghata (Individuals)	Badarkhali (Individuals)
1	*Odontamblyopus rubicundus*	Eel goby	-	D & W	1	-
2	*Scylla sp.*	Mud crab	Maitta kakra	D & W	1	2
3	*Acanthopotamon martensi*	Padanian goby	-	D & W	11	3
4	*Pisodonphis boro*	Rice-paddy eel	-	W	1	2
5	*Glosogobius giuris*	Gobioid fish	Sada bele	D & W	15	11
6	*Terapon jarbua*	Crescent bass	Gogo mach	D & W	11	12
7	*Liza sp.*	Greenback mullet	Lomba bata	D & W	7	5
8	*Valamugil speigleri*	Speigler's mullet	Bata mach	D & W	2	3
9	*Trypauchen vagina*	Burrowing goby	Lal chua	W	9	5
10	*Pseudapocryptes elongatus*	Forktail large-eye bream	-	D & W	2	-
11	*Scatophagus argus*	Spotted scat	Bish tara	D & W	1	1
12	*Exopaleomon styliferus*	Roshna prawn	Gura icha	D & W	154	123
13	*Lutjanus johnii*	John's snapper	Ranga koi	W	1	-
14	*Stelopherus tri*	Spined anchovy	Fulkra fasha	D & W	3	1
15	*Ambassis sp.*	Glass fish	-	D & W	1	-
16	*Lates calcarifer*	Asian sea bass	Koral mach	D & W	2	3
17	*Metapenaeus monoceros*	Gray shrimp	Horina chingri	W	68	44
18	*Metapenaeus lysianassa*	Bird shrimp	Hanny chingri	D & W	30	23
19	*Strongylura strongylura*	Spottail needle fish	Kakle mach	D & W	6	1
20	*Loligo sp.*	Squid	Noinna	D & W	2	3
	Total				328	242

Table 4.8-14 List of Crab in the Study Area

SL No	Family	*Scientific Name*	Local Name	Season (D/W)	KH	BDK	MAT
1.	Portunidae	*Portunus plagicus*	Blue swimmer crab	D & W	-	✓	-
2.	Portunidae	*Charybdis feriatus*	Crucifix crab	D & W	✓	✓	✓
3.	Grapsidae	*Episesarma versicolor*	Tree-climbing/ Vinegar crabs	D & W	-	✓	-
4.	Portunidae	*Portunes*	Three spotted swimmer crab	D & W	✓	-	✓
5.	Calappidae	*Calappa lophos*	Box crab or shame-faced crabs	D & W	-	✓	-
6.	Calappidae	*Calappa sp.*	Box crabs	D & W	-	✓	-
7.	Calappidae	*Matuta planipes*	Flower Moon crabs	D & W	✓	-	✓
8.	Portunidae	*Scylla serrata*	Mud crab	D & W	✓	✓	✓
9.	Portunidae	*Scylla olivacea*	Mud crab	D & W	✓	✓	✓
10.	Ocypodidae	*Ocypoda*	Horn-eyed ghost crab	D & W	✓	✓	✓
11.	Grapsidae	*Grapsus sp.*	Red rock crab	D & W	✓	✓	-
12.	Portunidae	*Uca sp.*	Fiddler crab	D & W	✓	✓	✓
Total					**8**	**10**	**7**

Source: JICA Survey Team

Table 4.8-15 List of Shell in the Study Area

Sl. No.	Family	*Scientific Name*	Common Name	Season (D/W)	KH	BDK	MAT
1	Arcidae	*Anadara granosa*	Granular Ark	D & W	-	✓	✓
2		*Anadara rhombia*	Blood cockle	D & W	✓	-	✓
3		*Scapharca derrollie*	Ark Shell	D & W	✓	-	✓
4		*Scappharca sp.*	Ark Shell	D & W	✓	-	-
5	Carditidae	*Vepricardium asiaticum*	Asiatic cockle	D & W	✓	✓	✓
6		*Cardita laticostata*	Asiatic cockle	D & W	✓	-	✓
7	Donacidae	*Donax faba*	Pacific Baen Donax	D & W	✓	-	-
8	Mactridae	*Mactra abbriviata*	Trough shell	D & W	✓	-	✓
9	Mytilidae	*Perna viridis*	Asian brown mussel	W	✓	✓	-
10	Ostreidae	*Crassostrea ariakensis*	Oyster	D & W	✓	✓	-
11	Pectinidae	*Chlamys tranquebaricus*	Scallop	D & W	-	✓	✓
12	Placudidae	*Placuna placenta*	Windowpane oyster	D & W	✓	-	-
13	Psammobiibae	*Psammotaeta obesa*	Sunset clams	D & W	-	-	✓
14	Solenidae	*Solen vagina*	Nife and razor clams	D & W	-	✓	-
15	Veneribae	*Sunetta meroe*	Truncate sunetta	D & W	-	✓	-
16	Buccinidae	*Babylonia formosa*	Formosan ivory shell	W	-	✓	-
17	Cypraeidae	*Cypraea sp.*	Cowries	D & W	✓	✓	✓
18	*Gastropods*	*Agaronia nebulosa*	Cowries	D & W	✓	✓	✓
19		*Argobuccinum australasiae*	Pustular triton	D & W	-	-	-
20	Melongenidae	*Pugilina colosseus*	Spiral melongena	D & W	✓	✓	✓
21	Muricidae	*Thais bufo*	Toad purpura	D & W	-	-✓	-

22	Naticidae	*Polinices sp.*	Moon snail	D & W	-✓	-	-
23	Neritidae	*Nerita lineat*	Nerite	D & W	✓	✓	✓
24	Olividae	*Olivancillaria sp.*	olive-shaped shells	D & W	✓	✓	-
25	Potamididae	*Cerithidea cingulata*	Girdled horn shell	W	-	-	✓
26	Tonnidae	*Tonna sulcosa*	Banded tun	D & W	✓	✓	-
27		*Trochus radiatua*	Radiate top	D & W	-	-	✓
28		*Umbonium gigantium*	Giant button top	W	-✓	-	-
29		*Umbonium sp.*	Button top	D & W	-	✓	✓
30	Turritellidae	*Turritella sp.*	Turret shells	D & W	-	-	✓
Total					**18**	**15**	**16**

Source: JICA Survey Team

5) Terrestrial Organism

Samples were taken in field surveys in February and May 2018 from port areas on both sides of the Kohelia River, Haser char sands and mangroves, Uttar Nolbilla hill conservation forests. The results are based on this field survey, forestry bureau, community hearing.

a) **Flora**

Quadrant counting method for spot counting was used. Mangrove species were frequently confirmed within the Kohoheia River, Haser char & Badarkhali premises. The main mangrove species is the Avicennia sp local name (Baen), not particularly valuable species. Other common species include Acanthus ilifolius (Hargoja), Aegialitis rutundifolia (Nuinna) and others.

Table 4.8-16 List of Terrestrial Organisms

Sl. No.	Scientific name	Local name	Season (D dry /W wet)	IUCN Status	Family	Habit
1.	*Acanthus ilicifolius* L.	Hargoja	W	LC/LR	Acanthaceae	Shrub
2.	*Aegialitis rotu difolia* Roxb.	Nuniya	D&W	Not Listed	Plumbaginaceae	Tree
3.	*Albizia odoratissima* (L.f.) Benth.	Jatkorai	D&W	Not Listed	Mimosaceae	Tree
4.	*Albizia procera* (Roxb.) Benth.	Silkorai	D&W	Not Listed	Mimosaceae	Tree
5.	*Alocasia macrorrhizos* (L.) G. Don	Mankachu	D&W	Not Listed	Araceae	Herb
6.	*Alocasia odora* (Lindl.) K.Koch*	Hatalkachu	D&W	LC/LR	Araceae	Herb
7.	*Aloe vera* (L.) Burm.f.	Gritakumari	D&W	Not Listed	Aloaceae	Herb
8.	*Alternanthera philoxeroides* (Mart.) Griseb.	Helencha, Molicha	D&W	Not Listed	Amaranthaceae	Herb
9.	*Alternanthera sessilis* (L.) R.Br. *ex* DC.	Sachishak	D&W	LC/LR	Amaranthaceae	Herb
10.	*Avicennia alba* Blume	Dulia baen	D&W	LC/LR	Verbenaceae	Tree

Sl. No.	Scientific name	Local name	Season (D dry /W wet)	IUCN Status	Family	Habit
11.	*Avicennia officinalis* L.	Barobaen	D&W	LC/LR	Verbenaceae	Tree
12.	*Azadirachta indica* A. Juss.	Nim	D&W	LC/LR	Meliaceae	Tree
13.	*Bacopa monnieri* (L.) Pannell	Brammisha k	D&W	Not Listed	Scrophulariac eae	Herb
14.	*Bombax ceiba* L.	Simultula	D&W	Not Listed	Bombacaceae	Tree
15.	*Bothriochola pertusa* (L.) A.Camus	Gora dubla	D&W	Not Listed	Poaceae	Herb
16.	*Calotropis gigantea* (L.) Ait.f.	Akand	D&W	Not Listed	Asclepiadacea e	Shrub
17.	*Cassia fistula* L.	Sonalu	D&W	Not Listed	Caesalpiniace ae	Tree
18.	*Casuarina equisetifolia* L.	Jaw, Popan	D&W	Not Listed	Casuarinaceae	Tree
19.	*Cayratia tri folia* (L.) Domin*	Amollata	D&W	Not Listed	Vitaceae	Climbe r
20.	*Centella asiatica* (L.) Urban.	Thankuni	D&W	Not Listed	Apiaceae	Herb
21.	*Chromolaena odorata* (L.) R.M.King&H.Rob.	Asamlata	W	Not Listed	Asteraceae	Herb
22.	*Chukrasia tabularis* A. Juss.	Cikrasi	D&W	LC/LR	Meliaceae	Tree
23.	*Citrus limon* (L.) Burm.f.	Lebu	D&W	Not Listed	Rutaceae	Tree
24.	*Citrus maxima* (Burm.f.) Merr.	Jambura, Santara	D&W	Not Listed	Rutaceae	Tree
25.	*Cuscuta reflexa* Roxb.	Sunnalata	W	Not Listed	Cuscutaceae	Climbe r
26.	*Delonix regia* (Hook.) Raf.	Krisnachura	D&W	LC/LR	Caesalpiniace ae	
27.	*Dillenia indica* L.	Chalta	D&W	Not Listed	Dilleniaceae	Tree
28.	*Dipterocarpus turbinatus* Gaertn.	Garjan	D&W	VU	Dipterocarpac eae	Tree
29.	*Elaeocarpus floribundus* Blume	Jalpai	D&W	Not Listed	Elaeocarpacea e	Tree
30.	*Ficus benghalensis* L.	Bat	D&W	Not Listed	Moraceae	Tree
31.	*Ficus comosa* Kurz	Mosadumur	D&W	Not Listed	Moraceae	Tree
32.	*Kalanchoe pinnata* (Lam.) Pers.	Pathorkuchi	D&W	Not Listed	Crassulaceae	Herb
33.	*Leucas indica* (L.) R.Br. *ex*Vatke	Dondokalos h	D&W	Not Listed	Lamiaceae	Herb
34.	*Mentha arvensis* L.	Pudina	D&W	LC/LR	Lamiaceae	Herb
35.	*Mimosa pudica* L.	Lajjabati	D&W	LC/LR	Mimosaceae	Herb
36.	*Oryza rufipogon* Griff.	Uri dan	D&W	LC/LR	Poaceae	Herb

Sl. No.	Scientific name	Local name	Season (D dry /W wet)	IUCN Status	Family	Habit
37.	*Pandanus odorifer* (Forssk.) Kuntze	Keya	D&W	LC/LR	Pandanaceae	Tree
38.	*Phyllanthus emblica* L.	Amloki	D&W	Not Listed	Euphorbiaceae	Tree
39.	*Portulacao learacea* L.	Nunashak	D	Not Listed	Portulacaceae	Herb
40.	*Smilax ovalifolia* Roxb. *ex*D.Don	Kumairralata	W	Not Listed	Smilacaceae	Climber
41.	*Sonneratia apetala* Buch.-Ham.	Keowra, Kerpa	D&W	LC/LR	Sonneratiaceae	Tree
42.	*Sterculia foetida* L.	Keron	D&W	Not Listed	Sterculiaceae	Tree
43.	*Suaeda maritima* (L.) Dumort.	Sagorsuda	W	Not Listed	Chenopodiaceae	Shrub
44.	*Swieteniam ahagoni* (L.) Jacq.	Mehagoni	D&W	Not Listed	Meliaceae	Tree
45.	*Terminalia arjuna* (Roxb. *ex* DC.)	Arjun	D&W	Not Listed	Combretaceae	Tree
46.	*Terminalia bellirica* (Gaertn.) Roxb.	Bahera	D&W	Not Listed	Combretaceae	Tree
47.	*Terminalia catappa* L.	Katbadam	D&W	Not Listed	Combretaceae	Tree
48.	*Terminalia chebula* (Gaertn.) Roxb.	Horitoki	D&W	Not Listed	Combretaceae	Tree
49.	*Acacia Auriculacformis*	Akasmoni	D&W	Not Listed	Fabaceae	Tree
50.	*Eucalyptus citriodora*	Eucaliptus	D&W	Not Listed	Myrtaceae	Tree
51	*Avicennia marina*	Moricha baen	D&W	LC/LR	Acanthaceae	
52	*Melastoma malabathricum*	Tree indicator	D&W	Not Listed	Melastomataceae	

Source: JICA Survey Team

Note : IUCN Status: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient, NT-Near Threatened, NA- Not Assessed

b) **Fauna**

Also the quadrant counting method was done. Insects show a list of the survey results of 2018 below.
As a result of field survey and verification of secondary data, it was judged that no valuable species existed in the area.

Table 4.8-17 List of Insects

Sl. No.	*Species Name*	English Name (Local Name)	Habitat	Survey Sites			Remarks
				Sea Area/ Port area	Kuhelia Riverside	Badar khali Riverside	
1	*Gryllus* spp.	Cricket (Urchunga)	Rice field	-	√	√	Agricultural pest
2	*Oxya chinensis* (Thunberg)	Small Rice (Grasshopper) (Ghas Foring)	Rice field	-	√	√	Agricultural pest
3	*Periplaneta Americana Linn.*	American/ Cockroach (Telapoka)	Restaurant	-	√	√	Household pest
4	*Agromyza spp.*	Miner flies	Bush bean	√	√	√	Leaf miner pest of vegetables
5	*Bactrocera cucurbitae* (Coquillett)	Melon fly	Bottle gourd	√		√	Pest of vegetables
6	*Eristalinus*	Hoverfly	Cucumber		√		Pollinator in
7	*Agriocnemis femina* (Brauer)	Narrow-winged/ Damselfly (Foring)	Bush bean (Near the pond)		√		Predator and Bioindicator
8	*Agriocnemis pygmaea* (Rambur)	Damselfly (Foring)	Common bean (Near the pond)	-	√	√	Predator and Bioindicator
9	*Ceriagrion cerinorubellum* (Brauer)	Damselfly (Foring)	Woods of vegetation	-	√	√	Predator and Bioindicator
10	*Tholymis* sp.	Evening Skimmer (Foring)	Woods of vegetation				Predator and Bioindicator
11	*Episyrphus spp.*	Hover fly	Cucumber field		√		Predator and pollinator in most cases
12	*Musca domestica* Linn.	House fly	Restaurant	√	√	√	Pathogen carrier and pollinaotr in few cases
13	*Chrysomya megacephala (Fabricius)*	Oriental latrine fly	Dry fish	√	√	√	Pest of dry fish and pollinaotr in few cases
14	*Eurema hecabe contubernalis Moore*	Common Grass/Yellow / (Holud)	Common been	√	√	√	Pollinator in adult aged
15	*Delias descombesi descombesi* (Boisduval)	Red spot jezebel (Kanka)	Secondary forest	√		√	Pollinator in adult aged
16	*Junonia atlites* (Linn.)	Chandnori	Agricultural field	√	√	√	Pollinator in adult aged

Sl. No.	*Species Name*	English Name (Local Name)	Habitat	Survey Sites			Remarks
				Sea Area/ Port area	Kuhelia Riverside	Badar khali Riverside	
17	*Melanitis phedima bela* Moore	Dark Evening Brown	Agricultural field	√	√	√	Pollinator in adult aged
18	*Parnara guttatus mangala* Moore	Straight Swift (Nillbijuri)	Snake gourd		√		Pollinator
19	*Oriens goloides* Moore	Smaller Darlet	Agricultural field	√	√		Pollinator
20	*Aulacophora foveicollis* Lucas	Red pumpkin beetle	Pumpkin field	√	√	√	Agricultural pest
21	*Aulacophora frontalis* Baly	Pumpkin beetle	Pumpkin field	√	√	√	Agricultural pest
22	*Nephotettix cincticeps* Matsumura	Spotted jassid	Rice field	-		√	Pest of rice
23	*Leptocorisa acuta* Thunb.	Rice bug	Rice field	-		√	Pest of rice
24	*Rhopalosiphum sp.*	Aphis	Common bean	√			Agricultural pest
25	*Amegilla* spp.		Brinjal	√		√	Pollinator
26	*Lasioglossum* sp.	Solitary Bee	Cucumber field	-	√	√	Pollinator and bioindicator
27	*Trigona* sp.	Sweat bee	Cucumber field	-			Pollinator
28	*Apis mellifera* Linn.	Western Honey bee (Momachhi)	Cucumber field	√		√	Pollinator and Bioindicator
29	*Micraspis crocea* (Mulsant)	Lady beetle	Rice	-	√	√	Rice pest
Total				15	21	22	

Source: JICA Survey Team

Reptiles are described below.
As a result of the field survey in the dry season and rainy season in 2018, the survey team could not find the sea turtle during the field survey. However, it is judged that mitigation measures such as control of lighting, noise, vibration due to construction work are necessary because there is a possibility that the shore of the sandy beach adjacent to the planned place is the spawning ground and the egg site by interview with experts did.
According to the findings of the thermal power generation project in 2013, Tortoises are Lepidochelys olivacea (VU), Akamatsu turtle (Caretta caretta) (VU), Green turtle (Chelonia mydas) (EN) and Eretmochelys imbricate (CR). There said to be existing 34 individuals of these 4 species. However, the landing frequency from March to April is decreasing in various places around the planned project site. This is consistent with the findings of a survey article published in MTN (Marine Turtles Network) by

Marine Life Alliance, an environmental NGO on San Martin Island and San Diego Island.
It was announced in 2011 that 192 turtles announced on Sonadia Island were confirmed annually. Furthermore, in the same survey conducted at Marine Life Alliance, 19 individual landings were confirmed one day and night. On the other hand, it was confirmed that only 34 individuals landed on the Matarbari peninsula during the observation period of 40 days. Based on these facts, some experts conclude that the egg laying frequency is very low compared to the frequency in Sonadia Island.

Table 4.8-18 List of reptiles

Sl. No.	*Species Name*	English Name (Local Name)	Habitat	Survey Sites (Rainy Season)			Conservation Status		Remarks
				Sea Area	(KH)	(BDK)	IUCN	Local Status	
Amphibians									
1	*Duttaphrynus (Bufo) melanostictus*	Southeast Asian toad	Kono bang	√	√	√	LC		Very common throughout the county
2	*Euphlyctis cyanophlyctis*	Green Forq	Kotkoti bang	√	√	√	LC		Very common
3	*Fejervarya limnocharis*	Cricket frog		√	√	√	LC		Common
4	*Fejervarya sp*	Cricket frog			√	√			
5	*Hoplobatrachus tigerinus*	Bull frog	Kola bang, Sona bang,Bhawa beng	√	√	√	LC		Wide spread
6	*Sylvirana leptoglossa*	Cope's Assam Frog	Koper Ashami Bang		√	√	LC		
7	*Rana temporalis*	Bronzed Frog	Gaso Bang		√		LC		
Reptiles									
1	*Calotes versicolor*	garden lizard	Roktochusha	√	√	√		TH	
2	*Mabuya mabuya*	skink	Achil	√	√	√		TH	
3	*Gekko gecko*	Tokay Gecko	Tokkhak/ Tokhha	√	√	√		TH	
4	*Hemidactylus brooki*	house lizard	Tiktiki	√	√	√			
5	*Hemidactylus frenatus* Schlegel in Duméril & Bibron, 1836	house lizard	Tiktiki	√	√	√			
6	*Melanochelys trijuga* (Schweigger, 1812)	Indian Black Turtle	Kalo Kossop	√	√	√			
7	*Geoclemys hamiltonii* (Gray, 1830)	Spotted Pond Turtle	Kalo Kasim	√	√	√	EN	TH	
8	*Pangshura tentoria* (Gray, 1834)	Median Roofed Turtle	Majhari Kaitta	√	√	√		TH	

Sl. No.	*Species Name*	English Name (Local Name)	Habitat	Survey Sites (Rainy Season)			Conservation Status		Remarks
				Sea Area	(KH)	(BDK)	IUCN	Local Status	
9	*Ahaetull prasina(Boie, 1827)*	Common Vine snake	Laodoga /Shap/sutanoli Shap		√				
10	*Xenocrophis piscator*	Checkered keel back	Dhora sap	√	√	√			
11	*Naja kaouthia* Lesson, 1831	Monocled Cobra	Jati Sap	√	√	√			
12	*Naja naja*	Bicled Cobra	Gokhra Shap	√	√	√		TH	
13	*Cerberus rynchops* (Schneider, 1799)	Dog faced water snake	Andha sap	√					
14	*Enhydris sieboldii* (Schlegel, 1837)	Siebold's Smooth Water Snake	Sibolder Joloj Shap	√	√	√			

Source：JICA Survey team

Note： EN＝Endangered TH=Threatened LC Least Concern No mark No category

Spoonbilled Sandpipers（Eurynorhynchus pygmeus）

Field survey of the dry season and rainy season in 2018 confirmed that there were no fisheries using the sandy beach area around the proposed port border area. Also, regarding migratory birds such as spoonbilled sandpipers, it can be predicted that the surrounding area of the surveyed area is a moving area in the dry season. According to IUCN, spoonbilled sandpipers were found off the Sonadia in the dry season. However, the frequency of use as a habitat for the dry season on Matarbari Peninsula is not as strong as the nearby Sonadia Island. According to the findings so far,.

The opinion that the beach on the Matarbari peninsula is not the habitat of major migratory birds in Bangladesh, in particular is supported by local avian experts and reports.

As a result of hearing from experts such as IUCN, NGO and university, valuable species such as spoonbilled sandpipers are confirmed on Sonadia Island (corresponding to Ecologically Critical Area), which is about 15 km away from the planned project site. Considering this situation, the ocean dumping was selected as a place to dump more than about 60 km away from the planned project site and 30 meters deep, where the pollution spread is minimized,.

In addition, as a prediction of the impact of this project, from the results of the coastline change model and the turbid diffusion model carried out considering the marine dumping site and dredging, remarkable pollution rise due to dredging and marine dumping did not occur and influence on Sonadia have confirmed to be minor.

Table 4.8-19 List of Birds

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)			Conservation Status		Remarks
				Sea Area	(KH)	(BDK)	IUCN	Local Status	
1	*Passer domesticus*	House Sparrow	Pati Chorui	√	√	√			
2	*Dicrurus macrocercus*	Black Drongo	Kala Fingey	√	√	√			
3	*Sturnus contra*	Pied Myna	Pakra Shalik/Gubra Shalik/Gu Shalik	√	√	√			
4	*Sturnus malabaricus*	Chestnut-tailed Starling	Khoiralej Kathshalik/Deshi Pawei	√	√	√			
5	*Acridotheres cinereus*	Pale-bellied Myna	Dholatola Shalik	√	√	√			
6	*Acridotheres tristis*	Common Myna	Bhat Shalik	√	√	√			
7	*Acridotheres fuscus*	Jungle Myna	Jhuti Sahlik	√	√	√			
8	*Gracula religiosa*	Common Hill Myna			√				
9	*Copsychus saularis*	Oriental Magpie-Robin	Doel/Udoi Doel	√	√	√			
10	*Orthotomus sutorius*	Common Tailorbird	Pati Tuntuni	√	√	√			
11	*Columba livia*	Common Pigeon	Gola Paira/Jalali Kabutor	√	√	√			
12	*Treron bicintus*	Orenge-breasted Green Pigeon	Komlabook Horial/Horikol	√	√	√			
13	*Streptopelia decaocto*	Eurasian Collared Dove	Eurashio Konthighughu/ Raj Ghughu	√	√	√			
14	*Streptopelia chinensis*	Spotted Dove	Tila Ghughu		√				
15	*Treron phoenicopterus*	Yellow-footed Green Pigeon	Holdepa Horial/Botkol	√	√	√			
16	*Pycnonotus cafer*	Red-vented Bulbul	Bangla Bulbul/Bulbuli	√	√	√			
17	*Pycnonotus jocosus*	Red-whiskered Bulbul	Shipahi Bulbul/Bulbuli	√		√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)			Conservation Status		Remarks
				Sea Area	(KH)	(BDK)	IUCN	Local Status	
18	*Corvus splendens*	House Crow	Pati Kak	√	√	√			
19	*Corvus macrorhynchos*	Jungle Crow	Dar Kak/Danr Kak	√	√	√			
20	*Oriolus xanthornus*	Black-hooded Oriole	Kalamatha Benebou/Holdey Pakhi	√	√	√			
21	*Artamus fuscus*	Ashy Woodswallow	Metey Bonababil/Latora	√	√	√			
22	*Dendrocitta vagabunda*	Rufous Treepie	Khoira Harichacha/ Hari Chacha	√	√	√			
23	*Dicaeum cruentatum*	Scarlet-backet Flowerpecker	Lalpith Fuljhuri	√	√	√			
24	*Dicaeum erythrorhynchos*	Pale-billed Flowerpecker	Metethot Fuljhuri	√	√	√			
25	*Dicaeum trigonostigma*	Orenge-bellied Flowerpecker	Komlapet Fuljhuri	√	√	√			
26	*Chalcoparia singalensis*	Ruby-cheeked Sunbird	Chunimukhi Moutushi	√	√	√			
27	*Leptocoma zeylonica*	Purple-rumped Sunbird	Begunikomor Moutushi	√	√	√			
28	*Cinnyris asiaticus*	Purple Sunbird	Beguni Moutushi	√	√	√			
29	*Aethopyga siparaja*	Crimson Sunbird	Shidure Moutushi	√	√	√			
30	*Arachnothera magna*	Streaked Spiderhunter		√	√	√			
31	*Ploceus philippinus*	Baya Weaver	Deshi Babui/Baoi	√	√	√			
32	*Lonchura malabarica*	Indian Silverbill	Deshi Chandithot						
33	*Lonchura malacca*	Blkack-headed Munia	Kalamatha Munia	√	√	√			
34	*Lonchura punctulata*	Scaly-breasred Munia	Tila Munia	√	√	√			
35	*Lonchura straiata*	White-rumped Munia	Dholakomor Munia	√	√	√			
36	*Anthus rufulus*	Paddyfield Pipit	Dhani Tulika	√	√	√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)			Conservation Status		Remarks
				Sea Area	(KH)	(BDK)	IUCN	Local Status	
37	*Pellorneum ruficeps*	Puff-throated Babler	Golafola Satarey	√	√	√			
38	*Zosterops palpebrosus*	Oriental White-eye	Udoi Dholachokh/Shet Ankhi	√	√	√			
39	*Prinia inornata*	Plain Prinia	Nirol Prina	√	√	√			
40	*Ficedula albicilla*	Taiga Flycatcher	Taiga Chutki/Lalbook Chotok	√	√	√			
41	*Aegithina tiphia*	Common Iora	Fatik Jal	√		√			
42	*Hypothymis azurea*	Black-naped Monarch	Kalaghar Rajon	√	√	√			
43	*Disrurus paradiseus*	Greater Racket-tailed Drongo	Boro Recket-Fingey/ B himraj	√	√	√			
44	*Disrurus aeneus*	Bronzed Drongo	Fingey	√	√	√			
45	*Rhipidura albicollis*	White-throated Fantail	Dholagola Chatighurani/Lej Nachuni	√	√	√			
46	*Alcedo atthis*	Common Kingfisher	Pati Machranga	√	√	√			
47	*Alcedo meninting*	Blue-eared Kingfisher	Neelkan Machranga	√	√	√			
48	*Halcyon smyrnensis*	White-throated kingfisher	Dholagoloa Machranga	√	√	√			
49	*Ceryle rudis*	Pied Kingfisher	Pakra Machranga	√	√	√			
50	*Upupa epops*	Eurasian Hoopoe	Pati Hoodhood	√	√	√			
51	*Dinopium bengalensis*	Lesser goldenback	Bangla kaththokra						
52	*Merops leschenaulti*	Chestnut-headed Bee-eater	Khoiramatha Shuichora	√	√	√			
53	*Merops philippinus*	Blue-tailed Bee-eater	Neel-lej Shuichora	√	√	√			
54	*Psittacula alexandri*	Red-breasrted Parakeet	Modna Tia	√	√	√	NT		
55	*Psittacula krameri*	Rose-ringed Parakeet	Shobuj Tia	√	√	√			
56	*Cypsiurus balasiensis*	Asian Palm Swift	Asio / Talbatashi/ Nakkati	√	√	√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)			Conservation Status		Remarks
				Sea Area	(KH)	(BDK)	IUCN	Local Status	
57	*Ketupa zeylonensis*	Broun Fish Owl	Khoira mechupacha/Bho otoom Pecha	√	√	√			
58	*Athene brama*	Spotted Owlet	Khuruley Pencha/Konthi Kutipecha		√				
59	*Caprimulgus macrurus*	Large-tailed Nightjar	Lenja Ratchora	√		√			
60	*Ichthyophaga ichthyaetus*	Grey-headed Fish Eagle	Metemetha Kura Eagle				NT		
61	*Spilornis Cheela*	Crested Serpent Eagle	Tila Nag-eegol/Shapk heko Baj		√				
62	*Phalacrocorax niger*	Little Cormorant	Choto Pankouri	√	√	√			
63	*Phalacrocorax fuscicollis*	Indian Cormorant	Deshi Pankouri		√				
64	*Egretta garzetta*	Little Egret	Choto Boga	√	√	√			
65	*Egretta intermedia*	Yellow-billed Egret	Majhla Boga/Korche Bok		√				
66	*Casmerudias albus*	Great Egret	Boro Boga	√		√			
67	*Bubulcus ibis*	Cattle Egret	Go Boga	√	√	√			
68	*Ardeola bucchus*	Chinese Pond Heron	China Kanibok	√	√	√			
69	*Ardeola grayii*	Indian Pond Heron	Deshi Kanibok	√	√	√			
70	*Sterna aurantia*	River Tern	Nodia Panchil	√		√			
71	*Glareola lactea*	Small Pratincole	Choto Babubatan			√			
72	*Ardea cinerea*	Grey Heron	Dhupni Bok	√	√	√			
73	*Sterna albifrons*	Little Tern	Choto Panchil	√	√	√			
74	*Nycticorax nycticorax*	Black-crowned Night Heron	Kalamatha Nishibok	√	√	√			
	Pandion haliaetus	Osprey	Machmural/Mechubaj	√	√	√			

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)			Conservation Status		Remarks
				Sea Area	(KH)	(BDK)	IUCN	Local Status	
76	*Tadorna ferruginea*	Ruddy Shelduck	Khoira Chokachoki		√				
77	*Anas clypeata*	Northern Shoveler	Utturey Khuntehash/Panta mukhi						
78	*Jynx torquilla*	Eurasian Wryneck	Eureshio Gharbetha			√			
79	*Halcyon pileata*	Black-capped Kingfisher	Kalatupi Machranga		√				
80	*Todiramphus chloris*	Collared Kingfisher	Dholaghar Machranga	√	√	√			
81	*Porzana pusilla*	bailon's Crake	Bailoner Gurguri						
82	*Gallinago gallinago*	Common Snipe	Pati Chega						
83	*Gallinago stenura*	Pin-tailed Snipe	Lenja Chega		√				
84	*Limosa lapponica*	Bar-tailed Godwit	Dagilej Jourali			√	NT		
85	*Limosa limosa*	Black-tailed Godwit	Kalalej jourali				NT		
86	*Numenius arquata*	Eurasian Curlew	Eureshio Gulinda	√	√	√	NT		
87	*Numenius phaeopus*	Whimbrel	Choto Gulinda			√			
88	*Tringa glareola*	Wood Sandpiper	Bon Batan/Balu Batan	√	√	√			
89	*Actitis hypoleucos*	Common Sandpiper	Pati Batan/ Chapakhi	√	√	√			
90	*Tringa stagnatilis*	Marsh Sandpiper	Bali Batan						
91	*Tringa guttifer*	Nordmann's Greenshank	Nordman Shabujpa				EN	TH	
92	*Tringa nebularia*	Common Greenshank	Pati Shabujpa			√			
93	*Tringa totanus*	Common Redshank	Pati Lalpa			√			
94	*Xenus cinereus*	Terek Sandpiper	Terek Batan						
95	*Arenaria interpres*	Ruddy Turnstone	Lal Nuribatan		√				
96	*Limnodromus semipalmatus*	Asian Dowitcher	Eshio Daucher						
97	*Calidris alba*	Sanderlin	Sanderlin		√				
98	*Calidris ferruginea*	Curlew Sandpiper	Gulinda Batan						

Sl. No.	Species Name	English Name	Local Name	Survey Sites (Early winter)			Conservation Status		Remarks
				Sea Area	(KH)	(BDK)	IUCN	Local Status	
99	*Calidris minuta*	Little Stint	Choto Chaha						
100	*Calidris ruficollis*	Red-necked Stint	Lalghar Chaha						
101	*Calidris temminckii*	Timminck's Stint	Timinker Chaha		√	√			
102	*Calidris tenuirostris*	Graet Knot	Boro Noth				EN	TH	
103	*Himantopus himantopus*	Black-winged Stilt	Kalapakh Thengi/Lal pa Dhenga						
104	*Pluvialis fulva*	Pacific Golden Plover	Proshanto Shonajiria	√	√				
105	*Charadrius alexandrinus*	Kentish Plover	Kentish Jiria	√	√	√			
106	*Charadrius dubius*	Little Ring Plover	Choto Nothjiria	√		√			
107	*Charadrius leschenaultii*	Greater Sand Plover	Boro Dhuljiria	√	√	√			
108	*Charadrius mongolus*	Little Sand Plover	Choto Dhuljiria	√	√	√			
109 *	*Eurynorhynchus pygmeus**	Spoon-billed Sandpiper*	Chamuchthuto Batan*				CR*	TH*	Limited area*
110	*Larus brunnicephalus*	Brown-headed Gull	Khoiramatha Gangchil	√	√	√			
111	*Larus ichthyaetus*	Great Black-headed Gull	Palasi Gangchil/Bara Jal	√	√	√			
112	*Larus heuglini*	Heuglin's Gull	Heugliner Gangchil						
113	*Larus ridibundus*	Common Black-headed Gull	Kalamatha Gangchil						
114	*Sterna sumatrana*	Black-naped Tern	Kalaghar Panchil	√	√	√			
115	*Threskiornis melanocephalus*	Black-headed Ibis	Kalamatha Kastechora		√				

Source: JICA Survey Team

Note: CR=Critically Endangered EN＝Endangered TH=Threatened NT Near Threatened
NO category

Spoonbilled sandpipers have been reported to be confirmed at two off the Sonadia (Sonadia Island, 15 km away from the project site)

(3) Impact on Social Environment

1) Resettlement and Land Acquisition

Out of 108 ha required for the Project, private land to be acquired will be 80 ha. 57 HHs will be subject to displacement of their houses and 5 HHs will be subject to displacement of their shops. (Since 4 HHs will be with both their houses and shops displaced, total number of HHs with their houses/shops displaced will be 58 HHs.) 175 HHs will have their land affected, out of which 26 HHs will have also their houses and/or shops affected. Total number of HHs with their structures and/or land will be 207 HHs.

Table 4.8-20 Summary of Resettlement and Land Acquisition

Serial	Type of Impact	Amount/No	Comments
1	Land Required for the Project	108 ha	
1-1	Private land to be Acquired	80 ha	
	Loss of Residential land	4 ha	
	Loss of Salt farm	70 ha	
	Loss of Waterbody, Tidal Area, etc.	6 ha	
1-2	Government land to be transferred	28 ha	
2	Affected Household		
2-1	Household with their structures / land affected	207 households	
	With their Houses affected	57 households	Including 31 households of informal settlers
	With their Shops affected	5 households	4 households with both houses and shops affected
	Loss of Land (Residential land and/or Salt farm)	175 households	26 households with both structures and land affected.
2-2	Households with their livelihood affected	44 households	
	Sharecroppers	10 households	
	Other employees in salt farm	34 households	

Source: JICA Survey Team

2) Poor people

In Bangladesh, Poverty Reduction Strategy was formulated and poverty reduction has been taken up as a critical issue in "Seventh Five-Year Plan 2016-2020". Expenditure on Social Security programs in Bangladesh in FY 2014-15 is 306.4 billion taka, which is equivalent to 2.02% of GDP. Among them, 0.5% is allocated for "Economic Empowerment of the Poor", and 5.5% is allocated for "Vulnerable Group Feeding". However, especially as for the "Vulnerable Group Feeding", coverage of beneficiary is low. The "National Social Security Strategy" formulated in 2015 aims to expand the social security system to socially vulnerable people including the poor.

The per capita monthly income of the population below the "upper poverty line" in Bangladesh based on the basic needs cost method, is 1,304.64 Taka in the rural area of the Chittagong Division (Bangladesh Bureau of Statistics (2011), Report of Household Income & Expenditure Survey 2010). In order to grasp the number of poor households in this survey, households with monthly income below 15,000 Taka as of 2018 is defined as "poverty", considering the average inflation rate of about 7% and the average household size of 5.3 persons in addition to the above per capita monthly income.

According to this definition, 13 households are the poor out of 57 households to be displaced. Informal settlers are 31, out of which 7 households are the poor. Land loser excluding the aforementioned house losers are 150 HHs, out of which 4 HHs are the poor. 7 HHs out of 44 HHs of sharecroppers/ employees could be regarded as the poor. However, it shall be noted that income level can be reported higher in interview survey, which means there can be more HHs below poverty line than reported.

3) Indigenous people and ethnic minorities

In Bangladesh, ethnic minorities are treated as 'tribals' in official documents, though in the Act 12 of 1995 and Rules 6, 34, 45, 50 of Chittagong Hill Tracts (CHT) Regulation (1900), they are documented as 'indigenous peoples' or 'aboriginal' as per section 97 of the SAT Act (1950). The State Acquisition and Tenancy Act (1950) restricts the sale of lands of 'aboriginal castes and tribes' to anyone except aboriginal castes domiciled in Bangladesh. In Bangladesh there are about 50 different indigenous communities living in the plain lands and hill areas. Though they claim that their population is over 3 million, according to the census survey of BBS in 2011, the country's indigenous population is around 1,586,141, which signifies 1.8% of total population of the country.

Through the socio-economic survey, it was confirmed that there are no ethnic minority and indigenous people in PAPs.

4) Local Economy and Livelihood

a) Overview

Dhalghata Union as the proposed Project site is mainly fishery and salt cultivation area. Total households are 2,250 and population is 12,877 (Census, 2011, BBS). Around 25% households are fishermen and the remaining households are dependent on salt, shrimp cultivation and different types of small business.

i) Salt field of Moheshkhali

Figure 4.8-16 Salt Cultivation by using river water in the dry season in Moheshkhali

In Cox's Bazar district, in 2015-2016 total land under salt cultivation is 60,130 acre and in 2016 to 2017

the salt land coverage is 64,147 acre. (Source: Bangladesh Small and Cottage Industries Corporation, Cox's Bazar). Moheshkhali is especially famous for salt production. A major portion of farmers produce salt for their livelihood. Now salt cultivation is the most profitable economic activity to the local farmers. Due to increase of crude salt price, the farmers are getting handsome cash money to meet their needs. Average price of crude salt is 10 taka per kg. Moheshkhali produces the largest portion of salt to meet domestic demand. Salt farming of about 19,000 acres enlists some degree of participation from most of the island's 300 thousand population. (Source: Upazila Profile, Moheshkhali and Socio- Economic Survey). The salt production was 1,800 thousand MT in the financial year during 2016-17, which have great contribution both for the region and national economy.

ii) Fishing in the Bay Bengal

Approximate number of fisherman at Dhalghata is around 500 and in Cox's Bazar is estimated 1000 nos. The fishery is main income of local residents in this area. They go for fishing in the Bay of Bengal mostly for two times in rainy season and dry season every year. Each fishing team faces natural hazards commonly like tropical cyclone in the rainy season and faces anthropogenic hazard like pirates attack in the dry season.

Table 4.8-21 Average Household Income and the Volume of Fish Catches of Fisherman

Occupation	No. of Interviewee	H/H Income (BDT per month)	Volume of Fish Catches (kg per month)
Fisherman	123	23,870	1,969*

*fish cash volume per group consisting of approx. 20 persons. Fish catch volume per person can be considered to be 98kg/month.
Source: JICA Survey Team

iii) Economy of the project area

The economic advantages of the area are a wide range of salt cultivation, a big number of shrimp farm, and numerous betel leaf orchards and above all, unique natural beauty which attracts the tourists easily. But the transportation and infrastructures is still not fully developed and it constitutes a major hindrance on economic and the efficient logistical movement of goods and people.
Shrimp Cultivation and processing: Average investment is Tk.30, 000 per acre, Gross income is Tk.60,000 and net profit is Tk.30,000 per acre.
Salt Cultivation: Per Acre production is 30 Metric Ton (MT), selling price (gross income) of crude salt is Tk.10,000 per Metric Ton and total return is Tk.300,000. On the other hand, Tk. 100,000 is needed to invest per acre salt cultivation. Consequently, Net profit is Tk.200,000 per acre. From January 2016 the salt price has increased substantially to Tk.15,000 per Metric Ton, where higher profit can be expected.

b) **Employment**

Out of 1,093 Project Affected Persons, 32.6% are employed, 1.5% are unemployed, 22.4% are house

worker, and 41.4% are students as the table below.

Table 4.8-22 Employment of the Project Affected Persons

Upazila	Union	Employed	Unemployed	House worker	Student	**Others	Total
Moheshkhali	Dhalghata	356	16	245	453	13	1,093
Total		356	16	245	453	13	1,093
		32.6%	1.5%	22.4%	41.4%	1.2%	100%

**People with disability
Source: JICA Survey Team

c) **Income**

Average household income for each occupation (per month) are as follows.

Table 4.8-23 Household Income for Each Occupation (Tk per month)

Occupation	Household with their land/structure affected	Household without their livelihood only
Fisherman	41,278	-
Salt farm and shrimp cultivator	61,990	25.625

Source: JICA Survey Team

d) **Economic Development Project**

Among surrounding development projects, the projects which might directly affect Socio-economic conditions are as follows:

-Moheshkhali Special Economic Zone Project
-Dohazar-Cox's bazar Railway Line Project
-Matarbari Ultra Super Critical Coal-Fired Power Project

Along with improvement of employment, business transaction and mobility through the above projects, employment promoted by the Project will stimulate the local economy. On the other hands, salt farm and shrimp farm might be affected by these projects in Moheshkhali. Therefore, appropriate compensation and assistance for livelihood restoration are required in the Project.

5) Land Use

Main land use of port area is salt cultivation and shrimp culture. The land owners cultivate salt in the dry season and in the same land they culture shrimp and other varieties of fishes in the wet season.

6) Water Usage, Water Rights, and Communal Rights

Regarding water usage and communal right in the country, there is no distinct law. Also jurisdiction between local government and central government is not clearly identified. Local government is very weak in decision making and budget constraints are a major problem. Union Parishad in project area has no manpower, scope and scanty budget for development. On the other hand, there is no fishing ground except river and the Bay of Bengal. There is no closed water large water body and irrigation facilities.

Incase water usage, main source of drinking water is tube well.

7) Social Infrastructure and Services

Though there are primary schools and high schools in the Dhalghata Union, there is only one maternity center in the adjacent Matarbari Union as medical facilities. When doctor is required, it is necessary to use the Upazial medical complex in the center of Moheshkhali or Chakaria, about 30 to 40 km away as the road distance. There are no paved roads in Dhalghata, and access to social services is extremely limited especially in the rainy season. The project will not physically affect schools, hospitals or clinics.

The social infrastructure and services which can be affected by the project are as follows.

Table 4.8-24 Social Infrastructures which can be Affected by the Project

Existing infrastructure to be affected in the project area	No. of Infrastructure	Address /Location	Remarks
School	0		
College	0		
Madrasa	0		
Clinic/ Hospital	0		
Graveyard	1	Dhalghata	Dhalghata Public Graveyard (affected)
Total:	**1**		

Source: JICA Survey Team

The graveyard will be affected mainly by port component and partially by access road component. The concerned households is as shown below. For considering future plan of the port, relocation of the graveyard, whose cost is borne by the Project, will be inevitable. Consensus has been confirmed through the concerned households. Where to be relocated shall be decided in close consultation with the concerned households considering that the households live in the area away from the Project site now.

Table 4.8-25 Concened Households of Dhalghata public Graveyard

No.	Name of HH head	Father's Name	Village Name
1			Uttor Shuturia Dhalghata
2			Uttor Shuturia Dhalghata
3			Uttor Shuturia Dhalghata
4			Uttor Shuturia Dhalghata

Source: JICA Survey Team

8) Social Institutions and Local Decision Making Institutions

Religious festivals, Eid, Puja and Buddha Purnima renovate the family ties and social network and bondage. These festivals also get together of rural and urban people, relatives, and family and a source of support for economic development in bad time. Bengali New Year (Pahela Baisaque, Baisabi festival) is celebrated by the people as non communal social festival both plain land, hilly tribal people. All these social infrastructure help people to be organized and getting economic development of the area.

No such traditional leader or headman or institutions are formally involved in preliminary decision making process from planning stage. There may be PAPs committee including key representative of civil society of local community for suggesting the project proponent in decision making process. In the

proposed project area, PAPs, local union Parishad Chairman and Members are found vocal relating to project issue. Institutionalization of such committee or advisory group with proper representation of all section of people could eliminate communication gap between project proponent and project affected community.

9) Unequal Distribution of Benefit and Damage and Local Conflicts of Interest

In the stakeholders meeting at union level, chairman and other members expressed their opinion that local community shall be engaged in construction work of the project, not outsiders. Engagement of local community into the project work would contribute to maintain social harmony and local people's satisfaction.

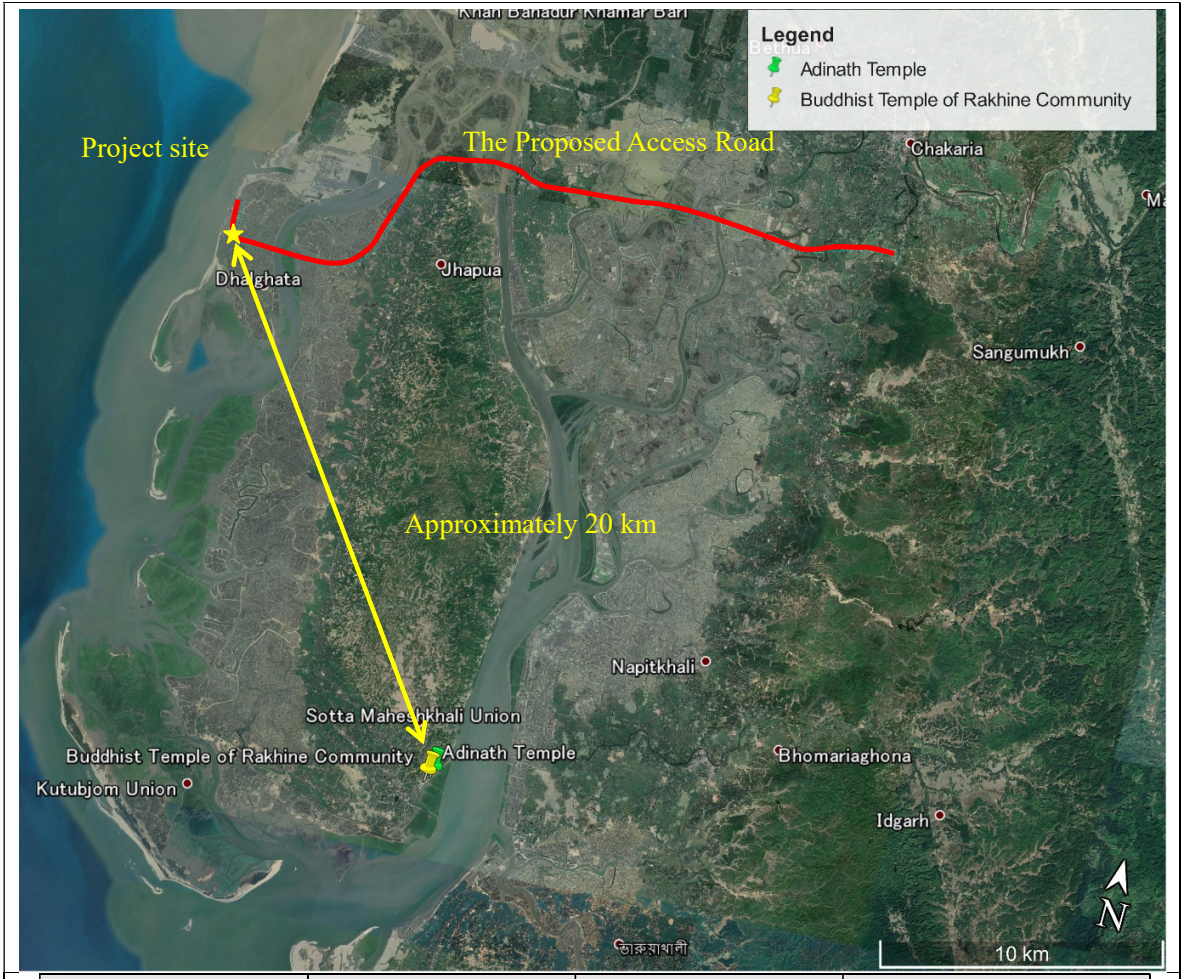
10) Local Conflict of Interest

At this stage, there is no conflict of interest among region. As mentioned above "9) Unequal Distribution of Benefit and Damage", engagement of local community into the Project work would contribute to prevent the conflict of interest.

11) Cultural Heritage

The main place of cultural and historical heritage in Moheshkhali are Adinath Temple and the temple for the Rakhine (ethnic minority ethnic group originated from Myanmar). Adinath Temple (16^{th} century) is one of the most attractive and famous Hindi temples. Adinath temple is located in Thakurtala village of Gorakhghata Union, the southern part of Moheshkhali, however the temple is far away, approximately 20km, from the Project site. Therefore, Adinath temple will not be affected by the Project.

One of the greatest attraction of Moheshkhali is the famous Buddhist temple of 400 years old in Rakhine para. A large number of people visit the temple of the Rakhine every day. In addition, this temple has been used as a place for Buddhist prayer of Rakhine. Since the distance between temple and project site is approximately 20km, the temple of the Rakhine also will not be affected by the Project.



Cultural Heritage	Latitude (North)	Longitude (East)	Distance from Project Site
Adinath Temple	21°31'41.00"N	91°58'29.40"E	Approximately 20km
Temple of the Rakhine	21°31'35.17"N	91°58'23.49"E	

Source: JICA Survey Team

Source: Google Earth edited by JICA Survey Team

Figure 4.8-17 Location of the Project Site and Cultural Heritage

Figure 4.8-18 Adinath Temple in Moheshkhali

Figure 4.8-19 Temple of the Rakhain in Moheshkhali

12) Landscape

As mentioned above, the scenic spots in Moheshkhali are Adinath Temple and temple of the Rakhain. The Sonadia, enriched biological diversity place, at the southern tip of Moheshkhali island is also one of the scenic spots. However, they will not be affected by the project since all of them are approximately 20 km away from the Project site.

13) Gender

Significant gender gap is found in educational level and occupation. Females tend to be severely restricted from going out particularly after their marriage.

The below table shows the gender-wise educational level of PAPs. Illiteracy rate of both male and female is around 16.4%, where significant difference cannot be found. The rate of primary level are 28.5% for males and 34.7% for females. The rate of secondary level are 21.1% for males and 34.1% for females. These mean that education level of more than 80% of females is up to secondary level. Females educated in HSC level are less than males; Males with HSC level are 13.6%, while females are 7.8%. The gender gap is more significant in graduate level; males are 11.1% while females are 3.0%.

Table 4.8-26 Gender-wise Education Level of the Project Affected Persons

Educational Level	Male		Female		Total	
	No. of Member	%	No. of Member	%	No. of Member	%
(1) Illiterate	99	16.4	80	16.3	179	16.4
(2) Primary Level	172	28.5	170	34.7	342	31.3
(3) Secondary Level	127	21.1	167	34.1	294	26.9
(4) HSC Level	82	13.6	38	7.8	120	11.0
(5) Graduate	67	11.1	15	3.1	82	7.5
(6) Post graduate	23	3.8	7	1.4	30	2.7
(7) Vocational	4	0.7	1	0.2	5	0.5
(8) Others (Children＜5yrs)	29	4.8	12	2.4	41	3.8
Total:	603	100.0	490	100.0	1,093	100.0

Source: JICA Survey Team

The below table shows gender-wise occupation of PAPs. A large number of males are engaged in fishery, salt cultivation, self-employed, and private service. On the other hand, approximately 50% of total females are engaged in household/ cottage industry; If "Unemployed though capable to work" and "Too young to work/disabled/student" are excluded, 90% of females are engaged in household/ cottage industry.

Table 4.8-27 Gender-wise Occupation of the Project Affected Persons

Occupation	Male		Female		Total	
	No. of Member	%	No. of Member	%	No. of Member	%
(1) Fishery	33	5.5%	1	0.2%	34	3.1%
(2) Salt Cultivation	159	26.4%	0	0.0%	159	14.5%
(3) Household/Cottage industry	1	0.2%	244	49.8%	245	22.4%
(4) Self Employed	31	5.1%	3	0.6%	34	3.1%
(5) Skilled Profession	6	1.0%	0	0.0%	6	0.5%
(6) Unskilled Labor	13	2.2%	0	0.0%	13	1.2%
(7) Private Services	51	8.5%	7	1.4%	58	5.3%
(8) Govt. Service	6	1.0%	1	0.2%	7	0.6%
(9) Retired/Pensioner	1	0.2%	0	0.0%	1	0.1%
(10) Unemployed though capable to work	5	0.8%	11	2.2%	16	1.5%
(11) Too young to work/disabled/student	242	40.1%	211	43.1%	453	41.4%
(12) Others	55	9.1%	12	2.4%	67	6.1%
Total:	603	100.0%	490	100.0%	1,093	100.0%

Source: JICA Survey Team

Gender is more vital issue and should be properly addressed for socio-economic development of the area. The project proponents should employ more female workers in the construction works and in port job facilities, provide and ensure discrimination free scope for the women.

Potential impact of the project is to expand female education in the area. The new development program will create scope of employment in the area. Socio economic survey reveals that enrollment of female students are more in the secondary level now. New opportunity will encourage female towards higher education. In this way social taboo regarding female student's education will gradually wither away.

Inclusion and consultation local women community is needed for improvement in project preparation and implementation period.

In tender documents, CPA should include terms and conditions to ensure female workers during the construction. For materializing this, equal wage shall be ensured with necessary supports to female workers.

14) Children's Rights

Bangladesh ratified Convention No. 182 of the International Labor Organization "Worst Forms of Child Labour Convention". Labor law in 2006 stipulated that employment of children under 14 years is prohibited and employment of children under 18 years in hazardous form is prohibited. Though National Child Labour Elimination Policy was issued in 2010, child labor is still widely and commonly observed in Bangladesh.

The percentage of child labor in Chittagong is 5.0% against the total number of children from 5 years to 17 years. This percentage is higher than the national average, 4.3%. Children working in salt farm are

commonly found in the project site during the survey. Some of them are considered to be child labor which could interfere with school attendance. The bidding document of the contractor shall stipulate that child labor shall be eliminated based on domestic law and FIDIC regulation.

Table 4.8-28 The Percentage and Number of Child Labor (2013)

Region	Child labor (5~17years)			Whole Child (5~17years)		
	Boy	Girl	Total	Boy	Girl	Total
Bangladesh	953,204	745,690	1,698,894	20,596,636	19,055,748	39,652,384
	4.6%	3.9%	4.3%	-	-	-
Chittagong	252,715	153,235	405,950	4,215,758	3,954,735	8,170,493
	6.0%	3.9%	5.0%	-	-	-

Source: BBS "Child Labour Survey 2013"

Education level is as shown in "13) Gender". In Cox's Bazar, vaccination rate of children by age of 23 months is slightly higher than the national average.

Table 4.8-29 Vaccination Rate by Age of 23 Months

Classification	Region	BCG	OPV1	Penta1	OPV2	Penta2	OPV3	Penta3	MR1	FVC
Vaccination Rate	National	99.5	99.3	99.3	98.7	98.7	97.9	97.9	95.3	95.1
	Chittagong Division	99.6	99.5	99.5	99.2	99.2	98.7	98.7	96.8	96.7
	Cox's Bazar	100.0	99.8	99.8	99.8	99.8	99.1	99.1	97.2	96.7
Vaccination rate within valid period	National	99.5	97.9	97.9	97.2	97.2	90.4	90.4	92.3	86.8
	Chittagong Division	99.6	97.9	97.9	97.2	97.2	90.4	90.4	93.9	87.8
	Cox's Bazar	100.0	98.1	98.1	98.4	98.4	92.3	92.3	92.2	87.4

Source: Expanded Programme on Immunization, Directorate General of Health Services, "Coverage Evaluation Survey 2016"

15) STD and HIV/AIDS

In Bangladesh, HIV infection rate is less than 1%, though it is pointed out that the actual infection rate might be higher because of insufficient inspection system. The number of HIV is the highest in Dhaka, while Chittagong has been reported to have the highest concentration of HIV along with Sylhet. (Health Bulletin 2017, Bangladesh)

In addition, many Rohingya refugees have flowed in Cox's bazar from Rakhine State in Myanmar. Rohingya diagnosed as infected with HIV/AIDS has been reported to be increased. Due to the examination system is underdeveloped, it is concerned that the number of HIV/AIDS would be higher.

Moreover, the Project itself will facilitate influx of outsiders including construction workers. Consequently, the budget shall be estimated considering social awareness program to check and minimize these social problems.

16) Work Environment (Including Work Safety)

Fishermen in bay of Bengal are faced with pirates attack in dry season as well as natural disaster such as

cyclone in rainy season.
Labor law in Bangladesh stipulates that working hours shall not exceed 8 hours a day, or 10 hours a day at a maximum even though overtime allowance will be additionally paid. The working hours per week shall not exceed 48 hours a week, or 60 hours a week at a maximum even though overtime allowance will be additionally paid. The working hours in a week shall not exceed 56 hours in annual average. These provisions shall be strictly complied in the Project.

(2) Others
1) Accident
Accidents in construction activities are concerned. In addition, traffic accident due to an increase traffic volume after operation is also concerned.

4.8.2 Access road

(1) Impact on Natural Environment / Pollution

1) Air Quality

Residential areas on the way of the ROW of the proposed port connecting access road project site were selected as sampling point for air quality measurement. The survey was conducted in the dry season (15 to 16 of February 2018, 28 to 29 April 2018) and in the wet season (08 to 09 of June 2018) to reflect the influence of precipitation in the fluctuation of air quality.

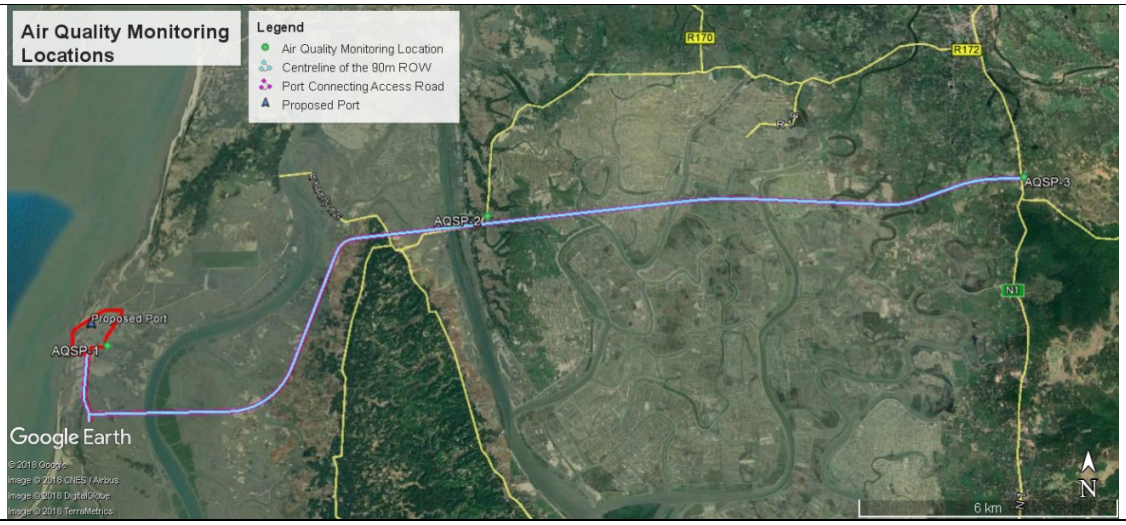


Figure 4.8-20 sampling points of air quality survey

Sampling Point	Latitude (North)	Longitude (East)
AQSP-1	21°41'27.44"N	91°52'1.84"E
AQSP-2	21°43'7.47"N	91°57'18.39"E
AQSP-3	21°43'34.44"N	92° 5'2.92"E

Source: JICA Survey Team

There is no industry in the Matarbari Island to the east the Fasiakhali. A power plant construction activities are ongoing adjacent to the proposed port area. All along the route there are agricultural and fishery activities, and not the industrial area. The air quality survey results indicated overall that the air quality in the rainy/wet season is much better than the Dry Season, with a slightly high concentration of dust (SPM) and a low concentration of SOx and NOx (Table below). The reasons of higher SPM

concentration in the dry season is the ongoing construction activities of the Coal Power Plant project in the Matarbari island and traffic movement along the road side area. But the concentrations were lower than the standard. Concentration of PM_{10} & $PM_{2.5}$ are within the IFC and National Standards.

Table 4.8-30 Results of air quality survey

Locations	Parameters	SPM	PM_{10}	$PM_{2.5}$	SO_2	NO_2	O_3	CO
	Units	µg/m3	µg/m3	µg/m3	µg/m3	mg/m3	mg/m3	mg/m3
AQSP-1	Dry	110	43.2	32.1	<12	<0.057	0.0034	<0.30
	Wet	88.9	24.5	10.9	<12	0.057	0.0032	<0.30
AQSP-2	Dry	184	126	90.5	<12	0.051	0.0034	<0.30
	Wet	97.3	35.3	23.8	<12	0.055	0.0031	<0.31
AQSP-3	Dry	178	118	86.2	<12	0.04	0.0031	<0.3
	Wet	101	43.9	33.5	<12	0.042	0.0032	<0.3
Ambient Air Quality Standards		200 (8hr)	150 (24hr) 50 (year)	65 (24hr) 15 (year)	365 (hr)	100 (year)	0.235 (24hr)	40 (24hr)
IFC EHS Guideline (General: 2007)		-	150 (24hr) 70 (year)	75 (24hr) 35 (year)	125 (24hr)	200 (1hr) 40 (Year)	160 (8hr)	-

Source: JICA Survey Team

2) Surface water

The river water quality of the rivers (Kohelia River, Moheshkhali Channel & Matamuhuri River) on the way of the proposed access road project were surveyed. The survey was conducted in the dry season in the end of 30th April 2018 and the rainy season from 18 to 19 May 2018.

Sampling Point	River Name	Latitude (North)	Longitude (East)
KWQS	Kohelia	21°40'35.63"N	91°52'42.96"E
MoWQS	Moheshkhali Channel	21°43'4.55"N	91°56'48.22"E
MaWQS	Matamuhuri River	21°43'18.43"N	92° 3'32.01"E

Source: Made from Google by JICA Survey Team

Figure 4.8-21 Sampling points of the surface water quality survey

The results of the surface water quality survey are shown in the next Table. The value of salinity suggests that the surveyed area has brackish water that is under the influence of sea water in the rainy season. SS and TDS show high concentration levels. Matamuhuri river does not contain the salinity and this rivers water is a very good source of sweet water fisheries in the study area.

Environmental standards for surface water quality are determined by 6 criteria in Bangladesh, and the survey results satisfied the defined standards.

Table 4.8-31 Results of the surface water quality survey

Parameter	Unit	Results					Standards for Inland Surface Water					
		Kohelia River		Moheshkhali Channel		Matamuhuri River	A	B	C	D	E	F
		Rainy Season	Dry Season	Rainy Season	Dry Season	Rainy Season						
Depth	M	0.5	0.5	0.5	0.5	0.5	-	-	-	-	-	-
Temperature	oC	30.5	25	28	24.5	26.57	-	-	-	-	-	-
Salinity	-	26	36.89	24	36.3	0	-	-	-	-	-	-
pH	-	8.07	7	8	7	8.07	6.5-8.5	6.5-8.6	6.5-8.7	6.5-8.8	6.5-8.9	6.5-8.9
DO	mg/L	5.95	6.1	6.02	5.46	6.68	6 or above	5 or above	6 or above	5 or above	5 or above	5 or above
BOD	mg/ L	3	2	3	3	5	2 or less	3 or less	3 or less	6 or less	10 or less	10 or less
COD	mg/ L	6	8	8	16	8	-	-	-	-	-	-
TDS	mg/ L	30750	28800	24450	28200	1280	-	-	-	-	-	-
SS	mg/ L	19.5	22	14.4	18	4.1	-	-	-	-	-	-

Notes: Category of water body is as below.

A: Potable water source supply after bacteria freeing only

B: Water used for recreational purposes

C: Potable water source supply after conventional processing

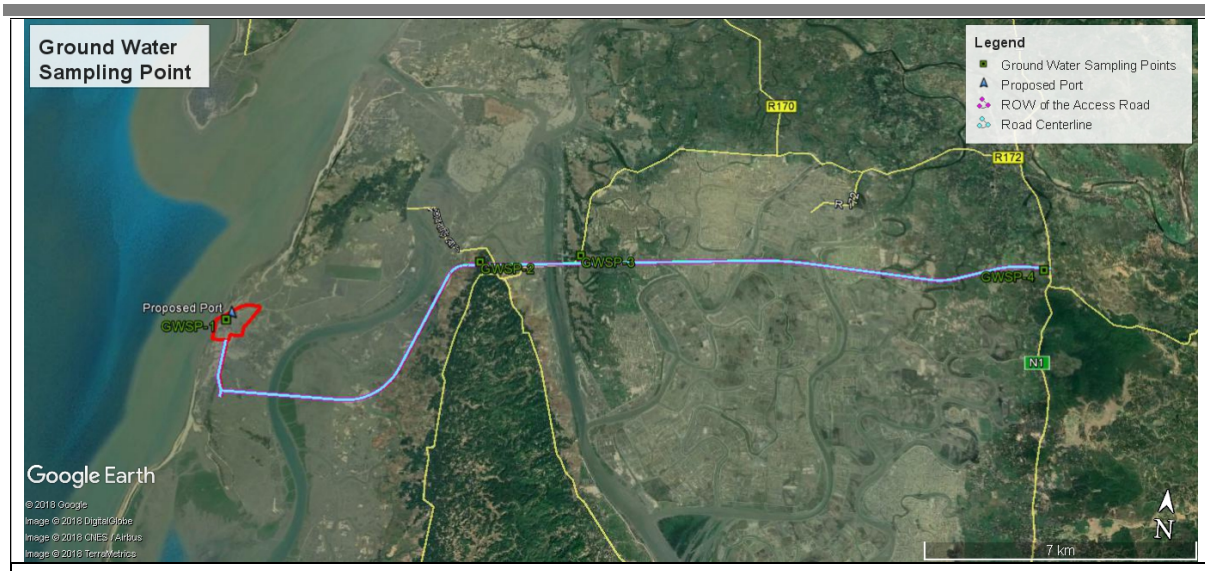
D: Water used for pisciculture

E: Industrial use water including chilling and other processes

F: Water used for irrigation
Source: JICA Survey Team

3) Soil (Ground Water)

The water quality of well water around the proposed project's right of way were surveyed. The survey was conducted in the dry season in the end of 30th April 2018 and the rainy season from 8 to 9 June 2018 to reflect the seasonal change of well water quality.



Sampling Point	Latitude (North)	Longitude (East)
GWSP-1	21°41'38.50"N	91°51'42.40"E
GWSP-2	21°42'53.29"N	91°55'39.75"E
GWSP-3	21°43'7.53"N	91°57'18.35"E
GWSP-4	21°43'29.85"N	92° 4'54.97"E

Source: JICA Survey Team

Figure 4.8-22 Sampling points of the ground water quality survey

The results of the ground water quality survey are shown in the next Table. The results of both the rainy and dry seasons satisfied most of the drinking water standards of Bangladesh except Fe, Mn and Color. Manganese and iron are present in natural water in large quantities, especially dissolved in groundwater. They are considered to be natural because there are no industrial facilities that will become pollution sources in the area. Manganese and iron are thought to cause coloring problems.

Table 4.8-32 Results of the ground water quality survey

Parameters		Temperature	pH	Chloride	Nitrogen (NO_3)	Iron (Fe)	Odor	Arsenic (As)	SS	Coliform	Colour	Lead (Pb)	Manganese (Mn)	Phosphate	Total Dissolved Solid (TDS)	Barium (Ba)	Cadmium (Cd)
Unit		$_oC$	-	mg/L	mg/L	mg/L	Odourless	mg/L	mg/L	N/100mL	Hazen	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GWSP-1	Dry	25	6.7	12	3.8	2.98	0	0.001	5	0	85	0.003	0.23	1.48	150	0.045	0.00015
	Wet	28	6.7	20	5.1	2.06	0	0.001	10	0	98.3	0.001	0.21	2.4	104	0.06	0.00015
GWSP-2	Dry	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wet	29	7	45	2.9	1.24	0	0.002	12	0	25.31	0.001	0.06	2.1	202	0.047	0.00015
GWSP-3	Dry	26	6.7	14	1.4	2.68	0	0.002	11	0		0.002	0.21	1.3		0.058	0.00015
	Wet	30	7.2	23	2.8	1.54	0	0.002	11	0	36.3	0.001	0.03	1.73	110	0.051	0.00016
GWSP-4	Dry	25	6.9	55	3.4	1.06	0	0.002	12	0		0.002	0.03	2.6		0.037	0.00015
	Wet	30	7	94	5	1.32	0	0.001	14	0	11.7	0.001	0.03	3.8	370	0.045	0.00015
Standards for Drinking Water		20 – 30	6.5-8.5	150 – 600	0.5	0.3-1.0	Odorless	0.05	10	0	15	0.05	0.1	6	1000	0.01	0.005

Source: JICA Survey Team

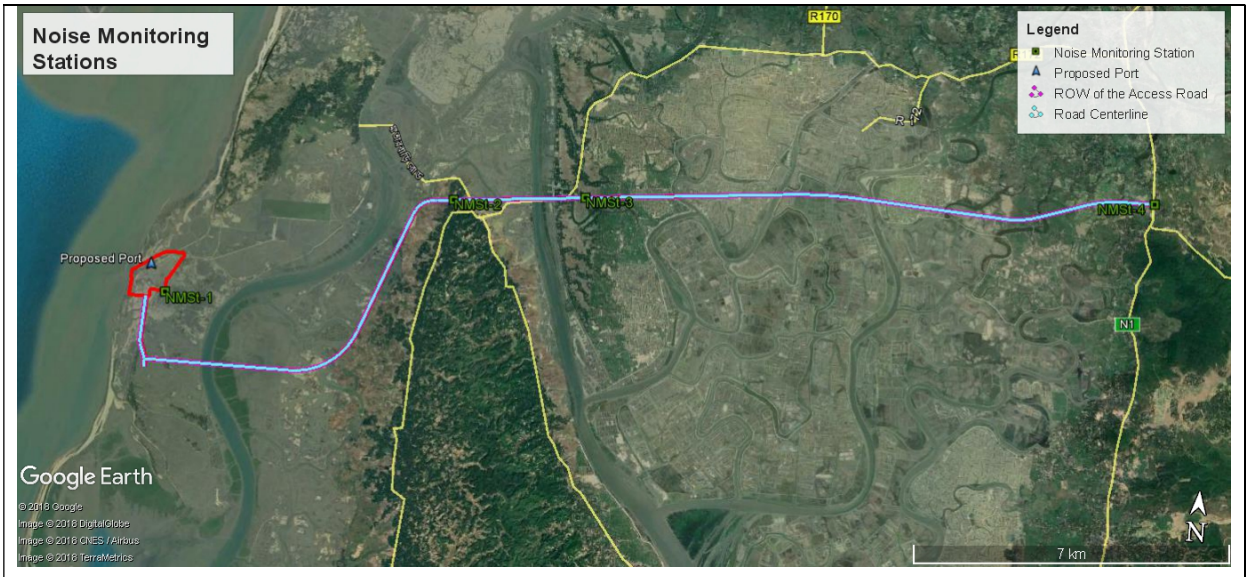
4) Land Subsidence

As the result of visual inspection and interview survey in the dry season and rainy season, in the surrounding area, underground water is not used even in the Coal Powerplant project. As there is no large groundwater use causing ground subsidence, ground subsidence was not confirmed. Under this project as well, there is no use of groundwater during the construction period and operation period.

5) Noise and Vibrations

a) **Noise**

The residential areas and a filling stations all along the right of way of the access road and the southeast corner of the port were selected as the sampling points for the noise survey. The survey was conducted in the dry season (15-16 February 2018 and 28-29 April 2018) and in the wet season (08-09 June 2018) to reflect the seasonal changes of noise levels.



Sampling Point	Latitude (North)	Longitude (East)
NMSt-1	21°41'25.90"N	91°52'0.79"E
NMSt-2	21°42'52.79"N	91°55'41.13"E
NMSt-3	21°43'2.78"N	91°57'26.37"E
NMSt-4	21°43'34.05"N	92° 5'1.96"E

Source: JICA Survey Team

Figure 4.8-23 Noise Level Monitoring of the Access Road Project

The noise measurement results indicated that the day time noise level was above the environmental standards for residential areas consideration at two monitoring points. Adjacent to the proposed port connecting access road project there is a project of Coal based power plant which is under the construction now, therefore vehicles used for construction activities, local transportation were the noise sources. These vehicles are limited in uses at the night time, but the movement of local transportation naturally has increased which has increased the noise level in compare to the Residential area. On the

other hand, the noise was monitored on the roadside and a filling station where the traffic movements were always in a regular interval with noise.

Table 4.8-33 Noise Level data of the Study Area

Season	Results				Standards for Noise (dB) (Day: 6AM-9PM) (Night: 9PM-6AM)				
	NMSt-1	NMSt-2	NMSt-3	NMSt-4	A	B	C	D	E
Rainy	59.1±3.3	51.3±0.3	53.1±0.30	56.8±1.9	Day: 45	Day: 50	Day: 60	Day: 70	Day: 70
	48.9±2.1	35.1±0.3	41.2±0.60	40.5±2.1	Night: 35	Night: 40	Night: 50	Night: 60	Night: 70
Dry	49.3±2	40.5±0.21	59.4±3.1	59.2±1.2	Day: 45	Day: 50	Day: 60	Day: 70	Day: 70
	42.1±1.9	34.1±0.33	42.1±1.3	43.4±2.2	Night: 35	Night: 40	Night: 50	Night: 60	Night: 70

Notes: Category of areas is as below.
A: Silent zone
B: Residential area
C: Mixed area (mainly residential area, and also simultaneously used for commercial and industrial purposes)
D: Commercial area
E: Industrial area
Source: JICA Survey Team

Reference: IFC/EHS guidelines

Receptor	Day 07:00-22:00	Night 22:00-07:00
Residential, institutional, educational area	55	45
Industrial, commercial area	70	70

(Source: IFC/EHS General Guidelines, 2007)

b) Vibrations

Vibration Level data was captured by the Equipment: Digital vibration meter (Model- C35 NVT).

Location Code	Latitude (North)	Longitude (East)
VLSt-1	21°41'25.90"N	91°52'0.79"E
VLSt-2	21°42'52.79"N	91°55'41.13"E
VLSt-3	21°43'8.31"N	91°55'44.89"E
VLSt-4	21°43'34.05"N	92° 5'1.96"E

Source: JICA Survey team

Figure 4.8-24 Location of Vibration Level Data

The frequency was in a range of 7-45 Hz. There is no vibration standard in Bangladesh, but the frequency value is popular in normal environment, and there were no significant sources of vibration.

Table 4.8-34 Description of Analysis:

Results of Vibration Level (Hz)			
VLSt-1	**VLSt-2**	**VLSt-3**	**VLSt-4**
7-28	8-36	7-32	15-45

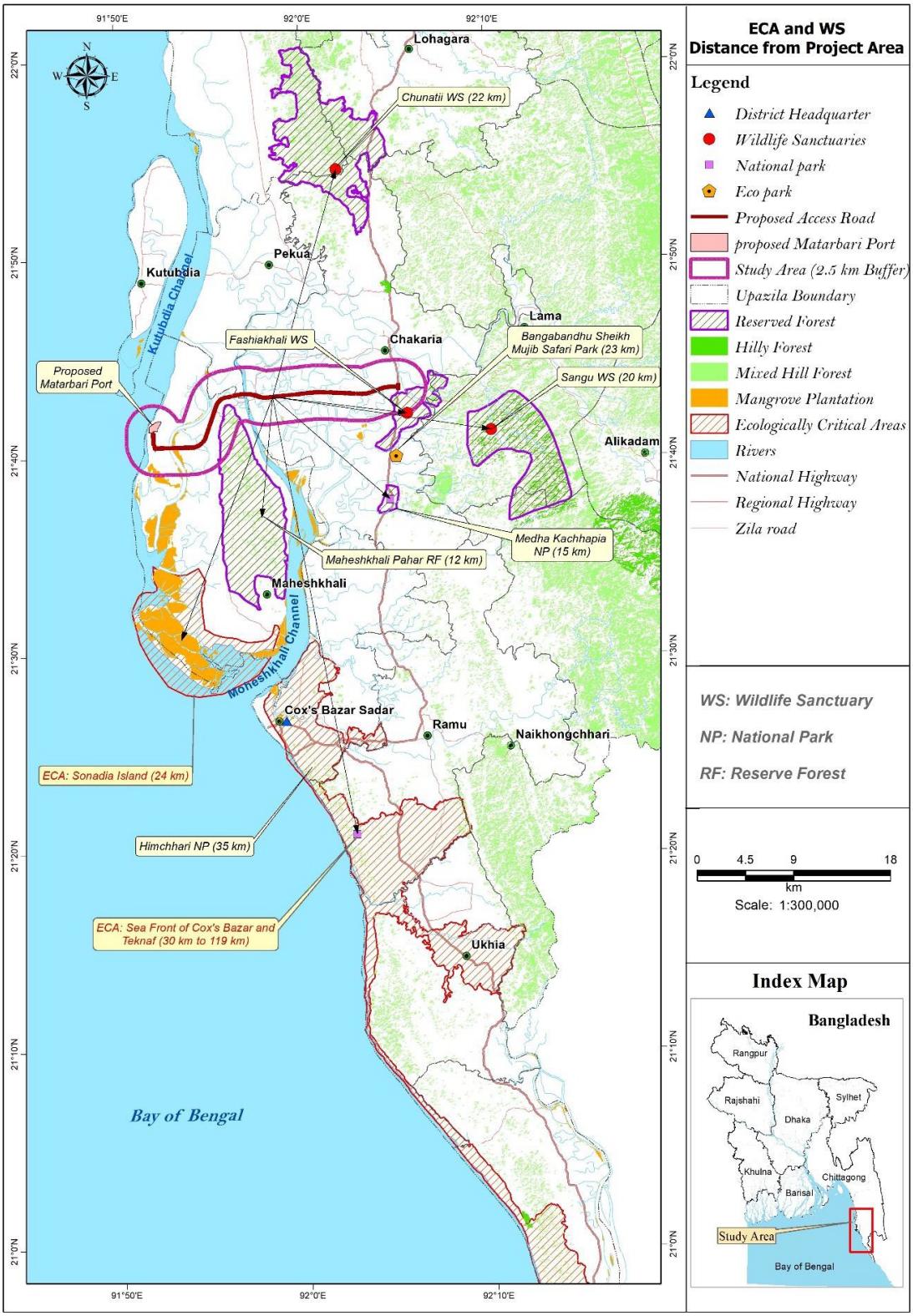
Source: JICA Survey team

6) Heavy Metals
See port section

7) Hydrology
See port section

8) Topography and geology
See port section

9) Reserved Areas
Regarding the protected area, 2.5 km buffer of the road linear is examined as shown below. From the center point of the road, the Moheshkhari Forest is 12 km and the Medhakacchapia National Park is 15 km. In addition, Fasiakhari Wildlife Reserve Area is the nearest neighbor within 2.5 km. This Fasiakhari wildlife reserve is adjacent to Dhaka Chittagong Highway (N1) and is divided by the road. Since this area has already received many negative influences from the highway and surrounding villages, it is necessary to take mitigation measures and monitoring carefully so as not to have any further influence.



Source: JICA Survey Team

Figure 4.8-25 Reserved area near the project site

10) The trees lost in the project

There are mangrove forest to be lost in the official land and no rare species in the private trees lost.

(2) Impact on living environment

1) Waste management

See port section.

2) Odors

See port section.

3) Heavy metals

See port section.

4) Benthos

See port section.

5) Outlines of the area

a) **Mangrove forests**

There is mangrove forest zone at the intersection of the Kohelia River, and these mangrove forests are scattered only on the river banks of the Kohelia River flowing between the Mallardary and Mahehari Islands. On the southern side of Matarbari Island, there is a large-scale artificially created mangrove forest, and the opposite embankment is Moheshkhali Island. Mangrove species were found in the Kohelia River, Huseleca, Badakhali premises. The major mangrove species are Abyssinia (Baen), Acanthus ilifolius (Hargoja), Aegialitis rutundifolia (Nuinna) and the like. It was confirmed that this mangrove is not one of the valuable species.

Source: Made from GOOGLE EARTH

Figure 4.8-26 Mangrove Forest in the Project Area

The area of the affected land is under the bridge and it is 1.23 hectares, which requires logging during construction. According to the DoFo (Forest Department), since the density of coastal mangrove forests is 4,444 ha / ha, it can be said that it is necessary to cut down about 5,500 mangroves. In these mangroves, replantation under the bridge excluding bridge pier position is possible. Through these alternative planting

trees, continuity of land and water ecosystems is considered to be maintained to some extent.

Although it is predicted that sufficient sunshine hours cannot be guaranteed under the bridge and the development of mangrove forests is expected to be less, it is desirable to plant alternative trees to the same place in order to preserve ecosystem continuity. For alternative planting, it is desirable to implement it based on the guidelines established in Bangladesh. According to the DoFo, there is no clear guideline on alternative planting trees, so we will continue to work with the Forest Department to decide the response in this project.

b) **Tideland**

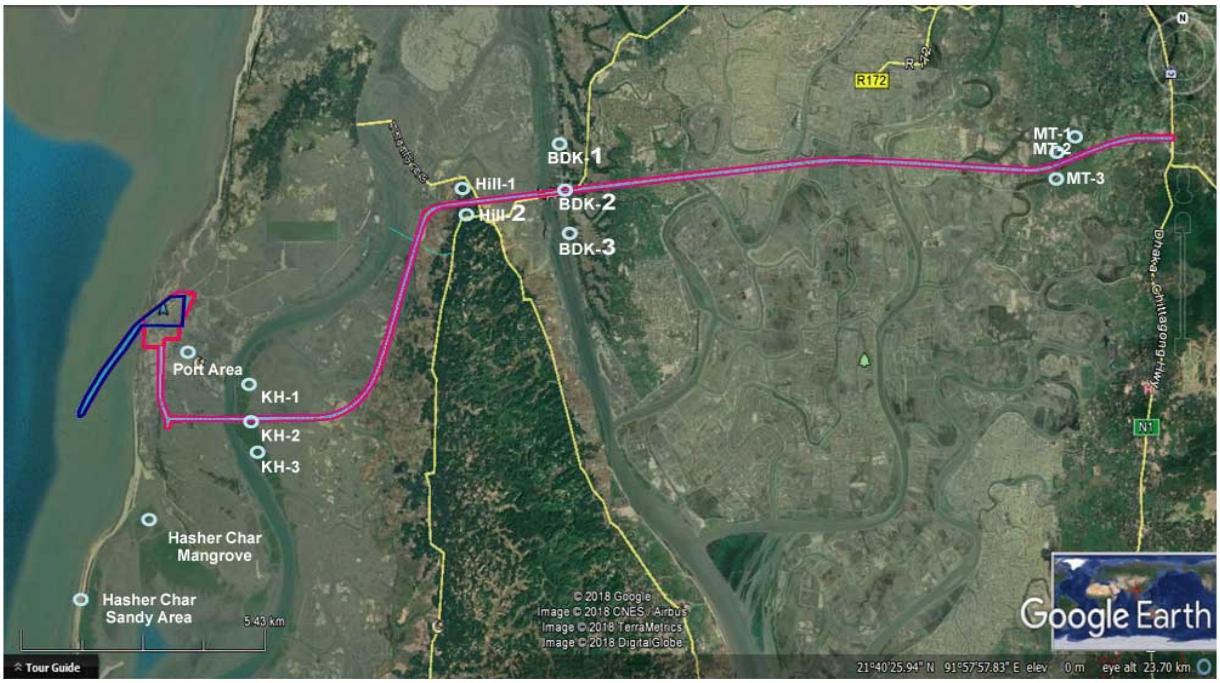
The coastline of Matarbari Island is a long sandy beach, the slope of the beach is steep and the area of the intertidal zone is relatively small. Meanwhile, the beach and the shallow waters have settled in the mouth of the Kohelia River located south of Matarbari Island.

6) Terrestrial Organism

a) **Flora**

Sample area

The specimens have been collected from Port area, Sandy beach, mangrove area, Uttar Nolbilla hill reserve forest, both side of Kohelia, Baderkhali & Matamuhuri river identified and documented through fieldwork during May 18-19, 2018.The present study is based onfield data, departmentof forest and local knowledge of the community. Photographs have been taken wherever necessary with a digital camera to identify and to confirm if necessary.



Source: made from GOOLE EARTH by JICA Survey Team

Figure 4.8-27 Study Area of Terrestrial Wildlife (Flora & Fauna)

Methods

Quadrat counting method has been followed for flora counting. When necessary, the second confirmation was pursued by using the digital photos.

Results

Mangrove species are found in Kohelia river & Badarkhali site. Major Mangrove species are Avicennia sp. (Baen), *Acanthus ilicifolius (Hargoja), Aegialitis rutundifolia (Nuinna)* etc. Department of Forest has planted the trees by steep forest or bloc system like fruit plant, medicinal plant and timber yield in plantation forest. Another observation is that a vast amount of naturally growing wild weeds like herb, shrub, climber, grasses and cedges were found. 50 flora, Insects 23, 115 birds, 7 amphibian, 14 reptile, (Table-50, 51, 52, 53) are identify from mangrove & hill region. The observed hill species are mostly *Dipterocarpus sp.(Gaarjan), Acacia Auriculacformis (Akasmoni),Phyllanthus emblica(Amoloki), Terminalia arjuna(Arjun)etc.* Out of 36 threatened species of plants, the following eight species were observed in the Moheshkhali Reserve Forest. Threatened Species Observed in the Study Area (Source-IDCJ, 2016)


Tournefortiaroxburghii


Cyatheagigantea

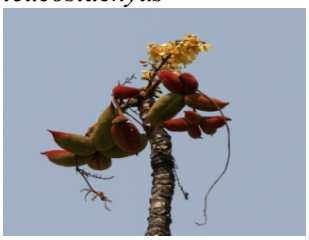

Pycnarrhenapleniflora


Acanthus leucostachyus


Calamuslatifolius

Calamuslongisetus

Hedychiumthyrsiforme


Sterculia versicolor

Source: JICA Survey Team

Figure 4.8-28 Plant Examples in the area

Hill Area Flora at Uttar Nolbunia

Mangrove in Badarkhali River site

Garjan (*Dipterocarpus sp.*)

Hargojaja(*Acanthus ilicifolius)*

Source: JICA Survey Team

Figure 4.8-29 Tree Examples from the area

b) **Fauna**

In the study area of Kuhedia, Matamuhuri and Badarkhali river and nearest shrimp projec and mudflat area have found 116 species of bird. Some bird are migratory which migrate basically in winter season. Mangrove forest & hill forest are their nesting habited. Brown-headed Gull (*Larus brunnicephalus),* Black-naped Tern (*Sterna sumatrana),* Greater Sand Plover (*Charadrius leschenaultii*), Curlew Sandpiper (*Calidris ferruginea*) etc are Major species in study area.

		
Eurasian Curlew(Numenius arquata)	Common-and-Spotted-Redshank	Grey Heron

Source: JICA Survey Team

Figure 4.8-30 Bird Examples from the area

7) Aquatic Organism

a) **Phytoplankton**

Samples

Phytoplankton survey was conducted at three sampling points similar to water quality survey ((Fig -3) at three water layers, surface (0.5 m depth), middle (1/2 depth) and bottom (1m up from the bottom).

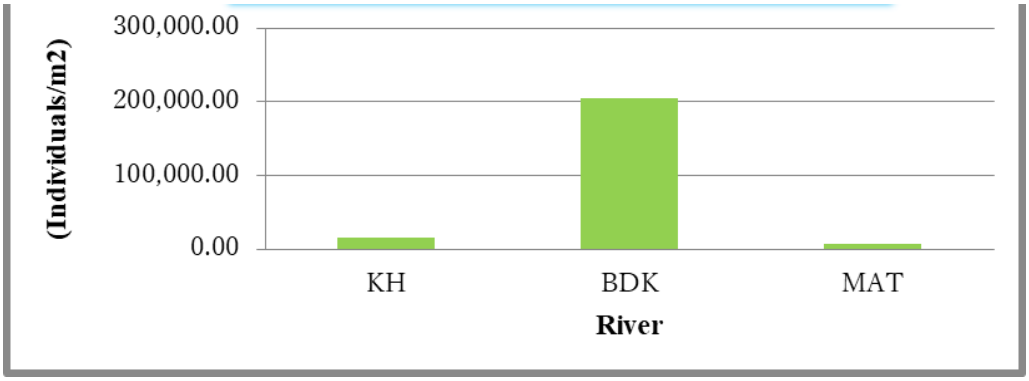
Methods

Water samples from different depths (pre-selected) were collected by using Nenson bottles and were immediately transferred to 24 commercially available plastic bottles as is the recommended method by Sourna (1978) to obtain an accurate depiction of the quantitative composition of phyto-plankton.

The collected samples were preserved with 3% neutralized formalin. Immediately after collection, the bottles were labeled and transferred to a laboratory for further analysis.

Results

High abundance of phytoplankton is fund at Matamuhuri river, Kohelia, Matamuhuri and Badarkhali river phytoplankton abundance comparison is shown in the figure below:



Source: JICA Survey Team

Figure 4.8-31 Comparison of Abundance of Phytoplankton (surface water)

b) **Zooplankton**

Samples

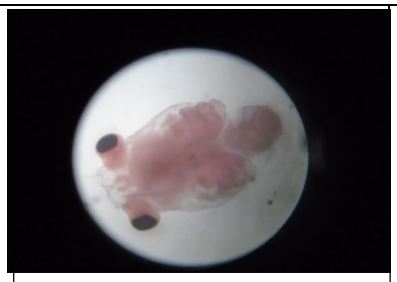
Zooplankton survey was conducted at three sampling points similar to water quality survey ((Fig -3) at three water layers, surface (0.5 m depth), middle (1/2 depth) and bottom (1m up from the bottom).

Methods

Zooplankton sampling was carried out with the help of conical zooplankton net made by Nylon Silk of 325 micro meter mesh size and having 24 cm circular mouth opening fitted with a plastic bucket at the cod. A digital flow meter was set up at the mouth of the net to record the quantity of the water filtered through the net during sampling. Precaution was taken for clearing the net & bucket before every sampling to avoid any possible contamination. Sample were collected from three distinct layers (surface, middle and bottom) around 10-15 min. After collecting samples were preserved in 5% formalin. For effective sorting, the samples were stained with Eosin and left for 24 hours. All the zooplankton attained reddish color, which helped to easy identification.

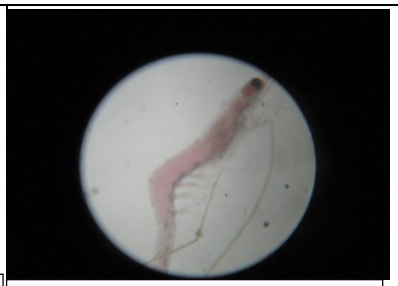
Results

Seven species of zoo-plankton were observed, and Copepoda (Arthropoda) is the largest in number of species. In surface layer zoo-plankton present in high, middle & bottom layer is law amount.



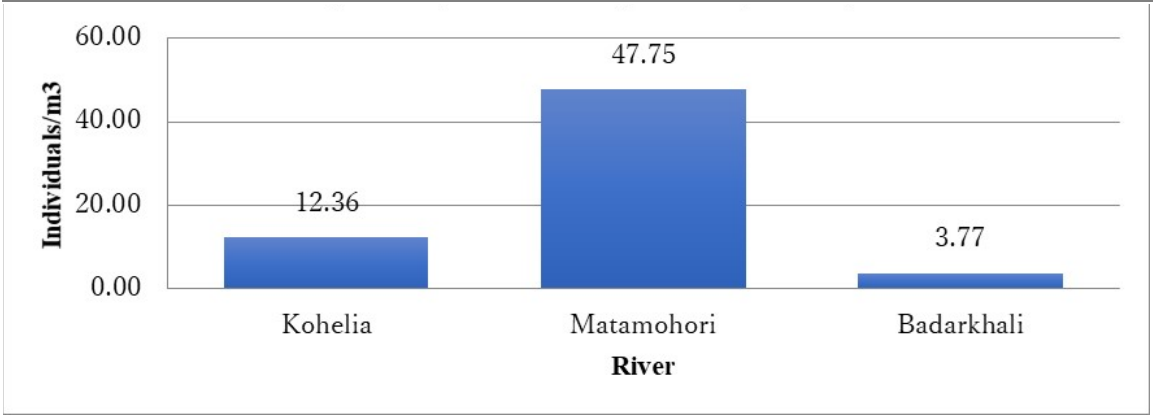
Crab larvae

Copepod



Mysidopsis

Source: JICA Survey Team



Source: JICA Survey Team

Figure 4.8-32 Comparison of Abundance of Zooplankton (surface water)

c) **Benthos**

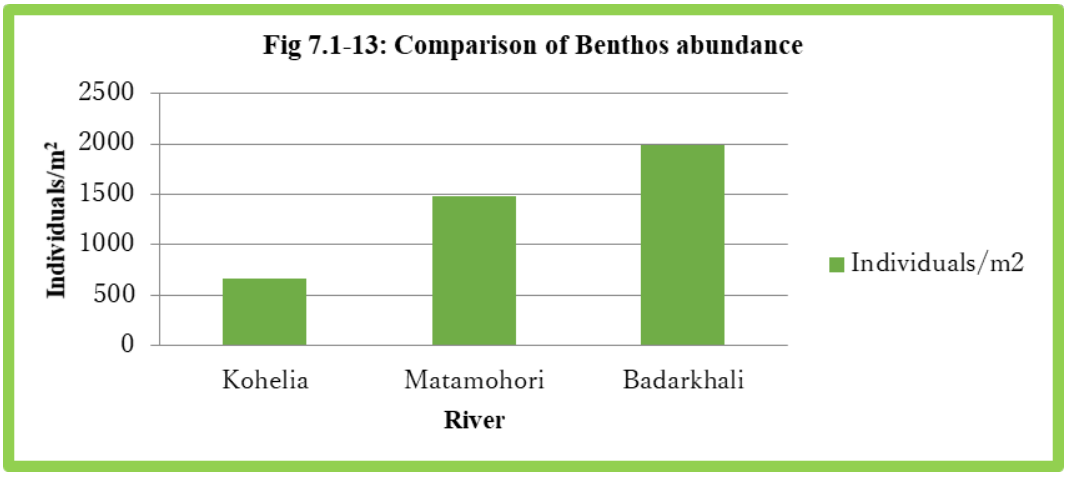
Samples

The Micro benthos survey was conducted conducted at three sampling points of Kohelia, Matamuhuri and Badarkhali river.

Methods

Results

Highly abundance found in Badarkhali river site and low abundance in Kohelia site



Source: JICA Survey Team

Figure 4.8-33 Comparison of the Benthos abundance

d) **Fish & Nekton**

The fish & Nekton survey were conducted at three points of Kohelia, Matamuhuri & Badarkhali Rivers and one sample was collected from local fish farm (Gona) of Dhalghata. Please see the port section for this survey.

e) **Crab**

There are 18 species of Crab found in Kohelia, Matamuhuri and Badarkhali river site. Mud crab were found in mangrove, mudflat and shrimp project area. Please see the port section for this survey.

(3) Impact on Social Environment

1) Resettlement and Land Acquisition

Out of 201 ha required for the Project, private land to be acquired will be 144 ha. 130 HHs will be subject to displacement of their houses and 7 HHs will be subject to displacement of their shops. (Since 2 HHs will be with both their houses and shops displaced, total number of HHs with their houses/shops displaced will be 135 HHs.) 576 HHs will have their land affected, out of which 97 HHs will have also their houses and/or shops affected. Total number of HHs with their structures and/or land will be 614 HHs.

Table 4.8-35 Summary of Resettlement and Land Acquisition

Serial	Type of Impact	Amount/No	Comments
1	Land Required for the Project	201 ha	
1-1	Private land to be Acquired	144 ha	
	Loss of Residential land	8 ha	
	Loss of Agricultural land	63 ha	
	Loss of Salt farm	72 ha	
1-2	Government land to be transferred	57 ha	
2	Affected Household		
2-1	Household with their structures / land affected	614 households	
	With their Houses affected	130 households	Including 33 households of informal settlers
	With their Shops affected	7 households	2 households with both houses and shops affected
	Loss of Land (Residential land and/or Salt farm)	576 households	90 households with both structures and land affected.
2-2	Households with their livelihood affected	515 households	
	Sharecroppers	258 households	Salt farm 76 Agriculture 182
	Agri-Labours	12 households	
	Labours in salt/shrimp farm etc.	112 households	Salt and shrimp 51 Salt 48, Shrimp 13
	Shop employees	119 households	

Source: JICA Survey Team

2) Poor people

In Bangladesh, Poverty Reduction Strategy was formulated and poverty reduction has been taken up as a critical issue in "Seventh Five-Year Plan 2016-2020". Expenditure on Social Security programs in Bangladesh in FY 2014-15 is 306.4 billion taka, which is equivalent to 2.02% of GDP. Among them, 0.5% is allocated for "Economic Empowerment of the Poor", and 5.5% is allocated for "Vulnerable Group Feeding". However, especially as for the "Vulnerable Group Feeding", coverage of beneficiary is low. The "National Social Security Strategy" formulated in 2015 aims to expand the social security system to socially vulnerable people including the poor.

The per capita monthly income of the population below the "upper poverty line" in Bangladesh based on the basic needs cost method, is 1,304.64 Taka in the rural area of the Chittagong Division (Bangladesh Bureau of Statistics (2011), Report of Household Income & Expenditure Survey 2010). In order to grasp the number of poor households in this survey, households with monthly income below 15,000 Taka as of 2018 is defined as "poverty", considering the average inflation rate of about 7% and the average household size of 5.3 persons in addition to the above per capita monthly income.

According to this definition, 34 households are the poor out of 130 households to be displaced. Informal settlers are 33, out of which 12 households are the poor. Land loser excluding the aforementioned house losers are 484 HHs, out of which 114 HHs are the poor. 37 HHs out of 290 HHs of sharecroppers/ employees interviewed could be regarded as the poor. However, it shall be noted that income level can be reported higher in interview survey, which means there can be more HHs below poverty line than reported.

3) Indigenous people and ethnic minorities

In Bangladesh, ethnic minorities are treated as 'tribals' in official documents, though in the Act 12 of 1995 and Rules 6, 34, 45, 50 of Chittagong Hill Tracts (CHT) Regulation (1900), they are documented as 'indigenous peoples' or 'aboriginal' as per section 97 of the SAT Act (1950). The State Acquisition and Tenancy Act (1950) restricts the sale of lands of 'aboriginal castes and tribes' to anyone except aboriginal castes domiciled in Bangladesh. In Bangladesh there are about 50 different indigenous communities living in the plain lands and hill areas. Though they claim that their population is over 3 million, according to the census survey of BBS in 2011, the country's indigenous population is around 1,586,141, which signifies 1.8% of total population of the country.

Through the socio-economic survey, it was confirmed that there are no ethnic minority and indigenous people in PAPs.

4) Local Economy and Livelihood

a) **Overview**

The proposed Project site is mainly salt cultivation and agricultural area. Households are on salt, shrimp cultivation, agriculture and different types of small business.

b) **Employment**

Out of 3,303 Project Affected Persons, 32.9% are employed, 0.6% are unemployed, 21.6% are house worker, and 42.0% are students as the table below.

Table 4.8-36 Employment of the Project Affected Persons

Upazila	Union	Employed	Unemployed	House worker	Student	Others	Total
Moheshkhali	Dhalghata	174	2	113	227	18	534
	Kalarmarchara	537	13	345	636	40	1,571
Chakaria	Badarkhali	96	0	60	111	6	273
	Saharbil	1	0	1	2	0	4
	Chiringa	205	3	140	292	24	664
	Fasiakhali	74	2	55	119	7	257
Total		1,087 (32.9%)	20 (0.6%)	714 (21.6%)	1,387 (42.0%)	95 (2.9%)	3,303 (100.0%)

Source: JICA Survey Team

c) **Income**

Average household income for each occupation (per month) are as follows.

Table 4.8-37 Household Income for Each Occupation (Tk per month)

Occupation	Household with their land/structure affected	Household without their livelihood only
Fisherman	46,000	-
Salt farm and shrimp cultivator	46,018	26,264
Agricultural farmer	33,176	23,380
Business	41,651	

Source: JICA Survey Team

d) **Economic Development Project**

Among surrounding development projects, the projects which might directly affect Socio-economic conditions are as follows:

-Moheshkhali Special Economic Zone Project
-Dohazar-Cox's bazar Railway Line Project
-Matarbari Ultra Super Critical Coal-Fired Power Project

Along with improvement of employment, business transaction and mobility through the above projects, employment promoted by the Project will stimulate the local economy. On the other hands, salt farm and shrimp farm might be affected by these projects in Moheshkhali. Therefore, appropriate compensation and assistance for livelihood restoration are required in the Project.

5) Land Use

Main land use of port area is salt cultivation and shrimp culture. The land owners cultivate salt in the dry season and in the same land they culture shrimp and other varieties of fishes in the wet season.

6) Water Usage, Water Rights, and Communal Rights

Regarding water usage and communal right in the country, there is no distinct law. Also jurisdiction between local government and central government is not clearly identified. Local government is very weak in decision making and budget constraints are a major problem. Union Parishad in project area has no manpower, scope and scanty budget for development. On the other hand, there is no fishing ground except river and the Bay of Bengal. There is no closed water large water body and irrigation facilities. Incase water usage, main source of drinking water is tube well.

7) Social Infrastructure and Services

There are primary schools and high schools in each Union. It is necessary to use the Upazila medical complex in the center of Moheshkhali or Chakaria, about 30 to 40 km away as the road distance when medical treatment is required. The social infrastructure and services which can be affected by the project are as follows. Schools and mosques will not be affected.

Two graveyards will be affected. The graveyard in Dhalghata will be affected by mostly port component and partially by access road component. For considering future plan of the port, relocation of the graveyard, whose cost is borne by the Project, will be inevitable. Where to be relocated shall be decided in close consultation with the concerned households considering that the households live in the area away from the Project site now. Graveyard in Badarkhali can be preserved since viaduct will be installed in the concerned section.

Table 4.8-38 Social infrastructures near the Project Site

Existing infrastructure to be affected in the project area	No. of Infrastructure	Address /Location	Remarks
School	3	Badarkhali	(1) Iqra Academy (not affected) (2) Little Jewels Kindergarten (not affected) (3) Badar Sha Academy School (not affected)
College	1	Badarkhali	Badarkhali Degree College (not affected)
Madrasa	1	Badarkhali	Badarkhali Fazil (Degree) Madrasa (not affected)
Clinic/ hospital	0		
Mosque	1	Badarkhali	Baitullah Mosque (not affected)
Graveyard	2	Dhalghata Badarkhali	Dhalghata Public Graveyard (affected) Badarkhali Association Graveyard (preserved by installing viaduct)
Total:	**8**		

Source: JICA Survey Team

8) Social Institutions and Local Decision Making Institutions

No such traditional leader or headman or institutions are formally involved in preliminary decision making process from planning stage. There may be PAPs committee including key representative of civil society of local community for suggesting the project proponent in decision making process. In the proposed project area, PAPs, local union Parishad Chairman and Members are found vocal relating to project issue. Institutionalization of such committee or advisory group with proper representation of all section of people could eliminate communication gap between project proponent and project affected

community.

9) Unequal Distribution of Benefit and Damage and Local Conflicts of Interest

In the stakeholders meeting at union level, chairman and other members expressed their opinion that local community shall be engaged in construction work of the project, not outsiders. Engagement of local community into the project work would contribute to maintain social harmony and local people's satisfaction.

10) Local Conflict of Interest

At this stage, there is no conflict of interest among region. As mentioned above "9) Unequal Distribution of Benefit and Damage", engagement of local community into the Project work would contribute to prevent the conflict of interest.

11) Cultural Heritage

As shown in "(3) Impact on Social Environment" of "4.7.1 Port," cultural heritages are away from the project site and not to be affected.

12) Landscape

As shown in "(3) Impact on Social Environment" of "4.7.1 Port," the scenic spots in Moheshkhali are Adinath Temple, temple of the Rakhine, the Sonadia, enriched biological diversity place, at the southern tip of Moheshkhali island. However, they will not be affected by the project since all of them are approximately 20 km away from the Project site.

13) Gender

Significant gender gap is found in educational level and occupation. Females tend to be severely restricted from going out particularly after their marriage in Moheshkhali.

The below table shows the gender-wise educational level of PAPs. Illiteracy rate of male is 6.7% while female is 7.9%. The rate of primary level are 31.2% for males and 34.9% for females. The rate of secondary level are 27.4% for males and 33.4% for females. These mean that education level of approximately 80% of females is up to secondary level. Females educated in HSC level are less than males; Males with HSC level are 12.5%, while females are 10.6%. The gender gap is more significant in graduate level; males are 10.6% while females are 3.9%.

Table 4.8-39 Gender-wise Education Level of the Project Affected Persons

Educational Level	Male		Female		Total	
	No. of Member	%	No. of Member	%	No. of Member	%
(1) Illiterate	125	6.7	113	7.9	238	7.2
(2) Primary Level	586	31.2	497	34.9	1,083	32.8
(3) Secondary Level	515	27.4	475	33.4	990	30.0
(4) HSC Level	235	12.5	151	10.6	386	11.7
(5) Graduate	199	10.6	55	3.9	254	7.7
(6) Post graduate	97	5.2	15	1.1	112	3.4
(7) Vocational	2	0.1	2	0.1	4	0.1
(8) Others	29	1.5	21	1.5	50	1.5
(9) Children＜5yrs	91	4.8	95	6.7	186	5.6
Total:	1,879	100.0	1,424	100.0	3,303	100.0

Source: JICA Survey Team

Gender is more vital issue and should be properly addressed for socio-economic development of the area. The project proponents should employ more female workers in the construction works and in port job facilities, provide and ensure discrimination free scope for the women.

Potential impact of the project is to expand female education in the area. The new development program will create scope of employment in the area. Socio-economic survey reveals that enrollment of female students are more in the secondary level now. New opportunity will encourage female towards higher education. In this way social taboo regarding female student's education will gradually wither away.

Inclusion and consultation local women community is needed for improvement in project preparation and implementation period.

In tender documents, RHD should include terms and conditions to ensure female workers during the construction. For materializing this, equal wage shall be ensured with necessary supports to female workers.

14) Children's Rights

Bangladesh ratified Convention No. 182 of the International Labor Organization "Worst Forms of Child Labour Convention". Labor law in 2006 stipulated that employment of children under 14 years is prohibited and employment of children under 18 years in hazardous form is prohibited. Though National Child Labour Elimination Policy was issued in 2010, child labor is still widely and commonly observed in Bangladesh.

The percentage of child labor in Chittagong is 5.0% against the total number of children from 5 years to 17 years. This percentage is higher than the national average, 4.3%. Children working in salt farm are commonly found in the project site during the survey. Some of them are considered to be child labor which could interfere with school attendance. The bidding document of the contractor shall stipulate that child labor shall be eliminated based on domestic law and FIDIC regulation.

Table 4.8-40 The Percentage and Number of Child Labor (2013)

Region	Child labor (5~17years)			Whole Child (5~17years)		
	Boy	Girl	Total	Boy	Girl	Total
Bangladesh	953,204	745,690	1,698,894	20,596,636	19,055,748	39,652,384
	4.6%	3.9%	4.3%	-	-	-
Chittagong	252,715	153,235	405,950	4,215,758	3,954,735	8,170,493
	6.0%	3.9%	5.0%	-	-	-

Source: BBS "Child Labour Survey 2013"

Education level is as shown in "13) Gender". In Cox's Bazar, vaccination rate of children by age of 23 months is slightly higher than the national average.

Table 4.8-41 Vaccination Rate by Age of 23 Months

Classification	Region	BCG	OPV1	Penta1	OPV2	Penta2	OPV3	Penta3	MR1	FVC
Vaccination Rate	National	99.5	99.3	99.3	98.7	98.7	97.9	97.9	95.3	95.1
	Chittagong Division	99.6	99.5	99.5	99.2	99.2	98.7	98.7	96.8	96.7
	Cox's Bazar	100.0	99.8	99.8	99.8	99.8	99.1	99.1	97.2	96.7
Vaccination rate within valid period	National	99.5	97.9	97.9	97.2	97.2	90.4	90.4	92.3	86.8
	Chittagong Division	99.6	97.9	97.9	97.2	97.2	90.4	90.4	93.9	87.8
	Cox's Bazar	100.0	98.1	98.1	98.4	98.4	92.3	92.3	92.2	87.4

Source: Expanded Programme on Immunization, Directorate General of Health Services, "Coverage Evaluation Survey 2016"

15) STD and HIV/AIDS

In Bangladesh, HIV infection rate is less than 1%, though it is pointed out that the actual infection rate might be higher because of insufficient inspection system. The number of HIV is the highest in Dhaka, while Chittagong has been reported to have the highest concentration of HIV along with Sylhet. (Health Bulletin 2017, Bangladesh)

In addition, many Rohingya refugees have flowed in Cox's bazar from Rakhine State in Myanmar. Rohingya diagnosed as infected with HIV/AIDS has been reported to be increased. Due to the examination system is underdeveloped, it is concerned that the number of HIV/AIDS would be higher.

Moreover, the Project itself will facilitate influx of outsiders including construction workers. Consequently, the budget shall be estimated considering social awareness program to check and minimize these social problems.

16) Work Environment (Including Work Safety)

No issues on work environment were reported through Focus Group Discussions.

Labor law in Bangladesh stipulates that working hours shall not exceed 8 hours a day, or 10 hours a day at a maximum even though overtime allowance will be additionally paid. The working hours per week shall not exceed 48 hours a week, or 60 hours a week at a maximum even though overtime allowance will be additionally paid. The working hours in a week shall not exceed 56 hours in annual average. These provisions shall be strictly complied in the Project.

(4) Others

1) Accident

Accidents in construction activities are concerned. In addition, traffic accident due to an increase traffic volume after operation is also concerned.

4.8.3 Cumulative Impact

1) Air, water quality, waste, soil, noise and vibration

The cumulative impacts of environmental pollution such as air, water quality, waste, soil, noise, vibration, etc. were studied in the following three stages.

① Compare the baseline data observed through the survey (hereinafter "port baseline data") with the results of the EIA by the powerplant project (hereinafter referred to as "powerplant baseline data") implemented in 2012-2013 (APPENDIX 1). At the time of acquiring port baseline data, since the construction of powerplant project had already started, it can be used as the construction period data of powerplant projects, and by comparing these baseline data, Understand the environmental change over the past five years, including the impact of construction in the project.
② The influence of the construction of both projects using the port baseline data and the results of forecast of construction period impact of this project obtained by this survey will be examined (APPENDIX 2).
③ The influence at the time of service by using the prediction result of the construction period / service by this project obtained by this survey and the prediction result of influence at the time of using the Powerplant Project obtained through EIA of the Powerplant Project will be examined.

a) **Air**

The port baseline data and the powerplant baseline data are much lower than the standard values in the Bureau air quality standards and the IFC guidelines (see 4.8.1 Environmental and Social Consideration Survey Results for APPENDIX 1 for ports and powerplant projects). In other words, pollutants are largely below the standard value even after the construction work of the generator in the Powerplant Project, which generates SOx, NOx, CO and CO2 and is thought to affect air pollution, and the construction machine There.
As for service, powerplant projects have large-scale emission forecasts in SOX. On the other hand, in the port project, SOx is not predicted, but predicted values for NOx and PM were predicted to be 34 tons and 132 tonnes per year, respectively (see APPENDIX 2). Considering these, the conclusion is that the existence of SOx, CO, O3 and CO2 as a cumulative effect, considering the influence of available domestic and IFC standards and forecast values of port projects, it can be predicted that the possibility of exceeding the reference value is extremely low. However, it is also predicted that PM · NOx will become serious, depending on diffusion, so it is necessary to properly manage it in the future monitoring and environmental management plan.

b) **Water Quality**

The water quality of the port baseline data was compared with the baseline data of the power plant project. The BOD (biochemical oxygen demand) is growing with the port data. Salinity is growing at the port data except for one point. From this point, it is predicted that the impact of construction by adjoining projects will raise the BOD, and the cumulative impact of the project is predicted.

In the port, water pollution based on the prediction of port accidents in the past in the country is expected to have very little impact (see APPENDIX 2), but because the cumulative effect of the powerplant project is also considered, monitoring and penal provisions It is considered necessary. As forecasts, oil leaks due to accidents are forecasted in both projects, so we are trying to prevent accidents, and in the event of an accident, BOD and coloring may be affected.

c) **Waste**

Regarding waste, there are no special sources when acquiring the port baseline data. This is because we are properly handling workers' waste etc. in the powerplant project. Regarding ports, in addition to dredged soil, we predict the waste from workers and ports activities. Since cumulative impacts are expected at the time of service, it is necessary to continue appropriate waste disposal and monitoring continuously in both projects.

d) **Soil**

Arsenic, mercury and cadmium were not detected in the powerplant baseline data, but arsenic and cadmium were detected in the port baseline data. Concentration of cadmium was low, but for arsenic, concentrations of ERL level of NOAA guidelines were observed at depths of 5 m and 10 m. The pH level of the site planned to be constructed by this project was almost neutral, but in the Powerplant Project baseline data, the sediment was acidic. In the forecast for soil, although thermal leakage is raised in the powerplant project, leakage on slight chemical materials is raised, but because it is managed in the appropriate place, there is no impact. In the forecast of the port, oil leakage from the accident was calculated, but it was predicted that the impact is minor from the accident probability. However, since the cumulative impact of both activities is predicted, it is necessary to continue monitoring.

e) **Noise and vibration**

The port baseline data (4.8.1 Environmental and social consideration survey result port) and the Powerplant Project baseline data (see APPENDIX 1) have been around 40 to 60 dB. Part of the port baseline data exceeds the standards of housing, business establishment and education area in the Banking standards. With regard to noise and vibration, the noise level in the port area has already exceeded the standard value at the baseline stage due to the construction work in adjacent business.

Noise and vibration are generated from various sound sources such as generator, excavator movement, dump truck, bulldozer wheel loader, R compactor, fuel track, tractor, etc. by construction work. Considering these arrangements, the predicted value of the powerplant project showed noises of 36.4 dB to 55.4 dB at the outer wall 5 m - 16 m during the construction period. The projected value of this project during the construction period was found to have an impact beyond the noise standard of the residential area in the neighborhood residential area when there was no outer wall. As for the service time, the predicted value of the powerplant project was 30.2 ~ 41.2 dB of residential area at the outer wall 5 m - 16 m. In this project, it was 55 dB when there was a 5 m outer wall at the time of service. In these results, we can conclude that it is necessary to manage using the outer wall. In addition, although the predicted value was a level that was not problematic in each case, since cumulative effects are also predicted, it is necessary to continue monitoring and, in some cases, manage by modeling.

2) Cumulative impact study of ecosystem predicted from coastline change model and turbidity diffusion model result

In this survey, as for the cumulative effect of this project and Powerplant Project, about the change of the

surrounding coastline by construction of breakwater and dredging of the route, and water pollution by dredging of the route and dredged soil, see "2.9.3 Coastal deformation" and " As described in 2.9.2 Offshore dredged sediment ", they analyzed by coastline change model and turbidity diffusion model respectively, and concluded that the influence on Sonadia, which is said to be a habitat for rare species, is minor It has gained. In addition, in this survey we interviewed experts to examine the relationship between these studies and the impact on ecosystem.

a) **Points and results of the hearing**

Two things: 1. The current state of the surrounding natural environment, 2. Impact of the project are shown in the results of coastline change model and turbidity diffusion model and heard experts and activists familiar with the natural environment of the area.
The experts who conducted hearing, the contents of the date and hearing are as shown in the table below.

Table 4.8-42 Results of Interviews

Professional name	Date DD/MM/YY	Contents
Md. Abdul Kaiyum, NACOM(NGO)	240118	Asked about the circumstances and animals and plants in the Moheshkhali Forest Reserve, who is doing conservation activities around Cox Bazaar. ·There is a large feline family mammal FISHING CAT (VU endangered type II stator).
A.B.M. Sarowar Alam, IUCN	050318	After explaining the interim report of the model above, mainly got advice the following. · It is necessary to consider circle 10 to 15 km from Sonadia Island. This is because there are other migratory birds on Sonadia Island, such as only 200 spatulas in the world. ·in ADB's "NWPGCL power plant" biodiversity analysis Considering 30 km. Spoonbilled sandpipers prefer mud with essential salinity. Two kinds of turtles and two kinds of dolphins are inhabited in the area. · In Nantong City, Jiangsu Province, Jiangsu Province, a power station and Spoonbilled sandpiper habitat coexists by making sanctuary for them in the past, to refer to examples in the past.
Zashim Uddin, Dhaka University	060318	After explaining the interim report of the model above, we will explain the situation in the area and the future activities in general. · Moheshkhali Forest is mainly Dipterocarpus turbinatus (Gurjan) and Hopea odorata (Telsur) trees, and Sonadia Island is Mangrove and Jhaoban. Even if the coastline change model and turbidity diffusion model have no problem, the reality of the ecosystem is complicated. · It is important to observe influence observation before construction, during construction and after construction.
M. Zahirul Islam, Marinelife Alliance	170418 (phone)	Considering that the organization is an advanced group of sea turtle protection of Sonadia, asked about the impact of the project on

(NGO)		Sonadia's nature. · Protecting hatchlings of sea turtles with the support of local people, but the spawning ground has been moved from Matarbari due to many constructions before this project. · Educating the fishermen in environmental education to protect dolphins, sharks and seagulls.For example, when fishermen capture dolphins and sharks, the organization instructs them to release.
Rashedul Kabir, Isabela Foundation(NGO)	190418 (phone)	Considering that the organization is an advanced organization for the protection of animals and plants in Sonadia, asked about the impact of the project on the nature of Sonadia. · Doing projects to help hatching sea turtle at Sonadia. Spoonbilled pipers and other waterbirds that are threatened to extinction worldwide live. Hold awareness raising education for fishermen. They want the project to do developments while considering such situation.
Md. Abdul Kaiyum, NACOM(NGO)	230418 (phone)	Considering that the organization is doing activities in Meakachapia Wildlife Sanctuary and Fasiakhali National Park, the organization asks about the situation of the area and the impact of the project. They are also in charge of the followings · The governance part of Natural Resource Management (NRM). · afforestation programs and monitoring work in the area. For this project, they emphasized monitoring for this project.
Dr. Sultan Ahmed, DoE Dhaka	020718	Taking advantage of the career as a researcher of the marine ecosystem, he worked as a DoE for a long time and is now the Director of DoE. He is familiar about implementation of SEA. After explaining the model, received opinions on future activities. · It is necessary to carefully check the validity of the selected model. · Changes in the construction period are very short, so it is difficult to adapt new organisms to the environment. During operation phase, biologists and marine experts should hold joint meetings to understand ecosystem formation and adaptation periods based on periodic monitoring of environmental parameters. · To confirm the output of the model, it is critical to confirm the verification test and analyze ecosystem formation during operation.
Zashim Uddin, Dhaka University	030718	Visited him again as the model has completed, explain the finished model and got opinions on future activities · The area is the area where shape changes frequently occur by ocean currents. Conducting further investigation on seaweed which is part of what supports the habitat of spoonbilled sandpipers. · It is also necessary to consider socioeconomic changes such as influx of population and progress of development as well as natural changes. This cannot be shown with a simple metric model.

Prof. Tanvir Ahmed, BUET	040718	Explained the models to the prof, who is familiar with SEA and get opinions. · It is necessary to monitor ecosystems, turbulence, dissolved oxygen content and protect marine life and benthos. · Since dredging at the time of construction is more drastic than maintenance dredging, it will have a serious negative impact on living things. · It should be monitored because ship's navigation route and ship maneuvering space should be greatly affected.

Note:
IUCN The International Union for Conservation of Nature
BUET Bangladesh University of Engineering and Technology

b) **Conclusion**

Based on the above results, we summarize the cumulative impact study of the ecosystem predicted from the coastline change model and the turbidity diffusion model result and list the items that should be advanced in the future considering it as a research team.

1. Endangered species and scarce organisms exist in protected areas around the planned site, such as Sonadia ECA, Moheshkhali Forest, Medhakacchapia National Park, Fasiakhali Wildlife Sanctuary, etc. It is an area where NGOs are actively active.
2. Experts should incorporate into ecosystem monitoring as they should carefully monitor everything in baseline, construction period, and service, without having to assume that changes are small and negligible as a result of the model.
3. The sudden change in the construction period becomes very burdensome for the living beings and it is a slow change at the time of service, so it is easy to adapt to living things, but taking into consideration such situations, it is included in ecosystem monitoring.
4. Based on the results of the model, DD should add a joint meeting with marine experts and biologists to understand ecosystem formation and adaptation period, so add to the monitoring plan.
1.5. I propose the following. Sonadia is an important area, if possible, it is necessary to set up an ecological assessment including a long-term survey of individuals in a separate frame, taking time. Therefore, the monitoring period will be longer, if there is a change, we will respond.

3) Social environment

The cumulative impact of the Project and the Adjacent Project is concerned on livelihoods especially on fishery, shrimp cultivation and salt cultivation. The cumulative impact should be considered in mitigation measures and compensation standard.

1) Regional economy of employment and means of livelihood

a) Fishery

The grounds of the offshore fishery around the project site are located off the southwestern coast of Moheshkhali, which is more than 20 km away from the project site. There is no loss of fishing grounds by the Project and the Adjacent project. On the other hand, the fishermen engaged in coastal fishery have moved their fishing ground to Char, about 6 km south to the Project Site, to avoid dredging of navigation

channel of the Adjacent project. Moreover, the fishermen reported that the catch volume of the coastal fishery decreased in comparison to pre-construction of the Adjacent projects, though the relation of cause and effect is unclear because only 1 year has passed since the dredging began. Currently, 100 - 150 people are engaged in fishery around Hasher Char.

Table 4.8-43 Comparison of income and catch before and after Construction of the Adjacent Project (Survey in 2018)

Occupation	Interviewee	Household income before construction of Coal Fire Power Plant (BDT/Month)	Household income after the commencement of construction of Coal Fire Power Plant (BDT/Month)	Catch before construction of Coal Fire Power Plant (kg/Month*)	Catch after the commencement of Coal Fire Power Plant (kg/Month*)
Fisherman	123	45,366	23,870	4,326	1,969

* Catch per month for 1 group organized by about 20 people. In terms of per person, they will be 216 kg / month and 98 kg / month respectively.

Source: JICA Survey Team

Figure 4.8-34 Location of the Project Site and Fishing Ground

Though the nearest fishing grounds (Hasher Char) are about 6 km south from the terminal area, it will be within 1 km from the extended navigation channel. Coastline, however, will not be newly affected by the Project. Expected impact can be summarized as follows.

1. Impact during Construction

1-1. Since there is no additional coastline loss by this project, there is no cumulative impact on the fishing ground. In addition, dredging and offshore disposal of dredged soil will not cause significant water pollution is negligible impact as shown in "(4) Numerical simulation results and concluding remarks " of "2.9.2 Dredged Sediment Offshore".
No cumulative impact is expected in terms of water pollution since mitigation method as described in the environmental management plan will also be taken.

1-2. However, the possibility cannot be denied that part of the fishery around Hasher Char can be physically hampered by frequent traffic of dredger ships during dredging of the extended navigation channel. As mentioned above, it was reported that the fisherman around the Project site and the Adjacent Project site moved to Hasher Char due to dredging work of navigation channel of the Adjacent Project. There is also the possibility that they will have to move their fishing ground again to other areas. In case that the fishery is hampered by the dredging of the Project, there might be cumulative impact on their livelihood. For example, there are no other fishing grounds or unable to get enough volume of catches after moving their fishing ground.

2. Impact after operation

2-1. Since there is no thermal discharge after operation in the Project, cumulative impact will not be expected

2-2. On the other hand, supposed that this project increases the number of vessels entering the port, fishery activities might be hindered. An immediate impact, however, will not be expected since the vessels that can be handled by the Project (Phase 1) and the Adjacent Project are approximately 340 per year (or one vessel per day, which will be reached in 2028). By utilizing Vessel Traffic Management System (VTMS), hindrance to operation of fishing boat can be avoided.

However, in case that the volume in the current fishing ground decreased, the relation between the Project and the decrease shall be surveyed, obtaining advices from local experts. In case that the obvious relation is confirmed and fishermen cannot move their fishing ground to the appropriate place, or when the volume is reduced even after moving fishing ground, they will be subject to cash compensation. In case that obvious relationship is not confirmed between the Project and the decrease of fish catch volume, livelihood restoration assistance shall be provided. This compensation policy is described in No.3 “Permanent loss of means of livelihood/ source of income” of “Table 4.11-55 Entitlement Matrix.”

b) Salt Farm and Shrimp Cultivation

The total area of the port in the Project and power plant component in Adjacent Projects is 563 ha, 19.4% of the total area of Matarbari and Badarkhali Union (2,905 ha). Salt farm and shrimp farm which will be lost due to land acquisition of both projects are estimated to be approximately 367 ha and 41 ha respectively. This means that about 35.6% of the salt farm and shrimp farm in Matarbari and Badarkhali Union will be lost. Among them, 70 ha of salt firm and 8 ha of shrimp cultivation ponds are lost by the land acquisition of the Project. Workers in salt and shrimp farms need to have entitlement of compensation even without land ownership.

Table 4.8-44 Project Affected Union and Salt and Shrimp Farm in the Project Area

	Location	Total	Salt/ Shrimp Farm	Salt Farm	Shrimp Farm
The whole union	Dhalghata	200	88	79	9
	Matarbari	2,705	1,055	950	105
	Total	2,905	1143	1,029	114
Planned project site	Adjacent project	455	330	297	33
	This project	108	78	70	8
	Total	563	408	367	41
	% of total union	19.4%			35.6%

Source: Prepared by JICA Survey Team based on National Land Zoning Report: Moheshkhali Upazila (Ministry of Land, 2017)

Regarding shrimp cultivation, one shrimp processing company in Cox Bazar was interviewed. The company is a private company founded in 1986. Though there were eight companies in the Cox Bazar, but now the company is the only one. The processed shrimp will be exported. The interview result is as follows.

- From 10 to 15 years ago, approximately 40% of the shrimp processed by this processor was produced in Moheshkhali, approximately 40% in Chakaria, and approximately 20% in Teknaf. Currently, the production of Moheshkhali is declined; approximately 45% in Chakaria, approximately 35% in Moheshkhali, and approximately 20% in Teknaf.
- The season of shrimp farming is for 9 months from mid-March to November. During this season, the shrimp is cultivated for 12 days per month. From 10 to 15 years ago, approximately 10 to 15 tons per day were processed, but now it decreased till 4 tons per day.
- The above reduction is mainly due to the infection of pathogenic bacteria. The impact from the coal power plant construction is limited.
- The impact on shrimp cultivation from of the Project is not expected except physical loss of shrimp farm.

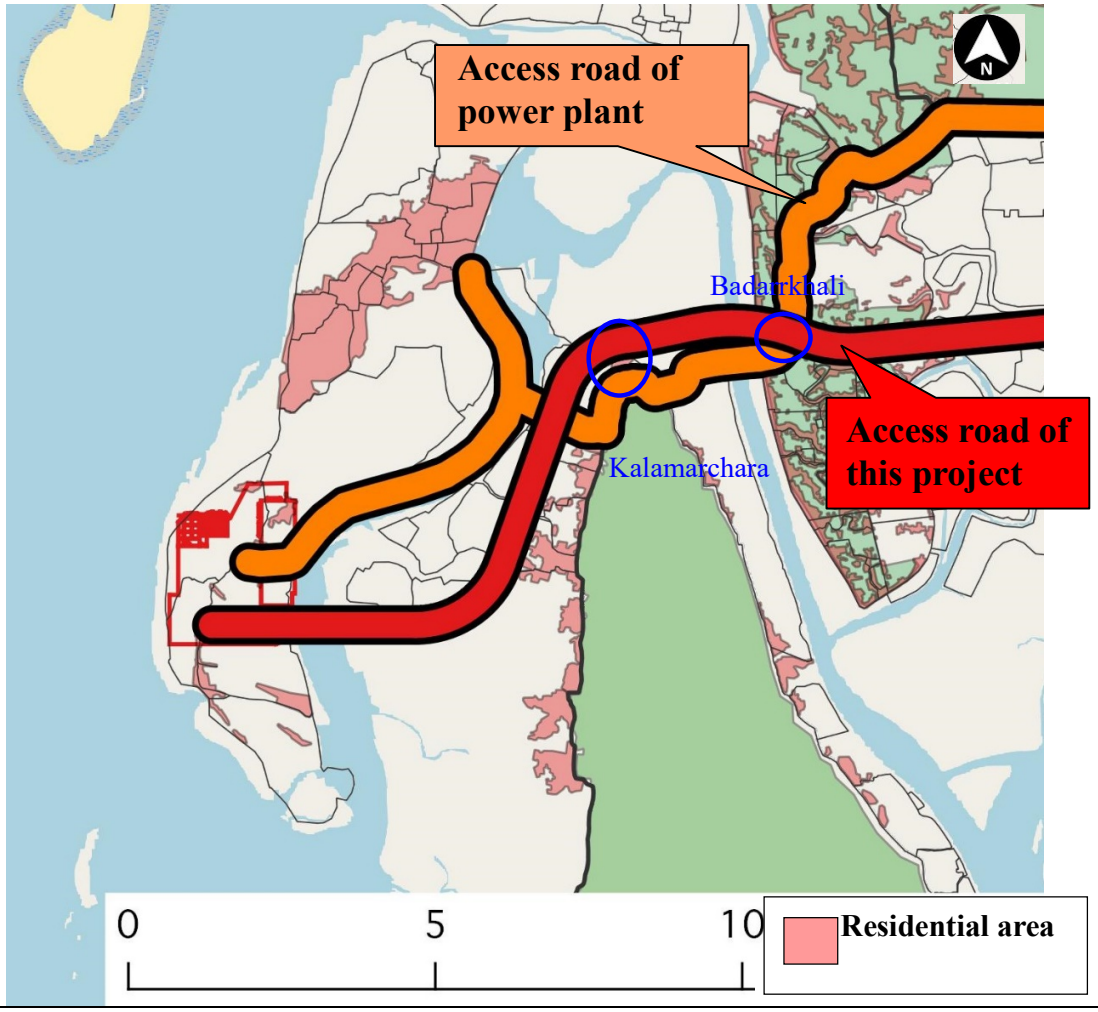
Source: Study team

Figure 4.8-35 Shrimp Processing Company in Cox Bazar (Cox Bazar Seafood)

Figure 4.8-36 Interview with the Company

2) Local Communities and Decision-making Institutions

In the initially proposed plan of the access road, there was concern that both project could interfere with the north-south passage and cumulatively divide the community. This concern is because two routes by this Project and Adjacent project will traverse the Kalarmarchara residential area, Badarkhali Bazar and neighboring residential area without distance. In this project, after the consultation meeting with PAPs, a proposal for detouring to the north side was made, which would not interfere with the passage in Kalarmarchara residential area. Since the new alignment also avoids Badarkhali Bazar and the most of residential areas, the possibility of the community severance is quite low. As the embankment might still hinder the residents north to the alignment from using the Bazar, box culvert will be installed to secure the existing road and the access to the Bazar.



Access Road by this Project and Adjacent Project
(Near the Starting Point)

Figure 4.8-37 Location Map of Both Projects

4.9 Environmental Management and Monitoring Plan (Including the implementation plan)

4.9.1 Port

(1) Construction phase

At the construction phase, the Project Implementation Unit (PIU) of CPA shall carefully consider all construction activities with the supervision consultant, and encourage the contractor to fully understand the necessary mitigation measures and to implement them. For this purpose, the environmental management unit (EMU) shall be organized prior to construction activity and an expert of the environmental management administrator in the EMU shall be employed. The unit will discuss and prepare mitigation measures with the supervision consultant and the contractor prior to the start of construction.

It is anticipated that a large inflow of workers and vehicles once construction begins. The EMU shall also function as a grievance organization to understand and address any grievances from local people during the construction phase, and conduct appropriate mitigation measures. The EMU shall improve the understanding

of the surrounding community regarding construction details, the schedule and mitigation measures, and shall obtain local input from people and change the mitigation measures as appropriate.

In order to confirm the implementation of environmental management and to consider further mitigation measures, the contractor should submit regular reports to the supervisory consultant and the EMU on the implementation status of the management plan.

The administrator of the EMU shall regularly hold explanation sessions with the local community, continuously listen to their grievances, submit reports to the Department of Environment, JICA and other relevant organizations regarding those grievances, as well as the implementation status of environmental management and environmental monitoring.

If environmental problems occur due to construction work, the EMU shall confirm the cause with the contractor as soon as possible. In order to resolve these problems, the administrator of the EMU shall instruct the contractor and consultant regarding necessary measures. If the problem is serious, the PIU may order the contractor to halt construction work until the problem is resolved.

Also, because it is planned to merge coal port with some port facilities, this project is similar in many points to the supplement points, CPGCBL (Coal Power Generation Company Bangladesh Limited), because it is necessary to manage, it shows a cooperative system because it is negotiating a joint management system.

The figure below outlines the environmental management and monitoring implementation structure in accordance with the reporting flow during the construction phase.

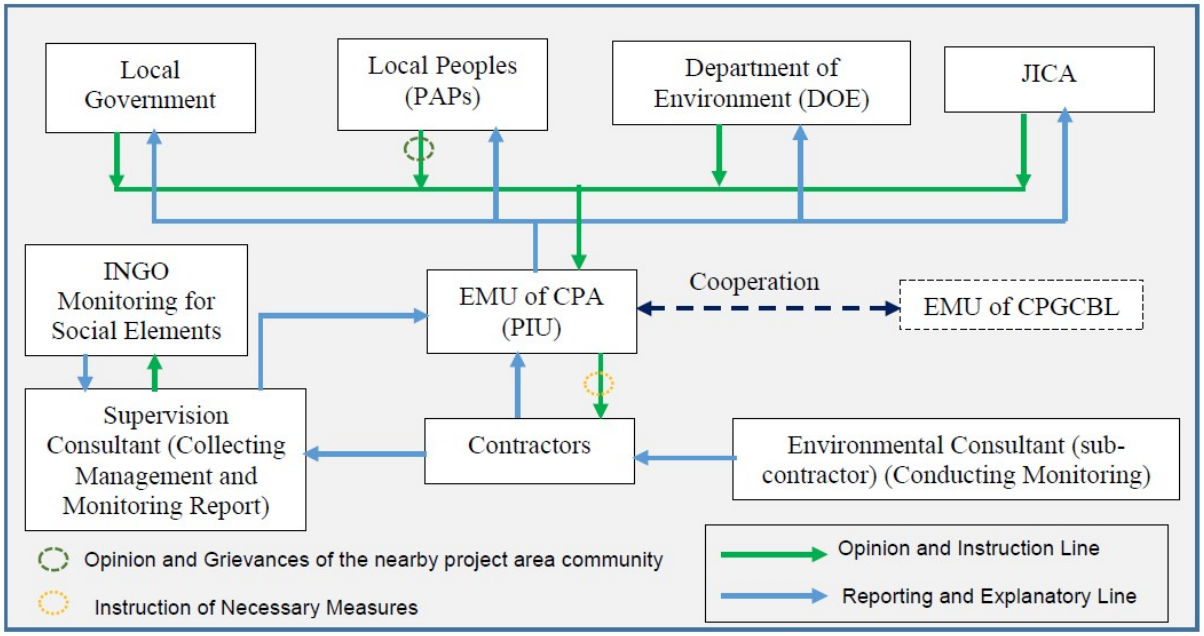


Figure 4.9-1 Implementation structure of Environmental Management and Monitoring Plan of the port during construction phase

(2) Operation phase

The port is responsible for organizing the EMU in a manner that allows it to develop and implement an environmental management plan that includes mitigation measures. An expert environmental

management administrator at the EMU shall be employed to ensure the environmental management plan is appropriately implemented. The administrator shall encourage the project staff to familiarize themselves with the environmental management plan prior to the start of plant operation, and shall regular educate those regarding ongoing matters during the operation phase.

The EMU shall also function as a grievance organization and will strive to understand and address any grievances from the local people during the operation phase, and undertake appropriate mitigation measures.

The basic function of the environmental management plan is to lease with the local community, and to provide them with sufficient explanations based on positive mitigation measures, which is very important. The administrator shall report on the contents and implementation status of the environmental management plan and environmental monitoring plan described below to the director of the plant, with the director taking final responsibility. The administrator of the EMU shall regularly hold explanation sessions with the local Preparatory Survey on Chittagong Area Coal Fired Power Plant Development Project in Bangladesh community, continuously listen to their grievances, submit reports to the Department of Environment, JICA and other relevant organizations regarding those grievances, as well as on the implementation status of environmental management and environmental monitoring activities (described hereinafter).

Also, because it is planned to merge coal port with some port facilities, this project is similar in many points to the supplement points, CPGCBL (Coal Power Generation Company Bangladesh Limited), because it is necessary to manage, it shows a cooperative system because it is negotiating a joint management system.

Figure 4.9-2 describes the environmental management and monitoring implementation structure with the reporting flow during the operation phase.

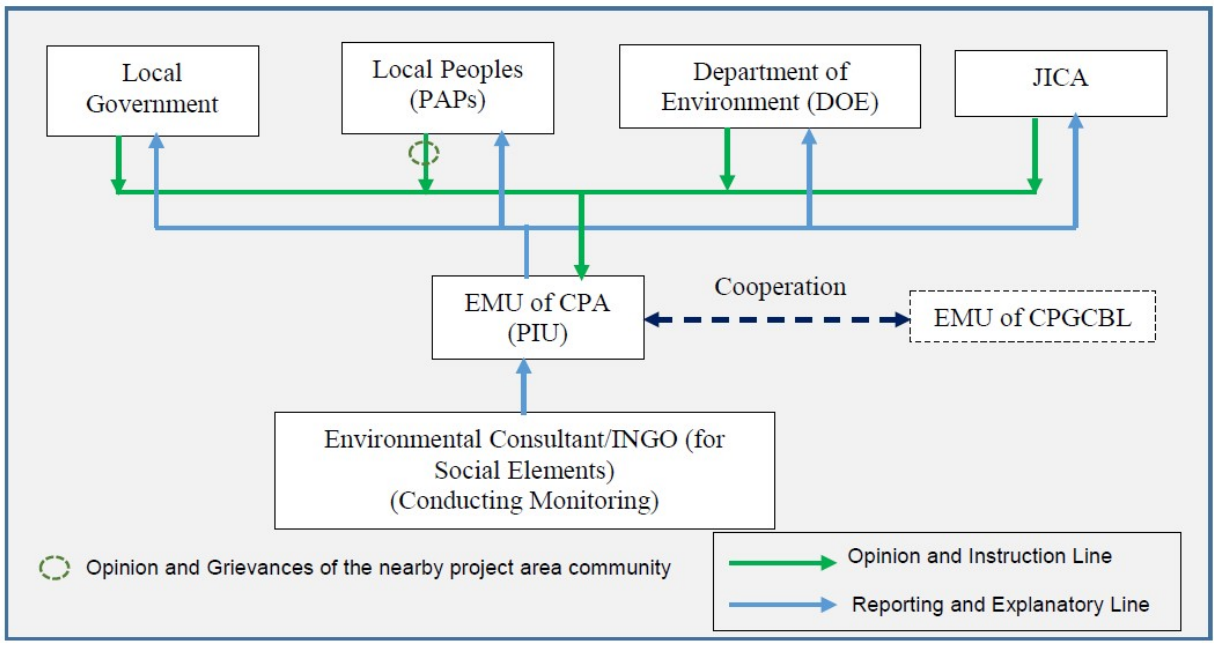


Figure 4.9-2 Implementation structure of Environmental Management and Monitoring Plan of the port during operation phase

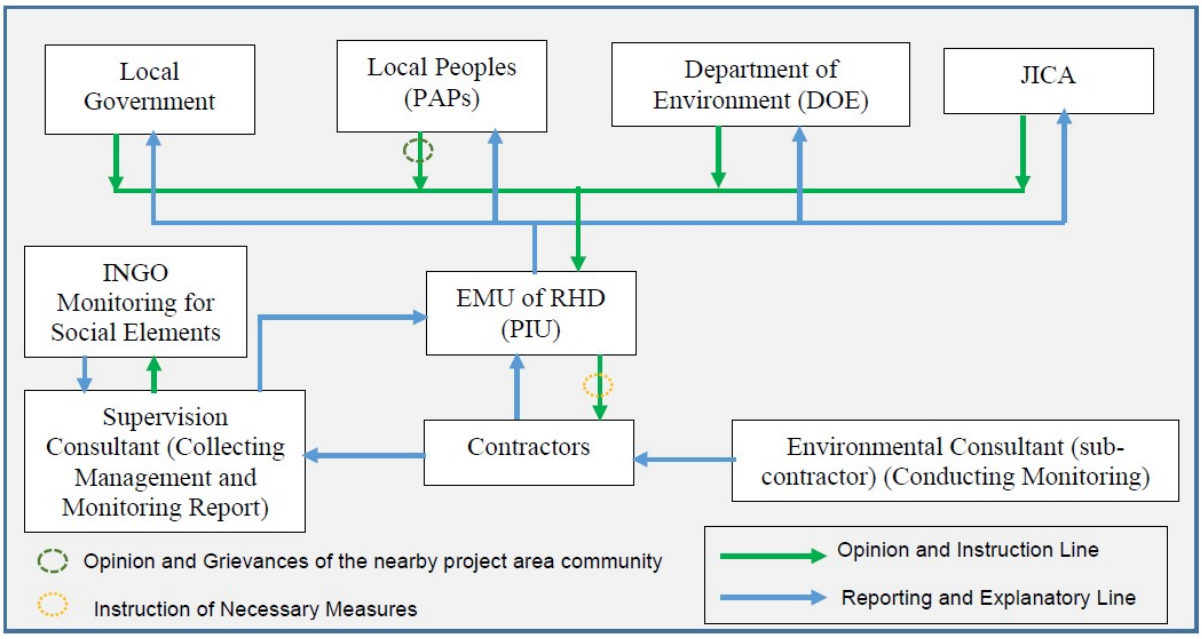
4.9.2 Access Road

(1) Construction phase

At the construction phase, the PIU of RHD shall carefully consider all construction activities with the supervision consultant, and encourage the contractor to fully understand the necessary mitigation measures and implement them. In this regard, an environmental management unit (EMU) shall be organized prior to the start of construction and an expert environmental management administrator in the EMU shall be employed. The unit will discuss and prepare mitigation measures with the supervision consultant and the contractor prior to the start of construction. A large inflow of workers and vehicles is expected once construction begins. The EMU shall also function as a grievance organization will seek to understand and address any grievances from local people during the construction phase, and conduct appropriate mitigation measures.

The EMU shall improve the understanding of the surrounding community regarding construction details, schedule and mitigation measures, and shall obtain local people's opinions and change the mitigation measures as appropriate. In order to confirm the implementation of environmental management and to consider further mitigation measures, the contractor should submit regular reports to the supervisory consultant and the EMU on the implementation status of the management plan. The administrator of the EMU shall regularly hold explanation sessions with the local community, continuously listen to their grievances, submit reports to the Department of Environment, JICA and other relevant organizations regarding those grievances, as well as the implementation status of environmental management and environmental monitoring (described hereinafter).

If environmental problems occur due to construction work, the EMU shall confirm the cause with the contractor as soon as possible. In order to resolve these problems, the administrator of the EMU shall instruct the contractor and consultant regarding necessary measures. If the problem is serious, the PIU may order the contractor to halt construction work until the problem is resolved.



Source: JICA Survey Team

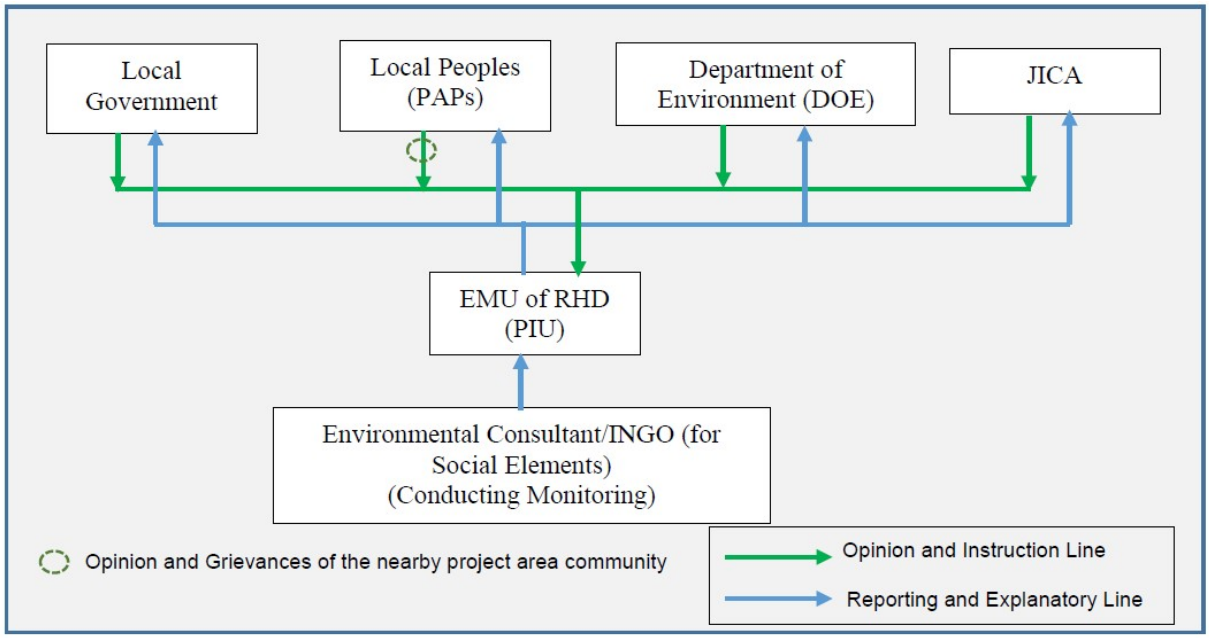
Figure 4.9-3 Environmental Management and Monitoring Implementation Structure of the access road during Operation phase

(1) Construction phase

The access road of the port is responsible for organizing the EMU in a manner that allows it to develop and implement an environmental management plan that includes mitigation measures. An expert environmental management administrator in the EMU shall be employed to ensure the environmental management plan is appropriately implemented. The administrator shall encourage the project staff to familiarize themselves with the environmental management plan prior to the start of plant operation, and shall regular educate them regarding ongoing matters during the operation phase.

The EMU shall also function as a grievance organization and will strive to understand and address any grievances from the local people during the operation phase, and conduct appropriate mitigation measures. The basic function of the environmental management plan is to liase with the local community, and to provide them with sufficient explanations based on positive mitigation measures, which is very important. The administrator shall report the contents and implementation status of the environmental management plan and environmental monitoring plan described below to the director of the plant, with the director taking final responsibility. The administrator of the EMU shall regularly provide explanations to the local community, Preparatory Survey on Chittagong Area Coal Fired Power Plant Development Project in Bangladesh continuously listen to their grievances, submit reports to the Department of Environment, JICA and other relevant organizations regarding those grievances, as well as on the implementation status of environmental management and environmental monitoring activities (described hereinafter).

Figure below describes the environmental management and monitoring implementation structure with the reporting flow during the operation phase.



Source: JICA Survey Team

Figure 4.9-4 Environmental Management and Monitoring Implementation Structure in Operation phase for the access road

Table 4.9-1 Environmental Management Plan (Port)

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
A.	**Preconstruction Phase**								
1	Land acquisition and Resettlement	i) Loss of private land ii) Loss of salt fields, shrimp farms and fishing ground for push net iii) Loss of residential /commercial structures iv) Loss of trees, home gardens, fish ponds and fruit	i), ii), iii) & iv) - The Acquisition and Requisition of Immovable Property Act of 2017 - JICA Guideline (2010)	i) Consideration for land owners ii) Consideration for persons losing their livelihoods iii), iv) Consideration for persons losing their property	i), ii), iii) & iv) - Developing an appropriate LARAP - Land acquisition should be conducted in compliance with the relevant laws and regulations - The cost related to relocation will be given to relocated residents - Employ local residents, especially loss of salt fields, shrimp farms, and fishing ground for push net as much as possible	i), ii), iii) & iv) - At the site	i), ii), iii) & iv) During land acquisition process	- Office of the Deputy Commissioner - CPA	CPA Cost is included in LARAP budget.
2	Disturbance to poor classes	- Poor households among those who are to be resettled.	- JICA Guideline (2010)	- Consideration for burden on vulnerable groups	- Developing "livelihood restoration program", including job training programs to persons who want the training.	- At the site	- During land acquisition process	- Office of the Deputy Commissioner - CPA	CPA Cost is included in LARAP budget.
3	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	- Loss of existing livelihood, employment and business opportunities	- Income level	- Maintaining or Improvement of living standards of local residents	- Developing an appropriate LARAP - Appropriate implementation of compensation	- At the site	- During land acquisition process	- Office of the Deputy Commissioner - CPA	CPA Cost is included in LARAP budget.
4	Land Use and Utilization of Local Resources	- Changing the traditional land use patterns and utilization of local resources	- Land Use Pattern - Use of Local Resources	- Mitigation of land use change and Prevention of local resource depletion	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - CPA	CPA Cost is included in LARAP budget.

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
5	Disturbance to Existing Social Infrastructure and Services	- Loss of access to social infrastructure	- Accessibility to Social Infrastructure and social services -GRM cases	- Ensuring access to social infrastructure and social services	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - CPA	CPA Cost is included in LARAP budget.
6	Disturbance to Local Communities and Decision making Institutions	- Loss of access to social infrastructure - community severance due to resettlement	- Accessibility within community -Perception of local residents	- Ensuring accessibility within community and maintaining Local Decision making Institutions	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - CPA	Expenses to be paid by CPA
7	Unequal Distribution of Benefits and Compensation	- It can occur among residents, workers, government officers and local politicians	- Perception of local residents	- Consideration for unequal distribution of benefits and losses	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - CPA	Expenses to be paid by CPA
8	Local Conflicts of Interest	- It can occur among residents, workers, government officers and local politicians	-Perception of local residents	- Consideration to affected peoples' emotions	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - CPA	Expenses to be paid by CPA
9	Gender	- Inappropriate distribution of compensation within HHs	- distribution of compensation within HHs	- Appropriate distribution of compensation within HHs	- Awareness and monitoring for appropriate distribution of compensation within HHs	- At the site	- During land acquisition process	- Office of the Deputy Commissioner - CPA	Expenses to be paid by CPA
10	Children's Rights	- Deterioration of livelihood due to resettlement and land acquisition	- enrollment rate	- ensuring education opportunity	- *Ditto*	- At the site	- During land acquisition process	- Office of the Deputy Commissioner - CPA	Expenses to be paid by CPA
B.	**Construction Phase**								
1	Air Quality	i) Dust resulting from construction work ii) Exhaust gas from construction machinery and vehicles used for mobilization of equipment	i) ii) & iii) - Ambient Air Quality Standard - IFC guideline values for ambient air quality (General/ 2007)	i) ii) & iii) - Prevention of air pollution in the surrounding area	i) Dust prevention ii) Watering access road and construction site, especially in the dry season iii) Using cover sheets on trucks for the transportation of soil Gas emission prevention	i) ii) & iii) - Construction area	i) ii) & iii) - During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant - Coordination with CPGCBL	Expenses included in contract cost by Contractor

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
		iii) Air pollution arising from incineration of construction materials and waste			- Periodic maintenance and management of all the construction machinery and vehicles Waste management - Prohibit open burning and illegal dumping				
2	Water Quality	i) Dredging Landfill for land preparation ii) Runoff water from construction area iii) Domestic wastewater of workers iv) Inappropriate disposal of waste v) Leakage oil and chemical materials from construction activity	i) Regulations on dredging Water standards ii) -vi) Wastewater standards for industrial activity	i) ~ vi) - Prevention of water pollution in the surrounding coastal area	i) Dredging Conducting dredging at sea area with pump dredger or grab dredger and setting film preventing the diffusion of contamination When dredging terrestrial area, firstly driving steel sheet pile at the sea side ii) Raising Collection of rain water, adequate treatment, drainage to port iii)Runoff water - Excavate channels, ditches and temporary settling pond around construction area - Install oil separator for treatment of oily wastewater - Construct silt basin iv)Domestic wastewater - Install wastewater treatment facility for workers such as septic tanks v)Wastewater management - Prohibit illegal dumping vi)Oil and chemical materials leakage - Storage of oil and chemical materials in an appropriate storage site and appropriate method to prevent permeation into ground and	i) Dredging area ii)-vi)Port site	i) During the dredging activities ii)-vi)During landfill activities	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPGCBL / Supervision Consultant	Expenses included in contract cost by Contractor Sample collection 50,000Tk./ Sample collection+analysis 100,000Tk./

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
					dredging with pump or grab after sea water penetrates the land				
		Breakwater areas pollution	Water standars	Minimize the water retention	Systems to seawater to go through the retention areas	Breakwater area	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPGCBL/ CPA /Supervision Consultant	Expenses included in contract cost by Contractor
3	Waste	- Dredging material for the channel	-dredging rules - Waste Management Rules	- Prevention of inappropriate waste disposal	i) Dredging material disposal - Use for leveling the site - Ocean dumping	i) Dredging area Port site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPGCBL/ CPA /Supervision Consultant	Expenses included in contract cost by Contractor
4	Noise and Vibration	i) Noise and vibration caused by construction machinery ii) Noise caused by vehicles used or mobilization of equipment and workers	Noise level standards IFC guideline values for noise (General/ 2007)	- Reduction of noise levels from construction activities	i) Optimizing construction schedule - Perform construction work during daytime, especially piling work - Using low-noise/ low vibration equipment as much as possible ii) Mobilization - Transportation of material and equipment for construction by shipping - Determine a traffic control plan including route-setting - Limit truck speed especially around residential areas	i) & ii) Construction area	i) & ii) During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPGCBL / Supervision Consultant	Expenses included in contract cost by Contractor
5	Odor	- Domestic wastewater of workers	- Wastewater standards	- Prevention of generating odor	- Taking appropriate measures for handling general waste - Prohibit illegal waste	- Construction area	- During construction phase	- Implementation: Contractor/ Environmental Consultant	Expenses included in contract cost by Contractor.

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
					disposal			- Supervisor: CPA/ Supervision Consultant	
6	Soil	i) Leakages of oil and chemical materials from construction activity ii) Inappropriate disposal of waste	i), ii) - Drinking water quality standards	i), ii) - Prevention of water and soil pollution in the surrounding area	i)Leakages of oil and chemical materials - Storage of oil and chemical materials in an appropriate storage site and method to prevent permeation into the ground ii) Waste management - Prohibit illegal dumping	i), ii) - Construction Area	i), ii) - During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor
7	Sediment	i) Runoff water from construction area ii) Domestic wastewater of workers iii)Inappropriate disposal of waste iv) Leakages of oil and chemical materials from construction activity	i) ii) iii) & iv) - Wastewater standards Waste management rules	i) ii) iii) & iv) - Prevention of water pollution in the surrounding area	i) ii) iii) & iv) - Implement the same mitigation measures as those addressed in "Water quality"	i) ii) iii) & iv) - Construction area	i) ii) iii) & iv) - During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor
8	Ecosystem	i) Existence of endangered species ii) Spawning of sea turtles	i) & ii) - Bangladesh Wild Life Preservation (Amendment) Act, 1974 JICA Guideline	i) & ii) - Protection of endangered species	i) Existence of endangered species - Prohibit disturbance, harassment, and hunting, especially the Spoon billed Sandpiper, by workers - Replace to nearby sites if needed. ii) Spawning of sea turtles - Turning off unnecessary lights during the nesting season - Using a smaller number or lower wattage of lights - Using red and yellow lights (as sea turtles are less affected by these colors)	i) Construction area Construction site adjoining sand beach	i) & ii) - During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
					- Using low noise machinery Planning construction activities to minimize adverse effects during the nesting season				
		-negative impact from construction activities	Emission standards	- Preventing the water pollution and minimize the negative impact to ocean creatures	- Same as water pollution	-construction site		-	
9	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	- Loss of existing livelihood, employment and business opportunities	- Income level, Number of employment opportunities for local residents and number of businesses around the construction area	- Maintaining or Improvement of the local economy - Maintaining or Improvement of living standards of local residents - Consideration to local residents' emotions	- Employ local residents as much as possible - Use the services (i.e., laundry and catering services, etc.) and products offered by the local community. - Developing "livelihood restoration program", including job training programs to persons who want the training.	- Villages near the site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant (jointly supervised by CPGCBL)	Expense is included in contract cost by Contractor - Hire local residence: 1,000Tk./person-day
10	Land Use and Utilization of Local Resources	- Changing the traditional land use patterns and utilization of local resources	- Land Use Pattern - Use of Local Resources	- Mitigation of land use change and Prevention of local resource depletion	- *Ditto*	- Villages near the site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant (jointly supervised by CPGCBL)	Expenses included in contract cost by Contractor
11	Disturbance to Water Usage, Water Rights, etc.	i) Adverse impact due to water pollution ii) Usage of underground water	i) Water pollution - Same as those addressed in "Water quality" ii) Ground water - Drinking water quality standards	i) Water pollution - Same as those addressed in "Water quality" ii) Ground water - Consideration to local residents' living	i) Water pollution - Implement the same mitigation measures as those addressed in "Water quality" ii) Ground water - Monitoring of water levels and water quality at wells in residential areas	i), ii) - Construction area	i), ii) - During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
12	Unequal Distribution of Benefits and Damages	- Unequal distribution of benefits and damages between local residents and external workers	- Consciousness of local residents	- Consideration of the attitudes of local residents to the project	- Employ local residents as much as possible - Promote communication between external workers and local people (e.g., join in local events)	- Villages near the site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor
13	Local Conflicts of Interest	- Conflicts between local residents and external workers	- Change in local customs - Perception of local residents	- Consideration of the attitudes of local residents to the project	*Ditto*	- Villages near the site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor
14	Gender	- Unequal opportunity of employment	- Opportunity of employment	- Equal opportunity of employment	- Opportunity of employment shall be properly provided both for male and female	- Construction Site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor
15	Children's Rights	- Child labor	- Child labor	- Banning child labor	- Prohibit labor contracts between subcontractor and children - Patrolling periodically to check for any child labor	- Construction area	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor
16	Infectious Diseases such as HIV/AIDS	- Temporary influx of migrant labor during construction may increase risk of infection	- sanitation for local residents	- Consideration for sanitation for local residents	- Implementation of periodic medical check-ups by temporary medical team - Education and training on health care of workers	- Construction area	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor - Medical checkups: 45,000Tk./ person (Full Medical Checkup) - Safety education and training: 150,000Tk./ 20 person
17	Work environment (including	i) Labor accidents ii) Diseases caused by air pollutants, water pollutants, and	i) Labor accidents - Handling heavy loads	i) & ii) - Prevention of labor accidents,	i) Labor accidents - Prepare a manual for labor accident prevention	i), ii) & iii) - Construction area	i), ii) & iii) - During construction phase	- Implementation: Contractor/ Environmental	Expenses included in contract cost by Contractor

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
	work safety)	noise by construction work iii) Disturbance to local residents by labor and/or security guards	- Working at heights - Electric shocks ii) Environment pollution Ambient Air Quality Standards - Noise level standards - Waste management rule - IFC guideline values for ambient air quality and noise (General/ 2007) - Perception of local residents	traffic accidents, and health problems iii) Prevention of Disturbance to local residents	including safety education and training - Provide workers with appropriate protective equipment - Inspect and ensure that any lifting devices, such as cranes, are appropriate for expected loads - Keep lifting devices well maintained and perform maintenance checks as appropriate during the period of construction - Use equipment that protects against electric shock ii) Environment pollution - Observe related standards and provide workers with appropriate facilities iii) Disturbance to local residents - Education/training to labor and/or security guards			Consultant - Supervisor: CPA/ Supervision Consultant	
18	Accidents	- Traffic accidents	i) Marine traffic accidents ii) Land traffic	i), ii) - Prevention of traffic accidents	i) Marine Traffic: Setting marking buoys around the construction area for marine safety - Informing vessel schedules to local fishermen, etc. ii) Land traffic: - Informing bus schedules to the surrounding villages - Determining a traffic control plan - Training safe operation of vehicles	i) Sea area around the construction site for port facility ii) Area around the construction site for port facility	i), ii) - During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
19	Cross-boundary impact and climate change	- CO_2 will be produced by construction work	-	- Reduce CO_2 emissions as much as possible	- Periodic maintenance and management of all construction machinery and vehicles	- Construction area	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor
C.	Operation Phase								
1	Air Quality	-Exhaust gas from vessels	-MARPOL 73/78 treaty Annex VI	- Prevention of air pollution caused by vessels	Gas emission from vessels - Hire vessels compliant to MARPOL 73/78 treaty - Stop engines in the port	- Port facility	- During unloading activity	CPA and Environmental Consultant	Expenses by CPA/ Vessel owners
2	Water	- Dredging material for the maintenance of the navigation channel	- Regulations relating to dredging	- Minimization of water pollution by dredging	- To choose dredging method and equipment that will minimize turbidity	- Dredging area	- During the dredging activities	CPA and Environmental Consultant	Expenses by CPA
		i) Leakages of oil from oil tankers ii) Wastewater from vessels will cause water pollution	i) & ii) - MARPOL 73/78 treaty (Annex I-V) ii) Wastewater from vessels - International Convention for the control and management of Ships' Ballast Water and Sediments (BWM), 2004	i) & ii) Prevention of water pollution caused by vessels	i) Leakages of oil from oil tankers - Installation of oil fence ii) Wastewater from vessels - Prohibition of dumping any contaminated materials - Hire vessels compliant to MARPOL 73/78 treaty and BWM - Any waste will be treated by the port facility	i) & ii) - Port facility	i) & ii) - During unloading activity		Expenses by CPA/ Vessel owners
	Water (sedimentation)	Retention of sand near the breakwater	Water quality standards	minimize the water pollution	- Removal of retention by Permeable pipes	Breakwater areas	During operation	CPA and Environmental Consultant	Expenses by CPA
3	Waste	- Dredging material for the maintenance of the channel	- Waste management rules	- Prevention of inappropriate waste disposal	- Sand: To use for construction material	- Dredging area	- During the dredging activities.	CPA and Environmental Consultant	Expenses by CPA
		- Waste from vessels	- Waste management rules - MARPOL 73/78 treaty	- Appropriate waste management	- Prohibition of dumping any contaminated materials - Hire vessels compliant to	- Port facility	- During unloading activity		Expenses by CPA / Vessel owners

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
					MARPOL 73/78 treaty - Any waste will be treated by the port facility				
		-Sewage and garbage from workers	- Waste management rules	- Management of waste, especially hazardous waste - Prevention of inappropriate waste disposal	Waste management - Waste management program consisting of reduction, reuse, and recycling of materials - Systematic collection and protected storage - Waste disposal at appropriate location - Hazardous waste shall be treated under the related regulations - Prohibition of dumping any contaminating materials	Ditto	During operation of the Port	CPA and Environmental Consultant	Expenses by CPA
4	Noise and Vibration	- Noise from Cargo handling activity at the port - Noise caused by vehicles used for mobilization of equipment and workers	- Noise standards - IFC guideline values for noise (General/2007)	- Mitigation of noise generated by the unloading activity	- Maintenance of equipment. - Installation of low noise type equipment - Optimizing unloading schedule	- Port facility	- During unloading activity	CPA and Environmental Consultant	Expenses by CPA
5	Odor	- Domestic wastewater of workers	- Wastewater standards	- Prevention of generating odors	- Taking appropriate measures for handling general waste - Prohibit illegal waste disposal	- Port Area	- During the operation of power plant	CPA and Environmental Consultant	Expenses by CPA
6	Soil	-Leakages of oil and chemical materials	- Ground water (Drinking water quality standards) Waste management rules from Environmental Conservation	- Prevention of soil and water pollution in the surrounding area	Oil and chemical materials leakage - Storage of oil and chemical materials in an appropriate tank with retaining wall and method to prevent permeation into ground	Port Area	- During cargo unloading activity Movement of vehicles	CPA and Environmental Consultant	Expenses by CPA

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
			Rules						
7	Ecosystem	i) Existence of endangered species ii) Spawning of sea turtles	i) & ii) - Bangladesh Wild Life Preservation (Amendment) Act, 1974 - JICA Guideline (2010)	i) & ii) - Protection of endangered species	i) Existence of endangered species - Prohibit disturbance, harassment, and hunting, especially of the Spoon billed Sandpiper, by workers ii) Spawning of sea turtles - Turning off unnecessary lights during the nesting season - Using a smaller number or lower wattage of lights - Using red and yellow lights (as sea turtles are less affected by these colors) - Using low noise machinery	- Around the port facility	- During the operation of the Port	CPA and Environmental Consultant	Expenses by CPA
		i) Leakage oil from oil tanker ii) Wastewater from vessels will cause water pollution	i), ii) MARPOL 73/78 treaty ii) Wastewater from vessels International Convention for the control and management of Ships' Ballast Water and Sediments (BWM), 2004	i), ii) Prevention of water pollution caused by vessels	i) Leakages of oil from oil tankers - Installation of oil fence ii) Wastewater from vessels - Prohibition of dumping any contaminated materials - Hire vessels compliant to MARPOL 73/78 treaty and BWM Any waste will be treated by the port facility	i) & ii) - Port facility	i) & ii) - During unloading activity - During oil storage activity	CPA and Environmental Consultant	Expenses by CPA/ Vessel owners
8	Hydrology	- Potential impact to tidal currents caused by construction of the port facility	- Tidal currents	- Minimization of change of tidal currents	- Conducting tidal current simulation to assess any changes in tidal currents	- Sea area port facility	- During operation of the port facility	CPA and Environmental Consultant	Expenses by CPA
9	Topography and Geology	- Potential impact on coastal line caused by changing tidal currents	- Coastal line	- Minimization of change of coastal line	- Conducting tidal current simulation to assess the change of drift sand movement	- Sea area around construction area for port facility	- During operation of the port facility	CPA and Environmental Consultant	Expenses by CPA
10	Disturbance to poor	- Poor households among those who are	- JICA Guideline (2010)	- Consideration for burden on	- Implementing "livelihood restoration program",	- At the site	- During operation	CPA and Environmental	Expenses by CPA

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
	classes	to be resettled.		vulnerable groups	including job training programs to persons who want the training.			Consultant	
11	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	- Loss of existing livelihood, employment and business opportunities	- Income level, Number of employment opportunities for local residents and number of businesses around the construction area	- Maintaining or Improvement of the local economy - Maintaining or Improvement of living standards of local residents - Consideration to local residents' emotions	- Employ local residents as much as possible - Use the services (i.e., laundry and catering services, etc.) and products offered by the local community. - Developing "livelihood restoration program", including job training programs to persons who want the training.	- Villages near the site	- During operation	CPA and Environmental Consultant	Expenses by CPA
12	Land Use and Utilization of Local Resources	- Changing traditional land use patterns and utilization of local resources	- Land Use Pattern - Use of Local Resources	- Mitigation of land use change and Prevention of local resource depletion	- Settlement of port workers shall be made in the organized manner.	- Villages near the site	- During the operation of port	CPA and Environmental Consultant	Expenses by CPA
13	Disturbance to Water Usage, Water Rights, etc.	- Adverse impact due to water pollution	- Same as those addressed in "Water quality"	- Same as those addressed in "Water quality"	- Implement the same mitigation measures as those addressed in "Water quality"	- Villages near the site	- During the operation of port	CPA and Environmental Consultant	Expenses by CPA
14	Disturbance to the Existing Social Infrastructure and Social Services	i) Increase in the number of vessels ii) Traffic jams caused by increased vehicles	i) ii) - Interference to other tankers or barges -Interference with local transport	i) ii) - Minimize disturbance to the local peoples - Minimize increase of traffic volume	i) vessels - Setting water routes after consultation with related authorities. ii) Traffic volume - Minimizing traffic volume by using buses for employees	- Villages near the site	- During the operation of port	CPA and Environmental Consultant	Expenses by CPA
15	Unequal distribution of Benefits and Compensation	- It can occur among residents, workers, government officers and local politicians	- Perception of local residents	- Consideration to affected peoples' emotions	- Developing an employment plan that is fair to every affected person	- Villages near the site	- During the operation of port	CPA and Environmental Consultant	Expenses by CPA
16	Local	- Conflict between	- Change in local	- Consideration of	- Employ local residents as	- Villages near the	- During the	CPA and	Expenses by CPA

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
	Conflicts of Interest	local residents and workers	customs	the attitudes of local residents to the project	much as possible - Promote communication between workers and local people (e.g., join in local events)	site	operation of port	Environmental Consultant	- Hire local residence: 1,000Tk./person-day
17	Gender	- Unequal opportunity of employment	- Opportunity of employment	- Equal opportunity of employment	- Opportunity of employment shall be properly provided both for male and female	- At the site	- During the operation of port	CPA and Environmental Consultant	Expenses by CPA
18	Children's Rights	i) Child labor ii) Improved access to education	i) Child labor ii) Access to education	i) Banning child labor ii) Improved access to education	i) Child labor - Prohibit labor contracts between subcontractor and children - Patrolling periodically to check for any child labor ii) Improved access to education - Livelihood restoration program in LARAP shall be properly conducted	i) At the site ii) Village near the site	i), ii) - During the operation of Port	CPA and Environmental Consultant	Expenses by CPA
19	Infectious Diseases such as HIV/AIDS	- Temporary influx of migrant labor during operation may increase risk of infection	- sanitation for local residents	- Consideration for sanitation for local residents	- Education and training on health care of workers	- At the site	- During operation phase	CPA and Environmental Consultant	Expenses by CPA
20	Work Environment (Including Work Safety)	i) Labor accidents ii) Diseases caused by air pollutants and noise by unloading activity iii) Disturbance to local residents by labor and/or security guards	i) Labor accidents - Handling heavy loads - Working at heights ii) Environmental pollution - Ambient air quality standards - Noise standards - Waste management rules - IFC guideline values for	i), ii) Prevention of labor accidents and health problems iii) Prevention of Disturbance to local residents	i) Labor accidents - Prepare a manual for labor accident prevention including safety education and training - Provide workers with appropriate protective equipment - Inspect and ensure that any lifting devices, such as cranes, are appropriate for expected loads - Keep lifting devices well	i), ii) & iii) Port facility	i), ii) & iii) - During unloading activity	CPA and Environmental Consultant	Expenses by CPA

Sl. No	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Implementation and Management Institution	Cost
			ambient air quality and noise (General/ 2007) - Perception of local residents		maintained and perform maintenance checks as appropriate ii) Environment pollution - Observe related standards and provide workers with appropriate equipment iii) Disturbance to local residents - Education/training to labor and/or security guards				
21	Accidents	- Traffic accidents	- Marine traffic	- Prevention of traffic accidents	- Consulting with related authorities on vessel schedules - Determining water routes after consultation with related authorities - Setting course buoys around navigation channel area for marine safety - Informing operation schedule to local fishermen etc.	- Sea area around port facility	- During unloading activity	CPA and Environmental Consultant	Expenses by CPA

Table 4.9-2 Environmental Management Plan (Access Road)

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
A. Preconstruction Phase									
1	Land acquisition	i) Loss of private land ii) Loss of salt fields, shrimp farms and fishing ground for push net iii) Loss of residential /commercial structures iv) Loss of trees, home gardens, fish ponds and fruit	i), ii), iii) & iv) -The Acquisition and Requisition of Immovable Property Act of 2017 -JICA Guideline (2010)	iii) Consideration for land owners iv)Consideration for persons losing their homes iii), iv) Consideration for persons losing their property	i), ii), iii) & iv) - Developing an appropriate LARAP - Land acquisition should be conducted in compliance with the relevant laws and regulations - The cost related to relocation will be given to relocated residents - Employ local residents, especially loss of salt fields, shrimp farms, and fishing ground for push net as much as possible	i), ii), iii) & iv) - Along the right of way (ROW) of the access road	i), ii), iii) & iv) During land acquisition process	- Office of the Deputy Commissioner - RHD	Expenses to be paid by RHD
2	Disturbance to poor classes	- Poor households among those who are to be resettled.	- JICA Guideline (2010)	- Consideration for burden on vulnerable groups	- Developing "livelihood restoration program", including job training programs to persons who want the training.	- Along the right of way (ROW) of the access road	- During land acquisition process	-Office of the Deputy Commissioner -RHD	Expenses to be paid by RHD
3	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	- Loss of existing livelihood, employment and business opportunities	- Income level	- Maintaining or Improvement of living standards of local residents	- Developing an appropriate LARAP - Appropriate implementation of compensation	- At the site	- During land acquisition process	- Office of the Deputy Commissioner - RHD	RHD Cost is included in LARAP budget.
4	Land Use and Utilization of Local Resources	- Changing the traditional land use patterns and utilization of	- Land Use Pattern - Use of Local Resources	- Mitigation of land use change and Prevention of local resource	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - RHD	RHD Cost is included in LARAP

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
		local resources		depletion					budget.
5	Disturbance to Existing Social Infrastructure and Services	- Loss of access to social infrastructure	- Accessibility to Social Infrastructure and social services -GRM cases	- Ensuring access to social infrastructure and social services	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - RHD	RHD Cost is included in LARAP budget.
6	Disturbance to Local Communities and Decision making Institutions	- Loss of access to social infrastructure - community severance due to resettlement	- Accessibility within community -Perception of local residents	- Ensuring accessibility within community and maintaining Local Decision making Institutions	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - RHD	Expenses to be paid by RHD
7	Unequal distribution of Benefits and Compensation	- It can occur among residents, workers, government officers and local politicians	- Perception of local residents	- Consideration for unequal distribution of benefits and losses	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - RHD	Expenses to be paid by RHD
8	Local Conflicts of Interest	- It can occur among residents, workers, government officers and local politicians	- Perception of local residents	- Consideration to affected peoples' emotions	- *Ditto*	- near the site	- During land acquisition process	- Office of the Deputy Commissioner - RHD	Expenses to be paid by RHD
9	Gender	- Inappropriate distribution of compensation within HHs	- distribution of compensation within HHs	- Appropriate distribution of compensation within HHs	- Awareness and monitoring for appropriate distribution of compensation within HHs	- Along the right of way (ROW) of the access road	- During land acquisition process	-Office of the Deputy Commissioner - RHD - External Monitoring Agency	Expenses to be paid by RHD
10	Children's Rights	- Deterioration of livelihood due to resettlement and land acquisition	- enrollment rate	- ensuring education opportunity	- *Ditto*	- At the site	- During land acquisition process	- Office of the Deputy Commissioner - RHD	Expenses to be paid by RHD

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
B. Construction Phase									
. 1	Air	i) Emission from construction vehicles and machinery ii) Vehicles will generate dust and suspended particles	i)-ii) - Ambient air quality standard - IFC guideline values for ambient air quality	i)-ivi Prevention of air pollution in the surrounding area	1) Dust prevention - In the dry season, water is sprayed on the access road. - Cover sheet on trucks during soil transport . 2) Exhaust gas prevention - Regular maintenance of construction machinery and vehicles	i) ii) Construction site	-During the construction stage	Implementation: Contractor/ Environmental Consultant Supervisor: RHD/ Supervision Consultant	Expense is included in contract cost by Contractor.
. 2	Water Quality	i) River water from construction area/water way in salt/paddy field ii) Contamination of water by fuel /oil spillage from vehicles iii) Contamination of stagnant water body by fecal matters from workers' camp iv) Deposition of dust in open wells near construction site v) Using drinking water for construction purpose	-Water Quality Standards for Drinking water and Surface water of DOE -IFC Guidelines 2007	-Prevention of water pollution in the project area	i)Monitoring of water quality of the river/water way in salt/paddy field ii) Construction vehicles / equipment shall be operated and maintained in such a manner so as to avoid contamination of water bodies due to oil spillage. Fuel storage shall only be done on wasteland and will be kept away from drainage channels and natural water bodies. iii) Labor camp shall not be allowed near any of the water bodies. Proper sanitation facilities shall be provided. iv)The mouth / opening of the well shall be covered with suitable material during any of the construction activities so as to prevent dust from entering the well. v) The contractor shall make arrangements for water required for construction in such a way	i)Rivers/waterway in the salt/paddy field ii) Near the workers' camp and sites for the installation of construction machineries iii) Preapproved locations Away from water bodies. iv) All the wells along the project corridor v) At respective planned construction sites	-During the construction stage	Implementation: Contractor/ Environmental Consultant Supervisor: RHD/ Supervision Consultant	Expense is included in contract cost by Contractor.

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
					that water availability and supply to nearby community is unaffected. Wastage of water shall be kept to a minimum during construction				
. 3	Waste	1) Construction material 2) Hazadous waste	- Waste Management Rules	- Prevention of inappropriate waste disposal	1) Promote separate collection, recycling and reuse of waste wastes. - Handle waste items that can not be recycled properly and appropriately. - Signs for Prohibition of illegal dumping 2) Hazardous waste - Treat hazardous waste appropriately according to relevant regulations	Constrution site	- During construction phase	- Implementation: Contractor/ - Supervisor: RHD	Expenses included in contract cost by Contractor
. 4	Noise and Vibration	i) Noise and vibration levels from vehicles, Asphalt plants and equipment ii) Noise barriers	Noise level standards - IFC guideline values for noise (General/ 2007)	Reduction of noise levels from construction activities	i) The plants and equipment used for construction shall confirm to DOE norms. Vehicles and equipment used shall be fitted with silencer. Any vehicle and machinery shall be kept in good working order and engines turned off when not in use. Regular monitoring of noise Parameters during the construction period as envisaged in the Environmental Monitoring Plan. Construction of noise barriers in the form of walls at sensitive locations upon consultation with	i) Wherever the plants are setup. All along the corridor wherever the sensitive locations like schools, hospitals and other community places are located. ii) All along the corridor wherever the sensitive locations like schools, hospitals and other	-During the construction stage	Implementation: Contractor/ Environmental Consultant Supervisor: RHD/ Supervision Consultant	Expense is included in contract cost by Contractor.

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
					stakeholders. ii) Construction of noise barriers in the form of walls at Sensitive locations upon consultation with stakeholders.	community places are located.			
. 5	Odor	- Domestic wastewater of workers	- Wastewater standards	- Prevention of generating odor	-Taking appropriate measures for handling general waste -Prohibit illegal waste disposal	- Construction area	- During construction phase	Implementation: Contractor/ Environmental Consultant -Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor.
. 6	Soil	i) Contamination of soil from fuel and lubricants ii) Contamination of land from construction waste	-Soil fertility test -JICA guidelines (2010) - EHS Guidelines for Construction Materials Extraction and the General EHS Guidelines -Environmental, Health, and Safety Guidelines for Toll Roads-2007	-Minimize the deterioration of the soil quality	i) Construction vehicles and equipment shall be operated and maintained in such a manner so that soil contamination from spillage shall be at a minimum. Fuel storage shall only be done on wasteland and will be kept away from drainage channels and natural water bodies ii) Debris generated due to the dismantling of the existing pavement structure and the cutting of the hill side for the widening shall be suitably reused in the proposed construction	i) & ii) Near the workers' camp and sites for the installation of construction machineries	-During the construction stage	Implementation: Contractor/ Environmental Consultant Supervisor: RHD/ Supervision Consultant	Expense is included in contract cost by Contractor.
. 7	Sediment	i) River bottom sediment ii) Runoff water from construction	i) ii) iii) & iv) - Wastewater standards	i) ii) iii) & iv) - Prevention of water pollution in the surrounding area	i) Excavate channels, ditches and temporary settling pond around bridge construction area ii) iii) iv) & v)	i) ii) iii) iv) & v) Construction area	i) ii) iii) iv) & v) - During construction phase	Implementation: Contractor/ Environmental Consultant Supervisor:	Expenses included in contract cost by Contractor

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
		area iii) Domestic wastewater of workers iv) Inappropriate disposal of waste v) Leakages of oil and chemical materials from construction activity			- Implement the same mitigation measures as those addressed in "Water Quality"			RHD/ Supervision Consultant	
8.	Protected areas	Near wildlife reserve and forests	Forest Act 1927 Bangladesh Wild Life (Preservation) (Amendment) Act, 1974	Desemination of hunting / capturing prohibition and other protected area rules to worker・	Holding an education program for wildlife Prohibition of illegal dumping Signs	2 areas near the reserved areas (Fasiakhali Wildlife reserves, Moheshkhali reserve forest	Ditto	Implementation: Contractor/ Environmental Consultant Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
9	Ecosystem	i)Mangrove forest ii) Tidal flats	i), ii) -Bangladesh Wild Life Preservation (Amendment) Act, 1974 -JICA Guideline (2010) -World Bank OP4.04	i), ii) Protection of endangered species Protection critical natural habitat	i)Mangrove replantations for the lost forest i)&ii) Common Developing "protective measures" Prohibit disturbance, Monitoring of water quality, sedimentation and topographical future	i), ii) Construction area	During construction phase	Implementation: Contractor/ Environmental Consultant Supervisor: RHD/ Supervision Consultant	Expense is included in contract cost by Contractor.
10	Topography and Geology	Land erosion	Present maps	minimization of erosion	Covering of the surface of the slope	access road	During construction phase	Implementation: Contractor/ Environmental Consultant	Expense is included in contract cost by

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
								Supervisor: RHD/ Supervision Consultant	Contractor.
11.	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	- Loss of existing livelihood, employment and business opportunities	- Income level, Number of employment opportunities for local residents and number of businesses around the construction area	- Maintaining or Improvement of the local economy - Maintaining or Improvement of living standards of local residents - Consideration to local residents' emotions	- Employ local residents as much as possible - Use the services (i.e., laundry and catering services, etc.) and products offered by the local community. - Developing "livelihood restoration program", including job training programs to persons who want the training.	- Villages near the site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expense is included in contract cost by Contractor - Hire local residence: 1,000Tk./person-day
12	Land Use and Utilization of Local Resources	- Changing the traditional land use patterns and utilization of local resources	- Land Use Pattern - Use of Local Resources	- Mitigation of land use change and Prevention of local resource depletion	*Ditto*	- Villages near the site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
13	Disturbance to Water Usage, Water Rights, etc.	i) Adverse impact due to water pollution ii) Usage of underground water	i) Water pollution - Same as those addressed in "Water quality" ii) Ground water - Drinking water quality standards	i) Water pollution - Same as those addressed in "Water quality" ii) Ground water - Consideration to local residents' living	i) Water pollution - Implement the same mitigation measures as those addressed in "Water quality" ii) Ground water - Monitoring of water levels and water quality at wells in residential areas	i), ii) - Construction area	i), ii) - During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
14	Disturbance to Existing Social Infrastructure and Services	Loss of access to social infrastructure and social services due to disturbance by construction work	-Access to social infrastructure and social services - Consciousness of Project Affected Persons	-Securing access to social infrastructure and social services	-Securing passage	Villages near the site	During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
15	Disturbance to Local Communities and Decision making Institutions	- Loss of access within social infrastructure - community severance due to resettlement	- Accessibility within community -Perception of local residents	- Ensuring accessibility within community and maintaining Local Decision making Institutions	- *Ditto*	- near the site	During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses to be paid by RHD
16.	Unequal Distribution of Benefits and Damages	- Unequal distribution of benefits and damages between local residents and external workers	- Consciousness of local residents	- Consideration of the attitudes of local residents to the project	- Employ local residents as much as possible - Promote communication between external workers and local people (e.g.,join in local events)	- Villages near the site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
17.	Local Conflicts of Interest	- Conflicts between local residents and external workers	- Change in local customs - Perception of local residents	- Consideration of the attitudes of local residents to the project	- *Ditto*	- Villages near the site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
18.	Gender	Unequal opportunity of employment	- Opportunity of employment	- Equal opportunity of employment	- Opportunity of employment shall be properly provided both for male and female	- Construction Site	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/	Expenses included in contract cost by Contractor

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
								Supervision Consultant	
19.	Children's Rights	- Child labor	- Child labor	- Banning child labor	- Prohibit labor contracts between subcontractor and children - Patrolling periodically to check for any child labor	- Construction area	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
20.	Infectious Diseases such as HIV/AIDS	- Temporary influx of migrant labor during construction may increase risk of infection	- sanitation for local residents	- Consideration for sanitation for local residents	- Implementation of periodic medical check-ups by temporary medical team - Education and training on health care of workers	- Construction area	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor - Medical checkups: 45,000Tk./ person (Full Medical Checkup) - Safety education and training: 150,000Tk./ 20 person
21.	Work environment (including work safety)	i) Labor accidents ii) Diseases caused by air pollutants, water pollutants, and noise by construction work iii)Disturbance to local residents by labor and/or	i) Labor accidents - Handling heavy loads - Working at heights - Electric shocks ii) Environment pollution Ambient Air Quality Standards	i) & ii) - Prevention of labor accidents, traffic accidents, and health problems iii) Prevention of Disturbance to local residents	i) Labor accidents -Prepare a manual for labor accident prevention including safety education and training -Provide workers with appropriate personal protective equipment (PPE) -Inspect and ensure that any lifting devices, such as cranes, are appropriate	i) ii) & iii) - Construction area	i) ii) & iii) - During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
		security guards	- Noise level standards - Waste management rule - IFC guideline values for ambient air quality and noise (General/ 2007) - Perception of local residents		for expected loads -Keep lifting devices well maintained and perform maintenance checks as appropriate during the period of construction -Use equipment that protects against electric shock ii) Environment pollution - Observe related standards and provide workers with appropriate facilities iii) Disturbance to local residents - Education/training to labor and/or security guards				
22.	Accidents	- Traffic accidents	i)River traffic ii) Land traffic	i), ii) - Prevention of traffic accidents	i) River Traffic: - Setting marking buoys around the construction area for river safety - Informing construction schedules to local fishermen, etc. ii) Land traffic: - Informing bus schedules to the surrounding villages - Determining a traffic control plan - Training safe operation of vehicles	i) River area around the construction site for bridge construction ii) Area around the construction site	i), ii) - During construction phase	-Implementation : Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
23.	Cross-boundary impact and climate change	- CO_2 will be produced by construction work	-	- Reduce CO_2 emissions as much as possible	- Periodic maintenance and management of all construction machinery and vehicles	- Construction area	- During construction phase	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
C. Operation Stage									
. 1	Air Quality	i) Exhaust gas from vehicles used for mobilization of equipment and workers ii) Dust from road	i), ii) Ambient air quality standards -IFC guideline values for ambient air quality (General/ 2007) -DOE Guidelines -JICA Guidelines (2010)	i), ii) Prevention of air pollution	i), ii) Monitoring the ambient air quality along the road	i), ii) Along the road	1), 2) During the operation of the Road	RHD	RHD
. 2	Water Quality	Degradation due to Water quality road-run-off	Water Quality standards	Prevention of water pollution	Silt fencing, oil & grease traps, etc. shall be provided at sensitive water bodies to ensure that the water quality is not impaired due to contaminants from road run-off Monitoring shall be carried out as specified in the monitoring plan.	-salt pansand paddy fields	During the operation of the Road	RHD	RHD
. 3	Noise and Vibration	Noise caused by vehicles used for mobilization of equipment and workers	Noise standards -IFC guideline values for noise (General/2007) -JICA guideline	Prevention of noise and vibration impact	-Monitoring the noise and vibration levels -Determine a traffic control plan including route-setting	Along the road	During the operation of Road	RHD	RHD

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
			(2010)		-Limit truck speed, especially around residential areas -Install noise barrier (wall etc.) in sensitive areas, if necessary				
. 4	Soil Quality	Soil and water contamination from accidental spills	-Soil quality standards	Prevention of soil and water pollution in the surrounding area	-Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals. -Monitoring shall be carried out as specified in the Monitoring Plan	Salt/ paddy fields	During the operation of the Road	RHD	RHD
. 5	Sediment	Existence of bridge piers	World Bank OP4.04	Prevention of deterioration of tidal flat	Monitoring of sediment quality of mud flat and river bottom	River around bridges	During the operation of the Road	RHD	RHD
. 6	Protected areas	Near wildlife reserve and forests	Forest Act 1927 Bangladesh Wild Life (Preservation) (Amendment) Act, 1974	Desemination of hunting / capturing prohibition and other protected area rules to worker・	Holding an education program for wildlife Prohibition of illegal dumping Signs	2 areas near the reserved areas (Fasiakhali Wildlife reserves, Moheshkhali reserve forest	Ditto	Implementation: Contractor/ Environmental Consultant Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
. 7	Ecosystem	i) Mangrove forest ii) Tidal flats	i), ii) Bangladesh Wild Life Preservation (Amendment) Act, 1974 JICA Guideline (2010) -World Bank OP4.04	i), ii) Protection of endangered species Protection critical natural habitat	i) -Compensatory Afforestation in the Mangrove area; -Mangrove replantations for the lost forest ii) -Developing "protective measures" -Prohibit disturbance -Monitoring of water	i) -Compensatory Afforestation in the both bank of the Kohelia River ii) Around the new bridges.	During the operation of the Road	RHD	RHD

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
					quality, sedimentation and topographical features				
8	Disturbance to Poor People	- Poor households among those who are to be resettled.	- JICA Guideline (2010)	- Consideration for burden on vulnerable groups	- Implementing "livelihood restoration program", including job training programs to persons who want the training.	- At the site	During the operation of the Road	RHD	RHD
9	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	- Loss of existing livelihood, employment and business opportunities	- Income level, Number of employment opportunities for local residents and number of businesses around the construction area	- Maintaining or Improvement of the local economy - Maintaining or Improvement of living standards of local residents - Consideration to local residents' emotions	- Employ local residents as much as possible - Use the services (i.e., laundry and catering services, etc.) and products offered by the local community. - Developing "livelihood restoration program", including job training programs to persons who want the training.	Villages near the road	During the operation of the Road	RHD	RHD
10	Disturbance to Water Usage, Water Rights, etc.	- Adverse impact due to water pollution	- Same as those addressed in "Water quality"	- Same as those addressed in "Water quality"	- Implement the same mitigation measures as those addressed in "Water quality"	Villages near the road	During the operation of the Road	RHD	RHD
11	Disturbance to the Existing Social Infrastructure and Services	i)Traffic jams caused by increased traffic volumes ii)Improved roads	i) ii) -Accessibility to Social Infrastructure	i) Traffic volume will increase ii) Access to social services	i) Minimizing traffic volume by using buses for employees of port ii) Access to social services. The access road can be used even in the rainy season.	i), ii) Villages near the road	During the operation of the Road	RHD	RHD
12	Disturbance to Local Communities and Decision making Institutions	- Loss of access within community due to disturbance to passage	- Accessibility within community -Perception of local residents	- Ensuring accessibility within community and maintaining Local Decision making Institutions	- Ensuring passage (should be considered as the time of design and construction)	Villages near the road	During the operation of the Road	RHD	RHD
13	Unequal	-It can occur	-Perception of	Consideration to	- Developing an	Villages near	During the	RHD	RHD

Sl. No.	Potential Impact to be Managed	Sources of Potential Impact	Standard of Impact Assessment	Objectives	Management Effort	Management Location	Period of Management	Responsible Authority	Cost
	distribution of Benefits and Compensation	among residents, government officers, and local politicians	local residents	affected peoples' emotions	employment plan that is fair to every affected person	the road	operation of the Road		
14.	Infectious Diseases such as HIV/AIDS	- Temporary influx of migrant during operation may increase risk of infection	- sanitation for local residents	- Consideration for sanitation for local residents	- Education and training on health care of workers	Villages near the road	During the operation of the road	RHD	RHD
15.	Accidents	Traffic accidents	Land traffic	Prevention of traffic accidents	-Observation of traffic regulations, installation of traffic signs, and education on safe driving -Reducing the number of vehicles by scheduling buses -Consulting with related authorities on schedules -Informing vehicle schedules to the surrounding villages	Villages near the road	During the operation of the road	RHD	RHD
16.	Cross-boundary Impact and Climate Change	Efficient road maintenance Idling stops, economic driving	Amount of CO_2 emissions	Reduce CO_2 emissions per road length	Efficient maintenance Promotion of efficient fuel driving	Villages along the road	During the operation of the port	RHD	RHD

Table 4.9-3 Environmental Monitoring Plan of the Project (Port)

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
. Preconstruction Phase									
1.	Hydrology	i) - Possibility of water-logging due to construction of embankment/ any facilities	- Frequency and duration of flood/ water logging	- Collection of baselines for evaluation of possibility of flood/ water logging -Collection of baselines for examination of countermeasure upon necessity	- interview with key informants	- Villages near the site	- Twice a year before/after monsoon(past 5 years record shall be also asked at the first interview)	- Implementation: NGO - Supervisor: CPA /Design and Supervision Consultant	Expenses included in contract cost by Contractor
2.	Land acquisition and Resettlement	ii) Loss of private land iii) Loss of salt fields, shrimp farms and fishing sites iv) Loss of residential structures v) Loss of trees and pond	i), ii), iii) & iv) -The Acquisition and Requisition of Immovable Property Ordinance of 2017 JICA Guideline (2010)	i), ii), iii) & iv) Confirmation of compensation process	i), ii), iii) & iv) - Attendance at compensation payment Record of compensation agreements	i), ii), iii) & iv) -Areas eligible for compensation	i), ii), iii) & iv) - During land acquisition process	- Implementation : DC Office/ CPA - Supervisor: CPA/Design and Supervision Consultant	Expenses by CPA - Witness: 8,500Tk. /person/day
3.	Disturbance to poor classes	i) Poor households among those who are to be resettled ii) Loss of salt fields, shrimp farms and fishing sites	i), ii) - JICA Guideline (2010)	i), ii) - Same as those addressed in "Land acquisition"	i), ii) - Interviewing affected people	i), ii) - Affected people	i), ii) - Once a year	- Implementation : CPA/ NGO - Supervisor: CPA/ Design and Supervision Consultant	Expenses by CPA - Interviewer: 7,500Tk./ Person/day

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
4.	Social Institutions such as Social Infrastructure and Local Decision-making Institutions	- Loss of access to social infrastructure - community severance due to resettlement	- affected peoples' perceptions	- Confirmation of affected peoples' perceptions	- Interviewing affected people	- Affected people	- Once a year	- Implementation : CPA/ NGO Supervisor: CPA/ Design and Supervision Consultant	Expenses by CPA
5.	Unequal distribution of Benefits and Compensation	- It can occur among residents, workers, government officers and local politicians	*Ditto*	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions "	- Implementation : CPA/ NGO Supervisor: CPA/ Design and Supervision Consultant	Expenses by CPA
6.	Local Conflicts of Interest	- It can occur among residents, workers, government officers and local politicians	*Ditto*	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions"	- Implementation : CPA/ NGO Supervisor: CPA/ Design and Supervision Consultant	Expenses by CPA
7.	Gender	Inappropriate distribution of compensation within HHs	distribution of compensation within HHs	- Appropriate distribution of compensation within HHs	Interview of Project Affected Persons	- Same as those addressed in "Land Acquisition"	- Same as those addressed in "Land Acquisition"	- Implementation : CPA/ NGO Supervisor: CPA/ Design and Supervision Consultant	Expenses by CPA

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
Construction Phase									
1.	Air Quality	i) Dust resulting from construction work ii) Exhaust gas from construction machinery and vehicles used for mobilization of equipment iii) Air pollution arising from incineration of construction materials and waste	i), ii) & iii) -PM_{10} - Ambient Air Quality Standard - IFC guideline values for ambient air quality (General/ 2007) - Meteorological Condition (Temperature, Moisture, Wind)	i), ii) & iii) - Evaluation of effect of the mitigation measures towards air pollution	i), ii) & iii) - Collecting samples and analyzing at a lab - Measuring meteorological data	i), ii) & iii) **- 2 points** Residential area around the Port	i), ii) & iii) - Once every three months	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA and CPGCBL/ Supervision Consultant	Expenses included in contract cost by Contractor Sampling: 50,000Tk./sample Analyzing :45,000Tk./sample
2.	Water Quality (Soil) (Sediment)	i) Runoff water from construction area ii) Domestic wastewater of workers iii) Inappropriate disposal of waste iv) Leakages of oil and chemical materials from construction activity	i), ii) iii) & iv) **pH, BOD, TSS, Oil, Coliforms, SS** **Diffusion of the Silt by SS and physical properties and shape** - Wastewater standards - Ambient water quality standards (inland surface water) - Ground water (Drinking water quality standards)	i), ii) iii) & iv) - Evaluation of effect of the mitigation measures towards water pollution	i), ii) iii) & iv) - Collecting samples and analyzing at a lab	i), ii) iii) & iv) **- 1 point:** Foreside of the drain outlet **- 1 point:** Surface water near the construction area **- 1 point:** Ground water from existing wells **- 4 points:** Sea water near the construction area	i), ii) iii) & iv) - Once every three months	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA and CPGCBL / Supervision Consultant	Expenses included in contract cost by Contractor Sampling: 50,000Tk./ sampling - Analyzing: 100,000Tk./ all sample

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
	Water (Sedimentation)	Diffusion of clay content by land dumping of the dredged soil	Survey of outflow / scattering on land, SS concentrations	Evaluation of effect of the mitigation measure towards water pollution	Collecting samples at the site, analyzing at a lab temperature profile with CTD meter	Land dumping site area	-seasonal (twice a year)	-Implementation: Contractor/ Environmental Consultant Supervisor: CPGCBL/ Supervision Consultant	Expenses by CPGCBL
			Water depth of the sea	Ditto	On-site	Ocean dumping site area	-seasonal (twice a year)	Ditto	Ditto
	Water (Ecosystem)	Pollution by the ocean dumping of the dredged soil	Pollution of water quality around the dumping site (salinity, BOD, temperature, colors, SS etc.)	Evaluation of effect of the mitigation measure towards water pollution	Collecting samples at the site Analysis based on the indicators that relate to the habitats of flora and fauna	Ocean dumping site area	-seasonal (twice a year)	Ditto	Ditto
3.	Wastes (Odor) (Sediment)	i) Domestic waste from workers ii) Hazardous waste such as dry batteries, etc.	i), ii) - Waste Management Rules	i), ii) - Evaluation of effect of the mitigation measures for waste	i), ii) - Record of kinds and quantity of waste, and the disposal method	i), ii) - Construction area	i), ii) - Continuous records	-Implementation: Contractor/ Environmental Consultant -Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
		Dumping the dredged soil	Rules for dredging	Prohibiting the inadequate dumping	Samples from the dredged soil Dumping 7 million m3 (350 million m3 for ocean dumping, another 350 million m3 for land dumping for 33 ha 8m height)	Dredging area	During construction	-Implementation: Contractor/ Environmental Consultant -Supervisor: CPGCBL / Supervision Consultant	Inclusive to Contractor fee
4.	Soil	Dumping the dredged soil	Physical properties and chemical composition of dredged soil	Prohibiting the inadequate dumping Evaluation of the effects of the mitigation measures	Samples from the dredged soil	Dredging area	During construction	Same as above	Expenses by CPGCBL
		Dumping the dredged soil	Particle size distribution	Evaluation of the effects of the mitigation measures	Sample soil in the Sonadia coast	Sonadia island	During construction	Same as above	Expenses by CPGCBL
5.	Noise and Vibration	i) Noise and vibration caused by construction machinery ii) Noise caused by vehicles used for mobilization of equipment and workers	i), ii) **Noise level** - Noise level standards - IFC guideline values for noise (General/ 2007)	i), ii) - Evaluation of effect of the mitigation measures towards noise levels	i), ii) - Measurement using noise level meter	i), ii) **- 3 points:** On the border of the site near the residential areas	i), ii) - Once every three months	-Implementation: Contractor/ Environmental Consultant -Supervisor: CPA/ and CPGCBL Supervision Consultant	Expenses included in contract cost by Contractor - Measurement: 50,000Tk. / session

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
6.	Ecosystem (Endangered Species)	i) Existence of endangered species ii) Spawning of sea turtles	i), ii) **Species, Number** - Bangladesh Wild Life Preservation (Amendment) Act, 1974 - JICA Guideline (2010)	i) Evaluation of existence of endangered species ii) Evaluation of spawning of sea turtles	i), ii) - Observation	i) Endangered species **- 1 point:** Construction area ii) Sea turtle **- 2 lines:** Beach in front of the site and the sandbar	i) Endangered species - Bird: Once a week in migration season - Others: Twice a year in dry and rainy seasons ii) Every 3 days in spawning season	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA and CPGCBL / Supervision Consultant	Expenses included in contract cost by Contractor -Observation: 400,000Tk./ Researcher/year
	Ecosystem (Marine Biota)	i) Potential impact due to the degradation of water quality caused by civil engineering work ii) Domestic wastewater of workers iii) Inappropriate disposal of solid waste	i), ii) & iii) **Species, Number** - Phyto and Zoo Plankton - Benthos (Sea bottom)	i), ii) & iii) - Evaluation of effect of the mitigation measures towards water pollution - Confirming the population and change in types of marine organisms	i), ii) & iii) - Collecting samples at the site, analyzing at a lab	i), ii) & iii) **- 4 points:** Sea area in front of construction area	i), ii) & iii) - Twice a year in dry and rainy seasons	Implementation: Contractor/ Environmental Consultant Supervisor: CPA and CPGCBL / Supervision Consultant	Expenses included in contract cost by Contractor - Sampling & analyzing: 200,000Tk./ season (Same as "water quality")
	Ecosystem (Mud Flat, Fish & Nekton)	i), ii) & iii) Ditto	i), ii) & iii) **Species, Number, Weight** Benthos (Mud flat)	i), ii) & iii) Ditto	i), ii) & iii) - Collecting samples at the site, analyzing at a lab	i), ii) & iii) **- 1 point:** In front of the site	i), ii) & iii) - Twice a year in dry and rainy seasons	Implementation: Contractor/ Environmental Consultant Supervisor: CPA and CPGCBL /	Expense is included in contract cost by Contractor

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
			Fish and Nekton					Supervision Consultant	- Sampling & analyzing: 200,000Tk./ season
7.	Sedimentation	i) Drainage from the construction area ii) Domestic wastewater from workers iii) Leakage of oil and chemical substances in construction work	i) - iii) - Drainage standard - Waste disposal regulation	i) - iii) - Prevention of water pollution in surrounding areas	i) - iii) - same as water quality and waste	i) - iii) - Construction area	i) - iii) Construction time	Implementation: Contractor/ Environmental Consultant Supervisor: CPA and CPGCBL / Supervision Consultant	Inclusive in the contractor's contract
8.	Hydrology	- Possibility of water-logging due to construction of embankment/ any facilities	- Frequency and duration of flood/ water logging	- Evaluation of possibility of flood/ water logging - Examination of countermeasure upon necessity	a) continuous record at the gate of port facility using water level chart b) interview with key informants	a) at the gate of port facility b) Villages near the site	a) Continuous records b) Twice a year before/after monsoon	- Implementation: Contractor/ NGO - Supervisor: CPA and CPGCBL /Supervision Consultant	Expenses included in contract cost by Contractor
9.	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	i) Loss of existing livelihood, Increase in employment and business opportunities ii) Dredging work	i) - Income level, Number of employment opportunities for local residents and number of businesses around the construction area ii) - Fish catch volume and income from fishery	i) - Maintaining or Improvement of the local economy - Maintaining or Improvement of living standards of local residents - Consideration	i) - Information from related institutions - Interviewing residents ii) - Interview with fishermen working at fishing grounds near	i) - Related institutions - Villages near the site ii) - Fishing grounds near the site	- Once a year	- Implementation: Contractor/ NGO - Supervisor: CPA/CPGCBL/Supervision Consultant	Expenses included in contract cost by Contractor -Interviewer: 5,500Tk./ researcher (Same as "Poor

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
				to local residents' perceptions ii) - Proper compensation and/or assistance if negative impact is confirmed	the site (Hasher Char) - Data collection from fisheries union - Data collection from Department of Fishery	- Department of Fishery in Cox's Bazar			people")
10.	Land Use and Utilization of Local Resources	- Changing the traditional land use patterns and utilization of local resources	- Usage of land and local resources	- Observation of land use change - Observation of local resource usage	- Field observation -Interviewing residents	- Villages near the site	- Once a year	- Implementation: Contractor/ NGO Supervisor: CPA Supervision Consultant	Expenses included in contract cost by Contractor
11.	Disturbance to Water Usage, Water Rights, etc.	Usage of underground water	Pollution and Usage of underground water	- Evaluation of mitigation measure to underground water pollution - consideration to water usage of local residents	- Same as those addressed in "Water quality" - water levels and water quality at wells in residential areas	1 point: existing well	- Quarterly	- Implementation: Contractor/ NGO Supervisor: CPA/Supervision Consultant	Expenses included in contract cost by Contractor
12.	Disturbance to Existing Social Infrastructure and Services	i) Increase in the number of vessels ii) Increase in the number of cars	i), ii) - Traffic volume by construction	i), ii) - Evaluation of effect of construction schedule	i), ii) - Record of numbers of vessels and cars being used	i), ii) - Project site	i), ii) - Continuous records	- Implementation : Contractor/ NGO - Supervisor: CPA/Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
13.	Local Conflicts of Interest	- Conflict between local residents and external workers	- Change in local customs - Consciousness of local residents	- Confirmation of the attitudes of local residents to the project	- Interviewing residents	- Villages near the site	- Once a year	- Implementation: Contractor/ NGO - Supervisor: CPA/Supervision Consultant	Expenses included in contract cost by Contractor - Interviewer: 7,500Tk./researcher (Same as "Poor People")
14.	Gender	- Unequal opportunity of employment	Opportunity of employment	Equal opportunity of employment	- Interviewing residents	- Residential area of Project Affected Persons	- Once a year"	- Implementation: Contractor/ NGO Supervisor: CPA/Supervision Consultant	Expenses included in contract cost by Contractor
15.	Children's Right	- Child labor	Banning Child labor	- Evaluation of effect of banning child labor	- Checking the labor contracts between subcontractor and workers - Patrolling construction area for child labor	- Construction area	- Once a year	- Implementation: Contractor/ NGO Supervisor: CPA/Supervision Consultant	Expenses included in contract cost by Contractor
16.	Infectious Diseases such as HIV/AIDS	- Temporary influx of migrant labor during construction may increase risk of infection	-Health of labours/ residents	- Evaluation of sanitation for labor	- Labor health records	- Related institutions	- Once a year	- Implementation: Contractor/ NGO - Supervisor: CPA/Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
17.	Work Environment (Including Work Safety)	- Labor accidents	- Handling heavy loads - Working at heights - Electric shock	- Evaluation of effect of the work safety plan	- Record of accidents	- Contractor's office	- Continuous records	- Implementation: Contractor - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor
18.	Accidents	- Traffic accidents	-Marine traffic -Land traffic	- Evaluation of effect of traffic schedules	- Record of accidents	- Contractor's office	- Continuous records	- Implementation: Contractor - Supervisor: CPA/ Supervision Consultant	Expenses included in contract cost by Contractor
19.	Cross-boundary Impact and Climate Change	- CO_2 will be produced by construction work	-	- Efforts to reduce CO_2	- Record of machinery maintenance	- Contractor's office	- Continuous records	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/Supervision Consultant	Expenses included in contract cost by Contractor
. Operation Phase									
1.	Air Quality	i) Exhaust gas from vehicles used for mobilization of equipment and workers ii) Dust from cargo handling activity at jetty and yard iii) Exhaust gas from vessels	i), ii) & iii) **SO_2, NO_2, PM_{10}** - Emission gas standards - Ambient air quality standards - IFC guideline values for gas emission and ambient air quality (General/ 2007) i), ii) & iii) **Meteorological Condition**	i), ii) & iii) - Evaluation of effect of the mitigation measures towards air pollution	Set up CEMS (Continuous Emission Monitoring System) i), ii) & iii) - Collecting samples at the site, analyzing at a lab - Measuring the meteorological	Installation of CEMS at the gate of the Port. **-2 points measurements:** Residential area around the port	-Continuous measurement -two points measurements shall be once in every 3 months	Implementation and supervision: CPA and Environmental Consultant	-CEMS (Expenses included in contract cost by Contractor) Expenses by CPA -Sampling: 50,000Tk.

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
			(Temperature, Moisture, Wind) - MALPOL 73/78 treaty						/ staff - Analyzing: 45,000Tk. / sample
2.	Water Quality (Soil) (Sediment)	i) Dredging material for the maintenance of the navigation channel ii) Wastewater from port area iii) Leakages of oil and chemical materials iv) Wastewater from vessels will cause water pollution	i), ii) iii) & iv) **Water temperature, TSS, pH, DO, SS, oil, BOD,** **COD, Heavy metals** Clay content diffusion in the sea - Wastewater standards - IFC guideline values for wastewater - Ground water (Drinking water quality standards) iii) & iv) - MALPOL 73/78 treaty iv) International Convention for the control and management of Ships' Ballast Water and Sediments (BWM), 2004 -Ground water (Drinking water quality standards)	i), ii) iii) & iv) - Evaluation of effect of the mitigation measure towards water pollution	i) Collecting samples at the site, analyzing at a lab temperature profile with CTD meter ii), iii) & iv) - Collecting samples at the site, analyzing at a lab - Continuous measurement using a sensor - Record of vessels log - Record of oil leakages	- **4 points:** Sea area around Dredging area and disposal of wastewater from the Port to the sea. - **2 points: One** Ground water from existing well inside the port and another ground water of the deep tube-well from the nearby residential area	- Once every 3 months for the sea water testing - Sampling and analyzing: **SS, Oil, BOD, Heavy metal etc.(as necessary)** - Continuous measurement: pH - Drinking water quality measurement for the Ground water	Implementation and supervision: CPA and Environmental Consultant	- Continuous sensor (Expenses included in contract cost by Contractor) and Expenses by CPA Sampling: 100,000Tk./ staff - Analyzing: 200,000Tk./sample

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
	Water (Sedimentation)	Diffusion of clay content by continuous land dumping of the dredged soil	Survey of outflow / scattering on land,	Evaluation of effect of the mitigation measure towards water pollution	Collecting samples at the site, analyzing at a lab temperature profile with CTD meter	Land dumping site area	-seasonal (twice a year)	Implementation and supervision: CPA and Environmental Consultant	Expenses by CPA
	Water (Ecosystem)	Pollution by the continuous ocean dumping of the dredged soil	Pollution of water quality around the dumping site, Water depth of the sea	Evaluation of effect of the mitigation measure towards water pollution	Collecting samples at the site,	Ocean dumping site area	-seasonal (twice a year)	Implementation and supervision: CPA and Environmental Consultant	Expenses by CPA
3.	Waste (Odor) (Sediment)	i) Sewage and garbage from workers ii) Waste from vessels	i) & ii) - Waste management rules - MALPOL 73/78 treaty	i) & ii) - Evaluation of effect of the waste handling	i) Record of the amount garbage ii) Record of the amount of waste from vessels	- Port office	- Continuous record	Implementation and supervision: CPA and Environmental Consultant	Expenses by CPA
20.	Soil	Dredged soil	Physical properties and chemical composition of the dredged soil	Prohibiting the inadequate dumping Evaluation of the effects of the mitigation measures	Samples from the dredged soil in the ocean	Dredging area	Quarterly (4 times a year)	CPA	Expenses by CPA
4.	Noise and Vibration	i) Noise and vibration from port generators, and pumps, etc. ii) Noise caused by vehicles used for mobilization of equipment and workers iii) Noise from cargo handling activity at jetty and the port area	i), ii) & iii) **Noise level** -Noise standards -IFC guideline values for noise	i), ii) & iii) - Evaluation of effect of the mitigation measures towards noise levels	i), ii) & iii) - Measurement using noise level meter	i), ii) & iii) **3 points:** On the border of the site near the residential area	i), ii) & iii) - Once every 3 months	Implementation and supervision: CPA and Environmental Consultant	Expenses by CPA - Measurement: 100,000Tk./ season

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
5.	Ecosystem (Endangered Species)	i) Existence of endangered species (migration bird) ii) Spawning of sea turtles	a. & ii) **Species, Number** - Bangladesh Wild Life Preservation (Amendment) Act, 1974 - JICA Guideline (2010)	i) Evaluation of existence of endangered species (migration bird) ii) Evaluation of spawning of sea turtles	i) & ii) - Observation	i) Endangered species (migration bird) **- 2 point: Port Area and Sonadia island** ii) Sea turtles **- 2 lines:** Beach in front of the port site and the sandbar	i) Once a week in migration season ii) Every 3 days in spawning season	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses by CPA -Observation: 250,000Tk// researcher
	Ecosystem (Marine Biota)	i) Potential impact due to the degradation of water quality caused by civil engineering works ii) Domestic wastewater of workers iii) Inappropriate disposal of solid waste	i), ii) & iii) **Species, Number** - Phyto and Zoo Plankton - Benthos (sea bottom)	i), ii) & iii) -Evaluation of effect of the mitigation measure towards water pollution -Confirming the population and change in types of the marine organisms	i), ii) & iii) - Collecting samples at the site, analyzing at a lab	i), ii) & iii) **- 4 points:** Sea area in front of the site	i), ii) & iii) - Twice a year in dry and rainy seasons	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses by CPA - Sampling & Analyzing: 400,000Tk./ all sample

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
	Ecosystem (Mud Flat, Fish & Nekton)	Ditto	i), ii) & iii) **Species, Number, Weight** -Benthos (mud flat) -Fish and nekton	i), ii) & iii) Ditto	i), ii) & iii) - Collecting samples at the site, analyzing at a lab	i), ii) & iii) **-2 point:** In front of the port site	i), ii) & iii) - Twice a year in dry and rainy seasons	- Implementation: Contractor/ Environmental Consultant - Supervisor: CPA/ Supervision Consultant	Expenses by CPA - Sampling & Analyzing : 350,000Tk./ all sample
6.	Sedimentation	i) Drainage from the construction area ii) Domestic wastewater from workers iii) Leakage of oil and chemical substances in construction work	i) - iii) - Drainage standard - Waste disposal regulation	i) - iii) - Prevention of water pollution in surrounding areas	i) - iii) - same as water quality and waste	i) - iii) - Construction area	i) - iii) Construction time	Supervisor: CPA/ Supervision Consultant	Inclusive in the contractor 's contract
7.	Hydrology	- Possibility of water-logging due to construction of embankment/ any facilities	- Frequency and duration of flood/ water logging	- Evaluation of possibility of flood/ water logging - Examination of countermeasure upon necessity	a) continuous record at the gate of port facility using water level chart b) interview with key informants (past 10 years record shall be also asked at the first interview for baseline)	a) at the gate of port facility b) Villages near the site	a) Continuous records b) One a year	- Implementation: Contractor/ NGO - Supervisor: CPA/Supervision Consultant	Expenses included in contract cost by Contractor
8.	Disturbance to Poor Classes	- Increase in employment and business opportunities	- Income level	- Evaluation of improvement of living standard	- Interviewing residents	- Villages near the site	Once a year	Implementation: Environmental Consultant/ NGO Supervision: CPA	Expenses by CPA

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
9.	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	i) Increase in employment and business opportunities ii) Possibility of hinderance to fishery by navigation of vessels	i) Number of employed local residents and shops ii) Fish catch volume and income from fishery	i) Evaluation of increase in employment and business opportunities ii) Proper compensation and/or assistance if negative impact is confirmed	i) Ditto ii) - Interview with fishermen working at fishing grounds near the site (Hasher Char) - Data collection from fisheries union - Data collection from Department of Fishery	i) Ditto ii) - Fishing grounds near the site - Department of Fishery in Cox's Bazar	Once a year	Implementation: Environmental Consultant/ NGO Supervision: CPA	Expenses by CPA
10.	Land Use and Utilization of Local Resources	- Changing traditional land use patterns and utilization of local resources	Usage of land and local resources	- Observation of land use change - Observation of local resource usage	- Field observation - Interviewing residents	- Villages near the site	- Once a year	Implementation: Environmental Consultant/ NGO Supervision: CPA	Expenses by CPA - Interviewer: 7,500Tk./researcher (Same as "Poor people")
11.	Disturbance to the Existing Social Infrastructure and Services	i) Increase in the number of vessels ii) Increase in the number of cars	i), ii) - Traffic volume	i) & ii) - Evaluation of effect of traffic schedules	i), ii) - Record of numbers of vessels and vehicles being used	i) & ii) - Project site	i) & ii) Once a year	Implementation: Environmental Consultant/ NGO Supervision: CPA	Expenses by CPA
12.	Unequal distribution of Benefits and Compensation	- It can occur among residents, workers, government officers, and local politicians	Consciousness of local residents	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	- Once a year	Implementation: Environmental Consultant/ NGO Supervision: CPA	Expenses by CPA

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
13.	Local Conflicts of Interest	- Conflict between local residents and workers	Consciousness of local residents	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	- Once a year	Implementation: Environmental Consultant/ NGO Supervision: CPA	Expenses by CPA
14.	Gender	Unequal opportunity of employment	Opportunity of employment	- Equal opportunity of employment	-Interview with relevant agencies - Interview with residents	- Project site"	- Once a year	Implementation: Environmental Consultant/ NGO Supervision: CPA	Expenses by CPA
15.	Children's Rights	i) Child labor ii) Improved livelihoods	i) Child labor ii) School Enrollment	i) Evaluation of effect of banning child labor ii) Evaluation of access to education	i) Child labor - Checking labor contracts between subcontractor and workers - Patrolling construction area for child labor ii) Interview with residents	i) Working area ii) Villages near the site	i) & ii) Once a year	Implementation: Environmental Consultant/ NGO Supervision: CPA	Expenses by CPA
16.	Work Environment (Including Work Safety)	- Labor accidents	- Labor accidents - Handling heavy loads - Working at heights - Electric shocks	- Evaluation of effect of the work safety plan	- Record of accidents	-Port area	- Continuous records	Implementation / Supervision: CPA	Expenses by CPA
17.	Accidents	Traffic accidents Fire	i) Traffic accidents - Land traffic - Marine traffic ii) Fire - Record	i), ii) - Evaluation of effect of the work safety plan	i), ii) - Record of accidents and fire	i), ii) - Port Area	- Continuous records	Implementation / Supervision: CPA	Expenses by CPA

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Implementing and Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
18.	Cross-boundary Impact and Climate Change	- CO_2 emissions	- Amount of CO_2 emissions	- Efforts to reduce CO_2	- Calculate the CO_2 emissions from fuel consumption	- Port area and the vessels	- Once a year	- CPA and Environmental Consultant	Expenses by CPA

Table 4.9-4 Environmental Monitoring Plan of the Project (Road)

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
A. Preconstruction Phase									
1.	Land acquisition	i) Loss of private land ii) Loss of salt fields, shrimp farms and fishing sites iii) Loss of residential structures iv) Loss of trees and water body	i), ii), iii) & iv) -The Acquisition and Requisition of Immovable Property Ordinance of 2017 -JICA Guideline (2010)	i), ii), iii) & iv) -Confirmation of compensation process	i), ii), iii) & iv) - Attendance at compensation payment - Record of compensation agreements	i), ii), iii) & iv) -Areas eligible for compensation	i), ii), iii) & iv) - During land acquisition process	- Office of the Deputy Commissioner - RHD	Expenses by RHD - Witness: 8,500Tk. /person/day
2.	Disturbance to poor people Classes	i) Poor households among those who are to be resettled ii) Loss of salt fields, shrimp farms and fishing sites	i), ii) - JICA Guideline (2010)	i), ii) - Same as those addressed in "Land acquisition"	i), ii) - Interviewing affected people	i), ii) - Affected people	i), ii) - Once a year	- Implementation : Contractor/ Environmental Consultant - Supervisor: RHD/Supervision Consultant	Expenses by RHD - Interviewer: 7,500Tk./ Person/day
3.	Social Institutions such as Social Infrastructure and Local Decision-making Institutions	- Loss of access to social infrastructure - community severance due to resettlement	- affected peoples' perceptions	- Confirmation of affected peoples' perceptions	- Interviewing affected people	- Affected people	- Once a year	Implementation: Contractor/ Environmental Consultant Supervisor: RHD/Supervision Consultant	Expenses by RHD
4.	Unequal distribution of Benefits and Compensation	- It can occur among residents, workers, government officers and local politicians	*Ditto*	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions "	- Implementation: Contractor/Environmental Consultant	Expenses by RHD

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
								- Supervisor: RHD/ Supervision consultant	
5.	Local Conflicts of Interest	- It can occur among residents, workers, government officers and local politicians	*Ditto*	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions"	- Same as those addressed in "Social Institutions "	-Implementation: Contractor/ Environmental Consultant -Supervisor: RHD/ Supervision Consultant	Expenses by RHD
6.	Gender	Inappropriate distribution of compensation within HHs	distribution of compensation within HHs	- Appropriate distribution of compensation within HHs	Interview of Project Affected Persons	- Same as those addressed in "Land Acquisition"	- Same as those addressed in "Land Acquisition"	- Office of the Deputy Commissioner RHD	Expenses by RHD
B.	**Construction Phase**								
1.	Air Quality	i) Emission from construction vehicles and machinery ii) Air pollution from various plants affecting settlements iii) Air pollution may exceed the limits prescribed by the DOE/IFC/JICA guidelines iv) Vehicles will generate dust and suspended particles	i), ii) iii) & iv) **- PM_{10}, $PM_{2.5}$ SO_2, NOx, CO** - Ambient Air Quality Standard - IFC guideline values for ambient air quality (General/ 2007) **- Meteorological Condition (Temperature, Moisture, Wind)**	i), ii) iii) & iv) - Evaluation of effect of the mitigation measures towards air pollution	i), ii) iii) & iv) - Collecting samples and analyzing at a lab - Measuring meteorological data	i), ii) iii) & iv) **- 3 points** Residential area around the P	i), ii) iii) & iv) - Once every three months	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor Sampling: 50,000Tk./ sample Analyzing: 45,000Tk./ sample

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
2.	Water Quality (Soil) (Sediment)	i) Runoff water from construction area ii) Domestic wastewater of workers iii) Inappropriate disposal of waste iv) Leakages of oil and chemical materials from construction activity	i), ii) iii) & iv) **pH, BOD, TSS, Oil & Grease, etc.** - Wastewater standards - Ambient water quality standards (inland surface water) - Ground water (Drinking water quality standards)	i), ii) iii) & iv) - Evaluation of effect of the mitigation measures towards water pollution	i), ii) iii) & iv) - Collecting samples and analyzing at a lab	i), ii) iii) & iv) **- 3 point:** Foreside of the drain outlet **- 3 point:** Surface water near the construction area **- 3 point:** Ground water from existing wells	i), ii) iii) & iv) - Once every three months	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor Sampling: 50,000Tk./ sampling - Analyzing: 100,000Tk./ all sample
3.	Waste	i)Construction waste due to construction ii) Hazardous waste iii) illegal dumping	i), ii) waste management rules iii) waste management rules /RHD standards	i), ii) preventing inadequate waste management iii) preventing illegal dumping	1) Promote separate collection, recycling, and reuse of construction waste. - Handle waste that can not be recycled properly according to regulations. - Prohibition by Signboard of illegal dumping 2) Hazardous waste - Treat hazardous waste appropriately according to relevant regulations iii) checking the illegal dumping on	I) Construction site II) After any accidental spillage on the road and its nearby area Iii) Near Protected areas	-ii) after the accidental spillage -i) , iii) Once in every three months	-Implementation: Contractor/ Environmental Consultant -Supervisor: RHD/ DoFo/Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
					the road				
4.	Wastes (Odor) (Sediment)	Domestic waste from workers	- Waste Management Rules	- Evaluation of effect of the mitigation measures for waste	- Record of kinds and quantity of waste, and the disposal method	- Construction area	1) - 4) - Continuous records	-Implementation: Contractor/ Environmental Consultant -Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
5.	Noise and Vibration	i) Noise and vibration levels from vehicles, Asphalt plants and equipment ii) Noise barriers	i), ii) **Noise level** - Noise level standards - IFC guideline values for noise (General/ 2007)	i), ii) - Evaluation of effect of the mitigation measures towards noise levels	i), ii) - Measurement using noise level meter	i), ii) Free field at 1m from the equipment whose noise levels are being determined.	i), ii) - Once every three months	-Implementation: Contractor/ Environmental Consultant -Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor - Measurement: 50,000Tk./ session
6.	Ecosystem (Endangered Species)	i) Mangrove forest ii) Tidal flats	i), ii) **Species, Number** - Bangladesh Wild Life Preservation (Amendment) Act, 1974 - JICA Guideline (2010)	iii) Evaluation of existence of endangered species	i), ii) - Observation	i) Endangered species **- 3 point:** Construction area	i) Endangered species - Bird: Once a week in migration season - Others: Twice a year in dry and rainy seasons ii) Every 3 days in spawning season	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor -Observation: 400,000Tk./ Researcher/year
	Ecosystem (Mud Flat, Fish & Nekton)	i), ii) & iii) Ditto	i), ii) & iii) **Species, Number,**	i), ii) & iii) Ditto	i), ii) & iii) - Collecting samples at the site, analyzing	i), ii) & iii) **- 3 points:** In front of the	i), ii) & iii) - Twice a year in dry and rainy	Ditto	Expense is included in contract cost by Contractor

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
			Weight - Benthos (Mud flat) - Fish and Nekton		at a lab	construction sites especially the river crossings	seasons		- Sampling & analyzing: 200,000Tk./ season
7.	Topography and geology	Land erosion	Surface water SS concentration	- Evaluation of land erosion	- See water quality	See water qualit	See water qualit	See water qualit	See water qualit
8.	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	- Loss of existing livelihood, - Increase in employment and business opportunities	- Income level, Number of employment opportunities for local residents and number of businesses around the construction area	- Maintaining or Improvement of the local economy - Maintaining or Improvement of living standards of local residents - Consideration to local residents' perceptions	- Information from related institutions - Interviewing residents	- Related institutions - Villages near the site	- Once a year	- Implementation: Contractor/ NGO - Supervisor: RHD/Supervision Consultant	Expenses included in contract cost by Contractor -Interviewer: 5,500Tk./ researcher (Same as "Poor people")
9.	Land Use and Utilization of Local Resources	- Changing the traditional land use patterns and utilization of local resources	- Same as those addressed in "Local Economy"	- Observation of land use change - Observation of local resource usage	- Field observation Interviewing residents	- Villages near the site	- Once a year	- Implementation: Contractor/ NGO - Supervisor: RHD/Supervision Consultant	Expenses included in contract cost by Contractor
10.	Disturbance to Water Usage, Water Rights, etc.	Usage of underground water	Pollution and Usage of underground water	- Evaluation of mitigation measure to underground water pollution - consideration to water usage of	- Same as those addressed in "Water quality" - water levels and water quality at wells in residential areas	1 point: existing well	- Quarterly	- Implementation: Contractor/ NGO - Supervisor: RHD/Supervision Consultant	Expenses included in contract cost by Contractor

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
				local residents					
11.	Disturbance to Existing Social Infrastructure and Services	i) Increase in the number of vessels ii) Increase in the number of cars	i), ii) - Traffic volume by construction	i), ii) - Evaluation of effect of construction schedule	i), ii) - Record of numbers of vessels and cars being used	i), ii) - Project site	i), ii) - Continuous records	- Implementation: Contractor/ NGO - Supervisor: RHD/Supervision Consultant	Expenses included in contract cost by Contractor
12.	Local Conflicts of Interest	- Conflict between local residents and external workers	- Change in local customs - Consciousness of local residents	- Confirmation of the attitudes of local residents to the project	- Interviewing residents	- Villages near the site	- Once a year	- Implementation: Contractor/ NGO - Supervisor: RHD/Supervision Consultant	Expenses included in contract cost by Contractor
13.	Gender	- Unequal opportunity of employment	Opportunity of employment	Equal opportunity of employment	- Interviewing residents	- Residential area of Project Affected Persons	- Once a year"	- Implementation: Contractor/ NGO - Supervisor: RHD/Supervision Consultant	Expenses included in contract cost by Contractor
14.	Children's Right	- Child labor	Banning Child labor	- Evaluation of effect of banning child labor	- Checking the labor contracts between subcontractor and workers - Patrolling construction area for child labor	- Construction area	- Once a year	- Implementation: Contractor/ NGO - Supervisor: RHD/Supervision Consultant	Expenses included in contract cost by Contractor
15.	Infectious Diseases such as HIV/AIDS	- Temporary influx of migrant labor during construction may increase risk of infection	-Health of labours/ residents	- Evaluation of sanitation for labor	- Labor health records	- Related institutions	- Once a year	- Implementation: Contractor/ NGO - Supervisor: RHD/Supervision Consultant	Expenses included in contract cost by Contractor
16.	Work Environment	- Labor accidents	- Handling heavy loads	- Evaluation of effect of the work	- Record of accidents	- Contractor's office	- Continuous records	- Implementation: Contractor	Expenses included in contract cost by

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
	(Including Work Safety)		- Working at heights - Electric shock	safety plan				- Supervisor: RHD/ Supervision Consultant	Contractor
17.	Accidents	- Traffic accidents	-River traffic -Land traffic	- Evaluation of effect of traffic schedules	- Record of accidents	- Contractor's office	- Continuous records	- Implementation: Contractor - Supervisor: RHD/ Supervision Consultant	Expenses included in contract cost by Contractor
18.	Cross-boundary Impact and Climate Change	- CO_2 will be produced by construction work	-	- Efforts to reduce CO_2	- Record of machinery maintenance	- Contractor's office	- Continuous records	- Implementation: Contractor/ Environmental Consultant - Supervisor: RHD/Supervision Consultant	Expenses included in contract cost by Contractor
C.	**Operation Phase**								
1.	Air Quality	i) Exhaust gas from vehicles used for mobilization of equipment and workers ii) Dust from road	i), ii) & iii) **CO, SO_2, NO_2, PM_{10}** - Emission gas standards - Ambient air quality standards - IFC guideline values for gas emission and ambient air quality (General/ 2007) i), ii) & iii) **Meteorological Condition (Temperature, Moisture, Wind)**	i), ii) & iii) - Evaluation of effect of the mitigation measures towards air pollution	i), ii) & iii) - Collecting samples at the site, analyzing at a lab - Measuring the meteorological	**-3 points measurements:** Residential area around the Access Road	-Continuous 24 hours in three points measurements shall be once in every 3 months	- RHD/ Environmental Consultant	Expenses by RHD -Sampling: 50,000Tk./ staff -Analyzing: 45,000Tk./ sample

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
2.	Water Quality	Degradation due to Water quality road-run-off	**Water Temperature, TSS, pH, DO, SS, Oil & Grease , BOD, COD, Heavy metals** - Wastewater standards - IFC guideline values for wastewater - Ground water (Drinking water quality standards)	- Evaluation of effect of the mitigation measure towards water pollution	- Collecting samples at the site, analyzing at a lab	- **3 Surface (river crossings) water points** - **Three** Ground water points	- Pre-monsoon & Monsoon Seasons	- RHD/ Environmental Consultant	- Continuous sensor (Expenses included in contract cost by Contractor) and Expenses by RHD Sampling: 100,000Tk./ staff - Analyzing: 200,000Tk./sample
3.	Noise and Vibration	Noise caused by vehicles used for mobilization of equipment and workers	**Noise level** -Noise standards -IFC guideline values for noise	- Evaluation of effect of the mitigation measures towards noise levels	- Measurement using noise level meter	**3 points:** On the access road of the site near the residential area	- Once every 3 months	- RHD/ Environmental Consultant	Expenses by RHD - Measurement: 100,000Tk./ season
4.	Soil	Soil and water contamination from accidental spills	Soil Quality -Soil parameters -IFC Guideline values for soil parameters	Prevention of soil and water pollution in the surrounding area	-Sampling as specified in the engineering standards -Heavy metal, oil & grease etc.	-After any accidental spillage on the road and its nearby area	-after the accidental spillage -Once in every three months	- RHD/ Environmental Consultant	Expenses by RHD - Measurement: 100,000Tk./ season
5.	Sediment	Existence of bridge piers	World Bank OP4.04	Prevention of deterioration of tidal flat	Monitoring of sediment quality of mud flat and river bottom	Bridge locations	Twice in a year	- RHD/ Environmental Consultant	Expenses by RHD
6.	Protected areas	1) Presence of wildlife reserves / forest area	Forest Act 1927 Bangladesh Wild Life (Preservation)	Desemination of hunting / capturing prohibition and	Holding an education program for wildlife Prohibition of illegal	2 areas near the reserved areas (Fasiakhali Wildlife reserves, Moheshkhali	During construction	- RHD/ Environmental Consultant	Expenses by RHD

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
			(Amendment) Act, 1974	other protected area rules to workers	dumping Signs	reserve forest			
7.	Ecosystem (Endangered Species)	i) Mangrove Forest ii) Existence of endangered species (migration bird)	i) & ii) **Species, Number** - Bangladesh Wild Life Preservation (Amendment) Act, 1974 - JICA Guideline (2010)	Evaluation of existence of endangered species	i) & ii) - Observation	Near the bridge crossing at the Kohelia River	-Once in every three months	RHD/ Environmental Consultant	Expenses by RHD -Observation: 250,000Tk// researcher
	Ecosystem (Mud Flat, Fish & Nekton)	Ditto	**Species, Number, Weight** -Benthos (mud flat) -Fish and nekton	Ditto	- Collecting samples at the site, analyzing at a lab	Mud flat, fish & Nekton (around the new bridge locations)	i), ii) & iii) - Twice a year in dry and rainy seasons	Ditto	Expenses by RHD - Sampling & Analyzing: 350,000Tk./ all sample
8.	Disturbance to Poor Class	- Improved road along with the Access road	- Income level	- Evaluation of access to social services	- Information from related institutions - Interviewing residents	- Related institutions - Villages near the site	Once a year	Implementation: Environmental Consultant/ NGO Supervision: RHD	Expenses by RHD - Interviewer: 7,500Tk./researcher
9.	Deterioration of Local Economy such as Losses of Employment and Means of Livelihood	- Increase in employment and business opportunities	-Number of employed local residents and shops	- Evaluation of increase in employment and business opportunities	Ditto	Ditto	Ditto	Implementation: Environmental Consultant/ NGO Supervision: RHD	Expenses by RHD
10.	Land Use and Utilization of Local Resources	- Changing traditional land use patterns and utilization of local resources	-Usage of land and local resources	- Observation of land use change - Observation of local resource usage	- Field observation -Interviewing residents	- Villages near the site	- Once a year	Implementation: Environmental Consultant/ NGO Supervision: RHD	Expenses by RHD - Interviewer: 7,500Tk./researcher (Same as "Poor people")

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
11.	Disturbance to the Existing Social Infrastructure and Services	i) Increase in the number of vessels ii) Increase in the number of cars	i), ii) - Traffic volume	i) & ii) - Evaluation of effect of traffic schedules	i), ii) - Record of numbers of vessels and vehicles being used	i) & ii) - Project site	i) & ii) Continuous records	Implementation: Environmental Consultant/ NGO Supervision: RHD	Expenses by RHD
12.	Unequal distribution of Benefits and Compensation	- It can occur among residents, workers, government officers, and local politicians	-local resident's emotion	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	Implementation: Environmental Consultant/ NGO Supervision: RHD	Expenses by RHD
13.	Local Conflicts of Interest	- Conflict between local residents and workers	-local resident's emotion	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	- Same as those addressed in "Land use"	Implementation: Environmental Consultant/ NGO Supervision: RHD	Expenses by RHD
14.	Gender	i) Improved road along with the access road ii) Improved economy	i) Access to social service of both male and female ii) living standard of residents (both male and female)	- Evaluation of living standard	-Interviewing residents	- Villages near the site	- Once a year	Implementation: Environmental Consultant/ NGO Supervision: RHD	Expenses by RHD
15.	Children's Rights	- Improved road along with the access road - Improved economy	i) Access to social service ii) School attendance rate	i) Evaluation of access to social service ii) Evaluation of school attendance rate"	-Interviewing residents	- Villages near the site	- Once a year	Implementation: Environmental Consultant/ NGO Supervision: RHD	Expenses by RHD
16.	Accidents	-Traffic accidents	Traffic accidents - Land traffic	- Evaluation of effect of the work safety plan	- Record of accidents and fire	- Along the Access Road	-Continuous records	Implementation/ Supervision: RHD	Expenses by RHD
17.	Cross-boundary Impact and	- CO_2 emissions	- Amount of CO_2 emissions	- Efforts to	- Calculate the CO_2 emissions from fuel	-Along the	- Once a year	- RHD/	Expenses by RHD

Sl. No.	Significant Impact to be Monitored	Source of Significant Impact	Monitored Parameter	Purpose of the Monitoring	Monitoring Method			Responsible Authority	Monitoring Cost
					Method of Collecting and Analysing Data	Location	Duration and Frequency		
	Climate Change			reduce CO_2	consumption	Access road area		Environmental Consultant	

4.10 Stakeholder Meetings

4.10.1 Stakeholder Meetings Required by Laws in Bangladesh

There is no provision in Bangladesh law on the stakeholder meetings at the stage of EIA preparation. In this Project, in accordance with World Bank O.P. 4.12, stakeholder consultations are scheduled twice, namely at the times of scoping and preparation of draft EIA.

4.10.2 Stakeholder Meetings in the Project

CPA/ RHD held stakeholder meetings (SHMs) in accordance with JICA Guidelines, which were supported by JICA Survey Team. Schedule of SHMs is summarized as follow.

Table 4.10-1 Schedule of Stakeholder Meetings

Year/Month	Contents of Meetings
January 2018	Outline and scoping of the port component (1 location)
March 2018	Outline and scoping of the access road component (5 locations, 1 was combined with supplemental meeting for port)
July 2018	Draft EIA/LARAP for the port component (2 locations, combined with below) Draft EIA/LARAP for the access road component (6 locations)
August 2018	Supplemental meeting for explaining re-alignment of the access road (2 locations)

Source: JICA Survey Team

4.10.3 Stakeholders Analysis

Stakeholders were listed as follows prior to stakeholder meetings.

Table 4.10-2 List of Stakeholders

Impact	Organization/ group	Role in the project
Overall	Chittagong Port Authority (CPA)	Executing Agency
	Road and Highways Department (RHD)	Executing Agency
	Deputy Commissioner's (DC) office of Cox's Bazar	Accepts the LAP and hold the District Land Acquisition Committee Give compensations to PAPs
	Upazila Nirbahi Officer (UNO) (Sub district Executive Officer)	Local Authority Could provide the local No Objection Certificate (NOC) of the project
	Local Representatives (Union Chairmen)	✓ Would voice for the Project Affected Persons (PAPs) ✓ Could be a key informant of the locality

		✓ Could provide No Objection Certificate (NOC) of the project
Adjacent/ related Project	CPGCBL	✓ Executing Agency of Adjacent Project
	BEZA	✓ Administers industrial development
Environment	Department of Environment (DOE)	✓ Approval of EIA's TOR and IEE waiver ✓ Accepts the EIA and gives Environmental Clearance Certificate (ECC) of the project ✓ Monitor the Environmental issues of the Port in Operation stages ✓ Major stakeholder of expected environmental pollutions
	Department of Forest (DOF) (if forest prevails in the Project Area)	✓ Administering Forests, checking the affected forests, requesting the re-forestation
	Environmental NGOs	✓ Giving opinions on the environmental aspects of the project
Social	Additional Deputy Commissioner (ADC) Land	✓ Provide Land information such as maps ✓ Supports for Land acquisition process
Social (Livelihood)	Department of Fisheries	✓ Could provide the fisheries and fishing communities information of the project area ✓ May require No Objection Certificate (NOC) during any project work in the sea, which can intervene fishing activities of fishermen
	Social NGO's	✓ Giving opinions on the social matters ✓ PAPs list preparation)
Social (community)	Religious leaders	✓ Giving opinions on the social matters ✓ Giving information on cultural/ religious facilities
	Teachers	✓ Giving opinions on the social matters
Resettlement/ Economic displacement	Residents	✓ Giving local information ✓ Affected positively and/or negatively
	Landowners	✓ Giving local information ✓ Affected positively and/or negatively
	Fishermen	✓ Giving local information ✓ Affected negatively
	Farmer/ worker for salt cultivation	✓ Giving local information

		✓ Affected negatively
	Shop owner/ employees	✓ Giving local information ✓ Affected negatively
	boatmen	✓ Giving local information ✓ Affected negatively

4.10.4 Result of Stakeholder Meetings

1) 1st Stakeholder Meeting (for port at the time of scoping)

Since mid-January, notification of the SHM was sent to the CPA, DC, upazila offices, and unions in sequence. The affected residents, considering the low literacy rate, were verbally notified by union chairmen, and then the local consultants confirmed that it was known to all. Local NGOs were directly notified by the local consultants. In order to reflect the opinions about children, education professionals were invited to participate. Moreover, considering the fact that the participation rate for female was low and that their free speech tended to be restricted in public places, an FGD was held separately.

Public consultation for LARAP was held combined with stakeholder meetings for EIA. Notification of public consultation was made from CPA, DC, Upazila Office and then Union Office from the middle of January 2018. Verbal notification was made from Union Chairman considering low literacy rate in the area and local consultant confirmed that notification was properly made. Local Consultant made notification directly to NGOs. FGDs were be held separately as female participants were only three. Participants and contents are as follows.

Table 4.10-3 Participants of SHM

Date	Venue	Participants								
		Total (M/F)*	EA, Survey Team	Relevant Agencies	DC, Upazila	Other Municipalities	PAPs	Religious/ Educational Personnel	NGO	Others
27 June, 2018 (Sat)	Moheshkhali UNO	51 (48/3)	3 (3/0)	2 (2/0)	15 (14/0)	9 (8/1)	12 (12/0)	6 (5/1)	1 (1/0)	3 (3/0)

*M: Male, F: Female, T: Total, EA: Executing Agencies

Source: JICA Survey Team

The below was explained. Materials were translated into Bengali; explanation, comments and question from participants and their response were also made in Bengali.

- Background of the Project
- Outline of the Project
- Purpose of the Public Consultations

- Necessity of the Port Project (Future Demand Forecast)
- Option Comparison, recommended option and its reason
- Plan for the access road connecting the port to N1
- Environmental and Socio-economic Conditions
- Impact to be caused by the Project

Remarkable comments and question from participants and their response were as follows.

Table 4.10-4 Remarkable comments, questions and their responses

Date	Venue	Remarkable Comments and Suggestion	Correspondences
27 Jan, 2018 (Sat)	Moheshkhali UNO	The port will be constructed in Dhalghata Mouza of Dhalghata union. So, it should be named as Dhalghata Deep Sea Port. (Dhalghata Union Parishad (UP) Chairman/ Member of Parliament(MP),Cox's Bazar-2)	The organizer of the SHM meeting committed to convey the message from to the higher authority.
		The project authority shall make the project sustainable to fulfill the people's future demand. (Upazila Chairman, Moheshkhali)	It will be examined through the Survey.
		The project will be implemented properly after finding out the problems and mitigation measures. (Upazila Chairman, Moheshkhali)	Socio-economic survey will be conducted for preparation of LARAP.
		The project authority shall make sure the proper compensation of lost assets to the project affected person (PAPs). (Dhalghata Union Parishad (UP) Chairman) The CPA shall ensure hassle free proper compensation to the PAPs. Improper compensation will create the sufferings of the project. (Member of Parliament(MP),Cox's Bazar-2). Proper compensation issue and the job opportunities of the local peoples shall be made. (Female Ward Member, Dhalghata Union/ Teacher, Dhalghata Adarsha High School)	Compensation will be examined in LARAP in accordance with Bangladesh law and JICA GLs.
		As the land price is getting higher so there should have the resettlement plan to another mouza or area for the PAPs. (PAPs)	Compensation and resettlement will be examined in LARAP in accordance with Bangladesh law and JICA GLs.
		A technical school need to be established where the local peoples and affected peoples would be trained and directly be recruited in both the projects. (Dhalghata Union Parishad (UP) Chairman, Upazila Chairman, Moheshkhali)	Livelihood restoration including job training will be examined in LARAP
		Around 100 years salt cultivation is ongoing in the area, which will be hampered due to mega project. Alternative support from the government and all mitigating measures are to be taken for income and other losses. (Member of Parliament(MP),Cox's Bazar-2)	Livelihood restoration will be examined in LARAP in accordance with Bangladesh law and JICA GLs.
		For the route selection of the Port access road there must be proper consultation with the local community. (Dhalghata Union Parishad (UP) Chairman) As a part of participatory planning for mega project like this CPA should arrange more SHM with all section of people. (Member of Parliament(MP),Cox's Bazar-2).	Consultation meeting will be held for access road. Supplemental SHM will be held.
		Mentioned about the natural resources and its diversity of the Sea and suggested about the proper investigation of the project baseline considering the ecology of the project area (NACOM, local NGO).	The investigation will be conducted in EIA process.
		Preservation of mangrove forestry like "Hansher Char" shall be preserved, less damage of housing structures shall be ensured and existing ecology of	The investigation, impact analysis and proposal of mitigation will be conducted

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		the area shall be maintained. Also, using latest safety measures can protect the environment and develop new mangrove forestry. (Member of Parliament(MP),Cox's Bazar-2)	in EIA process.

Figure 4.10-1 SHMs for Port

2) 1st Stakeholder Meeting (for access road at the time of scoping)

Stakeholder meetings for EIA was held combined with Public consultation for LARAP. Notification of SHMs was made from CPA, DC, Upazila Office and then Union Office from the early of March 2018. Verbal notification was made from Union Chairman considering low literacy rate in the area and local consultant confirmed that notification was properly made. Local Consultant made notification directly to NGOs. FGDs will be held separately as female participants were only few. Participants and contents are as follows.

Table 4.10-5 Participants of SHMs

Date	Venue	Participants								
		Total (M/F) *	EA, Survey Team	Relevant Agencies	DC, Upazila	Other Municipalities	PAPs	Religious/ Education.	NGO	Others
12th Mar, 2018 (Mon)	Mohe-shkhali UNO	50 (47/3)	8 (7/1)	0	10 (10/0)	14 (14/0)	17 (15/2)	0	0	1 (1/0)
13th Mar, 2018 (Tue)	Chakaria UNO	50 (41/9)	6 (6/0)	1 (1/0)	7 (6/1)	12 (10/2)	7 (4/3)	14 (11/3)	1 (1/0)	2 (2/0)
14th Mar, 2108 (Wed)	Kalamar chara Union	78 (75/3)	6 (6/0)	0	0	16 (13/3)	56 (56/0)	-**	0	0
15th Mar, 2018 (Thu)	Dhalghata Union	87 (86/1)	6 (6/0)	0	1 (1/0)	7 (6/1)	72 (72/0)	1** (1/0)	0	0
17th Mar 2018 (Sat)	Badarkhali Union	62 (58/4)	6 (6/0)	0	0	15 (14/1)	41 (38/3)	-**	0	0

*M: Male, F: Female, T: Total, EA: Executing Agencies

**Some included in PAPs

Source: JICA Survey Team

The below was explained. Materials were translated into Bengali; explanation, comments and question from participants and their response were also made in Bengali.

- Background
- Outline of the Project
- Purpose of the Public Consultations
- Necessity of Access Road
- Route of Access Road and Affected Area
- Option Comparison, recommended option and its reason
- Examination for Minimizing Resettlement
- Environmental and Socio-economic Conditions
- Impact to be caused by the Project

Remarkable comments and question from participants and their response were as follows.

Table 4.10-6 Remarkable comments, questions and their responses

Date	Venue	Remarkable Comments and Suggestion	Correspondences
12th Mar, 2018 (Mon)	UNO Conference Room, Moheshkhali	Port road and power plant road should be integratedly planned. (District AL President Advocate)	To be considered in road development plan.
		They have no objection regarding port access road but have objection regarding the naming issue. The naming of the access road must be Dhalghata port access road instead of Moheshkhali Port Access road. (Chairman Dhalghata Union Parishad)	The name issue is already conveyed to CPA high authority. CPA will discuss with the Member of Parliament.
		Among the three routes, priority route should involve less damage and disturbance to the affected people. (District AL President Advocate)	Priority route is selected through evaluation of various factors including minimization of negative environmental/ social impact.
		Proper compensation of PAPs is to be ensured. (Mayor Moheshkhali Pourashava) Road and port will benefit the whole country. It shall be considered that compensation at Dhalghata is Tk.6 lakh per acre (1.00acre) but at Chiringha land price is Tk. 12 lakh per decimal (0.01 acre). (Commander, Freedom fighter)	Compensation rate will be examined based on Bangladesh law and JICA GLs.
		Compensation rate must be consulted with local people. (District AL President Advocate)	To be considered in LARAP. Local consultation meeting will be held.
		Land and livelihood of the people is to be saved and salt land to be protected. (Honorable MP, Cox's Bazar-2)	To be considered in LARAP. Impact shall be minimized.
		Development needs alternative support and people should have access to these job and livelihood facilities and people's views must be honored. (District AL President Advocate)	Job creation and livelihood restoration will be examined in LARAP.
		Ensure equitable development shall be ensured for all people in the area. (District AL President Advocate)	Consideration will be given to maximize the benefit for local people and to minimize inequality.
13th Mar, 2018 (Tue)	UNO Conference Room, Chakaria	Access road project has been designed in such a way housing structures have been avoided. It is requested educational institution should also be avoided. In designing the project minimum damage of property, graveyard, and cemetery, and religious institution are to be ensured and minimizing all negative impacts. (UNO Chakaria) One school and Madrasha will be affected in the alignment, there should be initiative to avoid these area (UNO Chakaria).	JICA GL requires minimalization of land acquisition and resettlement. All effort will be also made to avoid disturbance to educational/ cultural/ religious facilities. If still unavoidable, relocation will be examined in close consultation with local communities.
		Hassle free compensation and intermediary service of middlemen will be expected. (President Chakaria Press Club)	Proper compensation will be planned in LARAP in accordance with Bangladesh law and JICA GLs.

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		At Badarkhali growth centre and adjacent areas, there is no Bangladesh survey[2] (BS) record. Due to this, previous acquisition some PAPs was unable to get compensation. The land is under a cooperative association. No direct purchase on that land. In bazaar land price per kani(0.40 acre) is around Tk.3 to 4 crore. (Chairman Badarkhali UP)	Proper compensation will be planned in LARAP in accordance with Bangladesh law and JICA GLs.
		Some people raised the issue of fish *gher*, salt cultivation in the leased land. They have concern of getting compensation of their investment. (UNO Chakaria)	Minimization of negative impact will be carefully examined. Proper compensation and livelihood restoration will be also examined in LARAP.
		Such information disclosure meeting will be helpful and expecting more meeting and thanks JICA for support such development project (Female Vice Chairman).	Local consultation meeting will be held to facilitate involvement of communities and PAPs.
		Mangrove forestry and environment is to be saved. (Site Officer, NECS CREL Project)	Minimization of negative impact will be carefully examined through EIA.
14th Mar, 2108 (Wed)	Kalarmarchara Union Parishad Auditorium, Moheshkhali Upazila	The affected people will lose land and livelihood, salt and shrimp land, so they should be properly rehabilitated and it should be minimum. (UP Chairman, Kalarmarchara) Shrimp *gher,* salt land, betel leaf cultivation will be affected. Sufficient drainage is essential. (PAPs)	Minimization of livelihood impact as well as livelihood restoration will be examined in LARAP. Minimization of negative impact on hydrology will be examined through EIA.
		Some people are unable to get compensation, so proper cooperation is sought from the requiring body. (PAPs)	Proper compensation will be examined in LARAP in accordance with Bangladesh law and JICA GLs.
		Direct Payment to the affected people with support of Union Parishad. Intermediary support in DC office is a major problem of getting payment for poor, illiterate PAPs. (UP Chairman, Kalarmarchara)	Proper compensation will be examined in LARAP in accordance with Bangladesh law and JICA GLs. PAPs will be supported in getting compensation.
		Engage local construction worker in construction work	Engaged of local construction workers will be considered in EIA/ LARAP.
		Poor people should have livelihood restoration. (PAPs)	Special consideration will be made for vulnerable peoples in LARAP.
		Female affected person should get support from the project. (Female UP Member)	Ditto
15th Mar, 2018	UP Conference Room,	They are very serious about the naming issue of port and land price. They will have all out	The name issue is already conveyed to CPA high

[2] In Bangladesh for ownership of land there are four land records. These are Cadestral Survey(CS) record, completed beginning of last century; State Acquisition(SA) records, completed during 1950s at the time of abolition of *Zaminder* system of land ownership, Revisional survey (RS record) during 1962 and Bangladesh Survey(BS), but in all areas this was not completed and it is ongoing.

Date	Venue	Remarkable Comments and Suggestion	Correspondences
(Thu)	Dhalghata, Moheshkhali Upazila	cooperation to the project authority. (Dhalghata Union Chairman)	authority. CPA will discuss with the Member of Parliament.
		The proposed development projects in the area are blessings for the local people but the affected community is to be properly resettled. (Dhalghata Union Chairman)	Proper resettlement will be examined in LARAP in accordance with Bangladesh law and JICA GLs.
		Already price has been increased substantially, that is why land transaction is temporarily declared off by the executive order in the area. Both the naming issue and land price are to be declared before starting the work. (Dhalghata Union Parishad)	Land price will be investigated and proper compensation rate will be examined in LARAP.
		As government informal decision, no transaction of land without DC's approval. So, only mouza rate of land price will not be helpful for proper compensation. Without proper compensation, people's sufferings will not be relieved in case of land acquisition. (Dhalghata UP Member)	Ditto
		They want 100% job for the affected persons as their livelihood is being hampered. (Dhalghata UP Member) We need job, otherwise we have to survive drinking only salt water. (Women UP member, Dhalghata) The project has acquired their agriculture and salt land. Therefore, they want training and job facilities. (Pundit's Deil village)	The proposed project will improve the situation Livelihood restoration and job creation will be examined in LARAP.
		They want other infrastructure support like establishment of hospital, vocational and polytechnic institute for improving their livelihood and living standard. (Dhalghata Union Chairman)	Livelihood restoration and preparation of relocation site will be examined in LARAP. Port access road will also help in smooth transportation of locally produced goods and import other daily necessities comparatively better prices.
17th Mar 2018 (Sat)	Badarkhali Union Parishad Conference Room, Chakaria Upazila	It would be recommended to change the alignment and avoid mosque from acquisition. A mosque and a Fazil Madrasa will be affected. (Panel Chairman, Baro Veola)	All effort will be made to avoid disturbance to educational/ cultural/ religious facilities. If still unavoidable, relocation will be examined in close consultation with local communities.
		It would be recommended to change the alignment along southern side of the Badarkhali Bridge. It will minimize the affected structure. During socio economic survey (SES), this will be verified. (President Badarkhali Cooperative Society)	Route is selected through evaluation of various factors including minimization of negative environmental/ social impact, as well as engineering viewpoint. To shift alignment to south will increase affected residential houses while it

Date	Venue	Remarkable Comments and Suggestion	Correspondences
			can avoid impact on bazar. It will also lead to zig-zag road considering that the route has to avoid Moheshkhali hills.

Eng. Nurul Alam Siddique is presenting the key note paper in Moheshkhali Upazila

Full view of the SHM in Moheshkhali Upazila

SHM at Chakaria UNO office

Upazila Nirbahi Officer is addressing in the meeting at Chakaria UNO office

View of the Stakeholders Meeting in KalamerChara Union Parishad Auditorium, Moheshkhali Upazila

UP Chairman is addressing in the meeting in Kalarmarchara Union Parishad Auditorium, Moheshkhali Upazila

Partial view of stakeholder's meeting in UP Conference Room, Dhalghata

PAP is addressing in the SHM in UP Conference Room, Dhalghata

Mr. Nurul Alam Siddique is presenting key note paper in the SHM at Badarkhali UP office

SHM at Badarkhali UP office, Chakaria

Figure 4.10-2 SHMs for Access Road

3) 2nd Stakeholder Meeting (for port and its access road)

Stakeholder meeting for EIA was held combined with Public consultation for LARAP. Notification of SHMs was made from CPA/RHD, Upazila Office and then Union Office from the late June 2018. Written notification was posted on bulletin board of Upazila Offices and Union Offices while verbal notification was made from Union Chairman considering low literacy rate in the area, which was confirmed by Local Consultant. Local Consultant made notification directly to NGOs. Attendance of teachers were secured to reflect interests of children. Participants and contents are as follows.

Table 4.10-7 Participants of SHMs

Date	Venue	Participants(M/F)*								
		Total	EA, Survey Team	Relevant Agencies	DC, Upazila	Other Municipalities	PAPs	Religious/ Education.	NGO	Others
5th July, 2018 (Thu)	Chakaria UNO	82 (72/10)	5 (4/1)	1 (1/0)	11 (11/0)	43 (34/9)	9 (9/0)	4 (4/0)	1 (1/0)	8 (8/0)
7th July, 2018 (Sat)	Mahe-shkhali UNO	70 (69/1)	7 (6/1)	0	7 (7/0)	17 (17/0)	28 (28/0)	5 (5/0)	0	6 (6/0)
8th July, 2018 (Sun)	Dhalghata Union	90 (77/13)	6 (5/1)	0	0	8 (8/0)	75 (63/12)	1 (1/0)	0	0
10th July, 2018 (Tue)	Badarkhali Union	123 (122/1)	5 (4/1)	0	0	24 (24/0)	80 (80/0)	7 (7/0)	0	7 (7/0)
10th July, 2018 (Tue)	Kalarmar-Chara Union	72 (71/2)	4 (3/1)	0	0	10 (9/1)	58 (58/0)	0	0	0
11th July, 2018 (Wed)	Fasiakhali Union	68 (61/7)	5 (4/1)	0	0	27 (21/6)	35 (35/0)	0	0	1 (1/0)

*M: Male, F: Female, T: Total, EA: Executing Agencies

**Some included in PAPs

Source: JICA Survey Team

The below was explained. Materials were translated into Bengali; explanation, comments and question from participants and their response were also made in Bengali.

- Outline of the Project
- Important Natural areas near the Project
- Results of Environmental Impact Assessment
- Monitoring Plan
- Management/Monitoring Implementation Structure
- Overview of Affected Area
- Examination for Minimizing Resettlement
- Overview of PAHs/ Affected Lands
- Resettlement and Rehabilitation framework (Compensation/ Rehabilitation)
- Institutional Arrangements (GRM)
- Correspondence to Opinions

Remarkable comments and question from participants and their response were as follows.

Table 4.10-8 Remarkable comments, questions and their responses

Date	Venue	Remarkable Comments and Suggestion	Correspondences
5th July, 2018 (Thu)	Chakaria UNO	We generally appreciate the project. We are expecting minimum loss of environment regarding Involuntary resettlement impact. (UNO, Chakaria)	Minimalization of the negative impact has ben examined in EIA/LARAP.

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		Proposed alignment should avoid Badarkhali Bazar. It Should also avoid Badarkhali Degree College and Madrasa. (UP member Badarkhali) The proposed project will affect Bazar, school, college and Mosque and if there is scope of avoidance, the mentioned community facilities should be avoided. (UP Chairman, Badarkhali)	Viaduct will be installed for reducing the ROW and ensuring the north-south passage. Madrasa and structure of the College will be avoided at least.
		The people will cooperate in the implementation process of the road. But they are expecting the college will lose a four storied building structure. These key installations should be avoided. Proper compensation is to be provided as actual market price if land is not avoided. If the present route is unavoidable, there must be accident management device, and also there may be underpass or flyover. (Acting Principal of Badarkhali Degree College)	Effort was made for avoiding at least College building. The currently-proposed alignment will traverse the playground, but passage will be ensured. Effort will be continuously made for minimizing impact.
		Some house of the poor people will be affected. Project authority should ensure proper compensation. (Ward Member, Fasiakhali) There are so many fish project at Rampur area of Fasiakhali Union. We foresee the socio –economic condition will be drastically change but livelihood losers must be properly compensated. (PAPs) At Rampur of Shaharbil UP, there are fish project. Livelihood loss should be properly compensated. (Chairman, Shaharbil)	Compensation will be properly made in accordance with Bangladesh law and JICA GLs.
		All expect the proposed road, as it will change feature of Chakaria area and it will make new Chakaria. The proposed project area is the economic zone of Chakaria which comprises shrimp cultivation, fish culture but law and order situation is not good. We are expecting improved road communication will make the area free of dacoit and improved law and order situation will be a future outcome. (Chairman, Fasiakhali union Parishad)	-
		Avoid housing structure and ensure proper and timely compensation of poor. Loss of livelihood should be regained. (UP Member Fasiakhali)	Compensation will be made in accordance with Bangladesh law and JICA GLs. Livelihood restoration has been also examined in LARAP.
		To provide employment facilities for PAPs to restore loss of employment. (Ward Member, Fasiakhali)	Livelihood restoration has been examined in LARAP
		We are very satisfied but there should be sufficient culvert as the alignment will cause no water logging, they suggested. (PAPs)	Culverts for irrigation and drainage have been considered in road planning.

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		It is expected for RHD that communication will be made properly to inform how the project affected people can get compensation. (Chairman, Chiringa Union Parishad)	Institutional arrangement for proper compensation has been examined in LARAP.
		Local people should be employed during construction period. (Chairman, Chiringa Union Parishad)	Employment of local people has been examined in EIA/ LARAP.
		Loss of natural Environment is to be avoided. We appreciate the project. (Chakaria Nature Conservation Management (NACOM))	Minimization/ mitigation of environmental impact has been examined in EIA,
7th July, 2018 (Sat)	Moheshkhali UNO	If possible in consideration of engineering view point and other social parameter, avoid homestead and housing structures. Otherwise, provide homestead land with structure before displacement of PAPs concerned. It is noted here around 66 households will lose their housing structure and they claim they have no alternative land for shifting as homestead. Their main demand is to shift the alignment around 300m north of the proposed alignment at Kalarmarchara. (MP, Cox's Bazar-2)	Viaduct or retaining wall will be installed for reducing the ROW to minimize land acquisition/ resettlement in Kalarmarchara populated area. It shall be noted, however, this is F/S and the alignment is yet finalized.
		The catchment area of the port will be 2 00 crore of people including neighboring countries. No one should be harmed. (MP, Cox's Bazar-2)	Examination for minimizing negative impact was made in EIA/LARAP.
		Present mouza rate land price of DC doesn't represent the actual land price as there is restricted transaction of land price from permission of DC. (MP, Cox's Bazar-2)	Compensation rate will be set based on Bangladesh law and JICA GLs.
		Naming of the port still is an issue. (MP, Cox's Bazar-2)	The issue needs to be solved in the ministry level.
		Provide actual market rate of land, Coal power project it was 7 million Tk. per acre and now it should be 10 million Tk. per acre. (Dhalghata Chairman)	Compensation rate will be set based on Bangladesh law and JICA GLs.
		A technical school and college are needed. (Upazila Chairman Moheshkhali)	Implementation of port will ensure the economic development. Also livelihood restoration support has been examined

Date	Venue	Remarkable Comments and Suggestion	Correspondences
			in LARAP.
		Local labour is to be engaged in the project and construction work. (Upazila Chairman Moheshkhali, President Upazila Awami League (AL))	Employment of local people has been considered in EIA/ LARAP.
		How proper price will be finalized while land sale is prohibited here? (President Upazila Awami League (AL))	Replacement cost survey was made through interview on PAPs, other people, register office and referring to land price in another project.
		Our houses and shelter will be affected. The project should save their home from acquisition. We are ready to sacrifice anything except shelter (PAPs)	Viaduct or retaining wall will be installed for reducing the ROW to minimize land acquisition/ resettlement in Kalarmarchara populated area. It shall be noted, however, this is F/S and the alignment is yet finalized.
8th July, 2018 (Sun)	Dhalghata Union	The area will be the development hub by the initiative of GoB and JICA as Bay of Bengal Industrial Growth Belt. So, both affected and non-affected persons will be the beneficiaries. (Assistant Manager, Land management Department)	-
		PAPs to get proper compensation as per new law enacted. (Assistant Manager, Land management Department, Principle Muhurighona Madrasa, Freedom Fighter)	Compensation will be made based on Bangladesh law and JICA GLs.
		There should be a monitoring team for identifying the real person for getting benefit as no one is deprived. (Principle Muhurighona Madrasa)	Monitoring team will be established in accordance with LARAP.
		Naming of the port still is an issue. (Principle Muhurighona Madrasa)	The issue needs to be solved in the ministry level.
		Easier processes for compensation in this	Procedure for

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		project than in previous JICA project should be ensured (Shrimp and Salt Cultivator)	compensation will be made based on Bangladesh law and JICA GLs.
		For getting payment I had to go to member of the parliament because they need for payment. LA section should have payment and finalization of documents with support of UP office and implementation NGO (Shrimp and Salt Cultivator)	This has been examined in LARAP.
		People in the area are suffering in tidal surge and cyclone; so they need embankment to protect crop and other belongings like shrimp and salt during cyclone. (Freedom Fighter)	Port access road could provide embankment as well as shelter at the time of flood.
		Need an inventory of loss for every PAPs including shrimp fingerlings collectors, crab farmer, sharecropper. They need five years demurrage for their losses as well as rehabilitation of them. (Freedom Fighter)	Persons with their livelihood affected will be eligible for compensation in accordance with JICA GLs.
10th July, 2018 (Tue)	Badarkhali Union	The project will improve socio economic condition of the area but will affect school, college, mosque etc. (PAP)	Minimization of the impact has been examined during the survey. School and mosques will be avoided.
		At Badarkhali, there are three kindergarten school, one Degree College, bazar affected, and they should be avoided. (PAP) It would be recommended to shift the alignment about 2,500m to the south, which ensures around 80% will be government land. Otherwise it would be recommended to shift it about 300m to the north at Badarkhali. (PAP) If the alignment is shifted either north or south, there will be no loss. (PAP)	Kindergarten and primary schools will be avoided. Minimalization of the impact has been examined.
		At the proposed alignment at Badarkhali, risk of accidents will increase. Around 10,000 students are studying adjacent areas of bazar. Due to affected school and madrasha building there will be disruption of education and probability of accident will increase. If shifting the alignment to the south, approximately 7km will be shortened for the proposed road. (Principal of Badarkhali Madrasa)	Minimization of the impact has been examined during the survey. Safe passage of students will be secured.
		Out of total 5-acre land of the college, 3 acres will be affected. Though we are not against the development, it would be requested to make flyover or underpass in this area if shifting the alignment is not possible. (Principal of the degree college)	Minimization of the impact has been examined during the survey. Passage will be secured. Proper relocation of the structure will be made if necessary.

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		As for Construction and other job facilities, priority should be given for local unemployed people. PAPs should have access to job. (PAP)	The employment of local people has been considered in both EIA/LARAP.
		Present market price is Tk.130,000 per decimal but in government rate it is only Tk.8,000 per decimal. Proper compensation will be required, otherwise PAPs will suffer. (PAP)	Compensation rate will be properly set in accordance with Bangladesh law and JICA GLs.
		DC's payment should be at union level, otherwise people will suffer. (PAP)	Compensation procedure will be made in accordance with Bangladesh law and JICA GLs. For fair compensation, monitoring and GRM will be established.
10th July, 2018 (Tue)	Kalarmarchara Union	We will cooperate in implementation of the project, but sacrifice should be within their limit. Uttar Nalbila village under Ward No-1 will suffer most; If the alignment is shifted 300m towards north, there will no physical displacement (PAP's representative, 2 PAPs)	Minimization of the impact has been examined during the survey. However, the proposed alignment is not the definite as this is F/S stage.
		What would be our compensation? it should not be mishandled (PAP)	Compensation package has been examined in accordance with Bangladesh law and JICA GLs.
		If issue on human settlement and environmental damage is arisen, human settlement should get priority. Because 1000 people of 70 households will lose their shelter at Uttar Nalbila as involuntary resettlement, we urge to save the settlement.	*Ditto*
		Though we will provide every opportunity to success the project and we are not opposing the development, this was their demand. They will become homeless for the proposed alignment and will be forced to use the vacant land.	*Ditto*
		We earnestly request, JICA team member to save our home and we will render highest cooperation to you in implementation the project. However, they would be highly indebted to the JICA team.	*Ditto*

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		Out of 70 affected family, only 10 HHs could reconstruct and resettle their home in other areas as the remaining are very poor (Ward 7 PAP)	Compensation will be made in accordance with Bangladesh law and JICA GLs so that they can be resettled properly.
		The project is for our development. We expect no loss. (Ward 3 PAP)	Minimization of the impact has been examined during the survey. Compensation and/or rehabilitation assistance will be provided in accordance with Bangladesh law and JICA GLs.
11th July, 2018 (Wed)	Fasiakhali Union	No diversion of alignment at Chiringa is expected. Currently we do not have enough road facilities in this area, which will be improved by the Project and the people will get security. (Chairman, Chiringa Union Parishad)	-
		Consideration shall be made especially for poor people in getting compensation and rehabilitation. Resettlement site is needed and it should be union wise. (Chairman, Fasiakhali Union Parishad)	Special consideration has been examined for the vulnerable people including poor in LARAP.
		Land value is high at Fasiakhali in comparison with Chiringa. We like to give thanks to JICA but project should be designed such as no to cause water logging. (PAP)	Compensation rate will be set based on replacement cost survey. Culverts for irrigation and drainage have been considered in road planning.
		No intermediary is expected in legal compensation and it should be at grass root and union level. No one is to be deprived and authority should confirm it. (PAP)	Compensation procedure will be made in accordance with Bangladesh law and JICA GLs. For fair compensation, monitoring and GRM will be established.

	
UNO Chakaria speaking in the SHM	SHM at Chakaria in Upazila Auditorium
	
SHM at Moheshkhali Upazila Auditorium	SHM at Moheshkhali Upazila Auditorium
	
Chairman speaking in SHM at Dhalghata	Attendees to SHM at Dhalghata

SHM at Badarkhali Co-operative society Premises

Attendees to SHM at Badarkhali

SHM at Kalarmarchara UP

PAP speaking in SHM at Kalarmarchara

SHM at Fasiakhali UP Auditorium

SHM at Fasiakhali UP Auditorium

Figure 4.10-3 2nd SHMs for Port and its Access Road

4) Supplementary stakeholder meetings (Access Road)

Concerns were found during the second SHMs on access roads in July 2018 about the proposed alignment traversing villages in Kalarmarchara and markets in Badarkhali. Consequently, re-alignment was made to north direction and consultations were held again in both Unions. This supplementary SHM was conducted in the same way as the second SHMs, though as it had to be held earlier in order to complete the necessary land acquisition/resettlement surveys within the period, the survey team members did not participate, and support for the Executing Agency was provided only through the local consultant.

67 people participated in community consultation in Badarkhali, and 36 people participated in Kalarmarchara.

Table 4.10-9 Participants of SHMs

Date	Location	Participants								
		Total (Male/Female)	Business Persons - Surveyors	Affiliated Government	Upazila - District	Other Administrative Districts	PAPs	Religious – Education Related	NGO	Other
Aug 13, 2018 (Mon)	Badarkhali Union	67 (67/0)	3 (3/0)	0	0	8 (8/0)	46 (46/0)	5 (5/0)	1 (1/0)	4 (4/0)
Aug 13, 2018 (Mon)	Kalarmarchara Union	36 (36/0)	4 (4/0)	0	0	8 (8/0)	24 (24/0)	0	0	0

Table 4.10-10 Remarkable Comments, Suggestions and Correspondences

Date	Venue	Opinions and Questions from Participants	Countermeasures
Aug 13, 2018 (Mon)	Badarkhali Union	We appreciate that the concerns of the local people were understood. We are requesting the alignment to the south approximately 3km from Badarkhali Bridge point directly (Secretary, Badarkhali Agricultural Cooperative Society)	The north detour was planned taking into consideration all of the environmental, social, and technical aspects. The realignment to south will pass through settlements at the bottom of hills, in addition to the Moheshkhali hill itself. On the other hand, for going south on the side of Badarkhali after detouring the Moheshkhali hill, the number of right/left turns increases, which is not desirable from technical aspects, as well as from road safety.
		All the land is triple cropped area. If road is constructed, there will be huge water logging and cannot be used for agriculture. Thus, shift to south is preferable. If shift to north is unavoidable, proper resettlement and compensation shall be ensured. (Madrasa teacher)	Installation of box culverts will be considered if necessary so that water logging will not occur.
		If the alignment is shifted to southward direction, almost 80% is government land, which will be preferable. (Panel Union Chairman, Ex Chairman, representative of Badarkhali Social Welfare Organization)	The north detour was planned taking into consideration all of the environmental, social, and technical aspects. The realignment to south will pass through settlements at the bottom of hills, in addition to the Moheshkhali hill itself.
Aug 13, 2018 (Mon)	Kalarmarchara Union	The proposed realignment might cause water logging at Badarkhali as claimed by the Badarkhali residents. However, as per new proposal to straighten port access road near Kalarmarchara government primary school through the hill passage, as claimed by the Badarkhali residents, more households will be affected in Kalarmarchara. (Ward Member).	Installation of box culverts will be considered if necessary so that water logging will not occur. As was pointed out, the resettlement of many residents will be necessary on the Moheshkhali side for the south detour plan.

Date	Venue	Opinions and Questions from Participants	Countermeasures
		The suggested north side detour plan is right. If it made straight through hill, many households will be affected. (PAPs)	As was pointed out, the resettlement of many residents will be necessary on the Moheshkhali side for the south detour plan, so the north detour plan is considered to be the best.
		We support the north side detour plan. The south side detour plan will result in a large-scale resettlement. (Ward Member, Kalarmarchara Panel Chairman)	Ditto
		With the planned introduction of culverts and bridges, and since the water flows in the southern and western directions, there will not be any water logging in Badarkhali even with the north side detour plan (Ward Member).	As per his understanding, there will be no water logging. Installation of box culverts will be considered if necessary.

As mentioned above, the Kalarmarchara Union approved the north side detour plan, however there were many in the Badarkhali Union who wanted the plan to be changed to the south side detour plan. Subsequently, after consultation with the residents, several consultations with the relevant parties were held in late August to explain the following.

- The north side detour plan was planned taking into consideration not only technical aspects, but also social and technical aspects as well. The straight-line change to the south plan will not just pass through the Moheshkhali hill, but also the settlements at the foot of the hill, which could result in large-scale resettlement.
- The proposed straight line avoids the Badarkhali market. Passage can be guaranteed by a box culvert.
- It was confirmed through hydraulic analysis that no water logging would occur. The main water flow is assumed to be in the east-west direction, but since the route is planned from east to west, it will not become a hinderance to this flow. When agricultural land drainage becomes necessary, it can be secured by introducing a box culver bar.

Through the consultations, the local community gained an understanding of the north side detour plan, and a general consensus was obtained.

Supplemental Consultation in Badarkhali Agricultural Cooperative Society （13 August, 2018）	Supplemental Consultation in Badarkhali Agricultural Cooperative Society （13 August, 2018）
	
Supplemental Consultation in Kalarmarchara （13 August, 2018）	Participants of Supplemental Consultation in Kalarmarchara （13 August, 2018）

Figure 4.10-4 Supplementary Community Consultation (Access Road)

4.11 Land Acquisition and Resettlement

4.11.1 Requirement for Land Acquisition and Resettlement

(1) Project components incurring land acquisition and resettlement

Overview of project components incurring land acquisition and resettlement and the affected area are shown below.

Table 4.11-1 Project Components Incurring Land Acquisition and Resettlement

Project component		Required Area				
		Location	Outline	Total	Transfer of Govern. Land	Acquisition of Private Land
Port	Container terminal	Moheshkhali Upazila, Cox's Bazar District	L = 460 m, area = 20 ha	74.9ha	26.0ha	48.9ha
	Multipurpose terminal	Same as above	L =300 m, area = 12 ha			
	Container Yard Navigation channel and basin (extended)	Same as above	Area = 43 ha			
	Soil dumping Site	Same as above	Area = 33 ha	32.4ha	1.6ha	30.9ha
Access road	North-south port connecting road	Moheshkhali Upazila, Cox's Bazar District	1.6km	200.8ha	57.4ha	143.4ha
	Matarbari Port to Route 1	Moheshkhali/ Chakaria Upazila, Cox's Bazar District	25.7km			

1) Port

Total 108 ha will be newly required including 20 ha for container terminal, 12 ha for multi-purpose Terminal, 54 ha for navigation channel, turning basin (extended area), container yards and others, and 33 ha for dumping site.

2) Access road

Based on RHD design standard, the road width has been set as follows in consideration of required road functions and traffic demand forecast.

(Main Road)

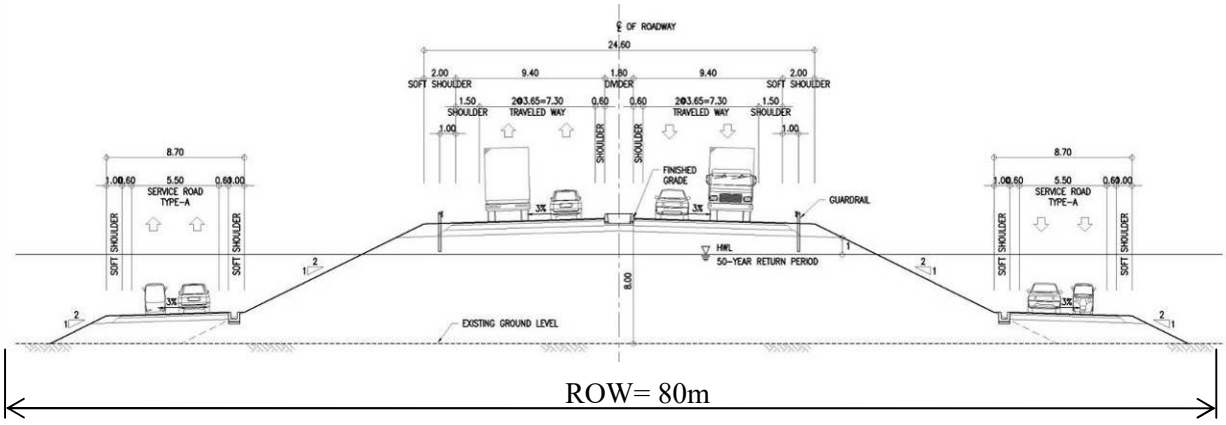
- Vehicle lane: 3.65m × 4
- Median strip: 3.0 m
- Side strip: 0.6m × 2
- Shoulder: 1.5m × 2
- Protective shoulder: 2.0m × 2
- Total: 25.8m (Inbound/Outbound 4 lanes)

(Side road)

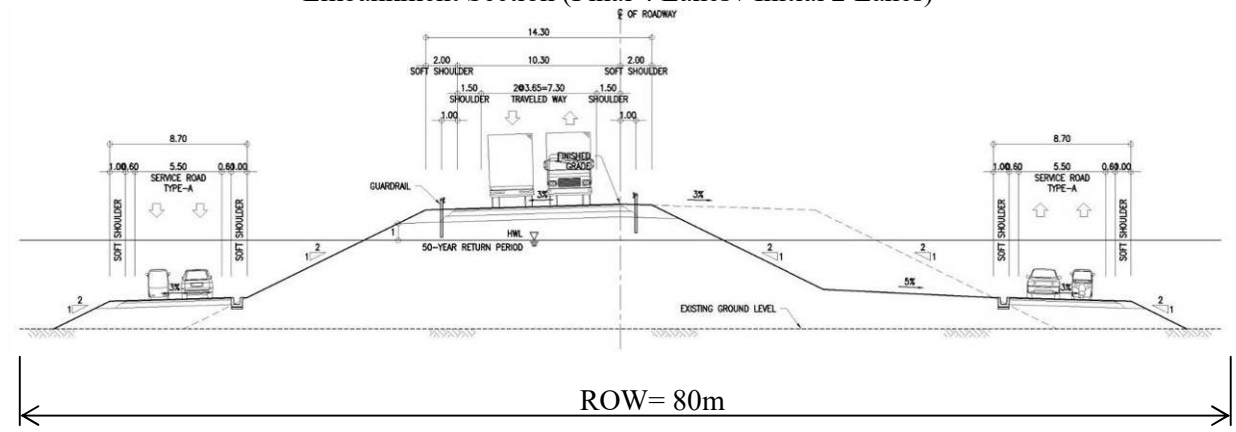
- Vehicle Lane: 3.00m (without car transportation) or 5.50m (with car transportation)
- Shoulder: 1.00m × 2
- Total: 5.00m or 7.50m × 2

Though this road is planned to be arranged on inbound/outbound 4 lanes in the future, this project is intended to implement stage construction of only half of them (inbound/outbound 2 lanes).
Considering that this is the construction of high embankment on soft ground, the foundation of the embankment needs to be constructed for the road width of future inbound/outbound 4 lanes to prevent uneven settlement at the time of future expansion. Consequently, all necessary ROWs for inbound/outbound 4 lanes are to be secured for the land acquisition in this Project.

Standard width of ROW is as follows:
-Embankment section: (Main route of access road) 25.8m + (Side road) 5.00 to 7.50m x 2 + (Embankment slopes) 16m *x 2 + (Construction allowance) 5m x 2 ＝ Approx. 80m
* Assuming that the average height of the embankment is 8m and the gradient of the slope is 1:2.0.
Bridge section: (Main route of access road) 22.6m + (Construction allowance) 1.5m x 2 = 25.6m



Embankment Section (Final 4 Lanes / Initial 2 Lanes)



Embankment Section (Initial 2 Lanes)

Figure 4.11-1 Typical Cross-section of Embankment Section

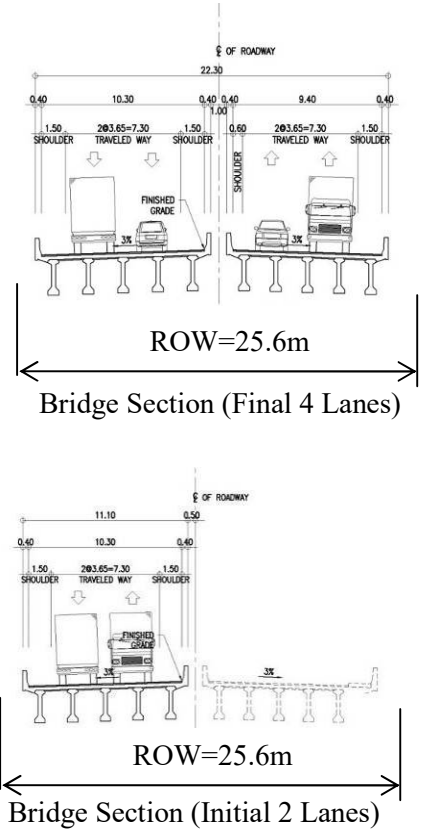


Figure 4.11-2 Typical Cross-section of Bridge Section

(2) Alternatives of Initial Design to Minimize Resettlement

Alternatives of initial design to minimize resettlement is as discussed in 4.4.1 for port and 4.4.2 for access road respectively.

As for port, 5 options (one option without project and the Options 1 to 4) were examined. Among the plans that can fully achieve project effects, a project site was selected to avoid residential villages.

As for access road, 4 options (one option without project and the Options 1 to 3) were initially examined, and an option with less private land was selected among the plans that can fully achieve the project effects ("Table 4.4-3 Overview of Alternatives" and "Table 4.4-4 Comparison of Alternatives and the Evaluation"). For the next step, the necessity of a flyover has been examined. Based on the transport demand forecast, it was decided to construct only the access road without flyover in this Project. The flyover could be constructed in another project according to the traffic growth after the road is in service (the Options 2-a and 2-b of "Table 4.4-5 Overview of Alternatives" and "Table 4.4-6 Comparison of Alternatives and the Evaluation"). In addition to the above comparison, options with elevation and detour were examined to minimize resettlement in villages. Based on the result of community consultation, a detour option has been selected (the Options 2-1 to 2-3 of "Table 4.4-5 Overview of Alternatives" and "Table 4.4-6 Comparison of Alternatives and the Evaluation"). The result of the community consultation is as shown in the section 4.11.10 "(2) Community consultations in this project." After two consultation meetings held in Kalarmarchara Union and Badarkhali Union described in "(3) Second community consultation (Port/Access road)", the route was realigned. No objection to the realigned route was confirmed through additional consultation as shown in "(4) Supplemental community consultation."

4.11.2 Legal Framework for Land Acquisition and Resettlement

The framework of the land acquisition and resettlement policy and the entitlements of Project Affected Persons in this project are to be set based on the "Acquisition and Requisition of Immovable Property Act (ARIPA2017)", the law of Bangladesh, and the policy related to involuntary resettlement on JICA guidelines.

"Acquisition and Requisition of Immovable Property Ordinance of 1982 (ARIPO 1982)", was revised in 1993 and 1994 after its enforcement and applied to acquisition and requisition (temporary acquisition) implemented by the government for the public purpose and interest. Currently, Acquisition and Requisition of Immovable Property Act, 2017 (ARIPA 2017)" is effective repealing the ARIPO 1982, and the amount of compensation for land acquisition has been raised. A legal process for land acquisition is initiated after a detailed map and land acquisition plan are submitted to the Deputy Commissioner (DC) of the concerned District. When the compensation amount based on ARIPA 2017 and replacement cost are different, the difference will be paid by the implementation organization via NGOs.

(1) Acquisition and Requisition of Immovable Property Ordinance of 1982(ARIPO) and its subsequent amendments in 1993 and 1994

Previously, the policy framework and entitlements in Bangladesh had been based on national law, *Acquisition and Requisition of Immovable Property Ordinance of 1982 (ARIPO 1982)*. DC is empowered to make permanently acquisition or temporarily requisition of property and pay compensation for the eligible PAPs. DC assesses the amount of compensation, taking into consideration factors such as: land transactions in the locality over the past 12 months. The amendments to the ARIPO in 1993 increased the amount of the premium for compulsory acquisition from 25 to 50% on the assessed value of the property. The 1994 amendment provides provision for payment of crop compensation to tenants. The ARIPO does not cover compensation for loss of wage income; it also does not cover losses of non-titled persons (Sharecropper, squatters, encroachers, etc.) aside from crop losses to tenants.

For the purpose of acquisition and requisition of immovable properties in Bangladesh, the government, taking into consideration all previous Acts, Rules, Ordinances etc., have prepared **'Acquisition of Immovable Properties Manual-1997'**. This manual guides all acquisition and requisition of immovable properties as well as payment of compensation for all sorts of losses.

(2) Acquisition and Requisition of Immovable Property Act-2017

The ARIPA 2017 annulled the ARIPO 1982 and changed the compensation calculation rate.

The compensation for the affected persons based on the ARIPA 2017 shall be the amount that adds 200% premium to the average market price of land in the past year for the purpose of governmental projects, and the amount that adds 300% premium for the purposed of private sector projects. Compensation for loss of crops and trees shall be the amount that adds 100% premium to their market prices. For the market price used to calculate land compensation, a mouza rate (municipality-specific rate) set by the DC (Deputy Commissioner) office will be applied. The market price used to calculate building compensation is set by PWD (Public Works Department).

The ARIPA 2017 retains the provision that land of religious institutions like mosques, temples and graveyards cannot be acquired generally. However, it also incorporates a provision that would allow the government to acquire land of any religious institutions if inevitable for public interest. The acquisition process is the same as previous.

For land acquisition in Bangladesh, feasibility study in the field area will have to be conducted for identifying houses and plots to be affected. Based on the feasibility study, any executing agency shall submit proposal for land acquisition to DC. DC, as a member of land committee, will make verification of the proposal on the field level. During the verification process, District Land Acquisition Commissioner, on behalf of DC, will hold the meeting calling concerned stakeholders. After the verification, DC will give notice to landowners for land acquisition. Land owners can submit application against land acquisition if any opposition. DC will take hearing from the landowners and reply to them.

(3) JICA's Policy on Land Acquisition and Resettlement

The key principle of JICA policies on involuntary resettlement is summarized below.

I. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.

II. When, population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.

III. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.

IV. Compensation must be based on the full replacement cost as much as possible.

V. Compensation and other kinds of assistance must be provided prior to displacement.

VI. For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.

VII. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.

VIII. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.

IX. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

Above principles are complemented by World Bank OP 4.12, since it is stated in JICA Guideline that "JICA confirms that projects do not deviate significantly from the World Bank's Safeguard Policies". Additional key principle based on World Bank OP 4.12 is as follows.

X. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits.

XI. Eligibility of Benefits include, the PAPs who have formal legal rights to land (including

customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying.

XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.

XIII. Provide support for the transition period between displacement and livelihood restoration.

XIV. Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.

XV. For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

In addition to the above core principles on the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed Financial Plan etc.

(4) Comparison between the JICA guidelines and the national legal system in Bangladesh regarding resettlement and land acquisition

The differences between the JICA Guidelines for Environmental and Social Consideration and the Resettlement / Land Acquisition Law in Bangladesh are as follows. If there is any gap between the GOB law and JICA guidelines for implementation of RAP, proper measure should be taken in compliance with JICA guidelines.

Table 4.11-2 Gaps between Law in Bangladesh and JICA Guidelines regarding Involuntary Resettlement

No.	JICA Guidelines (A)	Acquisition and Requisition of Immovable Property Ordinance-1982	Acquisition and Requisition of Immovable Property Ordinance-2017 (B)	Gaps between (A) and (B)	Project Policy
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	No formal laws, act or ordinance but common practice	No formal laws, act or ordinance but common practice	There is practice but not legally bound	Project shall be planned to avoid involuntary resettlement and loss of means of livelihood as much as possible.
2	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	No formal laws, act or ordinance but common practice; compensation by DC as Cash compensation under law (CCL);50% premium on calculated amount (ARIPO 1982, Part II, section (8(2))	No formal laws, act or ordinance but common practice; compensation by DC as Cash compensation under law (CCL); additional percentage of 200% on calculated amount in government projects (300% premium on calculated amount in private projects) (ARIPO 2017, Part II, section 9(2)) In addition to the compensation, it is also stipulated that necessary action may be taken to rehabilitate the displaced family (ARIPO 2017, Part II, section (9(4))	Minimization of the impact is not stipulated. It might be insufficient in terms of 200% premium on actual market price as replacement value.	Minimization of the impact shall be examined.
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore	No legal provision	The amount of compensation for the immoveable property shall be paid in consideration thereof In addition to the	Insufficient compensation, support and practice to restore pre-project living standard and production level.	Compensation and rehabilitation assistance shall be provided to restore pre-project living standard and production level.

No.	JICA Guidelines (A)	Acquisition and Requisition of Immovable Property Ordinance-1982	Acquisition and Requisition of Immovable Property Ordinance-2017 (B)	Gaps between (A) and (B)	Project Policy
	their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)		compensation mentioned in this section, due to the acquisition, necessary action may be taken to rehabilitate the displaced family. (ARIPO 2017 (9(4))		
4	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	In addition to the market value of the property as provided in sub-section (1), the Deputy Commissioner shall, in every case award a sum of 50% (fifty per centum) on such market value in consideration of the compulsory nature of the acquisition. (ARIPO 1982, Part II, section 8(2))	In case of acquisition of land for any government requirement, a person belonging to the interest shall be paid an additional percentage of 200 (two hundred) compensation on the market price. (As for a requirement of private company the additional amount will be 300 (300) percent.) (ARIPO 2017 (9(2)) Valuation of structure is made by PWD where depreciation will be considered if the structures are older than ten years. Compensation of trees and is made by market values which is assessed by Forest department and Agricultural Department respectively.	Compensation by ARIPO 2017 might be below the replacement cost.	Compensation to be provided at full replacement cost or 200 % of market price, whichever higher.
5	Compensation and other kinds of	No legal provision	No legal provision	Normally displaced	Compensation and other

No.	JICA Guidelines (A)	Acquisition and Requisition of Immovable Property Ordinance-1982	Acquisition and Requisition of Immovable Property Ordinance-2017 (B)	Gaps between (A) and (B)	Project Policy
	assistance must be provided prior to displacement. (JICA GL)			before getting compensation and support	kinds of assistance shall be provided prior to displacement.
6	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	Not such legal bindings in the law	Not such legal bindings in the law	Though no legal provision but practice in donor funded project	RAP will be prepared.
7	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	No such arrangement in the law, even no scope of RAP	No such arrangement in the law, even no scope of RAP	Preparation of RAP is a social reality	Consultations will be held with the affected people and their communities
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	No provision of consultations in the law but there is a practice of consultations in donor project	No provision of consultations in the law but there is a practice of consultations in donor project	In fact when consultations held, it is clearly understandable to the affected in their local language	Explanation in consultation will be made in Bengali language.
9	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	No provision and guideline in law	No provision and guideline in law	Stakeholders normally remain in dark regarding project formulation, implementation and monitoring issues	Participation of affected people will be promoted through consultation and FGDs.
10	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	There is a scope of arbitration regarding payment related issues for titled owner (ARIPO 1982, Part IV)	There is a scope of arbitration regarding payment related issues for titled owner (ARIPA 2017, Part IV)	This is not easy for common people and doesn't ensure compensation at the rate of full replacement cost, also	Appropriate and accessible grievance mechanisms will be established.

No.	JICA Guidelines (A)	Acquisition and Requisition of Immovable Property Ordinance-1982	Acquisition and Requisition of Immovable Property Ordinance-2017 (B)	Gaps between (A) and (B)	Project Policy
				for non-titled owners do not get any compensation and not get income restoration support	
11	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP 4.12 Para. 6)	Whenever it appears to the District Commissioner that any property is needed for any public purpose/interest, he shall cause a notice to be published at convenient places on or near the property (ARIPO 1982, Part II, section 3) No provisions of early identification of affected persons, there is act in case of Jamuna Bridge Project (land acquisition) (Compensation Refusal Laws)-1994(Act No-14); for refusal of compensation of fake structure.	Whenever it appears to the District Commissioner that any property is needed for any public purpose/interest, he shall cause a notice to be published at convenient places on or near the property, before Joint Verification Survey (ARIPO 2017, Part II, section 4(1)) Before the issue of the notice, the actual condition and nature of the immovable property proposed for acquisition, the structure and the infrastructure, crops and trees, everything else and videos of the project or other by using any technology, its statement will be prepared (ARIPO 2017, Part II, section 4(3)(a))	In Bangladesh law, cut-off-date is declared at DD stage after submission of F/S with Land Acquisition Plan from executing agencies while cut-off-date in JICA Projects is declared at the commencement of census.	Cut-off-date for Project Affected Person eligible for compensation in ARIPO 2017 is declared before Joint Verification Survey at DD stage. Cut-off-date for Project Affected Person not covered by in ARIPO 2017 is considered to be the one at the commencement of census.
12	Eligibility of benefits includes, the	The compensation will be	The compensation will be	Vulnerable and	All non-titleholders (as

No.	JICA Guidelines (A)	Acquisition and Requisition of Immovable Property Ordinance-1982	Acquisition and Requisition of Immovable Property Ordinance-2017 (B)	Gaps between (A) and (B)	Project Policy
	PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP 4.12 Para. 15)	paid to the bargadar, a person who cultivate the land of another person (ARIPO 1982, Part II, section 10) though no compensation for non-titled owner and squatter in the law	paid to the bargadar, a person who cultivate the land of another person (ARIPO 2017, Part II, section 12), though no compensation for non-titled occupants and squatter in the law	squatter are deprived	identified on date of census survey) will also be eligible for resettlement and rehabilitation benefits
13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP 4.12 Para. 11)	No support in the law	No support in the law though land will be provided under the responsibility of the executing agency in practice	Lack of legal support, but in donor supported project there is example of Resettlement Site (RS) specially for vulnerable homestead loser	Resettlement policy based on land shall be considered if livelihood is closely connected with specific land.
14	Provide support for the transition period (between displacement and livelihood restoration). (WB OP 4. 12, para.6)	No support in the law	No support in the law	Lack of livelihood restoration support	Transition benefits to be provided to non-titleholders (displaced and livelihoods impacted) who have been identified as per census survey
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic	No guideline in the law	No guideline in the law	No distinction or priority in Bangladesh's law regarding vulnerability	Special assistance shall be provided to the vulnerable groups.

No.	JICA Guidelines (A)	Acquisition and Requisition of Immovable Property Ordinance-1982	Acquisition and Requisition of Immovable Property Ordinance-2017 (B)	Gaps between (A) and (B)	Project Policy
	minorities etc. (WB OP 4.12 Para. 8)				

4.11.3 Scale and Scope of Land Acquisition and Resettlement

Scale and scope of land acquisition and resettlement incurred by the Project are shown below.

Table 4.11-3 Scale and Scope of Land Acquisition and Resettlement by the Project

Project component		Location		Required Land			Resettlement
		Upazila, District	Union	Total	Transfer of Gov. Land	Acquisition of Private land	
Port	Container terminal	Moheshkhali Upazila, Cox's Bazar District	Dhalghata	74.9 ha	26.0 ha	48.9 ha	House: 50 PAHs, 255 PAPs Shop: 5 PAHs, 26 PAPs (Out of 4 PAHs and 21 PAPs are common)
	Multipurpose terminal	Same as above	Dhalghata				
	Navigation channel and basin (extended)	Same as above	Dhalghata				
	Soil dumping Site	Same as above	Dhalghata	32.4 ha	1.5ha	30.9ha	House: 7 PAHs, 36 PAPs (Common to Access Road)
	Sub-total			107.3ha	27.5 ha	79.8 ha	House: 57 PAHs, 291 PAPs Shop: 5 PAHs, 21 PAPs
Access road	North-south port connecting road Matarbari Port to N 1	Moheshkhali Upazila, Cox's Bazar District	Dhalghata	28.3ha	3.5ha	24.8ha	House: 19 PAHs, 114 PAPs (Out of 7 PAHs and 36 PAPs are common with port) Shop: 0 PAHs, 0 PAPs
			Kalarmarchara	70.7ha	8.0ha	62.7ha	House: 16 PAHs 80 PAPs Shop: 0 PAHs 0 PAPs
		Chakaria Upazila, Cox's Bazar District	Badarkhali	33.6ha	18.4ha	15.2ha	House: 30 PAHs, 129 PAPs Shop: 4 PAHs, 17 PAPs
			Saharbil	16.2ha	16.2ha	0ha	House: 0 PAHs, 0 PAPs Shop: 0 PAHs, 0 PAPs
			Chiringa	43.0ha	10.2ha	32.8ha	House: 47 PAHs, 232 PAPs Shop: 2 PAHs, 10 PAPs
			Fasiakhali	9.0ha	1.1ha	7.9ha	House: 18 PAHs, 104 PAPs Shop:1 PAHs, 6 PAPs
	Sub-total			200.8ha	57.4ha	143.4ha	House: 130 PAHs, 659 PAPs Shop:7 PAHs, 33 PAPs

Source: JICA Survey Team

(1) Methodology of survey on PAHs

1) Census survey

Project Affected Households (PAHs) and Project Affected Persons (PAPs) have been identified through door-to-door visits using mouza maps and hearings to landowners. For port, 207 households were identified whose houses/stores and/or land will be affected will be affected while 44 households were identified whose livelihood is affected though without title of the affected land. For access road, 614 households were identified whose houses/stores and/or land will be affected while 515 households were identified whose livelihood is affected though without title of the affected land..

The survey, commissioned to a local consultant, was implemented by organizing a survey team consisting

of a coordinator, resettlement expert (team leader), survey supervisor and a group basically of 4 to 5 door-to-door researchers who also serve as record keepers.

2) Survey for inventory of losses (IOL)

Information on the area of affected land and structure and the quantity of affected crops and trees has been collected from PAPs by using questionnaires. During socio-economic survey (SES), replacement cost survey (RCS) has been carried out to check the market price of land and structure. Key community persons were asked about the land price of the area regardless whether their land was affected or not, which was again verified in the focus group discussion (FGD) meeting. The amount of replacement cost to be paid in addition to the DC's payment shall be finalized after an assessment made by Property Valuation Advisory Team (PVAT). The composition of replacement cost is as follows:

- Agricultural land: market value of land of equal productive potential or use located in the vicinity of the affected land (the pre-project or pre-displacement, whichever is higher) + the cost of preparing the land to levels similar to those of the affected land + the cost of any registration and transfer taxes
- Land in urban areas: the pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land + the cost of any registration and transfer taxes
- Houses and other structures: market cost of the materials to build a replacement structure with an area and quality similar to or better than those of the affected structure (or to repair a partially affected structure) + the cost of transporting building materials to the construction site + the cost of any labor and contractors' fees + the cost of any registration and transfer taxes

3) Livelihood survey

In livelihood survey, respondents were interviewed by using structured questionnaire. Household composition, education level, occupation, income, utilization of public amenities were confirmed. Questions related to livelihood restoration were included in the interview, where preference for skills training was asked.

(2) Survey Result

1) Port

a) **Census**

The overview of survey results is shown in the below table. 207 households were identified whose houses/stores and/or land will be affected will be affected while 44 households were identified whose livelihood is affected though without title of the affected land. For households whose houses/stores and/or land will be affected, information on their family members and living conditions were to be obtained through door-to-door visits. For residents whose livelihood is affected though without title of the affected land, information on their names, contacts and the crops cultivated on land were to be obtained through hearings to the landowners. Cut-off date for the Project Affected Persons ineligible for compensation in Bangladesh law was declared at the commencement of census, namely 11th February, 2018. Cut-off date for the Project Affected Persons eligible for compensation in Bangladesh law will be declared before Joint Verification Survey at a detailed design stage.

Table 4.11-4 Summary of the Survey

Category	Formal		Informal		Total		Remarks
	PAHs	PAPs	PAHs	PAPs	PAHs	PAPs	
1. Houses	26	140	31	151	57	291	
2. Shops	0	0	5	27	5	27	
2.1. Both Houses and Shops Affected	0	0	4	21	4	21	
2.2 Shop only	0	0	1	6	1	6	
3. Sub-total of Structures	26	140	32	157	58	297	1.Houses + 2.Shops - 2.1.Both Houses and Shops Affected
4. Loss of Salt Farm	159	856	0	0	159	856	
5. Loss of Residential Land	26	140	31	151	57	291	
5.1. Both salt farm and residential	10	60	0	0	10	60	
5.2. Residential land only	16	80	0	0	16	80	
6. Sub-total of Land	175	936	0	0	175	936	4. Salt farm + 5.Residential - 5.1. Both Salt farm and Residential
7. Sub-total of Structure/ Land	175	936	32	157	207	1,093	3. Structure + 6. Land - 5.Loss of Residential Land
8. Sharecropper	-	-	-	-	10	39	
9. Employee	-	-	-	-	34	157	
10. Sub-total of Non-title holder	-	-	-	-	44	196	
11. Total PAHs/PAPs	-	-	-	-	251	1,289	

Source: JICA Survey Team

In this survey, 207 households that will be physically affected were subjected to the survey on IOL and livelihood. For sharecroppers and daily laborers, survey on livelihood was conducted.

b) **Inventory of Loss**

i) Type/ Ownership of Houses

The following table shows the type of affected housing structures. Total affected residential structures are 56 and commercial structure is 5, out of which 4 commercial structures use same structures of residential ones. 45 of the residential structures are thatched. For calculating the replacement cost, depreciation shall not be considered.

Table 4.11-5 Type of House Structure and Value of the Affected Structure

Type		Unit value /m2	No. of structure	Area(m2)	Total (BDT)
Residential	Pucca	11,000	2	74	814,000
	Tin shed	3,900	9	410	1,599,000
	Thatched	2,000	45	1,578	3,156,000
	Sub-total		56	2,062	5,569,000
Commercial	Pucca	11,000	0	0	0
	Tin shed	3,900	0	0	0
	Thatched	2,000	5	89	178,000
	Sub-total		5	89	178,000
Total	Pucca	11,000	2	74	814,000
	Tin shed	3,900	9	410	1,599,000
	Thatched	2,000	50	1,667	3,334,000
	Total		61	2,151	5,747,000

Source: JICA Survey Team

56 out of 207 households to be surveyed have house structures in the Project affected area. 24 households (42.9%) among them are located in their own land while 32 households (57.1%) are located in governmental land.

Table 4.11-6 Ownership of Residential Structures

Upazila	Union	Housing on Owned land	Housing on Government land/other's land*	No response	Total
Moheshkhali	Dhalghata	24	32**	0	56
Total:		24 (42.9%)	32** (57.1%)	0 (0%)	56 (100%)

* Uncertain Owner

** Structures of 3 HHs are partly shop and partly housing structure. All structures on government land are owned by the PAPs.

Source: JICA Survey Team

Table 4.11-7 Ownership of Commercial Structures

Upazila	Union	Shop/store on Owned land	Shop/store on government land*	No response	Total
Moheshkhali	Dhalghata	0	5	0	5
Total:		0 (0%)	5 (100%)	0 (0%)	5 (100%)

Source: JICA Survey Team

ii) Land

Out of 1,073,381m^2 land, private land is 797,844 m^2, while governmental land is 275,497 m$_2$. 702,868m^2 of the private land and 61,014 m^2 of the public land are used as salt farms. In the rainy season, they are partially used as shrimp farms.

Table 4.11-8 Land System

Upazila	Union	Ownership	Land Utilization					
			Salt farm	Agriculture	Residential	Commercial	Others	Total
Moheshkhali	Dhalghata	Private Land	702,868	0	40,603	0	54,413	797,844
		Government Land	72,518	0	10,802	0	192,177	275,497
		Total	775,387	0	51,405	0	244,710	1,073,381

Source: JICA Survey Team

The table below shows different types of loss of land in the area.

Table 4.11-9 Size wise Affected Land in the Area

Type of Land	Size wise affected land							
	> 10 sqm and <=100	>100 sqm and <=250 sqm	>250 sqm and <=500 sqm	>500 sqm and <=1000 sqm	> 1000 sqm and <=1500	> 1500 sqm and <=2000 sqm	> 2000 sqm	Total
Salt Firm	0	6	4	18	6	12	105	151
Residential	14	4	1	4	0	1	0	24
Total	14	10	5	22	6	13	105	175

Source: JICA Survey Team

iii) Tree and Crops

In the proposed port terminal area, 6 PAHs will loss trees. No of affected trees are 48. No of large trees are 10, medium trees are 26 and small trees are 12.

Table 4.11-10 Loss of Trees

No. of tree		PAHs	Comments
Big	10	6	The tree varieties are Mehogoni, Cocoanut, Mango and Banana
Medium	26		
Small	12		
Total	48		

Source: JICA Survey Team

Location-wise affected trees are as shown below.

Table 4.11-11 PAH's Location Wise Affected Trees

Ref. H/H No.	Name of H/H	Village	Name of Tree	Unit Value of Tree (Tk.)	No. of Tree	Total Value of Tree (Tk.)	Annual Income from fruit tress (Tk.)
			Coconut	3,759	4	15,036	4,000
			Coconut	3,759	2	7,518	1,000
			Coconut	3,759	2	7,518	2,000
			Coconut	3,759	4	15,036	2,000
			Mehogoni	5,894	20	117,880	N/A
			Mango	3,363	4	13,452	8,000
			Banana	4,053	8	32,424	3,000
			Coconut	3,759	4	15,036	N/A
Total					48	223,900	20,000

Source: JICA Survey Team

c) **Livelihood (households with houses / shops and/or land affected)**

In this survey, livelihood survey was conducted on all 207 households with their houses, shops, and/or land affected. The table below shows the Union/Mouza-wise number of households.

Table 4.11-12 Union/Mouza-wise HHs subject to the Survey

Sl. No.	Union	Mouza	Households	
			No.	%
1	Dhalghata	Dhalghata	207	100.0
Total:			**207**	**100.0**

Source: JICA Survey Team

i) Distribution of household members by age

The table below shows the age distribution of household members of the PAHs. Households below the age of 15 are 28.6%. As for male, the economically active population aged 15 to 59 are 37.1%, while the economically dependent age group of 60 years and older are 3.6%. As for female, they are 28.1% and 2.6% respectively.

Table 4.11-13 Age Distribution of Household Member

Age	Male		Female		Total	
	Population	%	Population	%	Population	%
<=14	159	14.5%	154	14.1%	313	**28.6%**
>=15-59	406	**37.1%**	307	28.1%	713	65.2%
60+	39	**3.6%**	28	2.6%	67	6.1%
Total	604	55.3%	489	44.7%	1,093	100.0%

Source: JICA Survey Team

ii) Education

The union-wise education level of household member is as shown below. The illiterate rate is 16.4%, and primary- and secondary-level rates are 31.3% and 26.9% respectively.

Table 4.11-14 Educational Level of the Project Affected Persons

District	Union	Illiterate	Primary level	Second -ary level	HSC level	Gradu -ate	Post Gradu -ate	Voca -tional	Others (< 5yrs)	Total
Moheshkhali	Dhalghata	179	342	294	120	82	30	5	41	1,093
Total:		179 (16.4%)	342 (31.3%)	294 (26.9%)	120 (11.0%)	82 (7.5%)	30 (2.7%)	5 (0.5%)	41 (3.8%)	1,093 (100%)

Source: JICA Survey Team

Table below shows the gender-wise education level of the PAPs. Gender gap of education level is explained in detail in the "13) Gender" section of "(3) Impact on Social Environment" in "4.7.1 Port" of "4.7 Results of Environmental and Social Consideration Survey".

Table 4.11-15 Gender-wise Education Level of the Project Affected Persons

Educational status	Male		Female		Total	
	No. of Member	%	No. of Member	%	No. of Member	%
(1) Illiterate	99	**16.4**	80	**16.3**	179	16.4
(2) Primary level	172	**28.5**	170	**34.7**	342	31.3
(3) Secondary level	127	**21.1**	167	**34.1**	294	26.9
(4) HSC level	82	**13.6**	38	**7.8**	120	11.0
(5) Graduate	67	11.1	15	3.1	82	7.5
(6) Post Graduate	23	3.8	7	1.4	30	2.7
(7) Vocational	4	0.7	1	0.2	5	0.5
(8) Others (Children < 5 yrs)	29	4.8	12	2.4	41	3.8
Total:	603	100.0	490	100.0	1,093	100.0

Source: JICA Survey Team

iii) Employment

Table below shows 32.6% household members are working, 1.5% are unemployed, 22.4% are engaged in housework, and 41.4% are students.

Table 4.11-16 Number of Employed Members in PAHs

Upazila	Union	Employed	Unemployed	Housework	Students	Unknown*	Total
Moheshkhali	Dhalghata	356	16	245	453	13	1,093
Total:		356 (32.6%)	16 (1.5%)	245 (22.4%)	453 (41.4%)	13 (1.2%)	1,093 (100.0%)

**Vulnerability
Source: JICA Survey Team

iv) Occupation

The table below shows that occupation of the PAPs. Many of PAPs in the Dhalghata area are engaged in salt cultivation. Women do not work in the field. Gender gap in occupation is explained in detail in the "13) Gender" section of "(3) Impact on Social Environment" in "4.7.1 Port" of "4.7 Results of Environmental and Social Consideration Survey".

Table 4.11-17 Union-wise Occupation Pattern of the PAPs

Upazila	Union	Fishery	Salt Cultivation	Household Work	Self Employed	Skilled Profession	Unskilled Labour	Private Service	Govt. Service	Retired/ Pensioner	Unemployed	Too young to work/disabled/student	Others	Total
Moheshkhali	Dhalghata	34	159	245	34	6	13	58	7	1	16	453	67	1,093
Total:		34 (3.1%)	159 (14.5%)	245 (22.4%)	34 (3.1%)	6 (0.5%)	13 (1.2%)	58 (5.3%)	7 (0.6%)	1 (0.1%)	16 (1.5%)	453 (41.4%)	67 (6.1%)	1,093 (100.0%)

Source: JICA Survey Team

Table 4.11-18 Gender-wise Occupation Pattern of PAPs

Occupation	Male		Female		Total Pop.	
	No. of Member	%	No. of Member	%	No. of Member	%
(1) Fishery	33	5.5%	1	0.2%	34	3.1%
(2) Salt cultivation and shrimp culture	159	26.4%	0	0.0%	159	14.5%
(3) Household/Cottage industry	1	0.2%	244	49.8%	245	22.4%
(4) Self Employed	31	5.1%	3	0.6%	34	3.1%
(5) Skilled profession	6	1.0%	0	0.0%	6	0.5%
(6) Unskilled labour	13	2.2%	0	0.0%	13	1.2%
(7) Private Service	51	8.5%	7	1.4%	58	5.3%
(8) Govt. Service	6	1.0%	1	0.2%	7	0.6%
(9) Retired/Pensioner	1	0.2%	0	0.0%	1	0.1%
(10) Unemployed though capable to work	5	0.8%	11	2.2%	16	1.5%
(11) Too young to work/disabled/student	242	40.1%	211	43.1%	453	41.4%
(12) Others	55	9.1%	12	2.4%	67	6.1%
Total:	603	100.0%	490	100.0%	1,093	100.0%

Source: JICA Survey Team

Table 4.11-19 PAHs under Shrimp Cultivation

Serial	Type	PAHs	Comments
1	Both salt farm & shrimp cultivation	142	People normally cultivates salt and shrimp in the same land, winter and summer for salt and rainy season for shrimp cultivation
2	Only shrimp cultivation	17	

Source: JICA Survey Team

v) Income

The Table below shows the total monthly income of the PAHs. Households below poverty line are 8.1%. HHs with income range between Tk.15,000 to 20,000 are 7.7%; Tk,20,000 to 25,000 are 8.2% and income above Tk. 25,000 are 64.3%.

Table 4.11-20 Union-wise Monthly Household Income

Upazila	Union	Below Tk. 5000	Tk. 5000-Tk. 10000	Above Tk. 10000-Tk. 15000	Above Tk. 15000 -Tk.20000	Above Tk. 20000 - Tk. 25000	Above Tk. 25000	No response	Total H/H
Moheshkhali	Dhalghata	3	9	5	16	17	133	24	207
Total:		3 (1.4%)	9 (4.3%)	5 (2.4%)	16 (7.7%)	17 (8.2%)	133 (64.3%)	24 (11.6%)	207 (100.0 %)

Source: JICA Survey Team

vi) Public Amenities

The Table below indicates that 122 (58.9%) out of 207 households have electricity, which is solar and not grid electricity. Recently some transmission line of grid electricity is under process. Most of the toilets are not sanitary. 46.9% households use toilets without sewage pits, and 15.5% households have no toilet.

Table 4.11-21 Access to Electricity

Upaliza	Union	Electricity Yes	Electricity No	Total H/H
Moheshkhali	Dhalghata	122	85	**207**
Total:		122 (58.9%)	85 (41.1%)	**207 (100.0%)**

Source: JICA Survey Team

Table 4.11-22 Types of Toilet

Upaliza	Union	Latrine	Sanitary	Non Sanitary	Open field	Total H/H
Moheshkhali	Dhalghata	17	61	97	32	**207**
Total:		17 8.2%	61 29.5%	97 46.9%	32 15.5%	**207** 100.0%

Source: JICA Survey Team

vii) Vulnerable households

The Table below indicates that 16 are female headed households, household heads of above 60 years old are 41, and households below poverty line are 17.

Table 4.11-23 Vulnerability

Upazila	Union	Female HH	HH above 60	Minority	Below Poverty Line	Total Vulnerable	Total HHs
Moheshkhali	Dhalghata	**16**	**41**	0	**17**	74	207
Total		16	41	0	17	74	207

Source: JICA Survey Team

d) **Livelihood (Non-titled Persons with their livelihood affected)**

Apart from 153 HHs with their structures and/or land affected, 44 non-titled sharecropper or employees will have their livelihood affected, for whom interview survey was conducted. Total male-100, female-96 and total family member is 196. Family size is 4.45. Average monthly income is Tk.24,061. Out of 44 PAHs 9 are below poverty line which is 20.5%. All are Muslim and no one is in minority community. No one have electricity connection. Source of water is tube well for all households. Out of 44 households 37 depend on salt farming. In the Table below, occupation pattern of the non-tiled share cropper and employees are presented.

Table 4.11-24 Occupation Pattern of Non Titled PAHs

Serial	Type of Occupation	HHs	
		Number	%
1	Shrimp and salt	37	84.1
2	Business	6	13.7
3	Dairy	1	2.3
	Total	44	100

Source: JICA Survey Team

Table below shows the income range of the household of sharecroppers and employees. 20.5% are below poverty line.

Table 4.11-25 Income Range of Non-titled Sharecropper and Employee PAHs

Serial	Monthly Income Range	HHs		Average Monthly Income(Tk)
		Number	%	
1	Below Tk. 5000	0	0.0	-
2	Tk. 5000- below Tk. 10000	**2**	**4.5**	-
3	Tk. 10000- below Tk. 15000	**7**	**15.9**	
4	Tk. 15000 - below Tk.20000	21	47.7	
5	Tk. 20000 - below Tk. 25000	1	2.3	
6	Tk. 25000 and above	13	29.6	
	Total	44	100.0	Tk.30,965

Source: JICA Survey Team

In the following table, education level of the sharecroppers and employees are presented. 13.6% are illiterate, and 34.1% are primary level of education.

Table 4.11-26 Education Level of Non-titled Sharecropper and Employee PAHs

Serial	Level of Education	HHs	
		Number	%
1	Illiterate	6	**13.6**
2	Primary	15	**34.1**
3	secondary	14	31.8
4	higher secondary	6	13.6
5	Graduate	1	2.3
6	Post graduate	2	4.5
	Total	44	100.0

Source: JICA Survey Team

2) Access road

a) **Census**

The overview of survey results is shown in the below table. Survey was carried out based on the ROW in road planning discussed in the Preparatory Survey. 614 households with their 3,303 people were identified whose houses/stores and or land will be affected, while 515 people were identified whose livelihood is affected though without title of the affected land. For households whose houses/stores and/or land will be affected, information on their family members and living conditions were to be obtained through door-to-door visits. For residents whose livelihood is affected though without title of the affected land, information on their names, contacts and the crops cultivated on land are to be obtained through hearings to landowners. Cut-off date for the Project Affected Person ineligible for compensation in Bangladesh law was declared at the commencement of census, namely 1st April, 2018. Cut-off date for the Project Affected Person eligible for compensation in Bangladesh law will be declared before Joint Verification Survey at a detailed design stage.

Table 4.11-27 Summary of the Survey

Category	Formal		Informal		Total		Remarks
	PAHs	PAPs	PAHs	PAPs	PAHs	PAPs	
1. Houses	97	484	33	175	130	659	
2. Shops	5	23	2	10	7	33	
2.1. Both Houses and Shops Affected	1	6	1	6	2	12	
2.2 Shop only	4	17	1	4	5	21	
3. Sub-total of Structures	101	501	34	179	135	680	1.House+2.Shop-2.1 .Both Houses and Shops Affected
4. Loss of Agriculture/ Salt Farm	487	2,661	0	0	487	2,661	
5. Loss of Residential Land	97	484	0	0	97	484	
5.1. Both salt farm and residential	8	38	0	0	8	38	
5.2. Residential land only	89	446	0	0	89	446	
6. Sub-total of Land	576	3,107	0	0	576	3,107	4.Salt farm + 5.Residential - 5.1Both farm and residential
7. Sub-total of Structure/ Land	580	3,124	34	179	614	3,303	3.Structure+6.Land -5.Loss of Residential land
8. Sharecropper					258		
9. Agri-labour					12		
10. Labour in salt and shrimp farm					51		
11. Labour in salt farm					48		
12. Labour in shrimp farm					13		
13. Employee					119		
14. Sub-total of Non-title holder					515		
15. Total PAHs/PAPs					1,129		

Source: JICA Survey Team

In this survey, 614 households that will be physically affected were subjected to the survey on IOL and livelihood. For sharecroppers and daily laborers, sample survey on livelihood was conducted considering that because it was difficult to contact them.

b) **Inventory of Loss**

i) Type/ Ownership of Houses

Following table shows type of affected housing structure and ownership pattern. 80 houses, majority of all affected houses are tin shed. Semi-puca are 24 and Pucca is 22. For calculating the replacement cost, depreciation shall not be considered..

Table 4.11-28 Classification of Residential and Commercial Structures

Type		Unit Cost (BDT/m2)	No	Area (m2)	Total Amount (BDT)
Residential	Pucca	11,100	22	5,579	61,926,900
	Semi-puca	8,300	24	4,097	34,005,100
	Tin	3,900	80	7,831	30,540,900
	Katcha	2,000	10	1,222	2,444,000
	Sub-total		136	18,729	128,916,900
Commercial	Pucca	11,100	1	11	122,100
	Semi-puca	8,300	0	0	0
	Tin	3,900	4	158	616,200
	Katcha	2,000	2	20	40,000
	Sub-total		7	189	778,300
Total	Pucca	11,100	23	5,590	62,049,000
	Semi-puca	8,300	24	4,097	34,005,100
	Tin	3,900	84	7,989	31,157,100
	Katcha	2,000	12	1,242	2,484,000
	Sub-total		143	18,918	129,695,200

Source: JICA Survey Team

The following tables show the ownership of residential structures and commercial structures.

Table 4.11-29 Owenership of Residential Structures

Upazila	Union	Self-Owned	Rented	Informally occupied	Uncertain owner	Total
Moheshkhali	Dhalghata	34	1	3	0	38
	Kalarmarchara	0	0	0	0	0
Chakaria	Badarkhali	21	2	0	1	24
	Saharbil	0	0	0	0	0
	Chiringa	19	0	34	0	53
	Fasiakhali	18	1	2	0	21
Total		92 (67.6%)	4 (2.9%)	39 (28.7%)	1 (0.7%)	136 (100.0%)

Source: JICA Survey Team

Table 4.11-30 Owenership of commercial Structures

Upazila	Union	Self-Owned	Rented	Informally occupied	Uncertain owner	Total
Moheshkhali	Dhalghata	3	0	0	0	3
	Kalarmarchara	0	0	0	0	0
Chakaria	Badarkhali	1	0	0	0	1
	Saharbil	0	0	0	0	0
	Chiringa	1	0	1	1	2
	Fasiakhali	0	0	1	1	1
Total		5 (71.4%)	0 (0.0%)	2 (28.6%)	0 (0.0%)	7 (100.0%)

Source: JICA Survey Team

Other affected structures such as fences, stone walls and livestock huts are as follows.

Table 4.11-31 Other Affected Structures

Upazila	Union	No. of Strucutre	Area(m^2)
Moheshkhali	Dhalghata	31	4,466
	Kalarmarchara	9	981
Chakaria	Badarkhali	31	1,314
	Saharbil	0	919
	Chiringa	89	919
	Fasiakhali	42	387
Total		202	8,067

ii) Land

Out of 2,008,361m², private land to be acquired is 1,435,134m². where residential land is 75,272m², agricultural land is 37862m², and salt firm is 720,730 m².

Table 4.11-32 Land System

(Unit:m^2)

Upazila	Union	Priv.							Gov.	Total
		Res.	Agr.	Com.	Salt	Water	Others	Sub-total		
Moheshkhali	Dhalghata	299	0	0	248,112	0	0	248,411	34,515	282,926
	Kalarmarchara	2,394	149,627	0	472,361	2,621	0	627,003	79,667	706,671
Chakaria	Badarkhali	63,000	82,922	6,096	257	0	274	152,549	184,055	336,604
	Saharbil	0	0	0	0	0	0	0	162,190	162,190
	Chiringa	0	328,245	0	0	0	0	328,245	101,487	429,733
	Fasiakhali	9,579	69,345	0	0	0	0	78,924	11,314	90,238
Total		75,272	630,140	6,096	720,730	2,621	274	1,435,134	573,227	2,008,361

Source: JICA Survey Team

iii) Tree Loss

The number of project affected trees are 15,587.

Table 4.11-33 Affected Trees by Category

Name of Tree	Unit Price (Tk.)	No.	Total Value(Tk.)
Acatashamsia	9,000	12	108,000
Aistratran	1,000	14	14,000
Akashmoni	3,975	727	2,889,753
Arjun	5,000	1	5,000
Badam	15,000	2	30,000
Badi Tree	1,667	12	20,000
Bamboo	108	3,412	369,985
Banana tree	4,053	20	81,066
Banyan	8,500	3	25,500
Belgium	2,031	882	1,793,169
Betel Nut	976	280	273,274
Bilambu	4,053	1	4,053
Black Plum	3,045	33	100,500
Coconut	3,759	547	2,056,295
Cotton tree	3,500	4	14,000
Date	4,782	58	277,343
Eucalyptus	1,567	4,892	7,666,629
Fambara	3,500	2	7,000
Flower tree	8,400	33	277,200
Gamari	3,000	14	42,000
Garjan	500	14	7,000
Gooseberry	800	1	800
Guava	620	48	29,760
Hog Plum	242	18	4,350
Jackfruit	3,251	63	204,818
Jam	8,500	6	51,000
Jaue Tree	15,000	1	15,000
Lichi	300	1	300
Madar tree	4,053	4	16,213
Malaria	2,349	3,648	8,569,561
Mango	3,363	352	1,183,692
Mehegoni	5,894	115	677,803

Name of Tree	Unit Price (Tk.)	No.	Total Value(Tk.)
Melenda	15,000	1	15,000
Neem	3,250	19	61,750
Olive	2,700	11	29,700
Other tree	4,053	2	8,107
Palm	3,188	11	35,063
Papaya	13	161	2,147
Pea nut	250	2	500
Plum	2,055	22	45,210
Raintree	8,824	84	741,176
Rose Apple	700	2	1,400
Segun	10,000	3	30,000
Sharifa	500	3	1,500
Shisu	4,034	29	116,989
Shoita	500	4	2,000
Sofeda	5,000	1	5,000
Tamarind	7,650	11	84,150
		15,587	27,994,757

Source: JICA Survey Team

Table 4.11-34 Affected Trees by Households

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Badarkhali	Mehogoni	Timber	5		29,470
	Badarkhali	Akashmoni	Timber	30		119,247
	Badarkhali	Shisu	Timber	22		88,750
	Badarkhali	Coconut	Fruit bearing	7	30,000	26,315
	Badarkhali	Raintree	Timber	3		26,471
	Badarkhali	Bamboo	Timber	50		5,422
	Badarkhali	Malaria	Timber	20		46,982
	Badarkhali	Coconut	Fruit bearing	2	6,000	7,518
	Badarkhali	Banyan	Timber	1		8,500
	Badarkhali	Jaue Tree	Timber	1		15,000
	Badarkhali	Plum	Fruit bearing	1	2,000	2,055
	Badarkhali	Malaria	Timber	34		79,870
	Badarkhali	Eucalyptus	Timber	7		10,970
	Badarkhali	Coconut	Fruit bearing	3		11,278
	Badarkhali	Date	Fruit bearing	10		47,818
	Badarkhali	Malaria	Timber	62		145,645
	Badarkhali	Coconut	Fruit bearing	62		233,072
	Badarkhali	Maleria	Timber	10		23,491
	Badarkhali	Plum	Fruit bearing	1	5,000	2,055
	Badarkhali	Malaria	Timber	62		145,645
	Badarkhali	Coconut	Fruit bearing	2		7,518
	Badarkhali	Malaria	Timber	100		234,911
	Badarkhali	Raintree	Timber	1		8,824
	Badarkhali	Coconut	Fruit bearing	2	10,000	7,518
	Badarkhali	Mango	Fruit bearing	3		10,088
	Badarkhali	Date	Fruit bearing	2	3,000	9,564
	Badarkhali	Jam	Fruit bearing	1	5,000	8,500
	Badarkhali	Raintree	Timber	2		17,647
	Badarkhali	Melenda	Timber	1		15,000
	Badarkhali	Raintree	Timber	2		17,647
	Badarkhali	Malaria	Timber	29		68,124
	Badarkhali	Betel Nut	Fruit bearing	3		2,928
	Badarkhali	Date	Fruit bearing	1		4,782
	Badarkhali	Raintree	Timber	2		17,647

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Badarkhali	Coconut	Fruit bearing	3		11,278
	Badarkhali	Raintree	Timber	2		17,647
	Badarkhali	Raintree	Timber	1		8,824
	Badarkhali	Akashmoni	Timber	2		7,950
	Badarkhali	Malaria	Timber	2		4,698
	Badarkhali	Coconut	Fruit bearing	2	5,000	7,518
	Badarkhali	Malaria	Timber	1		2,349
	Badarkhali	Akashmoni	Timber	2		7,950
	Badarkhali	Guava	Fruit bearing	2		1,240
	Badarkhali	Aistratran	Timber	14		14,000
	Badarkhali	Raintree	Timber	1		8,824
	Badarkhali	Banyan	Timber	2		17,000
	Badarkhali	Coconut	Fruit bearing	1	20,000	3,759
	Badarkhali	Bamboo	Timber	2		217
	Badarkhali	Date	Fruit bearing	3	3,000	14,345
	Badarkhali	Palm	Fruit bearing	2	5,000	6,375
	Badarkhali	Mango	Fruit bearing	2		6,726
	Badarkhali	Raintree	Timber	2		17,647
	Badarkhali	Malaria	Timber	6		14,095
	Badarkhali	Tamarind	Fruit bearing	1	2,500	7,650
	Badarkhali	Mango	Fruit bearing	1	2,000	3,363
	Badarkhali	Belgium	Timber	1		2,031
	Badarkhali	Eucalyptus	Timber	50		78,359
	Badarkhali	Sofeda	Fruit bearing	1	10,000	5,000
	Badarkhali	Coconut	Fruit bearing	6		22,555
	Badarkhali	Eucalyptus	Timber	7		10,970
	Badarkhali	Mehogoni	Timber	10		58,939
	Badarkhali	Mango	Fruit bearing	10		33,628
	Badarkhali	Olive	Fruit bearing	8		21,600
	Badarkhali	Papaya	Fruit bearing	150	500,000	2,000
	Badarkhali	Coconut	Fruit bearing	3	600	11,278
	Badarkhali	Guava	Fruit bearing	1	1,000	620
	Badarkhali	Papaya	Fruit bearing	2	1,500	27
	Badarkhali	Mango	Fruit bearing	1	1,200	3,363
	Badarkhali	Raintree	Timber	2		17,647

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Badarkhali	Eucalyptus	Timber	2		3,134
	Badarkhali	Coconut	Fruit bearing	4	200	15,037
	Badarkhali	Eucalyptus	Timber	3		4,702
	Badarkhali	Raintree	Timber	5		44,118
	Badarkhali	Coconut	Fruit bearing	2	2,000	7,518
	Badarkhali	Date	Fruit bearing	2	1,000	9,564
	Badarkhali	Bamboo	Timber	50		5,422
	Badarkhali	Jackfruit	Fruit bearing	1	1,500	3,251
	Badarkhali	Coconut	Fruit bearing	1	2,000	3,759
	Badarkhali	Date	Fruit bearing	1	1,000	4,782
	Badarkhali	Mehogoni	Timber	5		29,470
	Badarkhali	Coconut	Fruit bearing	4	8,000	15,037
	Badarkhali	Mango	Fruit bearing	1	15,000	3,363
	Badarkhali	Palm	Fruit bearing	1	15,000	3,188
	Badarkhali	Bamboo	Timber	130		14,097
	Badarkhali	Mango	Fruit bearing	6	10,000	20,177
	Badarkhali	Betel Nut	Fruit bearing	8	50,000	7,808
	Badarkhali	Betel Nut	Fruit bearing	7	15,000	6,832
	Dhalghata	Raintree	Timber	3		26,471
	Dhalghata	Date	Fruit bearing	2	1,000	9,564
	Dhalghata	Mango	Fruit bearing	2	3,000	6,726
	Dhalghata	Coconut	Fruit bearing	13	50,000	48,870
	Dhalghata	Flower tree	Timber	2		16,800
	Dhalghata	Malaria	Timber	3		7,047
	Dhalghata	Coconut	Fruit bearing	16	25,000	60,148
	Dhalghata	Tamarind	Fruit bearing	1	5,000	7,650
	Dhalghata	Raintree	Timber	3		26,471
	Dhalghata	Mango	Fruit bearing	2	3,000	6,726
	Dhalghata	Coconut	Fruit bearing	13	50,000	48,870
	Dhalghata	Date	Fruit bearing	2	1,000	9,564
	Dhalghata	Raintree	Timber	3		26,471
	Dhalghata	Date	Fruit bearing	2	1,000	9,564
	Dhalghata	Coconut	Fruit bearing	13	50,000	48,870
	Dhalghata	Mango	Fruit bearing	2	3,000	6,726
	Dhalghata	Raintree	Timber	1		8,824

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Dhalghata	Neem	Timber	1		3,250
	Dhalghata	Date	Fruit bearing	2	1,000	9,564
	Dhalghata	Coconut	Fruit bearing	11	50,000	41,351
	Dhalghata	Raintree	Timber	1		8,824
	Dhalghata	Malaria	Timber	1		2,349
	Dhalghata	Neem	Timber	1		3,250
	Dhalghata	Coconut	Fruit bearing	10	50,000	37,592
	Dhalghata	Neem	Timber	1		3,250
	Dhalghata	Malaria	Timber	3		7,047
	Dhalghata	Flower tree	Timber	1		8,400
	Dhalghata	Coconut	Fruit bearing	2	10,000	7,518
	Dhalghata	Raintree	Timber	2	1,000	17,647
	Dhalghata	Malaria	Timber	1		2,349
	Dhalghata	Neem	Timber	1		3,250
	Dhalghata	Coconut	Fruit bearing	11	50,000	41,351
	Dhalghata	Raintree	Timber	3		26,471
	Dhalghata	Mango	Fruit bearing	2	3,000	6,726
	Dhalghata	Date	Fruit bearing	2	1,000	9,564
	Dhalghata	Coconut	Fruit bearing	13	50,000	48,870
	Fasiakhali	Raintree	Timber	3		26,471
	Fasiakhali	Mango	Fruit bearing	2	3,000	6,726
	Fasiakhali	Coconut	Fruit bearing	13	50,000	48,870
	Fasiakhali	Date	Fruit bearing	2	1,000	9,564
	Dhalghata	Raintree	Timber	2	1,000	17,647
	Dhalghata	Malaria	Timber	1		2,349
	Dhalghata	Neem	Timber	1		3,250
	Dhalghata	Coconut	Fruit bearing	11	50,000	41,351
	Dhalghata	Raintree	Timber	1		8,824
	Dhalghata	Malaria	Timber	2		4,698
	Dhalghata	Neem	Timber	1		3,250
	Dhalghata	Coconut	Fruit bearing	2	5,000	7,518
	Dhalghata	Coconut	Fruit bearing	7	25,000	26,315
	Dhalghata	Plum	Fruit bearing	1	20,000	2,055
	Dhalghata	Date	Fruit bearing	3	15,000	14,345
	Dhalghata	Badam	Fruit bearing	2	6,000	30,000

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Dhalghata	Plum	Fruit bearing	2	40,000	4,110
	Dhalghata	Date	Fruit bearing	3	15,000	14,345
	Dhalghata	Tamarind	Fruit bearing	1	10,000	7,650
	Dhalghata	Coconut	Fruit bearing	6	20,000	22,555
	Fasiakhali	Akashmoni	Timber	140		556,486
	Fasiakhali	Mango	Fruit bearing	10	5,000	33,628
	Fasiakhali	Malaria	Timber	50		117,456
	Fasiakhali	Mango	Fruit bearing	1	500	3,363
	Fasiakhali	Akashmoni	Timber	300		1,192,470
	Fasiakhali	Mango	Fruit bearing	10		33,628
	Fasiakhali	Jackfruit	Fruit bearing	10		32,511
	Fasiakhali	Betel Nut	Fruit bearing	13		12,688
	Fasiakhali	Malaria	Timber	50		117,456
	Fasiakhali	Mango	Fruit bearing	10		33,628
	Fasiakhali	Jackfruit	Fruit bearing	3		9,753
	Fasiakhali	Betel Nut	Fruit bearing	22	12,000	21,472
	Fasiakhali	Coconut	Fruit bearing	3	6,000	11,278
	Fasiakhali	Date	Fruit bearing	1	1,200	4,782
	Fasiakhali	Mango	Fruit bearing	1	1,000	3,363
	Fasiakhali	Malaria	Timber	70		164,438
	Fasiakhali	Jackfruit	Fruit bearing	14	2,500	45,515
	Fasiakhali	Mango	Fruit bearing	17	3,000	57,167
	Fasiakhali	Malaria	Timber	16	160,000	37,586
	Fasiakhali	Mango	Fruit bearing	26	12,000	87,432
	Fasiakhali	Coconut	Fruit bearing	7	6,000	26,315
	Fasiakhali	Papaya	Fruit bearing	4	10,000	53
	Fasiakhali	Mehogoni	Timber	12		70,727
	Fasiakhali	Coconut	Fruit bearing	9	40,000	33,833
	Fasiakhali	Mango	Fruit bearing	12	20,000	40,353
	Fasiakhali	Black Plum	Fruit bearing	4	500	12,182
	Fasiakhali	Mehogoni	Timber	2	5,000	11,788
	Fasiakhali	Bamboo	Timber	3	3,000	325
	Fasiakhali	Arjun	Timber	1	4,000	5,000
	Fasiakhali	Mango	Fruit bearing	12	40,000	40,353
	Fasiakhali	Mehogoni	Timber	1		5,894

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Fasiakhali	Black Plum	Fruit bearing	1	2,500	3,045
	Fasiakhali	Betel Nut	Fruit bearing	8	2,500	7,808
	Fasiakhali	Belgium	Timber	100		203,077
	Fasiakhali	Guava	Fruit bearing	5	30,000	3,100
	Fasiakhali	Jam	Fruit bearing	5	5,000	42,500
	Fasiakhali	Mango	Fruit bearing	20	20,000	67,255
	Fasiakhali	Mehogoni	Timber	1		5,894
	Fasiakhali	Gamari	Timber	5		15,000
	Fasiakhali	Mango	Fruit bearing	4	5,000	13,451
	Fasiakhali	Betel Nut	Fruit bearing	25	12,500	24,399
	Fasiakhali	Belgium	Timber	50		101,538
	Fasiakhali	Flower tree	Timber	5		42,000
	Fasiakhali	Mango	Fruit bearing	20		67,255
	Fasiakhali	Guava	Fruit bearing	5	3,000	3,100
	Fasiakhali	Mango	Fruit bearing	4		13,451
	Fasiakhali	Hog Plum	Fruit bearing	2		483
	Fasiakhali	Guava	Fruit bearing	2		1,240
	Fasiakhali	Olive Tree	Fruit bearing	2		5,400
	Fasiakhali	Coconut	Fruit bearing	18	10,000	67,666
	Fasiakhali	Mango	Fruit bearing	22		73,981
	Fasiakhali	Betel Nut	Fruit bearing	19	95,000	18,544
	Fasiakhali	Jackfruit	Fruit bearing	9	6,000	29,260
	Fasiakhali	Mehogoni	Timber	60		353,636
	Fasiakhali	Malaria	Timber	25		58,728
	Fasiakhali	Betel Nut	Fruit bearing	25	12,000	24,399
	Fasiakhali	Coconut	Fruit bearing	75	300,000	281,942
	Fasiakhali	Belgium	Timber	2	0	4,062
	Fasiakhali	Black Plum	Fruit bearing	1	1,000	3,045
	Fasiakhali	Date	Fruit bearing	2	1,000	9,564
	Jhapua	Coconut	Fruit bearing	13	25,000	48,870
	Palakata	Mango	Fruit bearing	20	500	67,255
	Palakata	Guava	Fruit bearing	15	500	9,300
	Palakata	Coconut	Fruit bearing	10	50	37,592
	Palakata	Hog Plum	Fruit bearing	12	500	2,900
	Palakata	Shisu	Timber	3		12,102

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Palakata	Mango	Fruit bearing	5	3,000	16,814
	Palakata	Jackfruit	Fruit bearing	4	2,500	13,004
	Palakata	Coconut	Fruit bearing	1	1,500	3,759
	Palakata	Belgium	Timber	6		12,185
	Palakata	Betel Nut	Fruit bearing	2	2,000	1,952
	Palakata	Plum	Fruit bearing	1	1,000	2,055
	Palakata	Coconut	Fruit bearing	4	12,000	15,037
	Palakata	Belgium	Timber	6		12,185
	Palakata	Coconut	Fruit bearing	4	12,000	15,037
	Palakata	Betel Nut	Fruit bearing	2	2,000	1,952
	Palakata	Plum	Fruit bearing	1	1,000	2,055
	Palakata	Bamboo	Timber	500		54,218
	Palakata	Malaria	Timber	200		469,822
	Palakata	Coconut	Fruit bearing	50	500,000	187,961
	Palakata	Mango	Fruit bearing	5	100,000	16,814
	Palakata	Belgium	Timber	5		10,154
	Palakata	Malaria	Timber	15		35,237
	Palakata	Mango	Fruit bearing	1	500	3,363
	Palakata	Raintree	Timber	5		44,118
	Palakata	Bamboo	Timber	50		5,422
	Palakata	Malaria	Timber	100		234,911
	Palakata	Mango	Fruit bearing	6	5,000	20,177
	Palakata	Malaria	Timber	20		46,982
	Palakata	Coconut	Fruit bearing	1	2,500	3,759
	Palakata	Date	Fruit bearing	2	2,000	9,564
	Palakata	Plum	Fruit bearing	1	500	2,055
	Palakata	Akashmoni	Timber	6		23,849
	Palakata	Coconut	Fruit bearing	6	5,000	22,555
	Palakata	Plum	Fruit bearing	1	200	2,055
	Palakata	Malaria	Timber	30		70,473
	Palakata	Malaria	Timber	10		23,491
	Palakata	Coconut	Fruit bearing	1	2,000	3,759
	Palakata	Malaria	Timber	950		2,231,657
	Palakata	Betel Nut	Fruit bearing	2		1,952
	Palakata	Malaria	Timber	130		305,385

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Palakata	Gamari	Timber	5		15,000
	Palakata	Coconut	Fruit bearing	1		3,759
	Palakata	Jackfruit	Fruit bearing	1		3,251
	Palakata	Malaria	Timber	400		939,645
	Palakata	Belgium	Timber	200		406,154
	Palakata	Mango	Fruit bearing	3		10,088
	Palakata	Malaria	Timber	60		140,947
	Palakata	Mango	Fruit bearing	10	1,000	33,628
	Palakata	Jackfruit	Fruit bearing	4	500	13,004
	Palakata	Malaria	Timber	70		164,438
	Palakata	Shisu	Timber	2		8,068
	Palakata	Malaria	Timber	1		2,349
	Palakata	Coconut	Fruit bearing	2	6,000	7,518
	Palakata	Gooseberry	Fruit bearing	1	1,000	800
	Palakata	Malaria	Timber	100		234,911
	Palakata	Malaria	Timber	180		422,840
	Palakata	Mango	Fruit bearing	1	1,000	3,363
	Palakata	Guava	Fruit bearing	1	500	620
	Palakata	Akashmoni	Timber	15		59,624
	Palakata	Malaria	Timber	5		11,746
	Palakata	Coconut	Fruit bearing	2	1,500	7,518
	Palakata	Pea nut	Fruit bearing	2	1,000	500
	Palakata	Malaria	Timber	100		234,911
	Palakata	Mango	Fruit bearing	8	500	26,902
	Palakata	Hog Plum	Fruit bearing	1		242
	Palakata	Coconut	Fruit bearing	1		3,759
	Palakata	Belgium	Timber	430		873,231
	Palakata	Akashmoni	Timber	210		834,729
	Palakata	Malaria	Timber	360		845,680
	Palakata	Mango	Fruit bearing	10		33,628
	Palakata	Belgium	Timber	50		101,538
	Palakata	Mango	Fruit bearing	5	5,000	16,814
	Palakata	Guava	Fruit bearing	2	1,000	1,240
	Palakata	Malaria	Timber	35		82,219
	Palakata	Coconut	Fruit bearing	3	3,000	11,278

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Palakata	Belgium	Timber	5		10,154
	Palakata	Malaria	Timber	100		234,911
	Palakata	Coconut	Fruit bearing	4	20,000	15,037
	Palakata	Betel Nut	Fruit bearing	3	1,800	2,928
	Palakata	Plum	Fruit bearing	1	3,000	2,055
	Palakata	Belgium	Timber	3		6,092
	Palakata	Raintree	Timber	15		132,353
	Palakata	Malaria	Timber	10		23,491
	Palakata	Coconut	Fruit bearing	3	5,000	11,278
	Palakata	Malaria	Timber	2		4,698
	Palakata	Raintree	Timber	3		26,471
	Palakata	Coconut	Fruit bearing	1	500	3,759
	Palakata	Raintree	Timber	2		17,647
	Palakata	Eucalyptus	Timber	4800		7,522,449
	Palakata	Coconut	Fruit bearing	1	10,000	3,759
	Palakata	Eucalyptus	Timber	20		31,344
	Palakata	Raintree	Timber	2		17,647
	Palakata	Coconut	Fruit bearing	1	20,000	3,759
	Palakata	Mango	Fruit bearing	1	2,000	3,363
	Palakata	Bamboo	Timber	100	30,000	10,844
	Palakata	Eucalyptus	Timber	3	30,000	4,702
	Palakata	Raintree	Timber	6		52,941
	Palakata	Coconut	Fruit bearing	6	20,000	22,555
	Palakata	Raintree	Timber	1		8,824
	Palakata	Segun	Timber	3		30,000
	Palakata	Belgium	Timber	5		10,154
	Palakata	Coconut	Fruit bearing	3	3,000	11,278
	Palakata	Malaria	Timber	6		14,095
	Palakata	Date	Fruit bearing	5	15,000	23,909
	Palakata	Coconut	Fruit bearing	9	180,000	33,833
	Palakata	Plum	Fruit bearing	2	6,000	4,110
	Palakata	Malaria	Timber	150		352,367
	Palakata	Shisu	Timber	2		8,068
	Palakata	Betel Nut	Fruit bearing	3		2,928
	Palakata	Betel Nut	Fruit bearing	2	20,000	1,952

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Palakata	Rose Apple	Fruit bearing	2	10,000	1,400
	Palakata	Betel Nut	Fruit bearing	2	8,000	1,952
	Palakata	Malaria	Timber	7		16,444
	Palakata	Betel Nut	Fruit bearing	3	5,000	2,928
	Palakata	Coconut	Fruit bearing	10		37,592
	Palakata	Mehogoni	Timber	1		5,894
	Palakata	Coconut	Fruit bearing	14	120,000	52,629
	Palakata	Mango	Fruit bearing	6	10,000	20,177
	Palakata	Plum	Fruit bearing	8	5,000	16,440
	Uttar Nolvila	Bamboo	Timber	800		86,749
	Uttar Nolvila	Belgium	Timber	20		40,615
	Uttar Nolvila	Garjan	Timber	2		1,000
	Uttar Nolvila	Mango	Fruit bearing	5	2,500	16,814
	Uttar Nolvila	Garjan	Timber	12		6,000
	Uttar Nolvila	Maleria	Timber	4		9,396
	Uttar Nolvila	Sharifa	Timber	1	1,000	500
	Uttar Nolvila	Lichi	Fruit bearing	1	5,000	300
	Uttar Nolvila	Badi Tree	Timber	1		1,667
	Uttar Nolvila	Neem	Timber	12		39,000
	Uttar Nolvila	Malaria	Timber	6		14,095
	Uttar Nolvila	Mango	Fruit bearing	5	25,000	16,814
	Uttar Nolvila	Betel Nut	Fruit bearing	15	22,500	14,640
	Uttar Nolvila	Black Plum	Fruit bearing	2	6,000	6,091
	Uttar Nolvila	Malaria	Timber	4		9,396
	Uttar Nolvila	Bamboo	Timber	177		19,193
	Uttar Nolvila	Akashmoni	Timber	8		31,799
	Uttar Nolvila	Neem	Timber	1		3,250
	Uttar Nolvila	Mango	Fruit bearing	10	55,000	33,628
	Uttar Nolvila	Date	Fruit bearing	1	1,800	4,782
	Uttar Nolvila	Betel Nut	Fruit bearing	16	24,000	15,616
	Uttar Nolvila	Jackfruit	Fruit bearing	3	15,000	9,753
	Uttar Nolvila	Black plum	Fruit bearing	4	10,000	12,182
	Uttar Nolvila	Cotton tree	Timber	1		3,500
	Uttar Nolvila	Flower tree	Timber	3		25,200
	Uttar Nolvila	Betel nut	Fruit bearing	20	30,000	19,520

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Uttar Nolvila	Mango	Fruit bearing	3	35,000	10,088
	Uttar Nolvila	Palm tree	Fruit bearing	2	10,000	6,375
	Uttar Nolvila	Olive	Fruit bearing	1	4,000	2,700
	Uttar Nolvila	Plum	Fruit bearing	2	12,000	4,110
	Uttar Nolvila	Gamari	Timber	2		6,000
	Uttar Nolvila	Bamboo	Timber	1200		130,124
	Uttar Nolvila	Mehegoni	Timber	10		58,939
	Uttar Nolvila	Flower Tree	Timber	1		8,400
	Uttar Nolvila	Akashmoni	Timber	2		7,950
	Uttar Nolvila	Malaria	Timber	30		70,473
	Uttar Nolvila	Badi Tree	Timber	5		8,333
	Uttar Nolvila	Betel nut	Fruit bearing	4	6,000	3,904
	Uttar Nolvila	Jackfruit	Fruit bearing	3	12,000	9,753
	Uttar Nolvila	Mango	Fruit bearing	4	16,000	13,451
	Uttar Nolvila	Black Plum	Fruit bearing	1	2,000	3,045
	Uttar Nolvila	Bamboo	Timber	350		37,953
	Uttar Nolvila	Akashmoni	Timber	2		7,950
	Uttar Nolvila	Flower Tree	Timber	5		42,000
	Uttar Nolvila	Mango	Fruit bearing	1	7,000	3,363
	Uttar Nolvila	Coconut	Fruit bearing	2	20,000	7,518
	Uttar Nolvila	Black Plum	Fruit bearing	2	6,000	6,091
	Uttar Nolvila	Betel Nut	Fruit bearing	20	30,000	19,520
	Badarkhali	Madar tree	Timber	4		16,213
	Badarkhali	Raintree	Timber	5		44,118
	Badarkhali	Malaria	Timber	2	56,000	4,698
	Badarkhali	Flower tree	Timber	13		109,200
	Badarkhali	Cotton tree	Timber	3	27,000	10,500
	Badarkhali	Acatashamsia	Timber	12		108,000
	Badarkhali	Gamari	Timber	2		6,000
	Badarkhali	Guava	Fruit bearing	4	4,000	2,480
	Badarkhali	Fambara	Fruit bearing	2	6,000	7,000
	Badarkhali	Sharifa	Fruit bearing	2	7,000	1,000
	Badarkhali	Papaya	Fruit bearing	5	6,000	67
	Badarkhali	Hog Plum	Fruit bearing	3	9,000	725
	Badarkhali	Date	Fruit bearing	4	10,000	19,127

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Badarkhali	Mango	Fruit bearing	9	55,000	30,265
	Badarkhali	Coconut	Fruit bearing	14	140,000	52,629
	Badarkhali	Other tree	Fruit bearing	2		8,107
	Badarkhali	Bilambu	Fruit bearing	1		4,053
	Badarkhali	Betel Nut	Fruit bearing	7	10,500	6,832
	Badarkhali	Black Plum	Fruit bearing	5	18,000	15,227
	Badarkhali	Tamarind	Fruit bearing	8		61,200
	Badarkhali	Flower tree	Timber	3		25,200
	Badarkhali	Malaria	Timber	5		11,746
	Badarkhali	Betel Nut	Fruit bearing	14	21,000	13,664
	Badarkhali	Coconut	Fruit bearing	3	30,000	11,278
	Badarkhali	Date	Fruit bearing	3	7,500	14,345
	Badarkhali	Black Plum	Fruit bearing	8	24,000	24,364
	Badarkhali	Mango	Fruit bearing	6	45,000	20,177
	Badarkhali	Badi tree	Timber	6		10,000
	Badarkhali	Palm	Fruit bearing	6	12,000	19,125
	Badarkhali	Guava	Fruit bearing	7	1,400	4,340
	Badarkhali	Banana tree	Fruit bearing	20		81,066
	Badarkhali	Black Plum	Fruit bearing	2	5,000	6,091
	Badarkhali	Jackfruit	Fruit bearing	2	12,000	6,502
	Badarkhali	Betel Nut	Fruit bearing	10	15,000	9,760
	Badarkhali	Mango	Fruit bearing	5	21,000	16,814
	Badarkhali	Date	Fruit bearing	3	17,000	14,345
	Badarkhali	Coconut	Fruit bearing	5	30,000	18,796
	Badarkhali	Mehegoni	Timber	8		47,152
	Badarkhali	Akashmoni	Timber	7		27,824
	Badarkhali	Coconut	Fruit bearing	10	100,000	37,592
	Badarkhali	Mango	Fruit bearing	15	80,000	50,441
	Badarkhali	Betel Nut	Fruit bearing	25	37,500	24,399
	Badarkhali	Black Plum	Fruit bearing	3	9,000	9,136
	Badarkhali	Jackfruit	Fruit bearing	9	15,000	29,260
	Badarkhali	Shoita	Fruit bearing	4	14,000	2,000
	Badarkhali	Akashmoni	Timber	3		11,925
	Badarkhali	Malaria	Timber	8	64,000	18,793
	Badarkhali	Mango	Fruit bearing	5	30,000	16,814

Name of PAH	Name of Mouza	Name of Tree	Kind of tree	No. of tree	Annual Income from Trees (Tk.)	Total Value of Trees (Tk.)
	Badarkhali	Coconut	Fruit bearing	5	5,000	18,796
	Badarkhali	Guava	Fruit bearing	4	1,200	2,480
Total:				**15,587**	**4,770,150**	**27,994,757**

Source: JICA Survey Team

c) **Livelihood**

Livelihood survey was conducted for a total of 614 households affected with their houses, shops, and/or land affected. The table below shows the Union/Mouza-wise number of households.

Table 4.11-35 Union/Mouza-wise HHs subject to the Survey

Sl. No.	Union	Mouza	Households	
			No.	%
1	Dhalghata	Dhalghata	96	15.6%
2	Kalarmarchara	Kalarmarchara	17	2.8%
3		Kaligong	20	3.3%
4		Jhapua	171	27.9%
5		Younuskhali	16	2.6%
6		Uttar Nolbila	61	9.9%
7	Badarkhali	Badarkhali	62	10.1%
8	Saharbil	Rampur	1	0.2%
9	Chiringa	Palakata	125	20.4%
10	Fasiakhali	Fasiakhali	45	7.3%
Total:			**614**	100.0%

Source: JICA Survey Team

i) Distribution of household members by age

The below table shows the age distribution of household members of the PAHs. Household members under age 15 comprise 27.2% of the entire population. As for male, the economically active population aged 15 to 59 are 37.5%, while the economically dependent age group of 60 years and older are 5.2%. As for female household members, they are 27.5% and 2.6% respectively.

Table 4.11-36 Distribution of Household Members by Age

Age	Male		Female		Total	
	Population	%	Population	%	Population	%
<=14	468	14.2%	431	13.0%	899	27.2%
>=15-59	1,240	37.5%	908	27.5%	2,148	65.0%
60+	171	5.2%	85	2.6%	256	7.8%
Total	**1,879**	56.9%	**1,424**	43.1%	**3,303**	100.0%

Source: JICA Survey Team

ii) Education

Union wise education level of household members is as shown below. Illiterate is 5.6%. 32.8% affected population have primary education and 30.0% have secondary level educational background. Higher secondary level of education are 11.7% and graduate level are 7.7% of population.

Table 4.11-37 Education Level of the Project Affected Persons

Upazila	Union	Illiterate	Primary level	Second -ary level	HSC level	Gradu -ate	Post gradu -ate	Voca tional	Others	Below 5 years	Total
Moheshkhali	Dhalghata	20	181	189	63	32	16	0	4	29	534
	Kalarmarchara	137	476	421	204	148	66	3	28	89	1572
Chakaria	Badorkhali	19	81	92	35	22	8	1	12	3	273
	Saharbil	0	0	0	2	0	0	0	0	2	4
	Chiringa	43	286	181	57	34	15	0	5	42	663
	Fasiakhali	19	59	107	25	18	7	0	1	21	257
Total:		238 (7.2%)	1,083 (32.8%)	990 (30.0%)	386 (11.7%)	254 (7.7%)	112 (3.4%)	4 (0.1%)	50 (1.5%)	186 (5.6%)	3,303 (100%)

Source: JICA Study Team

Table below shows the gender-wise education level of the PAPs. Gender gap of educational level is detailed in "13) Gender" of "(3) Primary impact on the social environment" in "4.7.2 Access Road," "4.7 Results of Environmental and Social Consideration Survey".

Table 4.11-38 Gender-wise Education Level of the Project Affected Persons

Educational level	Male		Female		Total	
	No. of Member	%	No. of Member	%	No. of Member	%
(1) Illiterate	125	6.7	113	7.9	238	7.2
(2) Primary level	586	31.2	497	34.9	1,083	32.8
(3) Secondary level	515	27.4	475	33.4	990	30.0
(4) HSC level	235	12.5	151	10.6	386	11.7
(5) Graduate	199	10.6	55	3.9	254	7.7
(6) Post graduate	97	5.2	15	1.1	112	3.4
(7) Vocational	2	0.1	2	0.1	4	0.1
(8) Others	29	1.5	21	1.5	50	1.5
(9) Others (Children < 5 yrs)	91	4.8	95	6.7	186	5.6
Total:	1,879	100.0	1,424	100.0	3,303	100.0

Source: JICA Study Team

iii) Employment

Table below shows 36.2% households members are employed, 7.1% are unemployed, 21.9% are engaged in housework, 34.4% are students.

Table 4.11-39 Number of Employed Members in PAHs

Upazila	Union	Employed	Un -employed	House work	Student	Others	Total
Moheshkhali	Dhalghata	174	2	113	227	18	534
	Kalarmarchhara	537	13	345	636	40	1,571
Chakaria	Badarkhali	96	0	60	111	6	273
	Saharbil	1	0	1	2	0	4
	Chiringa	205	3	140	292	24	664
	Fasiakhali	74	2	55	119	7	257
Total		1,087 (32.9%)	20 (0.6%)	714 (21.6%)	1,387 (42.0%)	95 (2.9%)	3,303 (100.0%)

Source: JICA Survey Team

iv) Occupation

The Table below shows that occupation pattern of the PAPs. Household members at Dhalghata area are involved in salt and shrimp cultivation. In Badarkhali, business is important. In western section of alignment, they are mostly engaged in salt cultivation in dry season and shrimp culture in the wet season while in the middle section they are engaged in paddy cultivation or fish culture. Women do not work in the field. They engage in daily household work including cooking, nursing of child, sweeping the premises of the house.

Table 4.11-40 Union-wise Occupation Pattern of the PAPs

Upazila	Union	Fishery	Agriculture /Salt Cultivation	Animal husbandry	forestry	House work	Self employed	Commerce	Skilled Profession	Unskilled Labour	Private Service	Gov. Service	Retired/ Pensioner	Unemployed	Too young to work/disabled/student	Others	Total
Moheshkhali	Dhalghata	4	92	0	0	113	7	26	6	5	26	6	2	2	236	9	534
	Kalarmarchara	5	181	2	15	345	38	146	24	3	85	30	8	13	648	28	1,571
Chakaria	Badorkhali	20	0	0	0	60	8	40	8	0	10	9	1	0	114	3	273
	Saharbil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Chiringa	59	0	0	1	141	8	57	7	16	48	8	2	3	306	3	668
	Fasiakhali	4	17		1	55	2	16	6	3	19	3	3	2	123	9	257
Total:		92	290	2	17	714	63	285	51	27	188	56	16	20	1,427	21	**3,303**

Source: JICA Survey Team

v) Income

The total monthly household income of PAHs is as indicated below. 9.9% of the households earn less than 10,000 BDT per month. Households with income ranging from 10,000 to 15,000 BDT make up for 14.2%, and those with income of 15,000 to 20,000 BDT amount to 16.3%. 5.9% report an income of 20,000 to 25,000 BDT, and 11.6% from 25,000 to 30,000 BDT. Although 42.2% of the households declare a monthly income in excess of 30,000 BDT, the possibility should be noted that the actual ratio of households below poverty line are higher than evident considering the overall tendency to report higher income standards than the actual situation in household surveys.

Table 4.11-41 Union-wise monthly household income

Upazila	Union	<=Tk. 10000	>Tk. 10000-<=Tk. 15000	>Tk. 15000-<=Tk. 20000	>Tk. 20000 -<=Tk.25000	> Tk. 25000 -Tk. 30000	>Tk. 30000	Total H/H
Moheshkhali	Dhalghata	7	3	4	2	17	63	96
	Kalarmarchara	21	47	55	15	28	119	285
Chakaria	Badarkhali	8	4	11	4	5	30	62
	Saharbil	0	0	0	0	0	1	1
	Chiringa	22	24	21	11	14	33	125
	Fasiakhali	3	9	9	4	7	13	45
Total:		61 (9.9%)	87 (14.2%)	100 (16.3%)	36 (5.9%)	71 (11.6%)	259 (42.2%)	614 (100%)

Source: JICA Survey Team

vi) Public Amenities

Utilization status of living facilities are as indicated in the table below. 523 out of the 614 households (85.2%) have electricity, which is solar and not grid electricity. Recently some transmission line of grid electricity is under process. Most of the toilets are not sanitary. 22.8% of households use toilets without sewage pits, while 1.8% of the households are not equipped with toilets.

Table 4.11-42 Access to Electricity

Upazila	Union	Electricity Yes	Electricity No.	Total H/H	Electricity Coverage in the area (%)
Moheshkhali	Dhalghata	80	16	96	83.3
	Kalarmarchara	258	27	285	90.5
Chakaria	Badarkhali	52	10	62	83.9
	Saharbil	1	0	1	100.0
	Chiringa	95	30	125	76.0
	Fasiakhali	37	8	45	82.2
Total:		**523**	**91**	**614**	**85.2**

Source: JICA Survey Team

Table 4.11-43 Types of Toilet

Upazila	Union	Latrine	Sanitary	Non Sanitary	Open Field	Total H/H
Moheshkhali	Dhalghata	37	48	11	0	96
	Kalarmarchara	31	177	71	6	285
Chakaria	Badarkhali	16	36	9	1	62
	Saharbil	0	1	0	0	1
	Chiringa	16	68	37	4	125
	Fasiakhali	3	30	12	0	45
Total:		**103**	**360**	**140**	**11**	**614**
		16.8%	**58.6%**	**22.8%**	**1.8%**	**100.0%**

Source: JICA Survey Team

vii)Vulnerable Households

Number of households with the socially vulnerable are as indicated in the table below. 44 households are female headed households. 104 are headed by elderly member over 60 years of ages, and 148 households are considered to be below the poverty line.

Table 4.11-44 Vulnerability

Upazila	Union	Female HH	HH above 60	Minority	Below Poverty Line	Total Vulnerable	Total HHs
Moheshkhali	Dhalghata	3	13	0	10	26	96
	Kalarmarchara	22	58	0	68	148	285
Chakaria	Badarkhali	6	9	0	12	27	62
	Saharbil	0	0	0	0	0	1
	Chiringa	11	17	0	46	74	125
	Fasiakhali	2	7	0	12	21	45
Total:		**44**	**104**	**0**	**148**	**296**	**614**

Source: JICA Survey Team

d) **Socio-economic Condition Non-titled PAHs (Sharecropper, daily labour of salt farm)**

Apart from 614 HHs with their structures and/or land affected, 515 non-titled sharecropper or employees will have their livelihood affected. Out of 515 non-titled sharecropper and employees, 290 were available for interview. Total male-479, female-358 and total family member is 837. Family size is 4.29. Average monthly income is Tk.24,061. Out of 290 PAHs, 121 are below poverty line which is 62.1%. All are Muslim and no one is in minority community. 173 HHs have electricity. Source of water is tube well for all households. Out of 290 households 213 depend on salt farming. 65 households are engaged in business.

In the Table below occupation pattern of the non-tiled share cropper and employees are presented. Around 73.4% are agriculture occupation i.e. here salt and shrimp farming.

Table 4.11-45 Occupation Pattern of Non Titled Share croppers and Employees

Serial	Type of Occupation	HHs	
		Number	%
1	Agriculture/ Salt cultivation	213	73.4%
2	Business	65	22.4%
3	Private Service	6	2.1%
4	Others	6	2.1%
	Total	290	100.0%

Source: JICA Survey Team

The table below indicates the income rage of sharecropper and laborer households: 12.8% fall below the poverty lined. However, there is an overall tendency to report higher income standards than the actual situation in household surveys, suggesting a potential increase in the actual number of poverty households.

Table 4.11-46 Income Range of Non-titled Sharecroppers and Employees

Serial	Monthly Income Range	HHs		Average Monthly Income(Tk)
		Number	%	
1	Income Up to Tk.15,000	37	12.8	-
2	Income above TK 15,000	253	87.2	-
	Total	290	100.0	Tk.25,850

Source: JICA Survey Team

In the following table educational level of the sharecroppers and employees are presented. 17.9% is illiterate, and 39.7% have primary level of education.

Table 4.11-47 Education Level of Non-titled Share cropper and Employee PAHs

Serial	Level of Education	HHs	
		Number	%
1	Illiterate	52	17.9
2	Primary	115	39.7
3	secondary	82	28.3
4	higher secondary	21	7.2
5	Graduate	12	4.1
6	Post graduate	7	2.4
7	Vocational	1	0.3
	Total	290	100.0

Source: JICA Survey Team

4.11.4 Compensation and Assistance Policy

The resettlement policy of the project was formulated in accordance with JICA guidelines and policies and World Bank OP 4.12. The policy framework for this project can realize the following:

I. The key objectives of this policy are (i) to safeguard the rights of the affected and/or displaced households/persons
II. To ensure that appropriate mitigation measures and resettlement plans are implemented,

III. To ensure that appropriate assistance is provided to affected households and communities to restore and improve their socio-economic conditions and
IV. To establish community social systems and networks during and after resettlement has occurred.
V. All those displaced involuntarily by development projects must be resettled and rehabilitated in a productive and sustainable manner in accordance with this policy
VI. People who are resettled must be able, through income and livelihood restoration programs and other supports as may be required, to restore and improve upon their level of living within a reasonable period.
VII. The right to compensation, resettlement and livelihood restoration shall not lapse or end with the conclusion of implementation of a project and shall remain an obligation of the owner of the project until fulfilled even beyond project completion.
VIII. Vulnerable groups, including landless, Adivasis, poor women headed households, physically challenged people, elderly and the poor (falling below the nationally defined poverty line by the government) are entitled to additional benefits and assistance packages.
IX. Cultural and customary rights of people affected by projects are to be protected, particularly those belonging to Adivasis and ethnic minorities.
X. Gender equality and equity in all stages and processes of resettlement and rehabilitation shall be fully respected.
XI. Adverse impacts of land acquisition and displacement are to be avoided or minimized and mitigated throughout the planning and implementation of all development projects.
XII. All affected persons shall be identified through census by the project proponent, irrespective of titles, and shall be provided with compensation and resettlement assistance as per the entitlement matrix for relocation and rehabilitation.
XIII. Project executing agencies will provide project brief, including entitlement matrix and implementation schedules, to all affected persons and communities. All entitlements will be delivered prior to dispossession of assets.
XIV. Consultations with affected people shall be conducted in a transparent and participatory manner so as to provide easy access to information concerning impacts and mitigation.

The policy framework stresses on the following key values:

- The affected Community is involved from the initial phase; through community and stakeholder meetings, FGDs, that informs the people about the project and their views are noted. Information about compensation, land acquisition, loss of livelihood is shared in the preparation stage.
- The consent of the community, especially the PAPs is compulsory for initiation of the survey and the project at large.
- Inclusion is accentuated with the involvement of vulnerable and marginalized groups such as women, minority groups and others wherever present.
- When displacement in inevitable, people affected will be assisted in measures that will better their current status of living without having to bear any cost. The socio-economic conditions of the PAPs must improve after project implementation.
- Involuntary settlement should be avoided or minimized as far as possible. Caution to affect any Religious and traditional structures, habitations, sanctuaries will be taken, through alternate routes, if not possible, all customary measures adopted by the community to remove such structures will be respected and assisted at the relevant cost.

(1) Compensation

The main issue of compensation process entails that PAHs will be rehabilitated at the rate of full replacement cost, at least to pre-project socio economic condition.
All structures either commercial or residential will be compensated at replacement cost as per entitlement matrix. Government has no replacement cost standard. Public Works Department (PWD) rate is used by DC and this price is not the replacement cost. Replacement cost has been fixed by replacement cost survey. The Price has been calculated excluding depreciation and new structures value has been recorded. The price will be verified by Property Valuation Advisory Team (PVAT). In case of land actual market price has been collected, including stamp duty and associated cost as land replacement value. Details are described in 4.11.8.

(2) Livelihood Restoration Assistance

1) Need Assessment of Income Restoration Program

Need assessment of Income Restoration Program was conducted during SES and FGD. The table below shows the outline of the assessment.

Table 4.11-48 Outline of the interview on Income Restoration Program

Type	Implementation timing	Subject	Interview content
SES	February to May 2018	[Port] HHs with their land/ structure affected: 207 [Access road] HHs with their land/ structure affected: 614	• Requirements for livelihood restoration assistance • Details of the required livelihood restoration assistance
FGD	February 2018	[Port] 4 FGDs • Land owner, salt field laborer, etc.: 18 people in total/2 FGDs • Females: 23 people in total/2 FGDs	• Overall livelihood restoration requirements within the communities
	April to May 2018	[Access road] 6 FGDs • Land owner, farmer: 39 people/2 FGDs • Local elites: 45 people/2 FGDs • Buddhism/Islamic community: 26 people • Females: 14 people	

Source: JICA Survey Team

In the Interviews conducted in socio-economic survey (SES) for PAHs of the port component, 48.8% answered to prefer provision of technical know-how while 8.2% preferred technical training. 18.4% preferred interest free capital for start business and 17.4% preferred extra money. In the Interviews conducted for PAHs of the access road component, 30.0% answered to prefer technical know-how provision, and 9.0% preferred technical training. Preference for extra money and interest free capital were 32.4% and 9.0% respectively. Results of interviews conducted as part of the focus group discussion are

detailed in section 4.11.10 (3).

Table 4.11-49 Livelihood Restoration Priorities

Type of Assistance Needed	Port		Access road	
	No. of Response	%	No. of Response	%
1) Technical know-how	101	48.8	184	30.0
2) Extra money (Capital)	36	17.4	199	32.4
3) Assistance for getting other Land	5	2.4	8	1.3
4) Managerial advice	1	0.5	2	0.3
5) Materials	1	0.5	2	0.3
6) Build the building	0	0	9	1.5
7) Skill training	17	8.2	55	9.0
8) Interest Free capital for start business	38	18.4	36	5.9
9) Banking loan Facilities	0	0	4	0.7
10) NGO Loan Facilities	0	0	4	0.7
11) Others(mention)	5	2.4	19	3.1
12) No Response	3	1.4	92	15.0
Total:	207	100	**614**	**100.0**

Source: JICA Survey Team

2) Income Restoration Program (IRP)

The livelihood restoration support policies shall restore the socioeconomic condition of PAPs to at least the level before the project implementation.

a) **Vocational Training**

Skill development through vocational training is a local demand. In the 1st stakeholders meeting (held on 27th January, 2018 at Upazila Auditorium of Moheshkhali) during pre socio economic survey , the participants clearly stated for establishing vocational training school in the area for awarding relevant trades for getting technical job in the power plant and in the port activities .Further, they suggest to train the local youths for getting service in abroad and also inside the country viz. Chittagong and Dhaka. The meeting was participated by local member of parliament, *Upazila Chairman, Upazila Nirbahi officer*, concerned *Union Parishad(UP) Chairman*, local elites and affected persons of the project area.

b) **Target Groups**

Individuals and households engaged in farming, salt or shrimp cultivation are facing the possibility of losing portions or entirety of their livelihood. PAPs facing this possibility are entitled to the livelihood restoration assistance program regardless of their land ownership and other rights in the Project site. Furthermore, PAPs below poverty line, as well as socially vulnerable households including households headed by women are to be priority targets of the livelihood restoration assistance program. The following will be the target of the livelihood restoration assistance program.

- Port
  - Among households with their land/structure affected, households engaged in salt cultivation as

the primary means of livelihood: 79 households
- Households with their livelihood affected: (sharecroppers, salt field laborers, etc.) 44 households; (fishery) approx. 150 households (in case that impact on livelihood is observed)
- Socially vulnerable: 74 households

• Access road
- Among households with their land/structure affected, households engaged in agriculture and salt cultivation as the primary means of livelihood: 217 households
- Households with their livelihood affected: 515 households
- Socially vulnerable: 296 households

Table 4.11-50 Vulnerables Eligible for Livelihood Restoration Assistance

Project	Female HH	HH above 60	Below Poverty Line	Total Vulnerable	Total HHs
Port	16	41	17	74	207
Access road	44	104	148	296	614
Total	60	145	165	370	821

Source: JICA Survey Team

c) **Skills and Professions**

Skill development in vocational trades will assist them to get fulltime jobs. These are new skills that would require relatively long period of training (2-6 months) and need to be carried out at an existing or specially created facility. Some suitable trades are presented below; Concerned Livelihood specialist will finalize which training will be fruitful. Among these, fish culture, and poultry farming have large demand in the area. As an industrial belt, in Chittagong garments sewing operator have also great demand.
Some prospective trades have been mentioned for training below. These are:

- Motor/automobile mechanics (especially rural vehicle 'Nasimon', tempo, CNG, battery driven Auto rickshaw, Motorcycle etc.;
- Electrician a cum Solar technology & technician (in Moheshkhali and Kutubdia a large number solar panels are installed by different NGOs);
- Rickshaw assembling and repairing;
- Secretarial skills/word processing and computer skills;
- Poultry Rearing;
- Beef fattening;
- Tailoring and Sewing Operating;
- Pisiculture and Fish breeding technician;
- Fish breeding;
- Fish Cultivation in Cage in Open water;
- Shrimp Cultivation (Both for sweet water and saline water species);
- Furniture technician/Carpentry;
- Fish processing;
- Vegetable cultivation/crop diversification;
- Animal husbandry/dairy;
- Dry fish processing;

Some of these skills like metal works and manufacture of sanitary equipment can lead to establishment of small-scale enterprises. In such cases the trainees would need additional training to start small enterprise either individually or collectively.

Training in these skills will be mainly organized at existing training facilities such as industrial training institutes, existing workshops or through informal apprenticeship with master mechanics. The training will be organized by NGOs but it will be accomplished under guidance of Livelihood and Poverty Reduction Specialist and Training Specialist from resettlement unit (RU) of the requiring body.

Assistance for finding employment shall be provided through INGO after the training where necessary.

d) **Priority Training choices for the implementing NGO**

Some priority training programs contents have been presented for income and livelihood restoration. The training lists here provided are only tentative. Agricultural training will also be included as per necessity. During implementation period, minor change may be occurred and a need assessment will be carried out at the time implementation theoretical and practical days of duration will be finalized after consultation with the concerned training and sector specialists. They will develop specific training module and present schedule may be reorganized. These are primarily assessed during conducting socio- economic survey.

Table 4.11-51 Livelihood Restoration Priorities

Program	Program contents	Responsibility
Agriculture	1. 120 days agriculture training for rice and vegetable cultivation 1.1 Salinity tolerant rice variety 1.2 Fish and rice cultivation in the same crop field 1.3 Disease management 1.4 Capital and financial Management 1.5 Marketing 1.6 Risk factor 1.7 Final Feed back (The course will be organized for farmers only)	1. Implementing NGO 2. With support and supervision of RU- CPA/RHD 3. Upazila agriculture and fishery department
Poultry Rearing	1. 120 days Theoretical Training Poultry Rearing 1.1 Inauguration of training course 1.2 Potentiality of Poultry Rearing 1.3 Disease management 1.4 Capital and financial Management 1.5 Marketing 1.6 Risk factor 1.7 Final Feed back 2. 3 month practical training in a poultry farm for internee course	1.Implementing NGO 2. With support and supervision of RU-CPA/RHD 3. Upazila livestock officer
Furniture Technician	1. 120 days theoretical training of Furniture Technician 1.1 Inauguration of Concerned training course 1.2 Potentiality of Furniture Technician and business 1.3 Furniture making, upholstery, repairing etc	1.Implementing NGO 2. With support and supervision of

Program	Program contents	Responsibility
	1.4 Capital and financial Management 1.5 Marketing 1.6 Risk factors and management 1.7 Final Feed back 2. 3 months practical training in a furniture making shop for internee course	RU-CPA/RHD
Tailoring/ Industrial sewing	1. 120days Theoretical of Tailoring/Industrial Sewing 1.1 Inauguration of Concerned training course 1.2 Potentiality of Tailoring business/Industrial sewing 1.3 Pattern, design, marking, garment cutting fabric related issue 1.4 Capital and financial Management tailoring business/job search, job placement for industrial sewing 1.5 Marketing tailoring business/ merchandising 1.6 Risk factors and management 1.7 Final Feed back 2. Minimum 3 months practical training in a tailoring shop/ garment factory for internee course	1.Implementing NGO 2. With support and supervision of RU- CPA/RHD
Pisiculture/Fish Cultivation	1. 120days Theoretical training of Pisciculture/Fish cultivation 1.1 Inauguration of Concerned training course 1.2 Potentiality of Pisciculture/Fish cultivation/ fish breeding 1.3 Selecting pond, water body/hiring pond, water body, selecting fish species, market demand, pond preparation, food supply, disease management 1.4 Capital and financial Management fish cultivation/ pisciculture 1.5 Marketing of fish, preservation in a healthy way, ice use, cold storage facility etc 1.6 Risk factors and management, ensuring profit 1.7 Final Feed back 2. Minimum 3 months practical training in a fish farm/gher for internee course	1.Implementing NGO 2. With support and supervision of RU-CPA/RHD 3. Fishery Department
Fish Breeding and agriculture	1. 120days Theoretical of Fish breeding 1.1 Inauguration of Concerned training course 1.2 Potentiality of Fish breeding 1.3 Selecting pond, water body/hiring pond, water body, selecting fish species, market demand, pond preparation, breeding technique, cross breeding, food supply, management, fish larvae, fingerling, disease management 1.4 Capital and financial Management fish cultivation/	1.INGO 2. With support and supervision of RU- CPA/RHD

Program	Program contents	Responsibility
	pisciculture 1.5 Marketing of fingerlings, transportation fingerlings 1.6 Risk factors and management, ensuring profit 1.7 Final Feed back 2. Minimum 3 months practical training in a fish farm, hatchery/ Fishery Research Institute (FRI) of Mymensing for internee course	
Business Trade	1. 30days Theoretical of Business Trade 1.1 Inauguration of Concerned training course 1.2 Potential of profitable business(fish, dry fish, salt processing, tourism, fast food etc) 1.3 Identification of profitable business 1.4 Capital and financial Management 1.5 Marketing of fingerlings, transportation fingerlings 1.6 Risk factors and management, ensuring profit 1.7 Final Feed back 2. Minimum 3 months practical training in a sole trading successful business enterprise	1.INGO 2. With support and supervision of RU-CPA/RHD 3. Fishery department 4. Bangladesh parjaton corporation (BPC), national tourism organization

Source: JICA Survey Team

e) **Notification of the implementation of the Livelihood Restoration Program**

Implementation of livelihood restoration program will be informed directly to PAPs through INGO, as well as through cooperation of Union Chairman so that all PAPs can surely obtain the information. Especially for sharecroppers and, salt/shrimp farm workers, information shall be provided also through landowners for securing information dissemination.

f) **Monitoring and Feedback to the Livelihood Restoration Program**

Regarding livelihood restoration program, monitoring shall be implemented as follows through INGO. Livelihood restoration program will be reviewed and updated in consultation with the concerned PAPs if necessary.

- Implementation status of vocational training: quarterly after the beginning of vocational training.
- Job finding: 3 months after completion of vocational training program.
- Situation of employment and livelihood recovery: Once a year from above mentioned.

(3) Relocation Site

1) Port

The preference for compensation policy of 57 households to relocate is as follows. During socio-economic survey, approximately 70% of the total and half of the regular residents prefer the alternative site. In accordance of the survey result, provision of alternative land to formal settlers is examined; it was revealed, however, that the PAHs preferred cash compensation to alternative land in

Matarbari. It was confirmed that all attended PAHs agreed with cash compensation. Regarding informal settlers, their entitlement is cash compensation only to structures, though the Executing Agency is scheduled to negotiate with DC so that they can participate in the project for housing supplying by NGOs.

Table 4.11-52 Preference for Compensation Policy (Port)

Upazila	Union	Formal Settler				Informal Settler				Total			
		Cash	Land	Don't Know	Total	Cash	Land	Don't Know	Total	Cash	Land	Don't Know	Total
Mohe shkhali	Dhalghata	12	13	1	26	3	26	2	31	15	39	3	57
Total		12	13	1	26	3	26	2	31	15	39	3	57
		46.2%	50.0%	3.8%	100.0%	9.7%	83.9%	6.5%	100.0%	26.3%	68.4%	5.3%	100.0%

Source: JICA Survey Team

Table 4.11-53 Plan Examined for Providing Alternative Land

<table>
<tr><th>Items</th><th>Description</th></tr>
<tr><td>Location of Alternative Land</td><td>• Matarbari Union, north to Coal Power Plant Area
 
</td></tr>
<tr><td>HHs for whom the land will be provided</td><td>26 HHs (formal settlers to be displaced by the Project)</td></tr>
<tr><td>Total Area for the Alternative Land</td><td>1 hectare (at max.)</td></tr>
<tr><td>Facilities to be provided</td><td>Houseing strucutre with 800 ft^2 (=72 m^2)/ HH will be provided.</td></tr>
<tr><td>Accessible Social Infrastructures</td><td>Accessibility to existing social structures will be generally improved as follows;
(1) Medical Centers
• Maternity Center: L= 2 km (6 km reduced from the area before displacement)
• Resident doctor in Badarkhali: L=10 km (4 km reduced from the area before displacement)
• Chakaria Upazilla Health Complex : L=27 km (4 km reduced from the area before displacement)
(2) School
• Matarbari High School: L=3 km (1 km increased from the area before displacement)</td></tr>
<tr><td>Cost</td><td>Approx. BDT 102 million will be estimated.
<table>
<tr><th>Items</th><th>Unit Cost</th><th>Quantity</th><th>Total Cost</th></tr>
<tr><td>House Structure</td><td>BDT 1,600,000/ HH</td><td>26 HHs</td><td>BDT 41,600,000</td></tr>
<tr><td>Land Acquisition</td><td>BDT 17,000,000/ ha</td><td>1 ha</td><td>BDT 17,000,000</td></tr>
<tr><td>Land Development (1m embankment and soil improvement)</td><td>BDT 20,000,000/ ha</td><td>1 ha</td><td>BDT 20,000,000</td></tr>
<tr><td>Other Cost for Infrastructures</td><td>30 % of total</td><td></td><td>BDT 23,580,000</td></tr>
<tr><td>Grand Total</td><td></td><td></td><td>BDT 102,180,000</td></tr>
</table></td></tr>
<tr><td>Schedule</td><td>• The preparation of the land shall be completed before displacement of the concerned HHs, i.e. 1st quarter of 2020.
• Consultation meeting for host community shall be held during DD stage.</td></tr>
<tr><td>Other conditions</td><td>• Only residential plots and structures will be provided while the remaining land owned by the concerned HHs will be provided by cash compensation</td></tr>
</table>

Source: JICA Survey Team

2) Road

The preferences for compensation policy of 130 households to be displaced are as follows. For access road component, it would be difficult to provide an appropriate alternative site for all households in 6

unions in 2 upaliza. Moreover, more than 80% of the total prefer cash compensation. Therefore, cash compensation is proposed as compensation policy, for which consensus was obtained through consultation.

Table 4.11-54 Preference for Compensation Policy (Access Road)

Upazila	Union	Formal Settler				Informal Settler				Total			
		Cash	Land	Don't Know	Total	Cash	Land	Don't Know	Total	Cash	Land	Don't Know	Total
Mohe shkhali	Dhalghata	13	6	0	19	0	0	0	0	13	6	0	19
	Kalarmarchara	14	1	1	16	0	0	0	0	14	1	1	16
Chakaria	Badarkhali	21	8	0	29	1	0	0	1	22	8	0	30
	Chiringa	15	2	0	17	26	4	0	30	41	6	0	47
	Fasiakhali	16	0	0	16	2	0	0	2	18	0	0	18
Total		79	17	0	96	29	4	0	33	108	21	1	130
		82.3%	17.7%	0.0%	100.0%	87.9%	12.1%	0.0%	100.0%	83.1%	16.2%	0.8%	100.0%

Source: JICA Survey Team

(4) Entitlement Matrix

The Entitlement Matrix has been developed in accordance with the principles adopted and analysis of initial identification of project impacts. The Entitlement Matrix recognizes and lists various types of losses associated with the project and provides the basic tools and guidelines for preparation of compensation and resettlement packages.

Entitlements for different categories of losses and their corresponding Project Affected Persons (PAPs) have been given in the entitlement matrix. Eligibility of PAPs will be governed by the entitlement matrix, cut-off dates and other conditions as per RAP Implementation Manual.

Table below provides an entitlement matrix for different types of losses and dislocation, based on established Inventory of Losses (IOL). The matrix also includes provisions for any unanticipated impacts arising during project implementation. The mitigation measures in the matrix are consistent with co-financiers‟ safeguard requirements. They also reflect "good practice" for examples (e.g., replacement value for land, dislocation allowance, transfer grant, relocation at project-sponsored resettlement sites, grievance redresses, income and livelihood restoration, third party independent monitoring etc.) from the Matarbari Port Development Project. Compensation and other assistance will be paid to PAPs prior to dislocation and dispossession from acquired assets or three months prior to construction activities, whichever is earlier.

Based on the findings and analyses in the field surveys, the entitlement matrix for the PAPs of the port and the access road has been prepared. The Entitlement Matrix lists 12 types of losses and category of entitled persons and corresponding proposed entitlements to cover all possible losses to achieve at least the same level of livelihood of the affected households. Entitlement Matrix is as in the table below:

Table 4.11-55 Entitlement Matrix

No	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Assistance Package)	Responsible Organizations
1	Loss of private land	Legal owners of land	✓ Cash compensation under the law (CCL) for all the private land stipulated by the Act 2017 or provision of alternative site is the average of last 12 months backward from cut-off date of mouza rate X 3 (200% premium). ✓ Cash grant that covers the difference between CCL and the replacement value (RV) ✓ Provision of stamp duty, land registration fee incurred for replacement land (15%) ✓ Dislocation allowance in case of agriculture, salt and shrimp gher@ Tk.200 per decimal but total amount will not exceed Tk.20,000 ✓ One-time assistance for lost income (based on monthly income for three minimum wage rates)	DC PVAT, JVT CPA/RHD
		Tenants and leaseholders	✓ Provision of another land including 200% premium ✓ Provision of stamp duty, land registration fee (15%) If land is purchase by the compensation money ✓ Dislocation allowance in case of agriculture, salt and shrimp gher@ Tk.200 per decimal but total amount will not exceed Tk.20,000 ✓ One-time assistance for lost income (based on monthly income for three years at minimum wage rates)	
2	Loss of government land including khas land	Tenants and lessee	✓ Provision of another khas land (assuming tenants and lessee will seek private land, 200% premium is added) ✓ Provision of stamp duty, land registration fee (15%) If land is purchase by the compensation money ✓ Dislocation allowance in case of agriculture, salt and shrimp gher@ Tk.200 per decimal but total amount will not exceed Tk.20,000	DC PVAT, JVT CPA/RHD

No	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Assistance Package)	Responsible Organizations
			✓ One-time assistance for lost income (based on monthly income for three years at minimum wage rates)	
3	Permanent loss of means of livelihoods/ source of income	Lessor (land owners who rent their land will lose income from land lease contract)	✓ One-time assistance for opportunity loss (based on the lease amount) (assuming the inflation rate stays 10%)	DC, DOF PVAT, JVT CPA/RHD
		Permanent laborers Temporary laborers Sharecroppers Fishermen (in case that nagagtive impact from the Project is confirmed)	✓ One-time assistance for lost income (based on monthly income for three years at minimum wage rates) ✓ Enrollment in vocational training courses based on assessment of skills (@300 taka / day for 120 days)	
		Businessmen, employers of salt farms, shrimp farms and fishing sites, self- employed people	✓ One-time assistance for opportunity loss (based on the lease amount) (assuming the inflation rate stays 10%) ✓ One-time assistance for lost income (based on monthly income for three years at minimum wage rates)	
	(Remarks) (1) Regarding fishermen who can be affected around the project area, if the decrease in the volume of fish catches is not confirmed or the income equivalent to the previous can be kept by moving their fishing ground, livelihood restoration assistance will not be required. However, in case that they cannot move to the appropriate place though the volume in the current fishing ground decreased, or when reduction of the volume is confirmed even after moving fishing ground, they will be subject to the livelihood restoration assistance. In case that obvious relationship is confirmed between the Project and the decrease of fish catch volume after the necessary survey, cash compensation for the decreasing shall be provided. (2) Regarding salt and shrimp cultivation workers, INGOs will help PAPs to seek for similar land that can be utilized for salt and shrimp cultivation as a substitute site.			
4	Loss of residential/ commercial structures	Legal title holders Owners of structures	✓ Cash compensation for affected portion of the structure and other fixed assets at replacement cost (plus 100% premium) ✓ Option to be compensated for entire structure if remaining structure is no longer viable ✓ Provision of all taxes, registration costs and other fees incurred for replacement structure (15%) ✓ Reconstruction grant for	DC PVAT, JVT, PWD CPA/RHD

No	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Assistance Package)	Responsible Organizations
			reconstruction / repair of the remaining structure (@30 taka / sft) ✓ Shifting allowance based on actual costs of moving (@20 taka / sft) ✓ Owners to take away all salvage materials	
		Legal tenants/ lease holders of the structure	✓ Cash compensation equivalent to replacement cost of structure (or part of structure) for the portions of the structure constructed by the tenant/ leaseholder (plus 50% premium) ✓ Reconstruction grant for reconstruction / repair of the remaining structure (@30 taka / sft) ✓ Shifting allowance based on actual cost of moving (@20 taka / sft) ✓ Owners to take away all salvage materials	DC PVAT, JVT, PWD CPA/RHD
		Socially recognized owners/ unauthorized occupants	✓ Cash compensation equivalent to replacement cost of structure (or part of structure) erected by the disld person (plus 50% premium) ✓ Reconstruction grant for reconstruction / repair of the remaining structure (@30 taka / sft) ✓ Shifting allowance based on actual cost of moving (@20 taka/ sft) ✓ Owners to take away all salvage materials at free of cost ✓ (port component: effort for incorporating the concened households's to rehabilitation (housing provision) project of NGO)	PVAT, JVT, CPA/RHD NGO
5.	Loss of access to Residential/ Commercial Structures	Tenants of rented leased properties (but not constructed the whole part of the structure)	✓ One time cash grant for facilitating alternative housing/ CBEs Tk. 15000/= per household ✓ Shifting allowance per household based on family members @ 3000/= per member minimum Tk. 9000/= maximum 12000/=	PVAT CPA/RHD
6	Loss of standing crops at home gardens, shrimp, and fish	Land owners, Bargadar, Lessee and Irregular resident	✓ One time assistance for opportunity loss (based on the lease amount) (assuming the inflation rate stays 10%) ✓ Market price of uncropped harvest	DC PVAT, DOF,DAM

No	Type of Loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Assistance Package)	Responsible Organizations
7	Loss of timber, fruit bearing trees, and harvest	Legal owner of land/Socially recognised owner Non-titled user of land	✓ Cash compensation under the law(CUL) ✓ Owner will be allowed to fell and take away their trees ✓ Five years fruit value trees for fruit trees ✓ Distribution of sapling of trees for the affected households(PAHs)	DC PVAT, BFD,DAM CPA/RHD
		Non-titled user of land	✓ Market Value of tree ✓ Owner will be allowed to fell and take away their trees ✓ Five years fruit Value of trees ✓ Distribution of sapling of trees for the affected households (PAHs)	DC,PVAT, BFD,CPA, NGO
8	Temporaryloss of land during construction	Owners with legal title, tenants, leaseholders	✓ Rental assistance for the period for which the land is temporarily requisitioned ✓ Temporarily requisitioned land will be returned to owners rehabilitated to original or preferably better condition	DC PVAT, CPA/RHD
9	Temporary loss of access to land, structure,utilities,common property resource during construction	Owners with legal title, tenants, leaseholders	✓ Provision of temporary access and relocation where possible ✓ Restoration of access to the land, structure, utilities	DC PVAT, CPA/RHD
10	Temporary loss of livelihood/ source of income during construction	Business owners, tenants, leaseholders, employees, vendors	✓ One-time assistance for lost income based on monthly income for three years from products, minimum wage rates or based on actual income, verified through incomes of comparable businesses in the area	DC, DOF, DAM CPA/RHD
11	Vulnerable Groups	Women-headed, elderly-headed, handicapped and PAHs under poverty line	✓ BDT 10,000.00 as one time grant in addition to other compensations ✓ Participation of one of their family members to livelihood restoration program	CPA/RHD, NGO
12	Community Facility	Community	✓ Restoration of access to the land, structure, utilities ✓ Provision of temporary access where possible ✓ Rebuilding and reinstating or replacing/reconstruction of community facilities at least pre project condition preferably better condition	CPA/RHD, NGO

Source: JICA Survey Team

(5) Gender

1) Support for socially vulnerable people

Special allowance in addition to general compensation is required for PAHs with widows and female-headed. In addition to cash compensation, prior employment regarding construction/ operation of the port/the road and vocational training support considering gender can be proposed.

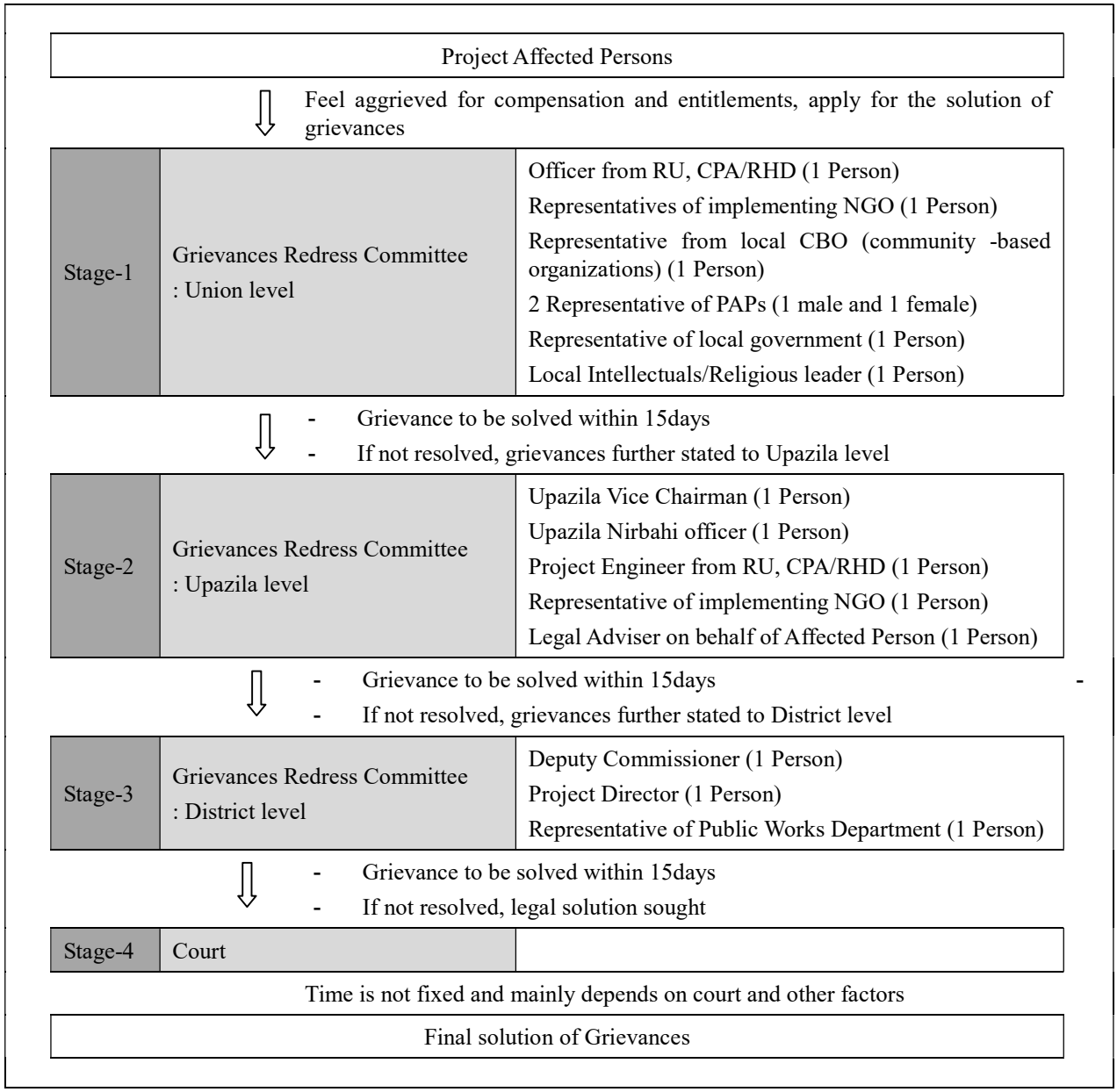
2) Fair compensation allocation within households

Even if men are heads of households, it can be considered that compensation is paid to women directly unless the heads are property owners. However, when women other than the head of household receive compensation, it is necessary for the representative of the relevant community to give consent in writing. If deemed that the above method is not appropriate in the society, compensation will be paid to the head of household according to the custom. It is recommended to seek impartial compensation allocation within the household by raising awareness and monitoring.

4.11.5 Grievance Redress Mechanism

(1) Outline

The grievance redress committee (GRC) would be established prior to the implementation of land acquisition and resettlement activities, which shall be available for PAPs as well as potentially-affected persons who were not identified as PAPs through this survey such as seasonal labour (hereinafter referred to as "PAPs (including potential ones)"). There would be four-step to handle grievances from PAPs including potential ones: first step is the union level; second is the Upazila level; third is the district level; and fourth is the court level and that the GRC will be required to resolve grievances within 45 days and maximum15 days at each level with the exception of the fourth level. Other than disputes relating to ownership rights under the court of law, the GRC will review grievances involving all resettlement benefits, relocation, and other assistance. The Grievance Redress Mechanism and appeal procedure are given below.



Source: JICA Survey Team

Figure 4.11-3 Grievance Redress Mechanism

Other than the grievance redress mechanism stipulated by the ARIPA-2018, CPA/RHD will make efforts at project level to resolve grievances through negotiations involving representatives of PAPs, village heads and Union Parishad Chairmen. The Project Director will allocate a resettlement officer at the project office, who deals with grievances lodged by the PAPs (including potential ones). The resettlement officer will be the entry point and receive all the inquiries, concerns and complaints directly from PAPs (including potential ones). A notebook will also be installed at the project office entrance for anybody to write suggestions anonymously.

A grievance redress committee at project site will convene meetings monthly. Non-regular meetings will also be held ad-hoc basis as necessary at such places as it is considered appropriate (such as village, union, etc.) for dealing with urgent matters. The proceedings (or minutes of meetings) will be made with the object to promptly address the concerns and complaints using an accessible and transparent process to the PAPs (including potential ones), and to bring an amicable settlement between the parties. All reports will be recorded in Bengali language and provided to all parties concerned.

PAPs (including potential ones) can state the complaint or suggestion in local language. Necessary stake holder and FGD meeting will be arranged for GRM.

Any grievance or complaint from the PAPs (including potential ones) on any aspects of land acquisition, compensation and resettlement will be solved in a timely and satisfactory manner. This RAP provides the grievance redress mechanism. The Executing Agency (EA) will ensure that PAPs are aware of the procedures. They will print the detailed grievance and redress mechanism and process appeals and will distribute them to PAPs during public consultations.

(2) Contents of Grievances

PAPs (including potential ones) can submit their grievance/complaint about any aspects of resettlement plan, implementation and compensation. Grievances can be submitted verbally or in written form, but in case of the verbal complaints, the GRCs will write them down in the first instance during the meeting at no cost to PAPs (including potential ones).

(3) Grievance and Redress Procedural Details

Grievances of PAPs (including potential ones) will first be brought to the attention of the implementing non-government organization (NGO). Grievances not redressed by the implementing NGO will be brought to the Grievance Redress Committee (GRC) constituted for the project. The GRC will comprise resettlement officers; representatives from local NGO and community-based organizations (CBOs); two representatives of PAPs; and local intellectuals or religious leaders, who represent the local residents around the project site with integrity, good judgment, and commands respect. The GRC, will meet every month, determine the merit of each grievance, and resolve grievances within 15 days of receiving the complaint in each stage. Other than disputes relating to ownership rights under the court of law, the GRC will review grievances involving all resettlement benefits, relocation, and other assistance.

In case the local committee cannot redress the grievances, they will be handled by the Upazila level committee. The Upazila Nirbahi Officer (UNO) will chair the committee comprised of the project level GRC member, project engineer, and legal advisor. If grievances still cannot be resolved at the Upazila level, they will be referred to the Project Director who will head a committee jointly with the Deputy Commissioner at the district level. In case of grievances cannot be settled at the district level, they will be settled through fair legal judgment. There will be no cost required when PAPs (including potential ones) appeal to the GRC and grievances will be verbally accepted at all levels.

Monthly meetings will be convened at the project site and non-regular meetings will also be held ad-hoc basis when urgent matters arise. Records will be kept of all grievances received including: contact details of complainant, date that the complaint was received, nature of grievance, agreed corrective actions and the date these were effected, and final outcome. All reports will be recorded in Bengali language and provided to all parties concerned. The PAPs (including potential ones) can appeal the decision of the GRC in the appropriate court of law, depending on the nature of the grievance.

4.11.6 Institutional Arrangements

(1) Institutional Arrangements

CPA/RHD are the Executing Agencies (EA) responsible for implementing the LARAP. CPA/RHD shall establish a Project Implementation Unit (PIU) for the Project, headed by a Project Director (PD) that will be responsible for the overall execution of the project including land acquisition, relocation, resettlement and other related matters. The PIU will prepare a land acquisition (LA) plan for the land to be acquired with the assistance from consultants and shall submit to the DC, Cox's Bazar.

For smooth implementation of resettlement plan and income restoration of the project affected person CPA/RHD will form a resettlement unit headed by Project Manager (PM) under guidance of Project Director (PD).

The PM/ Executive Engineer concerned under the direct supervision of the Project Director, will undertake day-to-day activities with the appointed Implementing NGO (INGO). The PM/ Executive Engineer concerned will be the convener of the Joint Verification Team (JVT) and Property Valuation Advisory Team (PVAT). There will be a Grievance Redress Committee (GRC) for resolution of disputes.

Grievance Redress Mechanism (GRM)

The PIU, with assistance from the INGO will carry out the following specific tasks relating to LARAP implementation:

- Liaise with district administration to support LARAP implementation activities i.e. appointment of JVT and will take step for formation of PVAT and GRC, etc.;
- Discharge overall responsibility of planning, management, monitoring and implementation of the resettlement and rehabilitation program;
- Ensure availability of budget for all activities;
- Synchronize resettlement activities and timely handover of the land to the contractor within the construction schedule;
- Develop LARAP implementation tools and form necessary committees;
- Monitor the effectiveness of entitlement packages and the payment modality

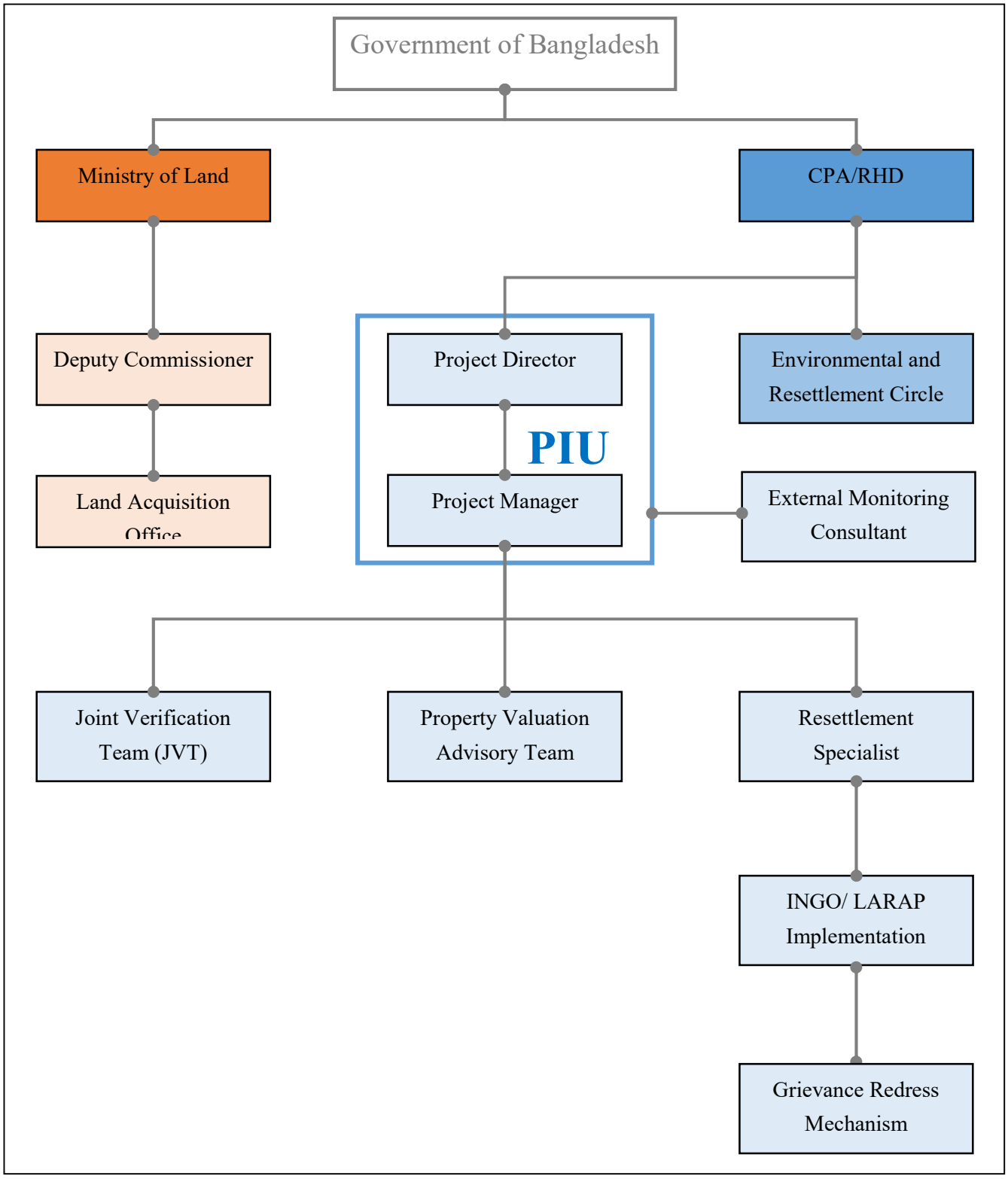


Figure 4.11-4 Institutional Arrangements

(2) Non-Governmental Organization for Implementation of LARAP

Proposed period for the Implementing NGO (INGO) is set to two years. The INGO is to be selected by the Executing Agency prior to the joint verification survey among social development NGOs with track records in land acquisition, resettlement or livelihood restoration assistance program. Scope of responsibility of the NGOs are as summarized below:

Role of NGO
Role of NGO will be support of acquisition process for the Executing Agency. Contracted NGO will support CPA/RHD in compensation payment and resettlement activities for implementation of LARAP.

Activities
(1) Provide support in the land acquisition process.
(2) Provide guidance to CPA/RHD in establishing strategy to speed up the joint verification survey
(3) Identify priority sections to speed up the payment of resettlement benefits of non-titled PAPs and other PAPs who are not eligible for compensation under Bangladesh Law
(4) Support CPA/RHD and NGO in the consultation process of non-titled Project Affected persons
(5) Support for issuing ID cards to persons being eligible for compensation
(6) Provide guidance to meet requirements of JICA Guidelines of environmental and social consideration
(7) Support Payment of Compensation, Provide notification and support PAPs for preparation and submission of documents
(8) Support in Grievance Redress Process
(9) Liaison with the DC office in getting payment document of CCL
(10) Implementation/promotion of livelihood restoration program (including occupational training), notification of the programs to PAPs

Reporting
Preparation monthly, quarterly, semiannual and annual and final report for LARAP implementation
Contents of report

I. Introduction
II. Background of the project and PAHs
III. The report will include latest position of compensation payment.
IV. Identification of PAPs and Photo taking
V. Income Restoration issue
VI. Skill training
VII. Future plan LARAP Implementation as per LARAP target and monitoring program
VIII. Identified Problems and solution of grievances in GRC
IX. Report of FGD meeting and Public consultation
X. Recommendations

Any relevant issues other than above points concerning LARAP implementation is to be included in the report.

4.11.7 Implementation Schedule

Implementation schedule shall be proposed based on the principle that compensation shall be completed

prior to the displacement of PAHs and the commencement of the construction. Land acquisition process in ARIPA2017 is as shown in Figure 4.11-5, while resettlement schedule with the start/end of each is as shown in Table 4.11-56. Preliminary start date for the resettlement is to be set after the commencement of notification in accordance with Section 4 by the Deputy Commissioner's office (DC). Resettlement is to be concluded within one year, with the Implementing NGO facilitating the acquisition process upon coordination with the Executing Agency (EA). Accordingly, the entire duration for land acquisition and resettlement is proposed to be three years. Payment by the Deputy Commissioner (DC) is scheduled to be completed by June 2020. Upon the completion, the land acquisition and actual resettlement process will be implemented.

Section 4	Preliminary notice of property acquisition by DC (After submission of Land Acquisition Plan by Executing Agency to DC)
⇩	
Section 4 (3) (b)	Joint verification survey by DC with concerned parties
Section 4 (6)	Disclosure of the results of the Joint verification
Section 4 (8) /Section 5	Receiving of objections against acquisition
⇩	
Section 6	Decision of land acquisition by DC (within 60 days)
Section 7	Notice of land acquisition
⇩	
Section 8 (1)	Inquiry about compensation amount by DC
Section 8 (2) (3)	Decision of compensation amount by DC and its notification to Executing Agency (within 7 days)
⇩	
Section 8 (4)	Deposit of compensation amount by Executing Agency to DC (within 120 days)
⇩	
Section 11	Payment of compensation by DC to those eligible for compensation (within 60 days)
⇩	
Section 13	Land and property acquisition by DC

Figure 4.11-5 Land Acquisition Process in ARIPA2017

Consensus from concerned residents or agencies is planning to be obtained as following schedules.

- Submission of LA Plan to DC: November, 2018
- Serving section-4 notice from LA section: September,2019
- Completion of Payment by DC: June,2020
- Land Submission to Contractor: September,2020

(1) R&R Implementation Schedule

The R& R implementation schedule will follow the below key activity:

(a) Project Preparation Phase
Project Preparation Phase are as follows,

- Submission of Land acquisition plan to DC
- Estimation compensation by DC
- Serving section -4 notice
- Fund Allocation to DC
- Starting CCL by DC

(b).LA RAP Implementation Phase
LARAP implementation period will be started after DC's Payment will be started.

- Starting payment of compensation
- Resettlement site selection and preparation for resettlement
- Payment of additional grant
- Physical Displacement
- Physical and economical rehabilitation

(c). Monitoring and Evaluation Period
Monitoring will starts at the initial stage of compensation payment and livelihood recovery support policy. Completion of resettlement as well as evaluation will be started at the same time.

Table 4.11-56 Resettlement Schedule

	2018			2019											2020												2021									Responsible Agency	
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	Management	Implementation
Preparation																																						
Completion of ROW drawings																																					CPA/RHD	Consultants
Hiring NGO for LARAP Preparation																																					CPA/RHD	Consultants
Verification and update LARAP																																					CPA/RHD	Consultants
Preparation of Rehabilitation Plan																																					CPA/RHD	Consultants
Submission of revised RAP to JICA																																					CPA/RHD	CPA/RHD
RAP budget approval from Central Government																																					CPA/RHD	CPA/RHD
Disclosure of revised RAP																																					CPA/RHD	NGO
Establish Grievance Redress Mechanism																																					CPA/RHD	NGO
Declaration of cut-off date (LA notification)																																					CPA/RHD	DC
Implementation																																						
Rehabilitation																																					CPA/RHD	NGO
Disbursement of compensation and assistance																																					CPA/RHD	DC+NGO
Physical displacement																																					CPA/RHD	NGO
Taking possession of acquired land																																					CPA/RHD	DC
Handover of acquired land to contractor																																					CPA/RHD	DC + Constactor
Monitoring																																						
Internal Monitoring																																					CPA/RHD	CPA/RHD+ Consultans +NGO
External Monitoring																																					CPA/RHD	CPA/RHD+ Consultans +NGO

Source: JICA Survey Team

4.11.8 Resettlement Budget and its Source

The budget related to land acquisition/resettlement, and rehabilitation is based on compensation for land, structures, and trees affected by the project, relocation allowance, support for the socially vulnerable, vocational training, employment costs for specialists and the Implementing NGO, monitoring costs, and replacement site maintenance costs. All costs related to land acquisition/resettlement and rehabilitation are borne by the Bangladesh government. At the present initial stage, as it is difficult to estimate the land acquisition and resettlement expenses for this project separately, the estimated cost of this project will be based on the land area and number of resettled households, from the socio-economic survey (SES) to the Project Affected Persons (PAP), and the replacement cost survey for land, trees, and structures. The price will be confirmed by the Property Valuation Advisory Team (PVAT).

(1) Port

1) Replacement Cost of Structures and land

Survey results of re-acquisition price of structure and land are shown below.

Table 4.11-57 Type of House and Commercial Structure

Type		Unit value /m2	No. of structure	Area(m2)	Total (BDT)
Residential	Pucca	11,000	2	74	814,000
	Tin shed	3,900	9	410	1,599,000
	Thatched	2,000	45	1,578	3,156,000
	Sub-total		56	2,062	5,569,000
Commercial	Pucca	11,000	0	0	0
	Tin shed	3,900	0	0	0
	Thatched	2,000	5	89	178,000
	Sub-total		5	89	178,000
Total	Pucca	11,000	2	74	814,000
	Tin shed	3,900	9	410	1,599,000
	Thatched	2,000	50	1,667	3,334,000
	Total		61	2,151	5,747,000

Source: JICA Survey Team

As there are no real estate company in the area, information was gathered from local residents and key informants regarding the market transaction price. Since this price is higher than three times of the rate set by DC, this price was applied for calculating the compensation cost for private land. Since land price is reported to increase 2.5 to 5 times in the last 10 years, 30% escalation cost for next 1-2 years was considered for calculating compensation amount.

Table 4.11-58 Land Price by Category

(BDT/m^2)

Union	Type	Rate determined by DC	market price
Dhalghata	Residential area	568	2,471
	Others	121	1,606

Source: JICA Survey Team

2) Market Value of Trees

48 Trees will be affected by the port area of this project. The price of the trees was calculated by the average price excluding outliers after hearing from the residents, and the validity was confirmed by comparison with the value obtained from the timber supplier. The tree price is 223,900 taka, and the income from fruit harvest is 20,000 taka yearly.

Table 4.11-59 Tree Loss in the Affected Area

Ref. H/H No.	Name of H/H	Village	Name of Tree	Unit price (Tk.)	Total No. of Tree	Total price (Tk.)	Annual Income from fruit tress (Tk.)
			Coconut	3,759	4	15,036	4,000
			Coconut	3,759	2	7,518	1,000
			Coconut	3,759	2	7,518	2,000
			Coconut	3,759	4	15,036	2,000
			Mehogoni	5,894	20	117,880	N/A
			Mango	3,363	4	13,452	8,000
			Banana	4,053	8	32,424	3,000
			Coconut	3,759	4	15,036	N/A
Total					48	223,900	20,000

Source: JICA Survey Team

3) LARAP Implementation Cost

Estimate of the LARAP implementation cost is shown in the following table.

Table 4.11-60 R&R Budget (port)

Item	Unit	Unit Cost (BDT)	Port	
			Quantity	Total (BDT)
I. Compensation				
Land				**1,967,898,043**
Land (homestead)	m2	2,471	40,603	100,330,013
Land (salt farm)	m2	1,606	757,281	1,215,989,748
Escalation Cost for Land (1-2 years)	30% of land cost			394,895,928
Land registration cost	15% of total land cost			256,682,353
Structure				**6,240,300**
Pucca	m2	11,000	74	814,000
Tin shed	m2	3,900	410	1,599,000
Thatched	m2	2,000	1,667	3,334,000
Accessories	10% of Structures			493,300
Trees				**223,900**
Mehegoni	number	5,894	20	117,880
Coconut	number	3,759	16	60,144
Mango	number	3,363	4	13,452
Banana	number	4,053	8	32,424
Sub-Total (I)				**1,974,362,243**
II. Allowance				
Assistance for transition in recovering loss of income source (3 years)				**291,611,000**
title holder		2,383,200	93	221,637,600
non-title holder		1,588,800	44	69,907,200
income from trees	Lump sum			66,200
Moving allowance	**Household**	**20,000**	**58**	**1,160,000**
Assistance to vulnerable	**Household**	**10,000**	**74**	**740,000**
Training	**Household**	**36,000**	**211**	**7,596,000**
Sub-Total (II)				**301,107,000**
III. Implementation				
NGO	staff-month	330	100,000	33,000,000
External monitoring	staff-month	18	200,000	3,600,000
Information disclosure	Lump sum			1,000,000
Sub-Total (III)				**37,600,000**
Sub-Total (I+II+III)				**2,313,069,243**
IV. Transfer of gov. land				
Land (homestead)	m2	1,704	10,802	18,406,608
Land (salt farm)	m2	363	264,695	96,084,285
Sub-Total (IV)				**114,490,893**
Contingency (10%)				**242,756,014**
Total				**2,670,316,149**
Total (round)				**2,670,000,000**

Source: JICA Survey Team

(2) Access Road

1) Replacement Cost of Structures and land

Following table shows total structure loss and prices and area. Total residential and commercial structure amounted 18,918m^2 and total replacement cost will be Tk. 129,695,200.

Table 4.11-61 Replacement Cost of Structures

Type		Unit Cost (BDT/m2)	No	Area (m2)	Total Amount (BDT)
Residential	Pucca	11,100	22	5,579	61,926,900
	Semi-puca	8,300	24	4,097	34,005,100
	Tin	3,900	80	7,831	30,540,900
	Katcha	2,000	10	1,222	2,444,000
	Sub-total		136	18,729	128,916,900
Commercial	Pucca	11,100	1	11	122,100
	Semi-puca	8,300	0	0	0
	Tin	3,900	4	158	616,200
	Katcha	2,000	2	20	40,000
	Sub-total		7	189	778,300
Total	Pucca	11,100	23	5,590	62,049,000
	Semi-puca	8,300	24	4,097	34,005,100
	Tin	3,900	84	7,989	31,157,100
	Katcha	2,000	12	1,242	2,484,000
	Sub-total		143	18,918	129,695,200

Source: JICA Survey Team

The table below shows the total area of other structures. These structures are fences, walls, toilets, garages, etc. The total area of other structures was 8,067 m^2, whose compensation amount was calculated using the same unit price as the above-mentioned Tin shed structure.

Table 4.11-62 Other Affected Structures and their Squire Meters

Upazila	Union	No. of Structure	Area(m^2)
Moheshkhali	Dhalghata	31	4,466
	Kalarmarchara	9	981
Chakaria	Badarkhali	31	1,314
	Saharbil	0	919
	Chiringa	89	919
	Fasiakhali	42	387
Total		202	8,067

Source: JICA Survey Team

As there are no real estate company in Dhalghata, information was gathered from local residents and key informants regarding the market transaction price. Information was gathered from real estate companies about market prices of land in other unions. Since this price is higher than three times of the rate set by DC, this price was applied for calculating the compensation cost for private land. Since land price is reported to increase 2.5 to 5 times in the last 10 years, 30% escalation cost for next 1-2 years was considered for calculating compensation amount.

Table 4.11-63 Replacement Cost Survey of Land

(BDT/m^2)

Union	Mouza	Rate determined by DC		market rate	
		Residence	Agri. Land and Others	Residence	Agri. land and Others
Dhalghata	Dhalghata	568	168	2,470	1,606
Kalarmarchara	Kaligonj	153	151	3,706	1,235
	Kalarmarchara	802	367	3,706	1,235
	Jhapwa	648	461	3,706	1,235
	Yunuskhali	1,022	626	3,706	1,235
	Uttor Nolbila	725	488	3,706	1,853
Badarkhali	Badarkhali	427	495	9,884	7,413
Chringa	Palakata	493	443	2,780	1,235
Fasiakhali	Fasiakhali	1,510	1,853	4,324	2,162

Source: JICA Survey Team

2) Market Value of Trees

The market price of trees is as follows. The price of the trees was calculated by the average price excluding outliers and after hearing from the residents, and the validity was confirmed by comparison with the value obtained from the timber supplier. The annual income from trees is as listed in Table 4.11-34 - Trees Affected by Household.

Table 4.11-64 Summary of Tree Loss by Category

Name of Tree	Unit Price (Tk.)	No.	Total Value(Tk.)
Acatashamsia	9,000	12	108,000
Aistratran	1,000	14	14,000
Akashmoni	3,975	727	2,889,753
Arjun	5,000	1	5,000
Badam	15,000	2	30,000
Badi Tree	1,667	12	20,000
Bamboo	108	3,412	369,985
Banana tree	4,053	20	81,066
Banyan	8,500	3	25,500
Belgium	2,031	882	1,793,169
Betel Nut	976	280	273,274
Bilambu	4,053	1	4,053
Black Plum	3,045	33	100,500
Coconut	3,759	547	2,056,295
Cotton tree	3,500	4	14,000
Date	4,782	58	277,343
Eucalyptus	1,567	4,892	7,666,629
Fambara	3,500	2	7,000
Flower tree	8,400	33	277,200
Gamari	3,000	14	42,000
Garjan	500	14	7,000
Gooseberry	800	1	800
Guava	620	48	29,760
Hog Plum	242	18	4,350
Jackfruit	3,251	63	204,818
Jam	8,500	6	51,000
Jaue Tree	15,000	1	15,000
Lichi	300	1	300
Madar tree	4,053	4	16,213
Malaria	2,349	3,648	8,569,561
Mango	3,363	352	1,183,692
Mehegoni	5,894	115	677,803
Melenda	15,000	1	15,000
Neem	3,250	19	61,750
Olive	2,700	11	29,700
Other tree	4,053	2	8,107
Palm	3,188	11	35,063
Papaya	13	161	2,147

Pea nut	250	2	500
Plum	2,055	22	45,210
Raintree	8,824	84	741,176
Rose Apple	700	2	1,400
Segun	10,000	3	30,000
Sharifa	500	3	1,500
Shisu	4,034	29	116,989
Shoita	500	4	2,000
Sofeda	5,000	1	5,000
Tamarind	7,650	11	84,150
		15,587	27,994,757

Source: JICA Survey Team

3) Market price of crops

The market price of paddy is 28 taka/kg, and an average harvest amount is 0.74 kg per m^2 (40 kg per 1/100 acre), which was used for calculation basis of compensation amount.

4) LARAP Implementation Cost

The estimate of LARAP implementation cost is shown below table.

Table 4.11-65 R&R Budget

Item	Unit	Unit Cost (BDT)	Access Road	
			Quantity	Total (BDT)
I. Compensation				
Land				**4,606,491,720**
Land (homestead)	m2	9,020	81,368	733,973,433
Salt farm and others	m2	1,805	1,353,765	2,442,917,408
Increase in land value	30% of land cost			953,067,252
Land registration cost	15% of total land cost			476,533,626
Structure				**161,156,500**
Pucca	m2	11,100	5,590	62,049,000
Semi-Puca	m2	8,300	4,097	34,005,100
Tin shed	m2	3,900	7,989	31,157,100
Thatched	m2	2,000	1,242	2,484,000
Accessories	m2	3,900	8,067	31,461,300
Trees	No.	1,796	15,587	**27,994,757**
Crops	m2	21	800,961	**16,820,181**
Sub-Total (I)				**4,812,463,157**
II. Allowance				
Compensation for loss				
Titel-holder	Household	150,000	217	32,550,000
Non-title holder	Household	120,000	515	61,800,000
Income from tree	Lump sum	15,047,757		15,047,757
Moving allowance	Household	20,000	135	2,700,000
Assistance to vulnerable	Household	10,000	296	2,960,000
Training	Household	36,000	516	18,561,600
Sub-Total (II)				**133,619,357**
III. Implementation				
NGO	staff-month	330	100,000	33,000,000
External monitoring	staff-month	18	200,000	3,600,000
Information disclosure	Lump sum			1,000,000
Sub-Total (III)				**37,600,000**
Sub-Total (I+II+III)				**4,983,682,514**
V. Transfer of gov. land		1,394	573,227	798,903,817
Contingency (10%)				**578,258,633**
Total				**6,360,844,963**
Total (Round)				**6,361,000,000**

Source: JICA Survey Team

4.11.9 Monitoring and Evaluation

Monitoring and evaluation are important tasks for understanding the periodic progress of the resettlement program. Accordingly, progress limitations and bottlenecks can be specified, and improvement measures can be decided. LARAP implementation will be monitored on a regular basis. The relocation unit, which is a Project Implementation Unit (PIU), will establish a quarterly monitoring system, including the implementing agency/NGO staff. The PIU will prepare a progress report on all aspects of land acquisition and resettlement activities. The progress report for LARAP implementation will be listed in the report, however attention should be paid in particular to the policies stipulated in the plan and the adherence situation of the matrix. CPA/RHD will select the monitoring and consultant, and will conduct external monitoring of the resettlement work. Reports on the external monitoring should be submitted to CPA/RHD and JICA as the same time. Monitoring is carried out annually during the resettlement activities implementation period, and the overall evaluation is carried out after the implementation period.

(1) Internal Monitoring:

Internal monitoring is an ongoing process that continues from the start to completion of LARAP implementation. Mechanisms included in internal monitoring are as follows:

- Resettlement Unit, Chittagong Port Authority, Road/National Highway Authority (RU-CPA/RHD)
- Implementing NGO
- Construction Supervising Consultant Resettlement Specialist (Monitoring Support)

Objectives:
The objectives of internal monitoring are for ensuring effective implementation of the LARAP and achievement of the set targets. Resettlement monitoring is a continuous process of data collection, dialogue with the various stakeholders, analysis & reporting and feedback to rethink of implementation procedures, if required.

Key activities include:
The major input into the monitoring system and activities will include the following activities and information:

- Collection of affected household data
- Collection of land acquisition data
- Data on losses
- Resettlement entitlement data
- Resettlement progress monitoring and evaluation data
- Data on progress of compensatory payment
- Implementation of vocational training, job finding after vocational training, employment status and livelihood restoration after job finding
  (The above result shall be fed back to Livelihood Restoration Program. The Program shall be amended where necessary.)

Internal monitoring will be undertaken by the Project Implementation Unit (PIU) under Executing Agency. The EA will gather information on LARAP implementation covering relevant activities as per schedule.

All activities listed will be illustrated in Gantt Charts showing the target dates for completing resettlement activities. Internal monitoring reports on LARAP implementation will be included in the quarterly Project Progress Report (PPR). It will be then submitted to JICA. The report of PMU will contain: (i) accomplishment to-date, (ii) objectives attained and not attained during the period, (iii) challenges encountered, and (iv) targets for the next quarter. The EA will make bi-annual reporting to JICA on monitoring.

Monitoring form
Monitoring form is to update on-going resettlement activities with its index/indicators of input/output and outcome. **(see Appendix)**

(2) External Monitoring:

The EA will recruit an Independent External Monitoring Consultant for LARAP implementation and carry out external monitoring. External Monitoring Consultants (EMC) acceptable to JICA for monitoring the performance of LARAP implementation and evaluation of resettlement process and final outcome.

The fundamental objective of external monitoring is as follows:

- Independently monitoring whole process social and environmental issues in LARAP implementation process
- Identify discrepancies with resettlement and suggest remedial measures

The key activities for external monitoring include:

- Monitoring the performance of LARAP implementation and evaluation of resettlement process and final outcome.
- Confirm that mitigation measures shall reduce any negative impacts on the social and environment to allowable levels during the construction and operation phases.
- Set up an organization that is responsible for the implementation of monitoring the plan.
- Perform appropriate monitoring during the construction and operation phases.

4.11.10 Public Consultations

(1) Public Consultations Required by Laws in Bangladesh

There is no provision on the resident consultation in the LARAP-related laws in Bangladesh. In this Project, in accordance with the JICA guidelines, stakeholder consultations are scheduled twice, namely at the times of scoping and preparation of draft LARAP.

(2) Public Consultations in the Project

CPA/ RHD held public consultations in accordance with JICA Guidelines, which were supported by JICA Survey Team. FGD was held separately considering that participation rate of female to public consultation is generally low and expression of their opinion in public is restricted. Participation of educational personnel were especially encouraged to understand impact on children. Schedule of public consultations is summarized as follow.

Table 4.11-66 Schedule of Public Consultations

Name of Consultation	Year/Month	Contents of Meetings
1st Public Consultation (for port)	January 2018	Outline and scoping of the port component (1 location)
1st Public Consultation (for access road)	March 2018	Outline and scoping of the access road component (5 locations, One of them is common with consultations for port)
2nd Public Consultation (for port/access road)	July 2018	Draft LARAP for the port component (2 locations) Draft LARAP for the access road component (6 locations, Two of the are common with consultation for port)
Supplemental meeting (for access road)	August 2018	Re-alignment of the access road (2 locations)
Supplemental meeting (for port/ access road)	November 2018	Compensation policy (4 locations)

Source: JICA Survey Team

1) 1st Public Consultation (for port)

Public consultation for LARAP was held combined with stakeholder meetings for EIA. Notification of public consultation was made from CPA, DC, Upazila Office and then Union Office from the middle of January 2018. Verbal notification was made from Union Chairman considering low literacy rate in the area and local consultant confirmed that notification was properly made. Local Consultant made notification directly to NGOs. FGDs will be held separately as female participants were only three. Participants and contents are as follows.

Table 4.11-67 Participants of Public Consultations

Date	Venue	Participants								
		Total (M/F)*	EA, Survey Team	Relevant Agencies	DC, Upazila	Other Municipalities	PAPs	Religious/ Education.	NGO	Others
27 Jan. 2018	Mohe-shkhali UNO	51	3	2	15	9	12	6	1	3

Source: JICA Survey Team

The below was explained. Materials were translated into Bengali; explanation, comments and question from participants and their response were also made in Bengali.

- Background of the Project
- Outline of the Project
- Purpose of the Public Consultations
- Necessity of the Port Project (Future Demand Forecast)
- Option Comparison, recommended option and its reason
- Plan for the access road connecting the port to N1
- Environmental and Socio-economic Conditions
- Impact to be caused by the Project

Remarkable comments and question from participants and their response were as follows.

Table 4.11-68 Remarkable Comments, Suggestions and Correspondences

Date	Venue	Remarkable Comments and Suggestion	Correspondences
27 Jan, 2018 (Sat)	Moheshkhali UNO	The port will be constructed in Dhalghata Mouza of Dhalghata union. So, it should be named as Dhalghata Deep Sea Port. (Dhalghata Union Parishad (UP) Chairman/ Member of Parliament(MP),Cox's Bazar-2)	The organizer of the SHM meeting committed to convey the message from to the higher authority.
		The project authority shall make the project sustainable to fulfill the people's future demand. (Upazila Chairman, Moheshkhali)	It will be examined through the Survey.
		The project will be implemented properly after finding out the problems and mitigation measures. (Upazila Chairman, Moheshkhali)	Socio-economic survey will be conducted for preparation of LARAP.
		The project authority shall make sure the proper compensation of lost assets to the project affected person (PAPs). (Dhalghata Union Parishad (UP) Chairman) The CPA shall ensure hassle free proper compensation to the PAPs. Improper compensation will create the sufferings of the project. (Member of Parliament (MP), Cox's Bazar-2). Proper compensation issue and the job opportunities of the local peoples shall be made. (Female Ward Member, Dhalghata Union/ Teacher, Dhalghata Adarsha High School)	Compensation will be examined in LARAP in accordance with Bangladesh law and JICA GLs.
		As the land price is getting higher so there should have the resettlement plan to another mouza or area for the PAPs. (PAPs)	Compensation and resettlement will be examined in LARAP in accordance with Bangladesh law and JICA GLs.
		A technical school need to be established where the local peoples and affected peoples would be trained and directly be recruited in both the projects. (Dhalghata Union Parishad (UP) Chairman, Upazila Chairman, Moheshkhali)	Livelihood restoration including job training will be examined in LARAP
		Around 100 years salt cultivation is ongoing in the area, which will be hampered due to mega project. Alternative support from the government and all mitigating measures are to be taken for income and other losses. (Member of Parliament(MP),Cox's Bazar-2)	Livelihood restoration will be examined in LARAP in accordance with Bangladesh law and JICA GLs.
		For the route selection of the Port access road there must be proper consultation with the local community. (Dhalghata Union Parishad (UP) Chairman) As a part of participatory planning for mega project like this CPA/RHD should arrange more SHM with all section of people. (Member of Parliament (MP), Cox's Bazar-2).	Consultation meeting will be held for access road. Supplemental SHM will be held.

Figure 4.11-6 1st Public Consultation (for port)
（27 January, 2018:UNO Conference Room, Moheshkhali）

2) 1st Public Consultation (for access road)

Public consultation for LARAP was held combined with stakeholder meetings for EIA. Notification of public consultation was made from RHD, DC, Upazila Office and then Union Office from the early of March 2018. Verbal notification was made from Union Chairman considering low literacy rate in the area and local consultant confirmed that notification was properly made. Local Consultant made notification directly to NGOs. FGDs will be held separately as female participants were only few. Participants and contents are as follows.

Table 4.11-69 Participants of Public Consultations

Date	Venue	Participants								
		Total (M/F)*	EA, Survey Team	Relevant Agencies	DC, Upazila	Other Municipalities	PAPs	Religious/ Education.	NGO	Others
12th Mar, 2018 (Mon)	Mohe-shkhali UNO	50 (47/3)	8 (7/1)	0	10 (10/0)	14 (14/0)	17 (15/2)	0	0	1 (1/0)
13th Mar, 2018 (Tue)	Chakaria UNO	50 (41/9)	6 (6/0)	1 (1/0)	7 (6/1)	12 (10/2)	7 (4/3)	14 (11/3)	1 (1/0)	2 (2/0)
14th Mar, 2108 (Wed)	Kalamar-Chara Union	78 (75/3)	6 (6/0)	0	0	16 (13/3)	56* (56/0)	-	0	0
15th Mar, 2018 (Thu)	Dhalghata Union	87 (86/1)	6 (6/0)	0	1 (1/0)	7 (6/1)	72* (72/0)	1 (1/0)	0	0
17th Mar 2018 (Sat)	Badarkhali Union	62 (58/4)	6 (6/0)	0	0	15 (14/1)	41* (38/3)	-	0	0

*Some included in PAPs

Source: JICA Survey Team

The below was explained in 1st public consultation. Materials were translated into Bengali; explanation, comments and question from participants and their response were also made in Bengali.

- Background
- Outline of the Project
- Purpose of the Public Consultations
- Necessity of Access Road
- Route of Access Road and Affected Area
- Option Comparison, recommended option and its reason
- Examination for Minimizing Resettlement
- Environmental and Socio-economic Conditions
- Impact to be caused by the Project

Remarkable comments and question from participants and their response were as follows.

Table 4.11-70 Remarkable Comments, Suggestions and Correspondences

Date	Venue	Remarkable Comments and Suggestion	Correspondences
12th Mar, 2018 (Mon)	UNO Conference Room, Moheshkhali	Port road and power plant road should be integratedly planned. (District AL President Advocate)	To be considered in road development plan.
		They have no objection regarding port access road but have objection regarding the naming issue. The naming of the access road must be Dhalghata port access road instead of Moheshkhali Port Access road. (Chairman Dhalghata Union Parishad)	The name issue is already conveyed to CPA/RHD high authority. CPA/RHD will discuss with the Member of Parliament.
		Among the three routes, priority route should involve less damage and disturbance to the affected people. (District AL President Advocate)	Priority route is selected through evaluation of various factors including minimization of negative environmental/ social impact.
		Proper compensation of PAPs is to be ensured. (Mayor Moheshkhali Pourashava) Road and port will benefit the whole country. It shall be considered that compensation at Dhalghata is Tk.6 lakh per acre (1.00acre) but at Chiringha land price is Tk. 12 lakh per decimal (0.01 acre). (Commander, Freedom fighter)	Compensation rate will be examined based on Bangladesh law and JICA GLs.
		Compensation rate must be consulted with local people. (District AL President Advocate)	To be considered in LARAP. Local consultation meeting will be held.
		Land and livelihood of the people is to be saved and salt land to be protected. (Honorable MP, Cox's Bazar-2)	To be considered in LARAP. Impact shall be minimized.
		Development needs alternative support and people should have access to these job and livelihood facilities and people's views must be honored. (District AL President Advocate)	Job creation and livelihood restoration will be examined in LARAP.
		Ensure equitable development shall be ensured for all people in the area. (District AL President Advocate)	Consideration will be given to maximize the benefit for local people and to minimize inequality.
13th Mar, 2018 (Tue)	UNO Conference Room, Chakaria	Access road project has been designed in such a way housing structures have been avoided. It is requested educational institution should also be avoided. In designing the project minimum damage of property, graveyard, and cemetery, and religious institution are to be ensured and minimizing all negative impacts. (UNO Chakaria) One school and Madrasa will be affected in the alignment, there should be initiative to avoid these area (UNO Chakaria).	JICA GL requires minimalization of land acquisition and resettlement. All effort will be also made to avoid disturbance to educational/ cultural/ religious facilities. If still unavoidable, relocation will be examined in close consultation with local communities.
		Hassle free compensation and intermediary service of middlemen will be expected. (President Chakaria Press Club)	Proper compensation will be planned in LARAP in accordance with Bangladesh law and JICA GLs.

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		At Badarkhali growth centre and adjacent areas, there is no Bangladesh survey [3](BS) record. Due to this, previous acquisition some PAPs was unable to get compensation. The land is under a cooperative association. No direct purchase on that land. In bazaar land price per kani (0.40 acre) is around Tk.3 to 4 crore. (Chairman Badarkhali UP)	Proper compensation will be planned in LARAP in accordance with Bangladesh law and JICA GLs.
		Some people raised the issue of fish *gher*, salt cultivation in the leased land. They have concern of getting compensation of their investment. (UNO Chakaria)	Minimization of negative impact will be carefully examined. Proper compensation and livelihood restoration will be also examined in LARAP.
		Such information disclosure meeting will be helpful and expecting more meeting and thanks JICA for support such development project (Female Vice Chairman).	Local consultation meeting will be held to facilitate involvement of communities and PAPs.
14th Mar, 2108 (Wed)	Kalarmarchara Union Parishad Auditorium, Moheshkhali Upazila	The affected people will lose land and livelihood, salt and shrimp land, so they should be properly rehabilitated and it should be minimum. (UP Chairman, Kalarmarchara) Shrimp *gher,* salt land, betel leaf cultivation will be affected. Sufficient drainage is essential. (PAPs)	Minimization of livelihood impact as well as livelihood restoration will be examined in LARAP. Minimization of negative impact on hydrology will be examined through EIA.
		Some people are unable to get compensation, so proper cooperation is sought from the requiring body. (PAPs)	Proper compensation will be examined in LARAP in accordance with Bangladesh law and JICA GLs.
		Direct Payment to the affected people with support of Union Parishad. Intermediary support in DC office is a major problem of getting payment for poor, illiterate PAPs. (UP Chairman, Kalarmarchara)	Proper compensation will be examined in LARAP in accordance with Bangladesh law and JICA GLs. PAPs will be supported in getting compensation.
		Engage local construction worker in construction work	Engaged of local construction workers will be considered in EIA/ LARAP.
		Poor people should have livelihood restoration. (PAPs)	Special consideration will be made for vulnerable peoples in LARAP.
		Female affected person should get support from the project. (Female UP Member)	Ditto
15th Mar, 2018 (Thu)	UP Conference Room, Dhalghata, Moheshkhali Upazila	They are very serious about the naming issue of port and land price. They will have all out cooperation to the project authority. (Dhalghata Union Chairman)	The name issue is already conveyed to CPA/RHD high authority. CPA/RHD will discuss with the Member of Parliament.
		The proposed development projects in the area are blessings for the local people but the affected community is to be properly resettled. (Dhalghata Union Chairman)	Proper resettlement will be examined in LARAP in accordance with Bangladesh law and JICA GLs.

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		Already price has been increased substantially, that is why land transaction is temporarily declared off by the executive order in the area. Both the naming issue and land price are to be declared before starting the work. (Dhalghata Union Parishad)	Land price will be investigated and proper compensation rate will be examined in LARAP.
		As government informal decision, no transaction of land without DC's approval. So, only mouza rate of land price will not be helpful for proper compensation. Without proper compensation, people's sufferings will not be relieved in case of land acquisition. (Dhalghata UP Member)	Ditto
		They want 100% job for the affected persons as their livelihood is being hampered. (Dhalghata UP Member) We need job, otherwise we have to survive drinking only salt water. (Women UP member, Dhalghata) The project has acquired their agriculture and salt land. Therefore, they want training and job facilities. (Pundit's Deil village)	The proposed project will improve the situation Livelihood restoration and job creation will be examined in LARAP.
		They want other infrastructure support like establishment of hospital, vocational and polytechnic institute for improving their livelihood and living standard. (Dhalghata Union Chairman)	Livelihood restoration and preparation of relocation site will be examined in LARAP. Port access road will also help in smooth transportation of locally produced goods and import other daily necessities comparatively better prices.
17th Mar 2018 (Sat)	Badarkhali Union Parishad Conference Room, Chakaria Upazila	It would be recommended to change the alignment and avoid mosque from acquisition. A mosque and a Fazil Madrasa will be affected. (Panel Chairman, Baro Veola)	All effort will be made to avoid disturbance to educational/ cultural/ religious facilities. If still unavoidable, relocation will be examined in close consultation with local communities.
		It would be recommended to change the alignment along southern side of the Badarkhali Bridge. It will minimize the affected structure. During socio economic survey (SES), this will be verified. (President Badarkhali Cooperative Society)	Route is selected through evaluation of various factors including minimization of negative environmental/ social impact, as well as engineering viewpoint. To shift alignment to south will increase affected residential houses while it can avoid impact on bazar. It will also lead to zig-zag road considering that the route has to avoid Moheshkhali hills.

	
Eng. Nurul Alam Siddique is presenting the key note paper in Moheshkhali Upazila (12 March, 2018)	Full view of the SHM in Moheshkhali Upazila (12 March, 2018)
	
SHM at Chakaria UNO office (13 March, 2018)	Upazila Nirbahi Officer is addressing in the meeting at Chakaria UNO office (13 March, 2018)
	
View of the Stakeholders Meeting in Kalarmarchara Union Parishad Auditorium, Moheshkhali Upazila (14 March, 2018)	UP Chairman is addressing in the meeting in Kalarmarchara Union Parishad Auditorium, Moheshkhali Upazila (14 March, 2018)

	
Partial view of stakeholder's meeting in UP Conference Room, Dhalghata (15 March, 2018)	PAP is addressing in the SHM in UP Conference Room, Dhalghata (15 March, 2018)
	
Mr. Nurul Alam Siddique is presenting key note paper in the SHM at Badarkhali UP office (17 March, 2018)	SHM at Badarkhali UP office, Chakaria (17 March, 2018)

Figure 4.11-7 Public Consultation for Access Road

3) 2nd Public Consultation (for port and its access road)

Public consultation for LARAP was held combined with Stakeholder meeting for EIA. Notification of public consultation was made from CPA/RHD, Upazila Office and then Union Office from the late June 2018. Written notification was posted on bulletin board of Upazila Offices and Union Offices while verbal notification was made from Union Chairman considering low literacy rate in the area, which was confirmed by Local Consultant. Local Consultant made notification directly to NGOs. Attendance of teachers were secured to reflect interests of children. Participants and contents are as follows.

Table 4.11-71 Participants of Public Consultations

Date	Venue	Participants								
		Total (M/F)*	EA, Survey Team	Relevant Agencies	DC, Upazila	Other Municipalities	PAPs	Religious/ Education.	NGO	Others
5 July, 2018	Chakaria UNO	82 (72/10)	5 (4/1)	1 (1/0)	11 (11/0)	43 (34/9)	9 (9/0)	4 (4/0)	1 (1/0)	8 (8/0)
7 July, 2018	Moheshkhali UNO	70 (69/1)	7 (6/1)	0	7 (7/0)	17 (17/0)	28 (28/0)	5 (5/0)	0	6 (6/0)
8 July, 2018	Dhalghata Union	90 (77/13)	6 (5/1)	0	0	8 (8/0)	75 (63/12)	1 (1/0)	0	0
10 July, 2018	Badarkhali Union	123 (122/1)	5 (4/1)	0	0	24 (24/0)	80 (80/0)	7 (7/0)	0	7 (7/0)
10 July, 2018	Kalarmarchara Union	72 (70/2)	4 (3/1)	0	0	10 (9/1)	58 (58/0)	0	0	0
11 July, 2018	Fasiakhali Union	68 (61/7)	5 (4/1)	0	0	27 (22/6)	35 (35/0)	0	0	1 (1/0)

*Some included in PAPs

Source: JICA Survey Team

The below was explained. Materials were translated into Bengali; explanation, comments and question from participants and their response were also made in Bengali.

- Outline of the Project
- Important Natural areas near the Project
- Results of Environmental Impact Assessment
- Monitoring Plan
- Management/Monitoring Implementation Structure
- Overview of Affected Area
- Examination for Minimizing Resettlement
- Overview of PAHs/ Affected Lands
- Resettlement and Rehabilitation framework (Compensation/ Rehabilitation)
- Institutional Arrangements (GRM)
- Correspondence to Opinions in 1st Consultation Meetings

Remarkable comments and question from participants and their response were as follows.

Table 4.11-72 Remarkable Comments, Suggestions and Correspondences

Date	Venue	Remarkable Comments and Suggestion	Correspondences
5th July, 2018 (Thu)	Chakaria UNO	We generally appreciate the project. We are expecting minimum loss of environment regarding Involuntary resettlement impact. (UNO, Chakaria)	Minimalization of the negative impact has been examined in EIA/LARAP.
		Proposed alignment should avoid Badarkhali Bazar. It Should also avoid Badarkhali Degree College and Madrasa. (UP member Badarkhali) The proposed project will affect Bazar, school, college and Mosque and if there is scope of avoidance, the mentioned community facilities should be avoided. (UP Chairman, Badarkhali)	Viaduct will be installed for reducing the ROW and ensuring the north-south passage. Madrasa and structure of the College will be avoided at least.
		The people will cooperate in the implementation process of the road. But they are expecting the college will lose a four storied building structure. These key installations should be avoided. Proper compensation is to be provided as actual market price if land is not avoided. If the present route is unavoidable, there must be accident management device, and also there may be underpass or flyover. (Acting Principal of Badarkhali Degree College)	Effort was made for avoiding at least College building. The currently-proposed alignment will traverse the playground, but passage will be ensured. Effort will be continuously made for minimizing impact.
		Some house of the poor people will be affected. Project authority should ensure proper compensation. (Ward Member, Fasiakhali) There are so many fish project at Rampur area of Fasiakhali Union. We foresee the socio –economic condition will be drastically change but livelihood losers must be properly compensated. (PAPs) At Rampur of Shaharbil UP, there are fish project. Livelihood loss should be properly compensated. (Chairman, Shaharbil)	Compensation will be properly made in accordance with Bangladesh law and JICA GLs.
		All expect the proposed road, as it will change feature of Chakaria area and it will make new Chakaria. The proposed project area is the economic zone of Chakaria which comprises shrimp cultivation, fish culture but law and order situation is not good. We are expecting improved road communication will make the area free of dacoit and improved law and order situation will be a future outcome. (Chairman, Fasiakhali union Parishad)	-
		Avoid housing structure and ensure proper and timely compensation of poor. Loss of livelihood should be regained. (UP Member Fasiakhali)	Compensation will be made in accordance with Bangladesh law and JICA GLs. Livelihood restoration has been also examined in

Date	Venue	Remarkable Comments and Suggestion	Correspondences
			LARAP.
		To provide employment facilities for PAPs to restore loss of employment. (Ward Member, Fasiakhali)	Livelihood restoration has been examined in LARAP
		We are very satisfied but there should be sufficient culvert as the alignment will cause no water logging, they suggested. (PAPs)	Culverts for irrigation and drainage have been considered in road planning.
		It is expected for RHD that communication will be made properly to inform how the project affected people can get compensation. (Chairman, Chiringa Union Parishad)	Institutional arrangement for proper compensation has been examined in LARAP.
		Local people should be employed during construction period. (Chairman, Chiringa Union Parishad)	Employment of local people has been examined in EIA/ LARAP.
		Loss of natural Environment is to be avoided. We appreciate the project. (Chakaria Nature Conservation Management (NACOM))	Minimization/ mitigation of environmental impact has been examined in EIA,
7th July, 2018 (Sat)	Moheshkhali UNO	If possible in consideration of engineering view point and other social parameter, avoid homestead and housing structures. Otherwise, provide homestead land with structure before displacement of PAPs concerned. It is noted here around 66 households will lose their housing structure and they claim they have no alternative land for shifting as homestead. Their main demand is to shift the alignment around 300m north of the proposed alignment at Kalarmarchara. (MP, Cox's Bazar-2)	Viaduct or retaining wall will be installed for reducing the ROW to minimize land acquisition/ resettlement in Kalarmarchara populated area. It shall be noted, however, this is F/S and the alignment is yet finalized.
		The catchment area of the port will be 2 00 crore of people including neighboring countries. No one should be harmed. (MP, Cox's Bazar-2)	Examination for minimizing negative impact was made in EIA/LARAP.
		Present mouza rate land price of DC doesn't represent the actual land price as there is restricted transaction of land price from permission of DC. (MP, Cox's Bazar-2)	Compensation rate will be set based on Bangladesh law and JICA GLs.
		Naming of the port still is an issue. (MP, Cox's Bazar-2)	The issue needs to be solved in the ministry level.
		Provide actual market rate of land, Coal power project it was 7 million Tk. per acre and now it should be 10 million Tk. per acre. (Dhalghata Chairman)	Compensation rate will be set based on Bangladesh law and JICA GLs.
		A technical school and college are needed. (Upazila Chairman Moheshkhali)	Implementation of port will ensure the economic development. Also livelihood restoration support has been examined in LARAP.
		Local labour is to be engaged in the project and construction work. (Upazila Chairman Moheshkhali, President Upazila Awami	Employment of local people has been considered in EIA/ LARAP.

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		League (AL))	
		How proper price will be finalized while land sale is prohibited here? (President Upazila Awami League (AL))	Replacement cost survey was made through interview on PAPs, other people, register office and referring to land price in another project.
		Our houses and shelter will be affected. The project should save their home from acquisition. We are ready to sacrifice anything except shelter (PAPs)	Viaduct or retaining wall will be installed for reducing the ROW to minimize land acquisition/ resettlement in Kalarmarchara populated area. It shall be noted, however, this is F/S and the alignment is yet finalized.
8th July, 2018 (Sun)	Dhalghata Union	The area will be the development hub by the initiative of GoB and JICA as Bay of Bengal Industrial Growth Belt. So, both affected and non-affected persons will be the beneficiaries. (Assistant Manager, Land management Department)	-
		PAPs to get proper compensation as per new law enacted. (Assistant Manager, Land management Department, Principle Muhurighona Madrasa, Freedom Fighter)	Compensation will be made based on Bangladesh law and JICA GLs.
		There should be a monitoring team for identifying the real person for getting benefit as no one is deprived. (Principle Muhurighona Madrasa)	Monitoring team will be established in accordance with LARAP.
		Naming of the port still is an issue. (Principle Muhurighona Madrasa)	The issue needs to be solved in the ministry level.
		Easier processes for compensation in this project than in previous JICA project should be ensured (Shrimp and Salt Cultivator)	Procedure for compensation will be made based on Bangladesh law and JICA GLs.
		For getting payment I had to go to member of the parliament because they need for payment. LA section should have payment and finalization of documents with support of UP office and implementation NGO (Shrimp and Salt Cultivator)	This has been examined in LARAP.
		People in the area are suffering in tidal surge and cyclone; so they need embankment to protect crop and other belongings like shrimp and salt during cyclone. (Freedom Fighter)	Port access road could provide embankment as well as shelter at the time of flood.
		Need an inventory of loss for every PAPs including shrimp fingerlings collectors, crab farmer, sharecropper. They need five years demurrage for their losses as well as	Persons with their livelihood affected will be eligible for compensation in accordance with JICA

Date	Venue	Remarkable Comments and Suggestion	Correspondences
		rehabilitation of them. (Freedom Fighter)	GLs.
10th July, 2018 (Tue)	Badarkhali Union	The project will improve socio economic condition of the area but will affect school, college, mosque etc. (PAP)	Minimization of the impact has been examined during the survey. School and mosques will be avoided.
		At Badarkhali, there are three kindergarten school, one Degree College, bazar affected, and they should be avoided. (PAP) It would be recommended to shift the alignment about 2,500m to the south, which ensures around 80% will be government land. Otherwise it would be recommended to shift it about 300m to the north at Badarkhali. (PAP) If the alignment is shifted either north or south, there will be no loss. (PAP)	Kindergarten and primary schools will be avoided. Minimalization of the impact has been examined.
		At the proposed alignment at Badarkhali, risk of accidents will increase. Around 10,000 students are studying adjacent areas of bazar. Due to affected school and madrasha building there will be disruption of education and probability of accident will increase. If shifting the alignment to the south, approximately 7km will be shortened for the proposed road. (Principal of Badarkhali Madrasa)	Minimization of the impact has been examined during the survey. Safe passage of students will be secured.
		Out of total 5-acre land of the college, 3 acres will be affected. Though we are not against the development, it would be requested to make flyover or underpass in this area if shifting the alignment is not possible. (Principal of the degree college)	Minimization of the impact has been examined during the survey. Passage will be secured. Proper relocation of the structure will be made if necessary.
		As for Construction and other job facilities, priority should be given for local unemployed people. PAPs should have access to job. (PAP)	The employment of local people has been considered in both EIA/LARAP.
		Present market price is Tk.130,000 per decimal but in government rate it is only Tk.8,000 per decimal. Proper compensation will be required, otherwise PAPs will suffer. (PAP)	Compensation rate will be properly set in accordance with Bangladesh law and JICA GLs.
		DC's payment should be at union level, otherwise people will suffer. (PAP)	Compensation procedure will be made in accordance with Bangladesh law and JICA GLs. For fair compensation, monitoring and GRM will be established.
10th July, 2018 (Tue)	Kalarmarchara Union	We will cooperate in implementation of the project, but sacrifice should be within their limit. Uttar Nalbila village under Ward No-1 will suffer most; If the alignment is shifted 300m towards north, there will no physical displacement (PAP's representative, 2 PAPs)	Minimization of the impact has been examined during the survey. However, the proposed alignment is not the definite as this is F/S stage.
		What would be our compensation? it should not be mishandled (PAP)	Compensation package has been examined in accordance with Bangladesh law and JICA

Date	Venue	Remarkable Comments and Suggestion	Correspondences
			GLs.
		If issue on human settlement and environmental damage is arisen, human settlement should get priority. Because 1000 people of 70 households will lose their shelter at Uttar Nalbila as involuntary resettlement, we urge to save the settlement.	*Ditto*
		Though we will provide every opportunity to success the project and we are not opposing the development, this was their demand. They will become homeless for the proposed alignment and will be forced to use the vacant land.	*Ditto*
		We earnestly request, JICA team member to save our home and we will render highest cooperation to you in implementation the project. However, they would be highly indebted to the JICA team.	*Ditto*
		Out of 70 affected family, only 10 HHs could reconstruct and resettle their home in other areas as the remaining are very poor (Ward 7 PAP)	Compensation will be made in accordance with Bangladesh law and JICA GLs so that they can be resettled properly.
		The project is for our development. We expect no loss. (Ward 3 PAP)	Minimization of the impact has been examined during the survey. Compensation and/or rehabilitation assistance will be provided in accordance with Bangladesh law and JICA GLs.
11th July, 2018 (Wed)	Fasiakhali Union	No diversion of alignment at Chiringa is expected. Currently we do not have enough road facilities in this area, which will be improved by the Project and the people will get security. (Chairman, Chiringa Union Parishad)	-
		Consideration shall be made especially for poor people in getting compensation and rehabilitation. Resettlement site is needed and it should be union wise. (Chairman, Fasiakhali Union Parishad)	Special consideration has been examined for the vulnerable people including poor in LARAP.
		Land value is high at Fasiakhali in comparison with Chiringa. We like to give thanks to JICA but project should be designed such as no to cause water logging. (PAP)	Compensation rate will be set based on replacement cost survey. Culverts for irrigation and drainage have been considered in road planning.
		No intermediary is expected in legal compensation and it should be at grass root and union level. No one is to be deprived and authority should confirm it. (PAP)	Compensation procedure will be made in accordance with Bangladesh law and JICA GLs. For fair compensation, monitoring and GRM will be

Date	Venue	Remarkable Comments and Suggestion	Correspondences
			established.

UNO Chakaria speaking in the SHM
(5 July, 2018)

SHM at Chakaria in Upazila Auditorium
(5 July, 2018)

SHM at Moheshkhali Upazila Auditorium
(7 July, 2018)

SHM at Moheshkhali Upazila Auditorium
(7 July 2018)

Chairman speaking in SHM at Dhalghata

Attendees to SHM at Dhalghata

(8 July, 2018)	(8 July, 2018)
	
SHM at Badarkhali Co-operative society Premises (10 July, 2018)	Attendees to SHM at Badarkhali (10 July 2018)
	
SHM at Kalarmarchara UP (10 July, 2018)	PAP speaking in SHM at Kalarmarchara (10 July, 2018)
	
SHM at Fasiakhali UP Auditorium (11 July, 2018)	SHM at Fasiakhali UP Auditorium (11 July, 2018)

Figure 4.11-8 2nd Public Consultations for Port and its Access Road

4) Supplementary Community consultation (Access Road)

Concerns were found during the second consultations on access roads in July 2018 about the proposed alignment traversing villages in Kalarmarchara and markets in Badarkhali. Consequently, re-alignment was made to north direction and consultations were held again in both Unions. This supplementary consultation was conducted in the same way as the second community consultation, though as it had to be held earlier in order to complete the necessary land acquisition/resettlement surveys within the period, the survey members did not participate, and support for the Executing Agency was provided only through the local consultant. 67 people participated in community consultation in Badarkhali, and 36 people participated in Kalarmarchara.

Table 4.11-73 Participants of Public Consultations

Date	Location	Participants								
		Total (Male/Female)	Business Persons - Surveyors	Affiliated Government	Upazila - District	Other Administrative Districts	PAPs	Religious – Education Related	NGO	Other
Aug 13, 2018 (Mon)	Badarkhali Union	67 (67/0)	3 (3/0)	0	0	8 (8/0)	46 (46/0)	5 (5/0)	1 (1/0)	4 (4/0)
Aug 13, 2018 (Mon)	Kalarmarchara Union	36 (36/0)	4 (4/0)	0	0	8 (8/0)	24 (24/0)	0	0	0

Table 4.11-74 Remarkable Comments, Suggestions and Correspondences

Date	Venue	Opinions and Questions from Participants	Countermeasures
Aug 13, 2018 (Mon)	Badarkhali Union	We appreciate that the concerns of the local people were understood. We are requesting the alignment to the south approximately 3km from Badarkhali Bridge point directly (Secretary, Badarkhali Agricultural Cooperative Society)	The north detour was planned to take into consideration all of the environmental, social, and technical aspects. The realignment to south will pass through settlements at the bottom of hills, in addition to the Moheshkhali hill itself. On the other hand, for going south on the side of Badarkhali after detouring the Moheshkhali hill, the number of right/left turns increases, which is not desirable from technical aspects, as well as from road safety.
		All the land is triple cropped area. If road is constructed, there will be huge water logging and cannot be used for agriculture. Thus, shift to south is preferable. If shift to north is unavoidable, proper resettlement and compensation shall be ensured. (Madrasa teacher)	Installation of box culverts will be considered if necessary, so that water logging will not occur.
		If the alignment is shifted to southward direction, almost 80% is government land, which will be preferable. (Panel Union Chairman, Ex Chairman, representative of Badarkhali Social Welfare Organization)	The north detour was planned to take into consideration all of the environmental, social, and technical aspects. The realignment to south will pass through settlements at the bottom of hills, in addition to the

Date	Venue	Opinions and Questions from Participants	Countermeasures
			Moheshkhali hill itself.
Aug 13, 2018 (Mon)	Kalarmarchara Union	The proposed realignment might cause water logging at Badarkhali as claimed by the Badarkhali residents. However, as per new proposal to straighten port access road near Kalarmarchara government primary school through the hill passage, as claimed by the Badarkhali residents, more households will be affected in Kalarmarchara. (Ward Member).	Installation of box culverts will be considered if necessary, so that water logging will not occur. As was pointed out, the resettlement of many residents will be necessary on the Moheshkhali side for the south detour plan.
		The suggested north side detour plan is right. If it made straight through hill, many households will be affected. (PAPs)	As was pointed out, the resettlement of many residents will be necessary on the Moheshkhali side for the south detour plan, so the north detour plan is considered to be the best.
		We support the north side detour plan. The south side detour plan will result in a large-scale resettlement. (Ward Member, Kalarmarchara Panel Chairman)	Ditto
		With the planned introduction of culverts and bridges, and since the water flows in the southern and western directions, there will not be any water logging in Badarkhali even with the north side detour plan (Ward Member).	As per his understanding, there will be no water logging. Installation of box culverts will be considered if necessary.

As mentioned above, the Kalarmarchara Union approved the north side detour plan, however there were many in the Badarkhali Union who wanted the plan to be changed to the south side detour plan. Subsequently, after consultation with the residents, several consultations with the relevant parties were held in late August to explain the following.

- The north side detour plan was planned taking into consideration not only technical aspects, but also social and technical aspects as well. The straight-line change to the south plan will not just pass through the Moheshkhali hill, but also the settlements at the foot of the hill, which could result in large-scale resettlement.
- The proposed straight line avoids the Badarkhali market. Passage can be guaranteed by a box culvert.
- It was confirmed through hydraulic analysis that no water logging would occur. The main water flow is assumed to be in the east-west direction, but since the route is planned from east to west, it will not become a hinderance to this flow. When agricultural land drainage becomes necessary, it can be secured by introducing a box culver bar.

Through the consultations, the local community gained an understanding of the north side detour plan, and a general consensus was obtained.

	
Supplemental Consultation in Badarkhali Agricultural Cooperative Society （13 August, 2018）	Supplemental Consultation in Badarkhali Agricultural Cooperative Society （13 August, 2018）
	
Supplemental Consultation in Kalarmarchara （13 August, 2018）	Participants of Supplemental Consultation in Kalarmarchara （13 August, 2018）

Figure 4.11-9 Supplemental Community Consultation (Access Road)

5) Supplemental Consultation (for compensation policy)

a) **Port**

One consultation meeting was held for explaining compensation policy to the households to be displaced. Notification of the meeting was made directly to the households to be displaced as well as through the Union Chairman.

50 out of 57 HHs to be displaced for port component attended the meeting on 7th November, 2018. Provision of alternative land with house structures in Matarbari was explained to attended households as compensation policy for formal settlers. It was revealed, however, that the PAHs preferred cash compensation to alternative land in Matarbari. It was confirmed that all attended PAHs agreed with cash compensation.

Table 4.11-75 Participants of Public Consultations

Date	Venue	Participants						Remarks
		Total	EA, Survey Team	Union	PAPs to be displaced	Other PAPs	Others	
7th Nov, 2018 (Wed)	Dhalghata Union	69	8	9	50	2	0	50 out of 57 HHs to be displaced attended the meeting.

Remarkable comments and question from participants and their response were as follows.

Table 4.11-76 Remarkable comments, questions and their responses

Date and Time	Venue	Remarkable Comments and Suggestion	Correspondences
7th November 2018 (Wed) 12:00	Dhalghata Union	Proper compensation will be required. Compensation rate shall be at least three times of mouza rate. (Member of Union Council)	Proper compensation will be made in accordance with ARIPA 2017 and JICA GL.
		We prefer cash compensation to alternative land in Matarbari. (PAP to be displaced)	-
		If alternative land is provided, land inside Dhalghata or center of Moheshkhali is preferable. (PAP to be displaced)	-
		Provision of alternative land will take time, so cash compensation will be better. (PAP to be displaced)	-

b) **Access Road**

Consultation meetings was held for explaining compensation policy to households to be displaced. Notification of the meeting was made directly to households to be displaced as well as through Union Chairmen. Cash compensation was explained to attended households as compensation policy, for which consensus was obtained from the concerned households.

- In Dhalghata, 10 out of 19 HHs to be displaced attended the meeting on 7th November, 2018. It was confirmed that all attended households to be displaced agreed cash compensation as compensation policy.
- In Kalarmarchara, 15 out of 16 HHs to be displaced attended the meeting on 6th November, 2018. Though requests for re-changing alignment to north direction again were observed, the meeting was concluded by Union Chairman that cash compensation shall be provided prior to displacement if changing is not feasible.
- In Badarkhali, 18 out of 30 HHs to be displaced attended the meeting on 6th November, 2018. It was confirmed that all attended households to be displaced agreed cash compensation as compensation policy since land-for-land compensation is not considered in this area where all land transaction is controlled by Badarkhali Agricultural Cooperative Society.
- In Chiringa, 27 out of 47 HHs to be displaced in Chiringa, 10 out of 18 HHs in Fasiakhali

attended the meeting on 8th November. It was confirmed that all attended households to be displaced agreed cash compensation as compensation policy. Proper compensation rate and payment prior to displacement were requested.

Table 4.11-77 Participants of Public Consultations

Date	Venue	Participants						Remarks
		Total	EA, Survey Team	Union	PAPs to be displaced	Other PAPs	Others	
6th Nov, 2018 (Tue)	Kalamar -chara Union	48	4	7	15	12	0	15 out of 16 HHs to be displaced attended the meeting.
6th Nov, 2018 (Tue)	Badarkhali Union	32	4	9	18	0	1	18 out of 30 HHs to be displaced attended the meeting.
7th Nov, 2018 (Wed)	Dhalghata Union	29	8	9	10	2	0	10 out of 19 HHs to be displaced attended the meeting.
8th Nov, 2018 (Thu)	Chringa Union (for Chiringa and Fasiakhali)	52	4	5	37	6	0	27 out of 47 HHs for Chiringa, 10 out of 18 HHs for Fasiakhali attended the meeting.

Remarkable comments and question from participants and their response were as follows.

Table 4.11-78 Remarkable comments, questions and their responses

Date	Venue	Remarkable Comments and Suggestion	Correspondences
6th November, 2018 (Tue) 12:00	Kalarmarchara Union	We cannot understand why the alignment cannot be shifted to north. We prefer the alignment shift to north direction. (PAP to be displaced)	There are control points, transmission tower in Kalarmarchara, and the alignment needs to be south than them. Effort has been made to avoid houses as much as possible.
		Proper compensation is required. We prefer cash compensation, not land for land (journalist, PAP with land affected)	-
		Payment through DC will be not preferable as many brokers will intervene (journalist, PAP with land affected)	-
		We should be involved in job opportunity. (journalist, PAP with land affected). Certificates need to be provided for PAPs for prioritization of job opportunity (PAP to be displaced)	Prioritization of job opportunity for PAPs is considered in LARAP.
		If changing alignment is not feasible, cash compensation shall be provided prior to displacement. (Union Chairman)	Compensation will be made prior to displacement.
6th November,	Badarkhali Union	The alignment change to south will be preferable. If not possible, proper	Proper compensation will be made in accordance with

Date	Venue	Remarkable Comments and Suggestion	Correspondences
2018 (Tue) 15:00		compensation will be required. (PAP to be displaced)	ARIPA 2017 and JICA GL.
		At Badarkhali, three times of mouza rate is not enough for compensation of land. Rate of Badarkhali Agricultural Cooperative Society shall be applied. (PAP to be displaced)	Compensation rate shall be replacement cost, which will be verified by PVAT.
		Compensation shall be made directly to PAPs though ownership of land needs to be certified by Badarkhali Agricultural Cooperative Society. (PAP to be displaced)	Payment procedure will be made in accordance with ARIPA 2017.
7th November 2018 (Wed) 13:30	Dhalghata Union	My salt farm can be divided by the alignment, which can make the remaining land unusable. In that case, will compensation be still made only for affected portion? (PAP to be displaced)	Elevation of the road can be examined. If not possible, special consideration will be made to pay compensation for whole plot.
8th November, 2018 (Thu) 12:00	Chiringa Union	Payment of compensation at grass-root level will be preferred. (PAP to be displaced)	Though Cash Compensation under the Law (CCL) shall be paid through DC, additional payment can be paid at grass-root level.
		Payment can be paid wrongly to other one if he claims that he is entitled person. (PAP to be displaced)	ID will be required for payment to certify that the person requesting payment is truly the entitled person.
		Resettlement site or compensation will be required prior to displacement. Sufficient time, at least two months for resettlement shall be secured.	Compensation will be made prior to displacement. Sufficient time for resettlement will be secured.
		Proper compensation will be required as mouza rate is very low.	Gap between CCL and replacement cost will be additionally paid, if any, in accordance with JICA GL.
		We concern about distribution of compensation within HHs (female PAP)	Though CCL shall be paid to property owner in accordance with Bangladesh Law, direct payment can be considered regarding additional payment if the concerned community agree.

	
Consultation Meeting in Kalarmarchara 6th November 2018(Tue)	Consultation Meeting in Badarkhali 6th November 2018(Tue)
	
Consultation Meeting in Dhalghata 7th November 2018(Wed)	Consultation Meeting in Chiringa 8th November 2018(Thu)

Source: JICA Study Team

Figure 4.11-10 Consultation Meeting for Compensation Policy

(3) Focus Group Discussion

1) Port

In February 2019, we held focus group discussions (FGD) for port component four times around the planned harbor area, mainly to discuss relocation, compensation and rebuilding support. Female FGDs were held twice. It was revealed that the most of the PAPs need the provision of relocation site. In addition, it is revealed that economically affected persons need technical training and facilities apart from cash compensation. Project affected persons' interests are as follows:

- Concerning compensation rate according to the increase in market price
- Request for NGO support regarding payment
- Request for vocational training
- Request for drinkable water and toilet
- Request for installation of health care center

Table 4.11-79 Outline of FGDs（Port）

Date	Venue	Target group	Participant			Opinions and Questions from Participants
			Male	Female	Total	
8 February, 2018	Banjamira	Land owner/ salt cultivation worker	10	0	10	1. Need appropriate compensation and land to land compensation. 2. Need to employ the local residents to construction site. 3. Concerning the social network after relocation. 4. Request for installation of health care center
9 February, 2018	Shekpara, Hamidkhali	Female	0	9	9	1. Need to construct the relocation site 2. Need to provide the vocational training and employment for woman.
10 February, 2018	Muhurghona	Salt cultivation worker	7	7	14	1. Concerning the livelihood after the project 2. Need an appropriate compensation 3. Need a support for income recovery
11 February, 2018	Hamidkhali	Female	0	8	8	1. Need the vocational training 2. Need the working place for woman 3. Need the additional assistance for poor and vulnerable 4. Need equal wage for men and women

Source：JICA Survey Team

FGD with Project Affected Persons in Banjamira
（8 February, 2018）

FGD with Project Affected women in Hamidkhali
（11 February, 2018）

FGD with Project Affected women in Shekpara, Hamidkhali
（9 February, 2018）

FGD with Affected Persons in Muhurighona
（February, 2018）

Figure 4.11-11 FGDs

2) Access Road

6 FGD's were held during the socio-economic survey. PAPs focused mainly on compensation-related issues. While some persons with their structure affected hoped for a relocation site, persons with their livelihood affected wanted monetary compensation, support, and income-related training and employment facilities. The primary concerns of the residents who would lose their land and structures was the payment of CCL (legal compensation amount) at the union level.

The main concerns of the Project Affected Persons are as follows.

- Concerning appropriate compensation due to increase in local market price significantly
- Need to pay a compensation in Project site
- Need NGO support to receive the payment
- Need the employment facilities for project affected persons
- Need the vocational training to livelihood recovery for women
- Need maintenance for village roads
- Need the vocational training for project affected persons
- Need RHD support of access for drinking water and clean toilets
- Request the health care centre for emergency assistance due to no primary health care support in this area.

Table 4.11-80 Outline of FGDs（Access Road）

Date	Venue	Target Group	Participant			Summary
			Male	Female	Total	
13 April, 2018	Fasiakhali, at home of Amir Hossain	Land owner Farmer	12	7	19	1. Need land and appropriate compensation 2. Provide local workers in construction work 3. Payment union level of CUL
14 April, 2018	Palakata Union Parishad	Land owner	20	0	20	• Need appropriate support for revenue recovery • Provide a relocation site because it is difficult to purchase for increasing in land price • Need a payment of compensation at Union level • Need an appropriate compensation
14 April, 2018	Nalbila, Baruapara, at Buddist Temple Premise, Kalarmerchara Union	Community of Islam and Buddhism	23	3	26	1.Need a provision of facilitation and relocation site 2.Need a support for receiving the payment 3.Need to design carefully the alignment to avoid affecting houses 4.Should be subject to compensation including house owner along railway lines.

16 April, 2018	Japua Kindergarten, Kalarmerchara Union	Local elite Land owner	21	0	21	1.Need a technical training 2.Need a workplace for women and young people 3.Need additional support for poor and vulnerable. 4.Need a payment of compensation at Union level 5.Need to prepare a facility for alternative and recovery livelihood by project implementing agency.
18 April, 2018	Dhalghata chairman office, Dhalghata	Local elite Land owner The worker of salt and shrimp cultivation.	23	1	24	1.Need to design carefully the alignment to avoid affecting houses 2.Need a payment of compensation at Union level
30 May, 2018	Uttar Nalbila, Kalarmarchara Union	Female	14	0	14	1. At present, we cannot imagine the work and facilities that will be needed for this region in the future. We want appropriate jobs for the restoration and increase of income for individuals and families. 2. Want jobs during the construction period, and permanent work in regards to this project. 3. Would like a cash loan. Training and employment facilities for livestock and sewing would also be useful. 4. Currently, women stay in their homes and don't work, so I want jobs.

Source：JICA Survey Team

	
FGD with project affected persons in Fasiakhali （13 April, 2018）	FGD with project affected persons in Palakata, Buripukur （14 April, 2018）
	
FGD with project affected persons in Japua （16 April, 2018）	FGD with project affected women in Uttar Nalbila, Kalarmarchara （30 May, 2018）

Figure 4.11-12 Focus **G**roup **D**iscussion

3) Response Policy for Opinions at FGD

・ Given that there are many requests for job training for livelihood recovery assistance, priority will be given to job training.

・Compensation payment will be done in accordance with JICA guidelines. While the payment method will follow the rules of Bangladesh Law, monitoring shall be done to ensure payment is made appropriately, and GRM will be established so that local residents can file a complaint when problems occur.

・Local residents will be given priority for employment in construction work.

・Encourage the Executing Agency for preparation of relocation site. If not possible, conduct another consultation with the residents according to the policies of the Executing Agency .

(4) Interview with Key Informant

An interview was conducted regarding compensation and support measures for the female union member and other female Project Affected Persons of the Kalarmarchara Union.

- Since women in this region stay in their homes after marriage and have no experience finding work, it may be difficult to come up with ideas for measures to support livelihood recovery. Job training for sewing may be helpful.
- Usually, compensation costs are directly received by the men, who are the head of the household, making it difficult for the women to directly receive them.
- Compensation expenses for agricultural land can help children go to school as well as in the purchase of alternative land,.

"(5) Gender 2) Fair Compensation Allocation within the Household" was described in the section "4.11.4 Compensation and Assistance Policy" as assistance measures based on the above discussions and interviews.

5. Economic and Financial Analysis

5.1. Financial Analysis for Port Investment

5.1.1 Financial Situation of CPA

The profit and loss statement and balance sheet are summarized as shown in Table 5.1-1 and Table 5.1-2 respectively. Revenues from port services were USD 281 million in fiscal year 2016/17, a 17.7% increase from the previous fiscal year. The income generated from the interest on fixed deposit was about USD 73.8 million in 2016/17, which was transferred to Reserve Fund and Provision Account for the repayment of principal of long-term loan and for the renewals/replacement of assets.

Operating expenses amounted to USD 128 million in 2016/17, of which personnel cost accounted for USD 37.7 million, contractor charges for USD 20.1 million, electricity and fuel for USD 16.8 million, repair and maintenance for USD 18.9 million, and depreciation cost accounted for USD 28.4 million.

Net operating revenue amounted to USD 118 million in 2016/17, which is a 6.9% increase from the previous year due to the increase of operating revenue. During the period from 2012/13 to 2016/17, operating revenue has increased by 9.8% per year, while operating expenses increased by 15.7% per year. Consequently, net surplus after tax has kept a level of USD 60 to 70 million during last a couple of years.

Table 5.1-1 Profit and Loss of CPA (2012/13 - 2016/17)

(million USD)

Fiscal Year	2016-2017	2015-2016	2014-2015	2013-2014	2012-2013
Revenue					
Operating Revenue	280.82	238.62	217.98	188.03	181.22
Other Revenue	9.64	6.20	8.45	9.13	8.23
Total Revenue	***290.46***	***244.81***	***226.42***	***197.17***	***189.45***
Expenditures					
Operating Expense	128.37	100.34	82.01	70.72	62.78
Administrative & General	34.80	28.24	21.86	27.68	34.09
Total Expenditure	*163.17*	*128.58*	*103.87*	*98.40*	*96.88*
Net Operating Revenue	*117.65*	*110.03*	*114.11*	*89.63*	*84.35*
Provision for Corporate Tax	51.27	53.69	51.27	47.65	48.26
Net Surplus After Tax	***76.02***	***62.54***	***71.28***	***51.11***	***44.32***

Source: CPA, Compiled by JICA Survey Team

The balance sheet of CPA indicates that total fixed assets amounted to USD 689 million at the end of June 2016, a 11.3% increase from the previous year, fixed deposit amounted to USD 1,121 million, and current

assets to USD 164 million. Total assets are USD 1,740 million, which is equivalent to the total of equity and liabilities. Total liability amounted to USD 236 million at the end of June 2016, of which long-term debt amounted to USD 9 million.

Table 5.1-2 Balance Sheet of CPA (2011/12 - 2015/16)

(million USD)

Fiscal Year	2015-2016	2015-2016	2014-2015	2013-2014	2012-2013
Fixed Assets	785.41	689.05	616.10	569.74	517.97
Deferred Expenditure	2.91	2.06	1.45	1.30	1.28
Fixed Deposit	1,255.77	1,121.03	989.14	847.63	746.63
Current Assets	165.70	164.24	153.38	165.04	147.01
Current Liabilities	283.75	236.42	205.79	201.64	203.86
Net Current Assets	-118.05	-72.18	-52.40	-36.60	-56.85
Capital Employed	***1,926.04***	***1,739.96***	***1,554.28***	***1,382.07***	***1,209.04***

Source: CPA, Compiled by JICA Survey Team

Financial performance of an enterprise is often evaluated by EBIT (Earnings before Interest and Taxes), EBITDA (Earnings before Interest, Taxes, Depreciation and Amortization) and NPM (Net Profit Margin), and sometimes checked by ROA (Return on Assets). These indicators of CPA are shown in Table 5.1-3. EBIT to the sales ratio is an indicator of a company's profitability, calculated as revenue minus expenses, excluding taxes and interest; it was 41.9% in 2016/17, which is quite a satisfactory level.

EBITDA to the sales ratio is a financial metric which indicates earning power before deducting depreciation and amortization; it reached 52.2% in 2016/17, which is the level of high performing ports. NPM is a ratio of net profit to operating income of a commercial enterprise, which indicates profitability of the commercial enterprise. Net profit margin of CPA was 26.2% in 2016/17, which is the level of very profitable ports.

ROA is a ratio of the net profit to the total assets, which indicates performance of total assets. ROA of CPA was 3.4% in 2016/17 but should generally be in the range of 5% - 10% for private enterprises. It may be necessary to utilize its current assets, in particular fixed deposits. In general, CPA's financial performance is deemed to be very satisfactory due to its monopolistic status.

Table 5.1-3 Financial Performance Indicators

Fiscal Year	2016-2017	2015-2016
EBIT (Earnings Before Interest and Taxes) to the Sales Ratio	41.9%	46.1%
EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) to the Sales Ratio	52.2%	56.8%
Net Profit Margin	26.2%	25.6%
ROA (Return on Assets)	3.44%	3.17%

Note: NPM: Net Profit Margin
EBIT: Earnings before Interest and Taxes
EBITDA: Earnings before Interest, Taxes, Depreciation and Amortization
ROA: Return on Assets

Source: JICA Survey Team

5.1.2 Financial Simulation Model

Financial model is designed to simulate the profit and loss statement, cash flow statement and balance sheet of CPA. The model is made on EXCEL worksheets consisting of cargo details and demands, ship entry and port dues, revenue details, cost details, future investment plan, depreciation, and loan repayment. These sheets are linked with each other and simulate financial returns responding to investment, cargo throughput and operational performance.

(1) Output of the Simulation Model

Profit and loss, cash flow, and balance sheet are summarized on a worksheet, which is linked to other worksheets of revenues, loan repayment, port dues, cost details, investment, depreciation, and FIRR. Items calculated in the simulation model are shown in the following Table 5.1-4, Table 5.1-5, and Table 5.1-6.

Table 5.1-4 Contents of Profit Loss Statement in the Simulation Model

Items	Remarks
Operating Revenues (excl. VAT)	
Container Handling Revenue	Container Handling, QGC Operation, River Dues Lo/Lo charges
Container Storage Revenue	Container Storage Fees
General/Bulk Cargo Handling	General/Bulk Cargo Landing, Shipping, Hoisting Charges
General/Bulk Cargo Storage	General Bulk Cargo Storage Fees
Port Dues	Tonnage Dues, Pilotage Fees, Tug boat, Berth Fees, Others
Operating Expenses	
Fuel, Electricity, Gas, Others	Fuel, Electricity, and Other Combustibles
Operational Staff Salaries	Staff Salaries of Operation Departments
Contract Staff Wages (Container)	Payment to Contract Staff for Container Operation
Repair and Maintenance	Workshop, Spare Parts, Lubricants, Others
Rental Equipment	Fee for Hired Equipment
Miscellaneous Operational Expenses	Other Operational Expenses
General/Bulk Cargo Contract	Payment to Contractors for General/Bulk Cargo Handling
Administrative Staff Salaries	Staff Salaries of Administrative Departments
Pension	Payment to Pension Fund
Other Administration Cost	Other Administrative Expenses
Depreciation	Depreciation Cost of Investment
Maintenance Dredging	Fee for Maintenance Dredging
Net Operating Income (EBIT)	
Non-Operating Revenues	Financial Income and Other Incomes
Interest Gain, Exchange Gain/Loss	Interest Received and Exchange Gains/Losses
Non-Operating Expenses	Financial Expenditure and Other Expanses
Interest on Long-term Loans	Interest on Long-term Investment Loans
Interest on Short-term Loans	Interest on Short-term Loans
Net Income Before Tax	
Income Tax	Income Tax on CPA (25%)
Net Income After Tax	
Net Profit Margin	Ratio of after-tax Profits to Operating Revenues
EBIT	Earnings before Interest and Taxes
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization

Source: JICA Survey Team

Table 5.1-5 Contents of Cash Flow Statement

Items	Remarks
Cash at Beginning	Current deposit at the beginning of fiscal year
Cash Inflow	
Net operating income	Earnings before interest and taxes
Depreciation	Depreciation among operation expenses
Loan Disbursement	Loans for construction and facility procurement
Interest on Reserves	Interest received
Cash Outflow	
Investment & Replacement	Investment in Construction, Facilities and their Replacement
Interest on Long-term Loan	Interest Payment on Loans
Repayment of Principal	Payment of Principal
Income Tax	Payment of Income Tax
Interest on Short-term Loan	Interest Payment on Short-term Loan
Cash Inflow - Cash Outflow	Excess or shortage of cash flow

Source: JICA Survey Team

Table 5.1-6 Contents of Balance Sheet

Items	Remarks
(Assets)	
Current Assets (I)	
Cash & Deposit	Cash in hand and equivalent cash
Others	Inventory, Other accrued revenues receivable
Fixed Assets (II)	
Terminal Facilities	Buildings, Pavement, Yard Facilities and Others
Dredging and Breakwaters	Navigation Channel, and Basin, Breakwaters
Cargo Handling Equipment	QGCs, RTGs, Other handling Equipment
Others	Pilot Boats, Tug Boats, Office Facilities, and Others
Total Assets	(I+II)
(Liabilities and Equity)	
Liabilities (III)	
Long-term Loan	Total amount of Long-term Loan remained
Short-term Loan	Short-term loan accumulated
Equity (IV)	Capital, retained earnings
Total Liabilities and Equity	III+IV

Source: JICA Survey Team

(2) Input of the Simulation Model

Based on the future projection of container, general and bulk cargo handling and ship entry, revenues are estimated from cargo handling charges, port dues, and storage charges. Operating expenses are estimated from fuel and lubricant consumption, salaries and bonuses, repair and maintenance work, rental equipment, administrative cost, pension, construction cost, cargo handling equipment cost, maintenance dredging, their service life, and other miscellaneous expenses.

Ship calls to Matarbari Port are estimated supposing a typical ship size and cargo volume. Average size of container ships is supposed to be 52,900 GT (60,000 DWT), loading capacity is 4,400 TEUs, LOA is 294 m, and discharges and loads are 2,380 boxes (3,520 TEU). Average of general cargo ships is supposed to be about 30,000 DWT in view of steel product carrier, and the size of bulk cargo ships (grain carrier) is about 70,000 DWT. Average load of a general cargo ship is supposed to be 27,000 tons and that of a grain carrier is about 35,000 tons supposing discharges at two ports.
Revenue from cargo handling services is summarized as shown in Table 5.1-7, breakdowns of port dues in Table 5.1-8, and operation cost in Table 5.1-9.

Table 5.1-7 Revenues from container cargo handling and storage per a model ship

Charges (Shipping Co., Agent)	Tariff	USD
Container Handling Charges	(USD)	
20' Laden	43.4	
20' Empty	22.1	
40' Laden	65.1	
40' Empty	33.2	
Gantry Crane Charges		
20' Laden	15.0 /Unit	
20' Empty	7.5 /Unit	
40' Laden	22.5 /Unit	
40' Empty	11.25 /Unit	
River Dues (Wharfage)		
20' Import Laden	4.92	
40' Import Laden	9.84	
20' Export Laden	2.22	
40' Export Laden	4.44	
20' Import Empty	1.23	
40' Import Empty	2.46	
20' Export Empty	1.23	
40' Export Empty	2.46	
Sub-Total	including VAT	
Charges on Consignees, Consignors	Tariff	USD
Lift On/Lift Off Charges		
20' Import Laden	12.06	
40' Import Laden	18.08	
20' Export Laden	12.06	
40' Export Laden	18.08	
20' Import Empty	4.52	
40' Import Empty	6.78	
20' Export Empty	4.52	
40' Export Empty	6.78	

Container Storage Charges	Free period: 4 days	
20' upto 7th day after free days	6.0 /day	
20' from 8-20 days	12.0 /day	
20' after 21 days	24.0 /day	
40' upto 7th day after free days	12.0 /day	
40' from 8-20 days	24.0 /day	
40' after 21 days	48.0 /day	
Labour Welfare Fund	0.054 /TEU	
Sub-Total	including VAT	
Total		
Total (including VAT)		

Note: A model container ship is 52,900 GT (60,000 DWT), loading capacity of 4,400 TEUs

Number of containers of a model case

Container Handling	20' Laden	40' Laden	20' Empty	40' Empty	Boxes	TEUs
Import (Box)	642	554	2	12	1,211	1,778
Export (Box)	127	370	507	185	1,188	1,742

Source: JICA Survey Team

Table 5.1-8 Revenue from Ship Entry

(USD)

Items	Tariff	Container Ship	General Cargo Ship	Bulk Cargo Ship	Coal Ship
Tonnage Dues	0.241 /GRT				
Pilotage Fees	35.75 /1000GRT				
Tug boat	1,000/tug/hour[1)]				
Berth Fees	0.0025 /GRT/Hour				
Mooring & Unmooring	88.5 /occasion				
Hatch Opening Closing	-				
Fresh Water	1.50 /m^3				
Garbage Removal	-				
Sub-Total	Sub-Total VAT				

Note: Model Container Ship: 60,000 DWT (52,900 GRT), General Cargo Ship 30,000 DWT (15,900 GRT), Bulk Cargo Ship 70,000 DWT (37,000 GRT), Coal Ship 80,000 DWT (42,300 GRT)

Source: JICA Survey Team

Table 5.1-9 Operating Cost

Operating Cost		Cost in USD	Unit
1	Fuel, Electricity, Gas	9.1	USD/Box
	Diesel Oil (Equipment)	2.82	liters/TEU
	Electricity (QGC, Terminal Facilities)	9.58	kWh/TEU
	Tug Boat (Port)	540.00	liters/vessel
2	Operational Staff Salaries	4,091	per person
3	Contract Staff Wages (Container)	10.1	USD/Box
4	Repair and Maintenance	9.7	USD/Box
	Maintenance of Civil Work	(1.5%)	of initial cost
	Maintenance of Equipment	(3.0%)	of initial cost
5	Rental Equipment	1.5	USD/Box
6	Miscellaneous Operational Expenses	2.2	USD/Box
7	General/Bulk Cargo Contract	75% of Tariff	
Administration Expenses			
8	Administrative Staff Salaries	4,091	per person
9	Pension	1,754	per person
10	Other Administration	3.8	USD/Box
Depreciation			
11	Depreciation		Determined by depreciation period
Maintenance Dredging		USD/m3	
	Share by Ship Tonnage	5.0-8.0	Port Share=0.871
12	Share by Capital Dredging	5.0-8.0	Port Share=0.368
	Volume of maintenance dredging	1.0-5.0	million m3

Source: JICA Survey Team

5.1.3 Financial Analysis of Port Investment

(1) Base Year and Project Life

The year of 2018 is set as the base year, when L/A will be agreed and design of facilities will be started. The project life is assumed to be 40 years, from 2019 to 2058, including the construction period from 2019 to 2024.

(2) Foreign Exchange Rate

The exchange rate adopted for the simulation is the same as in the cost estimation, 1 USD = 106.106 Yen = 82.8914 Taka, as of April 2018.

(3) Conditions of Long-term Loan

Interest rate and redemption period of long-term loan are assumed as follows.

Interest rate long-term loan for Engineering Services: 0.01%

Interest rate of long-term loan for Construction Work: 1.00%

Grace period: 10 years

Redemption Period: 30 years

Interest during construction period: not financed.

(4) Construction Cost

Table 5.1-10 Port Construction Cost

Work Description	Unit	Quantity	USD (in 1,000)
Land Acquisition and Resettlement	L.s	1	
Mobilization/Demobilization and Temporary Works	L.s	1	
Reclamation Works	m3	2,900,000	
Berth Construction	m	760	
Soil Improvement Works	m2	320,000	
Terminal Utilities	L.s	1	
Terminal Pavement Works	m2	360,200	
Seawall Works	m	1,100	
Terminal Buildings	L.s	1	
Cargo Handling Equipment	L.s	1	
Breakwaters	m	397	
Dredging and Disposal	m3	11,396,000	
Contingency	%	5	
Sub-Total			
Consultants Services	%	3.1	
Contingency	5	5	
Total			
VAT	%	7 & 15	
Import Duty	%	30	
Grand-Total for Port Construction			

Note: Price escalation is not included

Source: JICA Survey Team

(5) Port Revenues

Basic case of the financial analysis is made on a presupposition that port income will be generated from Phase 1 only, items of which are shown in Table 5.1-7 and Table 5.1-8. Profit earning facilities are limited to a multi-purpose berth of 300 m and a container berth of 460 m. On the other hand, large investment is requested for breakwaters, channel and basin dredging; consequently, it is estimated that income from the

Phase 1 facilities is not sufficient to cover the cost of port development and maintenance dredging. Therefore, this financial analysis is made on the assumption that port tariff will be raised by 22% after the opening of Matarbari port.

The port tariff of Chittagong Port isfe-zu at lower level compared with Bangkok Ports but slightly higher than VICT in Ho Chi Minh, Vietnam as shown in Table 5.1-11. Accordingly, it is assumed that the port tariff of Chittagong Port can be raised up to the level of Bangkok Port, i.e. a 22% increase, without jeopardizing port's competitiveness. Matarbari port tariff shall be the same or lower than the tariff of Chittagong Port in view of port competitiveness.

If Phase 2 of Matarbari port development can follow the Phase 1 and private port facilities are developed in Matarbari port, it will not be necessary to raise the port tariff as the port income will increase to cover the large initial investment.

Table 5.1-11 Comparison of Port Dues and Charges

(USD in thousand)

Port	Chittagong	Sihanoukville	Bangkok	VICT (HCM)
Port Dues				
(Shipping Co./Agent)	13,077	27,025	14,369	17,921
VAT	1,962	27	1,006	0
Sub-Total including VAT	15,039	27,052	15,375	17,921
Cargo Handling Charges				
(Shipping Co./Agent)	92,972	111,504	75,600	94,976
VAT	13,946	11,150	5,292	0
Sub-Total including VAT	106,918	122,654	80,892	94,976
Lo/Lo and Storage				
(Consignees/Consignors)	19,983	58,828	75,095	18,670
VAT	2,997	5,883	5,257	1,867
Sub-Total including VAT	22,981	64,711	80,352	20,537
Total (including VAT)	144,937	214,417	176,619	133,434

Note 1) Assuming a case that 30,000 DWT container ship entered with pilotage and tug boat service, discharged 1,010 TEUs and loaded 990 TEUs (Typical case of Chittagong Port)
Note 2) If Chittagong Port raises tariff by 22%, port dues and charges of the above typical case amount USD 176,800 with VAT
Source: JICA Survey Team

(6) FIRR of the Project

Applying the financial simulation model of the previous section, Financial Internal Rate of Return (FIRR) of the project is calculated based on the following presuppositions.

- Maintenance dredging volume will be 1.0-5.0 million m3 per year, so that 5.0 million m3 is adopted as the base case, and 3.0 million m3 and 1.0 million m3 as the additional case.
- Maintenance dredging cost is estimated at about USD 5 per m3 by utilizing dredged sand and silt as land reclamation materials or sand for sale.

- Cost of maintenance dredging is shared by CPA and CPGCBL based on the volume of their capital dredging. Coal ships of CPGCBL are not charged port dues and river dues. This scheme shall be modified when Phase 2 development is realized and ship calls will have increased.

- Phase 1 (Multi-purpose berth 300 m and container berth 460 m) will be completed in 2023 and container operation will be commenced from 2024, but container handling volume of the first year (2024) will remain at 20% of the estimated demand and that in the second year (2025) will remain at 40% of the estimated due to the delay in realizing shipping services. In the third year (2026), 100% of the estimated demand will be handled.

- In the additional case 1, it is assumed that the LNG terminal, Coal Transshipment Terminal (CTT) and other private berths will be developed in Matarbari Port along with the Phase 1. CPA will receive tonnage dues and river dues (wharfage) from vessels calling at these facilities. Additional dredging cost for the development of these terminals will be shared by CPA and private investors in accordance with the waterfront length of their terminals.

- In the additional case 2, it is assumed that the Phase 2 of commercial port will follow the development of the Phase 1 and LNG, CTT and other private terminals. Although it is not decided whether Phase 2 terminals will be developed by CPA or not, CPA will receive port dues and river dues from all calling ships.

- For both above cases, it is assumed that CPA requests private terminals to share the cost of additional dredging in accordance with the length of their waterfront and land area in the port.

- There are two scenarios for covering maintenance dredging cost; 1) CPA recovers the cost by port dues and river dues, and 2) CPA request private terminal owners to share the cost in accordance with total tonnage of calling vessels.

- For both cases, it is assumed that port tariff will be maintained at the present level except a case that CPA will bear all cost for maintenance dredging in which only tonnage dues will be raised by 50%

- During the development of Phase 2, it is assumed that CTT and LNG Terminal will enter into operation in 2026, and LPG terminal in 2024.

- For the Phase 1, maintenance dredging cost will be shared between CPA's commercial port project and CPGCBL's coal port. Taking into consideration the fact that CPGCBL would bear all costs of maintenance dredging if a commercial port were not developed, and the fact that tonnage dues from entering ships cannot cover the cost of maintenance dredging, two projects shall share the cost of maintenance dredging based on the volume of capital dredging.

- For the Phase 2, it is assumed that three container terminals will enter into operation in 2028, 2034 and 2038 respectively.

FIRR of Matarbari port development project is calculated as shown in Table 5.1-12 based on the abovementioned presuppositions.

Table 5.1-12 FIRR of the Port Project

(Thousand USD)

	Land Acqui., Engineering, Construction Replacement	Operation Cost excl. Depreciation	Total Cost	Total Revenue	Balance	Cost +10% Rev. +0%	Cost +0% Rev. -10%	Cost +10% Rev. -10%
Year								
2018								
2019								
2020								
2021								
2022								
2023								
2024								
2025								
2026								
2027								
2028								
2029								
2030								
2031								
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2047								
2048								
2049								
2050								
2051								
2052								
2053								
2054								
2055								
2056								
2057								
2058								
					FIRR= 2.89%	FIRR= 1.20%	FIRR= 1.01%	FIRR= -0.98%

Source: JICA Survey Team

FIRR of the basis cases in which maintenance dredging volume is 3 million m3 or 1 million m3 are examined as shown in Table 5.1-13.

Table 5.1-13 FIRR of Basic Cases (Phase 1)

Volume of Maintenance Dredging	Base Case	Cost +10% Revenue+0%	Cost +0% Revenue -10%	Cost +10% Revenue -10%
5,000,000 m3 (Base Case)	2.89%	1.20%	1.01%	-0.98%
3,000,000 m3	3.72%	2.19%	2.02%	0.32%
1,000,000 m3	4.48%	3.08%	2.93%	1.42%

Source: JICA Survey Team

FIRR of the additional case 1 is shown in Table 5.1-14 assuming that LNG Terminal, CTT and other berths will be developed in Matarbari port along with the Phase 1 of commercial port.

Table 5.1-14 FIRR of Additional Case 1 (Private Terminals and Phase 1)

	Base Case	Cost +10% Rev.+0%	Cost +0% Rev. -10%	Cost +10% Rev. -10%
Additional capital dredging cost will be shared between CPA and private terminal owners. Maintenance dredging cost will also be shared by CPA and private terminal owners based on total tonnage of calling vessels at each terminal. Port tariff will be maintained at the present level.				
Maintenance Dredging 5,000,000 m3	2.12%	0.55%	0.37%	-1.47%
3,000,000 m3	2.95%	1.54%	1.38%	-0.18%
Additional capital dredging cost will be shared between CPA and private terminal owners. Maintenance dredging cost will be borne by CPA. Port tariff will be maintained at the present level.				
Maintenance Dredging 5,000,000 m3	-1.87%	-5.19%	-5.69%	N.A.
3,000,000 m3	1.04%	-0.80%	-1.02%	-3.41%
Additional capital dredging cost will be shared between CPA and private terminal owners. Maintenance dredging cost will be borne by CPA. Tonnage dues will be raised by 50%, Other tariff will be maintained at the present level.				
Maintenance Dredging 5,000,000 m3	-0.61%	-3.23%	-3.57%	-8.82%
3,000,000 m3	1.90%	0.20%	0.01%	-2.05%

Source: JICA Survey Team

Additional case 2 includes the development of Phase 2 of the commercial port and CTT, LNG and other private terminals. CPA will dredge the basin and reclaim the land for the Phase 2 and recover the cost from private terminal owners as a concession fee, which will be calculated based on the waterfront length and the land area of each terminal.

FIRR of the whole project including the Phase 1 and 2, and private terminals are calculated as shown in Table 5.1-15.

Table 5.1-15 FIRR of Additional Case 2 (Phase 1 and 2 and Private Terminals)

	Base Case	Cost +10% Rev.+0%	Cost +0% Rev. -10%	Cost +10% Rev. -10%
Additional capital dredging cost will be shared between CPA and private terminal owners. Maintenance dredging cost will be borne by CPA. Port tariff will be maintained at the present level.				
Maintenance Dredging 5,000,000 m3	0.68%	-1.14%	-1.34%	-3.60%
3,000,000 m3	2.54%	1.10%	0.94%	-0.65%
Additional capital dredging cost will be shared between CPA and private terminal owners. Maintenance dredging cost will be borne by CPA. Tonnage dues will be raised by 50%, Other tariff will be maintained at the present level.				
Maintenance Dredging 5,000,000 m3	1.79%	0.15%	-0.03%	-1.94%
3,000,000 m3	3.46%	2.09%	1.94%	0.47%

Source: JICA Survey Team

FIRR of the Base Case is estimated at 2.89% assuming that port tariff will be raised by 22%. Due to the large investment required for non-earning facilities at the initial stage of the development, FIRR is negative and CPA will make a loss if the project is finished at the first stage. In case that the volume of maintenance dredging is about 3 million m3, FIRR is about 0.5% which is not enough to justify the project.

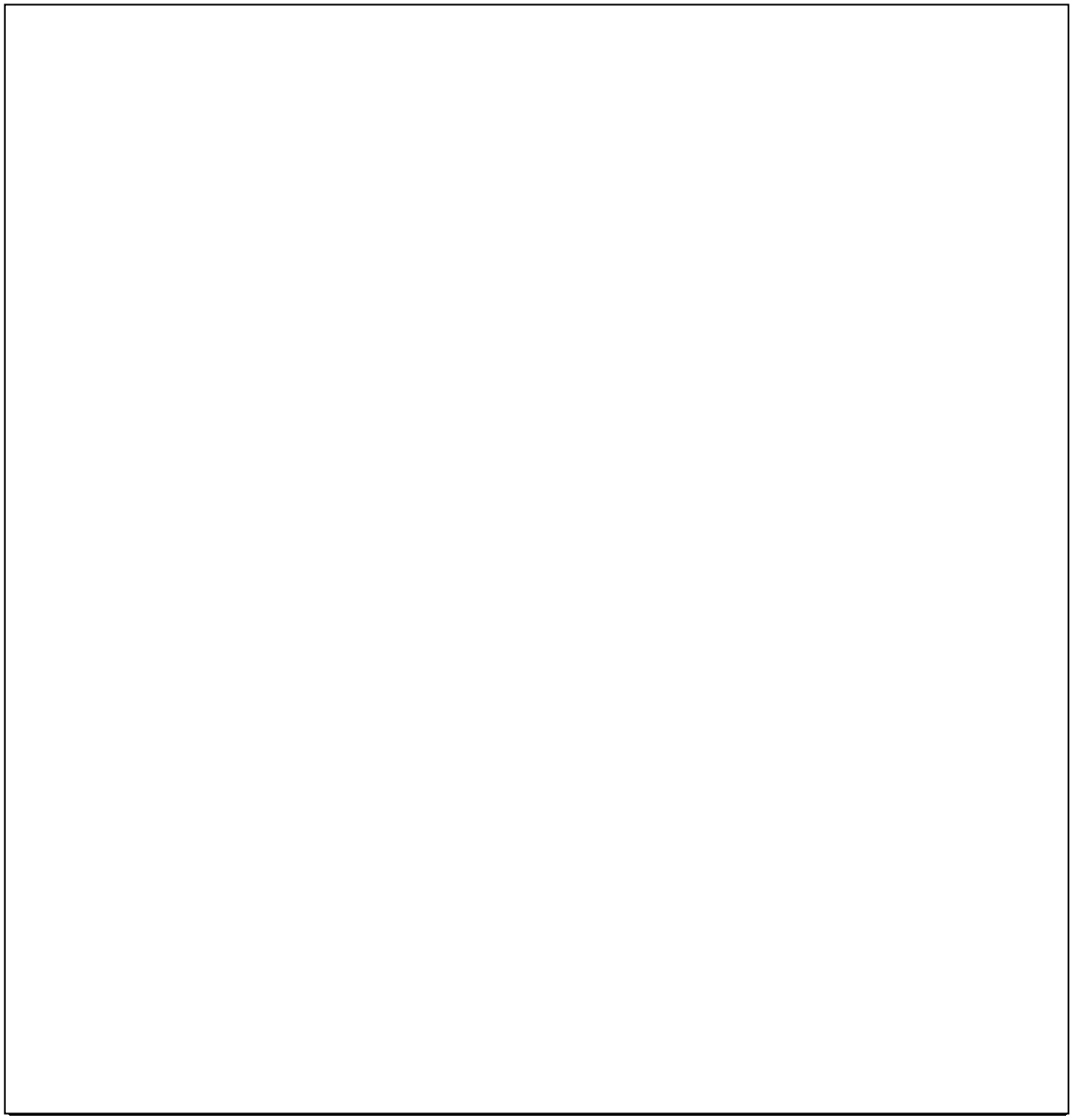
In the additional case 1 and 2, CPA's income increases along with more ship calls so that raising the tariff would not be necessary. However, capital dredging cost shall be shared between CPA and private terminal owners in the port. If the volume of maintenance dredging exceeds 5 million m3, some additional channel fees on calling ships will be necessary.

(7) Profit Loss, Cash Flow and Balance Sheet of Port Project

Based on the abovementioned basic case, future financial conditions of the project are simulated as shown in Table 5.1-16 (Profit and Loss Simulation), and Table 5.1-17 (Cash Flow and Balance Sheet Simulation). This financial simulation is based on the following assumptions.

- The volume of maintenance dredging is about 5 million m3 and its cost is shared by the volume of capital dredging between port project and coal fired power plant project. Maintenance dredging coat is USD 5 /m3
- Interest rate of an ODA loan is 1% (30 years with a grace period of 10 years) for construction and 0.01% for consulting services.
- Interest during construction is not financed by the loan.
- Repayment is made every 6 months.
- In case of cash shortage, a short-term loan (interest rate: 10%) is obtained.
- ODA loan is obtained by the Ministry of Finance and lent to CPA at a rate of 2% (30 years with a grace period of 10 years)

(000 USD)



Source: JICA Survey Team

Based on the abovementioned financial analysis, following recommendations are made regarding the financial management of the port project.

- Interest rate of sub-loan from MOF to CPA should be 2% or less, due to the fact that the project requires a large investment in breakwaters and channel dredging.
- In order to ensure financial soundness, CPA shall have an own fund of maximum USD 50 million per year to manage cash shortages during the periods of construction and repayment of principal.
- As maintenance dredging cost is a key factor to improve financial performance, efforts shall be

made to reduce the volume of siltation and cost of maintenance dredging.

- Although the base case simulation is made on assumption that the project is finished at the end of Phase 1 and the port tariff is raised by 22%, it is important to encourage private companies to develop their terminals in the port and to increase ship calls. Phase 2 of the commercial port is also important to increase users and port income.
- Private terminal owners are requested to share the cost of port development and pay concession fees for their location in accordance with the length of waterfront and the size of land area they occupy.
- Private terminal owners are also requested to bear the cost of maintenance dredging in accordance with the share of gross tonnage of calling vessels, or as an additional channel fee. (Port dues is not sufficient to cover the cost of maintenance dredging of 5 million m3 at the present level.)
- To reduce the cost of maintenance dredging, efforts shall be made to utilize dredged materials for land reclamation.

5.2. Economic Analysis of Port and Road Investment

5.2.1 Preconditions

(1) Cost Benefit Analysis

Port development and access road development are interdependent on each other, so that neither one can viable by itself. This cost benefit analysis examines the economic viability of the development of port and access road. It should be noted that this access road is also beneficial to many projects in the Moheshkhali area, i.e. power plant projects, energy supply projects, steel mill projects, oil refinery projects, fertilizer factories, cement factories, SEZ and others.

The economic benefits and cost are calculated with economic price to evaluate whether the benefits exceed those that could be obtained from other investment opportunities in Bangladesh.

(2) Base Year and Project Life

As well as the financial analysis, the base year is 2018 and project life is assumed to be 40 years after the commencement of construction, i.e. from 2019-2058.

(3) Foreign Exchange Rate

The same exchange rate is adopted for the financial analysis and economic analysis, i.e. 1 USD = 106.106 yen = 82.8914 Taka as of April 2018.

(4) Economic Price

For the economic analysis, all prices must be expressed as economic prices, which do not include customs duties, subsidies, and taxes. Therefore, the market prices are usually converted into economic prices by using a conversion factor and eliminating these transfer elements.

Customs duties create a price difference between the domestic market and the international market. The Standard Conversion Factor is usually used to determine the economic price of non-tradable goods that have only market prices. The standard conversion factor is deemed to be about 0.88 to 0.91 in connection with duties ratio of Bangladesh as shown in Table 5.2-1.

Cost estimation in Chapter 5.1.3 and 5.2.3 does not include customs duties and VAT except sub-contract payments, so that usual SCF is not applied to economic prices of this project. As VAT (7%-15%) will be paid when sub-contracts are made, which is about 10% of total construction cost, economic price is deemed at 0.985 of the cost estimation.

Table 5.2-1 Trade Statistics of Bangladesh and Standard Conversion Factor (SCF)

(million USD)

Year	Customs Duties	Goods Imports	SCF
2014	3,746	37,406	0.91
2015	4,340	37,856	0.90
2016	5,300	40,279	0.88

Source: World Bank Development Indicators, 2017. Without customs duties ratio is estimated by JICA Survey Team

5.2.2 Benefit of the Port Project

A cost-benefit analysis is conducted on the difference between the "With-case" in which an investment is made and the "Without-case" in which no investment is made. This comparison of the benefits and cost arising from the investment is deemed as the effect of the project.

(1) Savings of Maritime Transportation Cost (Container)

Comparing container transportation cost by a 2,000 TEU vessel and a 6,000 TEU vessel, transport cost savings are estimated as follows by applying guidelines of the Ministry of Land, Infrastructure and Transport (MLIT), Japan. Average voyage days are supposed to be 7 days for container vessels.

Table 5.2-2 Maritime Transportation Cost Savings per Box (Container)

(USD)

	per 20' Box	per 40' Box
2,000 TEU Vessel	423.0	634.6
6,000 TEU Vessel	292.0	437.7
Difference	131.0	196.9

Source: Based on "Guidelines for Cost Benefit Analysis of Port Development Project, 2004, Ministry of Land, Infrastructure, and Transport, Japan", estimated by JICA Study Team

(2) Savings of Maritime Transportation Cost (General and Bulk Cargo)

Savings of maritime transportation cost of general and bulk cargo are also estimated assuming that bulk carriers of 70,000 DWT will be deployed at Matarbari port instead of 30,000 DWT at Chittagong port. Difference in operation cost is calculated by applying the guidelines of MLIT as shown in Table 2.8-18. Average voyage days are supposed to be 14 days in view of long distance maritime transportation.

Table 5.2-3 Maritime Transportation Cost Savings (General/Bulk Cargo)

Bulk Carrier	30,000 DWT	70,000 DWT
Ship operation cost	USD 24,700 /day	USD 35,200 /day
Scale merit of 70,000 DWT	USD 22,400 /vessel/day	

Source: Based on "Guidelines for Cost Benefit Analysis of Port Development Project, 2004, Ministry of Land, Infrastructure, and Transport, Japan", estimated by JICA Study Team

(3) Savings of Ship Waiting Cost (Congestion Surcharges on Container)

Congestion surcharges are levied on container imports and exports at Chittagong port at the rates of USD 150-450 per 20 foot container and USD 150-450 per 40 footer as of 2017. Average congestion surcharges are supposed to be USD 150 /20' and USD 300 /40' for the economic analysis. In case that Matarbari port is developed, congestion surcharges will not be levied at Matarbari port in spite of surcharges at Chittagong port. Difference in congestion surcharges is calculated as a benefit of the port development.

(4) Savings of Ship Waiting Cost (General Cargo and Bulk Carriers)

Waiting time of general and bulk cargo vessels is 10-14 days at Chittagong port in 2017 and it will increase for the time being due to the insufficient capacity of port facilities. In case that Matarbari port is developed, general cargo vessels and bulk carriers will not have to wait for berthing. Difference in ship waiting cost between "With" and "Without" cases is deemed as a benefit of port development. Ship waiting cost is estimated by applying the guidelines of MLIT: USD 626.9 /vessel/hour for a 30,000 DWT general cargo ship and bulk carrier. Average waiting time of 10 days is assumed.

5.2.3 Economic Analysis on Access Road Investment

(1) Access Road Traffic

Port traffic volume is estimated as shown in Table 5.2-4, which is derived from container throughput and general/bulk cargo throughput at the new port. Port related traffic is calculated based on the study "Estimation of Port Traffic, 2005" by the Research Institute of Ministry of Land, Infrastructure and Transport.

In the year 2033, total road traffic will reach 1.4 million vehicles, which is the design capacity of 2 lane access road. Taking into account the design capacity, cost benefit analysis is made based on the road traffic of 2033, therefore, it is assumed that access traffic will increase from 2023 to 2033 as shown in the table and keep the level of 2033 from 2034 till 2058.

Table 5.2-4 Estimation of Traffic to/from Matarbari Port

Year	Container Cargo				General/Bulk Cargo			(in 1,000)
	Container (TEU)	Container Trucks	Barges (Box)	Related Road Traffic	General/Bulk (ton)	Loaded Trucks	Related Road Traffic	Total Road Traffic
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	193	10	17	27
2024	122	67	8	33	386	19	35	154
2025	259	142	18	71	771	39	69	321
2026	691	378	47	189	1,928	96	174	837
2027	769	421	52	210	1,961	98	177	906
2028	854	468	58	234	1,994	100	180	981
2029	948	519	64	259	2,027	101	183	1,062
2030	1,049	574	71	287	2,061	103	186	1,150
2031	1,145	627	78	313	2,094	105	189	1,234
2032	1,248	683	85	342	2,127	106	192	1,323
2033	1,359	744	92	372	2,160	108	195	1,419
2034	1,478	809	101	405	2,194	110	198	1,521
2035	1,606	879	109	439	2,227	112	201	1,630
2036	1,743	954	119	477	2,260	113	204	1,748
2037	1,890	1,034	129	517	2,293	115	207	1,873
2038	2,047	1,120	139	560	2,327	117	210	2,007
2039	2,215	1,212	151	606	2,360	118	213	2,150
2040	2,396	1,311	163	656	2,393	120	216	2,302
2041	2,550	1,396	173	698	2,427	122	219	2,434

Note: Figures are annual traffic estimated in thousand
Source: JICA Survey Team

(2) Benefits of the Access Road Project

Benefits of the project are analyzed by comparing the "With-case" and "Without-case" of the access road project. "Without case" can be described as follows.

- If the access road is not developed, all containers are carried by barge, however, the number of berths in Phase 1 will not be sufficient to accommodate such a large number of barges. Container ships would have to discharge or load containers directly to/from barges in Matarbari port, which takes many hours and significantly increases cost. The use of truck transport in the With-case is thus a benefit of access road development.
- The access road can reduce travel time and cost of trucks, passenger cars, buses and other traffic.
- If the access road is developed, the Matarbari community, Dhalgahta community and nearby areas can enjoy free, fast and smooth traffic to the national road No.1, which is a substantial benefit for this area. However, this analysis counts benefits of the access road assuming that port related traffic will use the road up to its capacity.

(3) Savings of Travel Time Cost and Running Cost

In the "With case", trucks, passenger cars, buses and other vehicles can save travel time and running cost, which are counted as benefits of the access road. Such savings are estimated by applying "Guidelines for Cost Benefit Analysis of Road Project, 2018" prepared by MLIT as shown in Table 5.2-5. It is assumed that it takes about 25 minutes from the port to the national route No.1, however it takes 75 minutes in the "Without case". As the time cost in Bangladesh may be less than indicated in the abovementioned

guidelines, travel time cost is discounted by the ratio of Purchasing Power Parity (PPP), and running cost is discounted by the ratio of gasoline price between Japan and Bangladesh.

Table 5.2-5 Travel Time Cost and Running Cost

Type	Travel Time Cost (USD/unit/minute)		Running Cost* (USD/unit/km)	
	Original Unit	Bangladesh**	Original Unit	Bangladesh***
Passenger Car	0.373	0.037	0.190	0.148
Small Truck	0.476	0.047	0.200	0.156
Truck	0.640	0.063	0.321	0.250
Average excl. Bus	0.496	0.049	0.237	0.185

Note: * Running cost is calculated based on an average speed of 40km/h on a city road.
** Purchasing Power Parity (2017, Japan US$ 42,942, Bangladesh US$4,230; Ratio=9.85%)
*** Gasoline Price (2018, Japan US$ 1.36/liter, Bangladesh US$ 1.06/liter,） Ratio=77.9%
Source: "Guidelines for Cost Benefit Analysis of Road Project, 2018", MLIT Japan, Feb. 2018

(4) Savings of Domestic Cargo Transportation Cost

In the "Without case", all containers would have to be transported by barge to the hinterland, mainly to Chittagong and Dhaka. While bulk cargo can be transferred to barges at the outer anchorage, this is not possible for container cargo as the handling productivity would be too low. Therefore, a large number barges would have to berth to handle container cargo; however, the number of berths in Phase 1 is insufficient to accommodate many barges. Instead, barges would have to berth along a mother ship where containers could be directly discharged or loaded. Costs of barge transport and truck transport are assumed as follows.

- Unit rate of barge transportation will be similar to the rate between Chittagong and Pangaon, whose distance is 220 km and barge cost is as follows:
  USD 165 for 20'import
  USD 320 for 40' import
  USD 340 for 45'High Cube import
  USD 99 for 20'export
  USD 192 for 40'export
  USD 204 for 45'High Cube export
- Unit rate of land transportation will be similar to the rate between Chittagong and Dhaka, i.e. 240 km, USD172-USD319 per box.
- If barge transportation is required, Phase 1 port can accommodate only a limited number of barges due to their low cargo handling productivity. In many cases (for example, when the container volume exceeds 300,000 TEUs) containers would have to have to be handled directly from a mother vessel to barge or vice versa. Productivity of direct handling is assumed to be 5 boxes/hour compared with 25 boxes/hour at a container berth, therefore, handling cost of direct discharging and loading is five times the handling cost at the container terminal.
- In the "Without case", ship waiting will occur at Matarbari port and turnaround time of mother vessels will increase due to low productivity of ship to barge handling, however, these effects are not quantified in the benefit of the "With case".

(5) Cost of the Access Road Project

Necessary investment in the access road is estimated in Chapter 3.5 and summarized in Table 5.2-6, which implies the cost for two lane road.

Table 5.2-6 Estimated Cost for the Access Road (Two Lanes)

Item		Quantity	Cost (1,000 USD)
Land Acquisition and Resettlement		L.S.	
Road Work			
	Access Road	25.4 km	
	South North Road		
	Side Road		
	National Road No.1		
	Intersection		
	Sub-total		
	Bridges No.1 - No.17	17 bridges	
	Contingency		
Engineering Services			
	Consultancy Services	L.S.	
	Contingency		
Total			

Note: Contingencies, VAT, import duties are not included
Source: JICA Survey Team

5.2.4 EIRR of the Project

The abovementioned economic cost and benefits of the Phase 1 port project are calculated as shown in Table 5.2-7 and those of the road project are in Table 5.2-8. The port project provides important cost-saving benefits by reducing port congestion and maritime transportation cost as larger vessels will be able to call the port.

The access road project provides large cost-saving benefits for domestic transportation from the port to hinterland and vice versa. If the access road is not developed, the port project is not viable due to the fact that handling by barge requires transshipment of containers at the port, which is very costly because of the double handling of containers and the low handling productivity from ship to barge and vice versa.

Economic Internal Rate of Return (EIRR) is assessed as shown in Table 5.2-9. In the base case, EIRR of the project is estimated at 11.3% and sensitivity calculation shows that EIRR is 10.3% in case that costs increase by 10%, 10.2% in case that benefits decrease by 10%, and 9.3% in case both costs increase 10% and benefits decrease of 10%.

This range of EIRR implies that the port project is worth implementing from the viewpoint of the national economy.

Table 5.2-9 EIRR of the Port and Road Project

(1000 USD)

Year	Total Port Cost	Total Road Cost	Total Port Benefit	Total Road Benefit	Benefit - Cost	Cost +10% Benefit + 0%	Cost +0% Benefit -10%	Cost +10% Benefit -10%
2018								
2019								
2020								
2021								
2022								
2023								
2024								
2025								
2026								
2027								
2028								
2029								
2030								
2031								
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2053								
2054								
2055								
2056								
2057								
2058								
					EIRR=	**EIRR=**	**EIRR=**	**EIRR=**
					11.27%	10.30%	10.20%	9.27%

Sensitivity of EIRR

Case	Base Case	Cost +10% Benefit +0%	Cost +0% Benefit -10%	Cost +10% Benefit -10%
EIRR	11.3%	10.3%	10.2%	9.3%

Source: JICA Survey Team

5.3. Project Outcome Indicators

(1) Basic Indicators

Objectives of the development of Matarbari Port are to increase the handling capacity of maritime cargo to meet the future demand of Bangladesh, and to receive large-size oceangoing vessels, and thereby further promote maritime cargo transportation and logistics.

Taking the above into consideration, cargo throughput at the port is deemed as a basic indicator to evaluate the performance and outcome of the Matarbari port project.

Successful development of a new port, which is located far from its original port, usually requires not only the development of infrastructure like access roads, railways, port facilities, navigation channel and basin, but also the services of shipping agents, freight forwarders, customs agents, branch offices of shipping companies, government offices of customs, quarantine and immigration, and others.

Due to delays in establishing these services, cargo throughput of a new port sometimes lags far behind the expected demand in the early stage of operation. Taking into account JICA's report entitled "Lessons learnt from the new port development", cargo throughput of the Matarbari port is assumed to be 20% of the estimated demand in the first year, 40% in the second year and 100% in the third year.

As the Phase 1 of Matarbari Port is designed to handle container cargo of 800,000 TEUs and bulk cargo of 1,930,000 tons, the target of cargo throughput in the second year of operation is supposed to be 259,000 TEUs and 770,000 tons respectively due to the abovementioned reason.

Cargo throughput of Matarbari Port is none at present, so that the baseline to evaluate the target is zero. Chittagong Port handled containers of 2,567,000 TEUs and general/dry bulk cargo of 43,780,000 tons in 2017.

(2) Ancillary Indicators for Operation Performance

In addition to the abovementioned cargo throughput, number of ship calls and the size of calling vessels are considered as ancillary indicators. It is estimated that number of container ship calls is about 75 and general/bulk carrier calls is about 25 in the second year of operation.

Another ancillary indicator is the maximum size of calling vessels due to the fact that Matarbari Port is designed to accommodate large size ocean going vessels. Maximum size of container vessel calling at Chittagong Port is 37,000 DWT at present due to the limitation of ship draft. While the Matarbari port is designed to accommodate container vessels with a loading capacity of 8,000 TEU (100,000 DWT), max size of container ship is assumed to be 4,400 TEU (60,000 DWT) type in the second year of operation.

Maximum size of dry bulk carriers calling at Matarbari Port is assumed to be 70,000 DWT (former Panamax) for the import of grain from North America.

(3) Ancillary Indicators for Effectiveness

As an outcome of port development, mitigation of port congestion is expected as well as calls of large container ships and bulk carriers. At Chittagong port, average ship waiting time was 4-6 days in November 2017 and 6-10 days in June 2018. At Matarbari Port, no ship waiting is anticipated and no congestion surcharge is levied, therefore average ship waiting time is considered to be an indicator for effectiveness of port development.

Table 5.3-1 Indicators for Operation Performance and Effectiveness

Indicators	Item	Baseline Quantity	Target Quantity (in the second year of operation)
Basic Indicator	Cargo Throughput	-	Container Throughput: 259,000 TEU General/Bulk Cargo: 770,000 ton
Indicator for Operation Performance	Number of Ship Calls	-	Container Ship: 75 calls/ year General/Bulk Cargo Ship: 25 calls/year
	Maximum Size of Calling Ship	(Ref: Chittagong Port) Container Ship: 37,000 DWT Bulk Carrier: 58,000 DWT (Half cargo)	Container Ship: 60,000 DWT Bulk Carrier: 70,000 DWT
Indicator for Effectiveness	Ship Waiting Time	(Ref: Chittagong Port) Average Waiting of Container Ships: 5 days*	Ship Waiting Time: None

Note: * Average in November 2017
Source: JICA Survey Team

(4) Qualitative Indicators for Effectiveness

The opening of Matarbari Port will ease ship congestion at Chittagong port, however, this indicator will be evaluated qualitatively as the development of new terminals at Chittagong Port will also lead to less congestion.

Table 5.3-2 Indicators for Operation Performance and Effectiveness

To alleviate ship congestion at Chittagong Port	Inauguration of Matarbari Port is expected to ease ship congestion at Chittagong Port, which will reduce port congestion surcharges levied by shipping lines. As this will also be brought by the development of other ports, this item shall be evaluated qualitatively.

Source: JICA Survey Team

6. Conclusions and Recommendation

6.1 Port Development Project

6.1.1 Cyclic Review on Cargo Demand and Port Planning

In addition to Matabari port development; other new port developments are being discussed and examined in Bangladesh, e.g., Chittagong Bay Container Terminal and a deep sea terminal in Payra Port.
Cargo demand of Matarbari port could change depending on the surrounding conditions. It is necessary to monitor economic trends and developments at other ports in order update the cargo demand and revise the port plan as necessary.
The Integrated Port Management Committee chaired by the Secretary of the Ministry of Shipping was established in October 2017. The committee, which authorized the Matarbari port development plan as one of the national infrastructure development plans, is monitoring the situation of other port development plans in order to utilize the limited budget effectively.

6.1.2 Coordination with related development plan in Moheshkhali

As JICA's coal power generation project and Matabari port planning are being accelerated, it is necessary to coordinate with other new projects.
Moheshkhali Integrated Development Initiative (MIDI) was launched in February 2018 for the coordination of development and investment plans in the Moheshkhali area. Each ministry has been instructed not to pursue projects independently; instead, projects are to be developed comprehensively under the initiative of the Prime-Minister's Office in order to better promote national interests. Transport infrastructure development, i.e., ports, roads, railways, water ways and airports, in particular, should be carried out in a comprehensive and well-coordinated manner.

6.1.3 Close collaboration of Ultra Super Critical Coal Fired Power Generation Project

The new commercial port of CPA will be developed by expanding the coal power plan port. The knowledge and experience of construction works of coal power plant port should be reflected to the new port construction works. The new commercial port should be completed rapidly, economically and with high quality.
In addition, as the dike and breakwater construction and dredging are common works of both projects, these works should be done by CPGCBL to reduce time and construction costs.
Project coordination committee consisting of representatives of CPGCBL and CPA has been established at the initiative of relevant ministries. Effective coordination is vital for expediting both projects.
In 2022, vessels carrying required materials for the construction of power plant will call the port and coal imports will commence once the construction works are completed. For this reason, equipment (navigation aids, VTMS, tugs and pilot boat) and required services such as CIQ should be prepared in a timely manner.

6.1.4 Siltation and Maintenance Dredging in Approach Channel and Basin

The volume of siltation and maintenance dredging was re-evaluated in the JICA data collection and feasibility confirmation for Matarbari port development issued in December 2017.

To clarify this issue JICA established Port Support Committee (Chairman: Dr. Kuriyama) in which prominent academics and experts in this field gathered to examine this issue. As a result, the amount of siltation at present is assumed to be a maximum of 5 million m3 per year. This huge amount of maintenance dredging greatly impacts project feasibility.
The siltation simulation should be updated using the additional latest site data to sufficiently confirm the annual volume of maintenance dredging before the appraisal of the construction loan. It is also necessary to discuss and coordinate between CPGCBL and CPA on the maintenance cost allocation.

6.1.5 Port Management and Promotion

The legal procedure for expanding the port limits of Matabari port has already been carried out by CPA; a decision from the Ministry of Shipping is expected in the near future. Matarbari Port should not be managed by a new port authority but by CPA. A new management body undertaking a green field project always faces severe financial risks. CPA, which already manages Chittagong, Pangaon and other ports, should manage Matarbari port as well to realize integrated development, set competitive tariff rates and ease congestion.
Terminal concession contracts with the private sector are regulated by the PPP act in Bangladesh under the control of the PPP authority in the Prime-minister's Office. One option would be for the private sector to invest in and operate the new terminals in Matarbari, but this is not recommended at the initial stage since there are various uncertain factors at present, e.g., the volume of maintenance dredging is not clear, and CIQ and other port related private services are not sufficient. CPA should manage facilities with support from Japan based on a tool port manner in cooperation with private companies in Bangladesh.
CPA together with relevant government agencies and private companies should enhance port promotion activities to attract cargoes and shipping lines to Matarbari Port.

6.1.6 Utilization of Advanced Technologies of Japan and Technical Guidance

To reduce the construction period and ensure seismic resilience, submerged strut method will be utilized for the quay structure, and isolated anti-seismic device will be introduced to the quay gantry cranes to fortify them against large earthquakes. Japanese ceramic tubes will be also utilized for security cable installations to facilitate the installation and maintenance of communication fiber cables. Technical transfer to CPA staff will be necessary to use and maintain those advanced devices for efficient management of the port.

6.1.7 Navigation Safety

Navigation aids (buoys) are planned to be procured under the coal power plant project. Based on discussions with CPA, components and alignment are to be slightly modified. This should be followed up by CPGCBL.
Three tugs of 4,000 HP class, one pilot and one security boat with hydraulic survey sonar are necessary for port entry and departure. Maneuvering simulation will be necessary to determine the specifications of those boats.
That equipment including VTMS should be prepared up to the middle of 2022.

6.2 Project Risks and Adaptation Measures

Project risks and adaptation measure are assessed and summarized in the JICA Risk Management Framework Format as follows:

Potential Project Risk	Assessment
1.Staekholder Risk	
[Consistency between Primary Policy and Proposed Project] • Lowering of consistency with general public's needs • Possible conflict with vested interests groups	Probability: Low Impact: Mean <u>Analysis of Probability and Impact</u> 1) Port users e.g., exporters and importers, always complain about the congestion at Chittagong Port. They would welcome a new gate way port in Bangladesh. 2) Port related companies such as stevedoring, forwarding, customs clearance and trucking) enjoys the business concentration in Chittagong area and they might not welcome the new job style in the new port in Moheshkhali. 3) In the case of land acquisition for the port construction, local people living there might be against the port construction and the name of Matarbari Port. <u>Mitigation Measures:</u> Meetings and dialogs with those stakeholders are necessary. <u>Action during the implementation</u> Ditto <u>Contingency Plan (if applicable):</u> Ditto
[Project cost and financial Plan] • Probability for private sector to join and/or finance the project executing bodies, in case of use of private finance	Probability: Low Impact: Mean <u>Analysis of Probability and Impact</u> 1) The construction of a new port requires a huge investment. However, the private sector would be reluctant to invest at the initial stage due to the high risks involved. 2) Private sector investment for ICD behind and near the port would be welcome in this project to support the port logistics functions. <u>Mitigation Measures:</u> Integrated regional development plan in the hinterland of the port should be started as soon as possible.

	Action during the implementation Ditto Contingency Plan (if applicable): Ditto
2.Excuting agency risk	
2.1 Capacity risk Provision of appropriate resources and authorities	Probability: Mean Impact: Mean Analysis of Probability and Impact 1) CPA is considered to have sufficient human resources, as it has been executing the Chittagong port expansion project by ADB. 2) To expand the port function to Matarbari Port, it will be necessary to increase their staff size and collaborate with the private sector. Mitigation Measures: JICA Technical Support Project for port management and operation is strongly required. Action during the implementation Ditto Contingency Plan (if applicable): Ditto
• Accountability of financial management and procurement process , technical ability of project administration • Practical application of rules to ensure the freedom from political pressure	Probability: Mean Impact: High Analysis of Probability and Impact 1) CPA has regulations and rules for accountability and procurement, and has a great deal of experience in port projects. However, their procurement process is not the same as JICA guidelines and does not call for the borrower to obtain JICA's concurrence at the appropriate timing during project implementation. If their understanding of JICA Guidelines is insufficient, the necessary procedures for the loan between CPA and JICA will not progress smoothly which could lead to delays in the project schedule. As for the unnecessarily strict conditions in the procurement process, they are not stipulated in the sample of Notice Invitation Tender provided by CPA. Therefore possibility of rebidding originated from the strict conditions is not anticipated. 2) CPA has sufficient technical ability for project administration,

	but this project requires coordination with CPGCBL on budgetary matters. If the budget is not well coordinated, the project will be delayed. 3) CPA's budget is independent from the central ministries. Tender procedures and contracts for procurement of both consultant and contractor are determined at their board meeting. Mitigation Measures: It is proposed that seminar on JICA Guidelines be held prior to the start of the project in order to promote the understanding of CPA. In addition, frequent communication with CPA and monitoring of the political situation in Bangladesh should be undertaken in order to identify risk factors. Action during the implementation Ditto Contingency Plan (if applicable): Although possibilities of the above risks are low, timely coordination between JICA and CPA should be made.
[Project executing agency financial capability for project execution] • Accountability of capability to finance the project from its own financial resource • Accountability of capability t control financial status	Probability: Low Impact: Mean Analysis of Probability and Impact 1) It is considered that CPA has sufficient financial resources. Its revenue has been increasing in line with the growth in cargo handling volumes; recently, no financial assistance from outside has been sought. 2) It is considered that CPA is capable of financial management, as it has an internal financial adviser. Mitigation Measures: Financial statement of CPA shall be regularly checked. Action during the implementation Ditto Contingency Plan (if applicable): JICA shall offer advice on project financing if required, although the possibility of any risk seems low.
[Project executing agency financial capability, project executing organization] • Probability of delayed payment to the contractor	Probability: Low Impact: Low Analysis of Probability and Impact 1) There will be no difficulties for CPA to establish the project executing system, as it has sufficient human resources to implement

•	the project.. 2) The Prime minister's Office and the Ministry of Shipping was involved in making the policy and are involved in JICA surveys for the port development in Matarbari. Mitigation Measures: CPA created the pre-PIU and coordination committee with CPGCBL Matarbari MUSCCPP. If issues arise, they shall be handled by those organizations. Exclusive staffs for this project are to be assigned. Action during the implementation Ditto Contingency Plan (if applicable): JICA shall observe the project implementation and suggest holding meetings or convening the committee to deal with any issues that may arise.
2.2 Governance Risk	
[Project Executing Agency-Project Executing System, Operation/Management System] Cooperation System among Relevant Entities and Implementation System	Probability: Low Impact: Low Analysis of probability and Impact • Project Executing Agency Project Executing Agency is CPA, the largest port authority under the Ministry of Shipping of Bangladesh. CPA has developed the terminals along the Kanafri river and started Bay Container Terminal project by ADB. There is no difficulty for CPA to establish the project executing system as it has sufficient human resources to implement the project. • Relationship with Superior Government Organizations CPA keeps day to day communications with the Ministry of Shipping, the direct superior ministry to CPA. The Ministry of Shipping has established the Integrated Port Management Committee in 2017 to coordinate national port policy and investment. The Prime-minister's Office has been involved in coordinating this project with other relevant ministries and agencies. Mitigation Measures: • Project Executing System CPA has established pre-PIU(Project Implement Unit) and agreed to transform it to PIU from the beginning of ES (Engineering Service).

	Action during the implementation: Ditto. Contingency Plan (if applicable): Not applicable
• [Project Implementation Schedule]	
Approval of Loan Borrowing by the Congress	Probability: Low Impact: High Analysis of probability and impact: Implementation of this project was agreed to by both prime ministers in 2016, and the development of Moheshkhali is designated as one of 10 first track projects in Bangladesh. Mitigation Measures: In high level meetings JICA should always confirm that this new port project in Moheshkhali is the priority project for the economic development of Bangladesh. Action during the implementation: Ditto. Contingency Plan (if applicable): Not applicable
• 2.3 Fraud & corruption risk	
[Procurement/Work Methods] • Appropriateness/ Effectiveness of Rules and Regulations for Financing and Procurement	Probability: Low Impact: Mean Analysis of probability and impact: • It is considered that CPA is a suitable organization to procure consultants and contractors and execute and the project in accordance with JICA Guidelines as it has a financial auditor in its financial department. • It is considered that CPA has proper account auditing and information disclosure system as it discloses revenue accounts on its home page. • JICA loan system needs to be clearly explained to CPA as it differs somewhat from the ADB loan system. Mitigation Measures: Workshops on JICA yen loan system should be held for relevant staff in the financial department. Action during the implementation: Ditto.

	Contingency Plan (if applicable): Not applicable
3.Project Risk	
3.1 Design risk	
[Works to be financed by the loan] • Appropriateness of Scope or Works	Probability: Mean Impact: High Analysis of probability and impact: The scope of works to be financed by Loan is comprised of construction of breakwater extension in deep sea area, and dredging of approach channel and port basin. And a large amount of maintenance dredging is necessary. The facilities do not make revenue directly. Therefore, the revenue from adequate cargos shall be ensured. But in case initial investment and maintenance dredging cost exceed the estimate, profitability of the project possibly may not be ensured. Mitigation Measures: Enhancement of logistics service and attracting container shipping lines are the keys to increasing container cargo. Promotion and marketing team should be established and their activities and results should be informed to JICA. Action during the implementation: Ditto. Contingency Plan (if applicable): Not applicable
[Project executing agency-project executing system] Accountability of project monitoring system	Probability: Low Impact: Mean Analysis of probability and impact: • It is considered that CPA is capable of monitoring the project implementation timely with respect to both financial status and progress of construction works as it has sufficient engineers and accountants. • It is considered that CPA will properly use the loan according to the agreements and contracts as it has a financial audit officer. Mitigation Measures: Not applicable Action during the implementation: Ditto.

	Contingency Plan (if applicable): Ditto
• Packages for Procurement of Contractor • Capability of Contractor	Probability: Low Impact: Mean Analysis of probability and impact: • In case the project is divided into several packages, lack of coordination among several contractors may cause excess spending by CPA and delay of project completion. It is necessary, therefore, to select consultants having experience in supervision and management of maritime construction works of this scale. • In case that all the works are given to one contractor, the success of the project depends on its financial and technical capability. It is necessary, therefore, to carefully select the contractor. • As CPA has agreed on one package, the contractor shall be selected strictly in accordance with JICA guidelines. Mitigation Measures: All the procedures in selecting the contractor should carefully be monitored by JICA Action during the implementation: Ditto. Contingency Plan (if applicable): Not applicable
• Vulnerability to depressing demand to be cause by external factors	Probability: Low Impact: Mean Analysis of probability and impact: The container demand is likely to increase steadily in light of the continuing economic growth in Bangladesh. But in parallel with this project, Chittagong Bay Container Terminal Project and other container terminal projects along the Kanafri river are ongoing. If those projects are completed and operations commence faster than this project, the amount of container cargo in the initial stage will be affected. Mitigation Measures: JICA should monitor and support CPA to prevent any delay in the tender proceedings and all procedures in selecting the contractor should be carefully monitored by JICA.

	Action during the implementation: Ditto. Contingency Plan (if applicable): Not applicable
• 3.2 Program/donor risk	
A policy and system reform necessary for development	Probability: Low Impact: Low Analysis of probability and impact: MOS and CPA have already expanded the port limit of Matarbari. PMO (Prime Minister's Office) takes a leader ship to develop the Moheshkhali Area by establishing MIDI (Moheshkhali Integrated Development Imitative, inter-ministerial meeting). Mitigation Measures: High level meetings are to be held to monitor the policy changes. Action during the implementation: Ditto. Contingency Plan (if applicable): Not applicable
• (maintenance) • Decline of performance before the end of service life	Probability: Mean Impact: High Analysis of probability and impact: • Periodical maintenance dredging in the approach channel and basin is indispensable. If maintenance dredging is not regularly conducted, water depth will become inadequate. • Settlement of breakwater might occur due to the strong waves and current. Maintenance works must be carried out to ensure calmness of the basin area. • The corrosion of steel pile structure and defects of concrete slab should be monitored. Without periodical survey, the service life will be reduced. Mitigation Measures: JICA technical support project is proposed to upgrade the technical level of CPA staff. Action during the implementation: Ditto. Contingency Plan (if applicable): Not applicable
[Project Effectiveness]	Probability: Low

Narrowness of benefit disperse of development effectiveness	Impact: Low Analysis of probability and impact: The target of the project is to increase the handling capacity of container and other cargoes through the development of large berths which will greatly contribute to stable and low cost logistics in Bangladesh. Mitigation Measures: Not applicable Action during the implementation: Ditto. Contingency Plan (if applicable): Ditto
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6.2 Access Road Development Project

The following are conclusions pertaining to the access road component:

- The total length of roads under the project will be 27.3 km, comprising of 25.7 km-long access road and 1.6 km-long north-south connector road, and the accumulated length of bridges is approximately 7.1 km.
- The access road crosses two (2) Class II inland waterways as categorized by BIWTA, which requires a navigation clearance of 12.2 m in the vertical direction and 67.66 m in the horizontal direction. Steel narrow box girder type of bridge was selected as the optimum bridge type for such river crossings.
- Based on the results of geotechnical investigation and analysis on embankment stability and consolidation settlement, consolidation drained method with PVD was evaluated as the optimum solution for soft soil treatment. However, existence of sandwiched layers consisting of stiff clay, loose to dense sand were confirmed and PVD would not be applicable for such conditions. Sand compaction pile method would be applicable where PVD would not be feasible however the costs are prohibitive. Therefore, viaducts are viewed as more reasonable than embankment construction for such sections.
- The effect of climate change on water level such as rising sea and flooding levels ought to be anticipated. This study assumed that such increments in water levels can be accommodated within the 1 m of freeboard for embankment and bridge design instead of undertaking a detailed study of such a scenario.
- The traffic on the project road would be dominated by heavy vehicles. Therefore, polymer modified asphalt should be applied to this road. Also, a semi-flexible pavement design, which has higher durability against rutting, was proposed for the pavements at intersections.
- As a result of cost estimation, 35% of the construction cost is for embankment works and the estimated volume of embankment material is about 5 million m^3. Bangladesh has a poor environment for procurement of construction materials and this project would not be exempt from such a challenge. Dredging would be the most provable material source for the embankment materials and the cost for such material is considered in the unit rate of the embankment construction.
- Economic viability represented by EIRR is 12% under basic conditions and it would be less than 12% in case the project cost is increased by 10% or the benefit of the project is decreased by 10%. However, the access road is indispensable for Matarbari Port because the existing roads are not suitable for freight transport and transportation by inland waterways would not be reasonable.

Based on the conclusions, the following matters should be carefully studied during the implementation stage.

- Topographic surveys are necessary during the detailed design stage. The project site is dominated with soft ground and topographic survey work would be challenging. Therefore, the work schedule for topographic surveys should be carefully planned at the initial stage of the detailed design.
- More detailed geotechnical investigations would be necessary for identifying the optimum soft ground treatment measure and optimization of road structure either embankment or bridge should be evaluated in order to minimize the construction cost.
- Procurement and transportation plans for construction materials such as embankment material

should be re-examined in detail and such conditions should be incorporated into the bidding documents depending on their necessity.

- Semi-flexible pavements have never been applied in Bangladesh therefore their applicability should be studied.

6.3 Environmental and Social Considerations

6.3.1 Environmental Considerations (Port)

(1) Consideration for rare species

In areas surrounding the project site, habitats of sea turtles are confirmed in the southern part of Dhalghata. However, the area is not defined as an important habitat for them as there are surveys that the frequency of the turtles' nesting is very rare compared to the frequency in Sonadia Island. Sonadia island is 15 km away from the project site and the influence of various constructions and operations is considered to be minor, but it is a critical natural habitat for rare species and it needs the special consideration. Since Sonadia site and surrounding project site, where various valuable species exist are thus located, it is proposed to implement awareness programs for construction workers and neighboring residents in order to deepen their understanding of rare species.

(2) Environmental consideration for coastal area ecosystem

The surrounding area of Matarbari Port is formed of sand dunes. There are no large-scale developments in the surrounding area until now, and it is considered to be a region where there are many animals and plants other than small-scale residential facilities. Construction of ports and dredging accompanying routes and berths will result in changes in waves and currents around the area, especially in the long term, it occurs erosion and sedimentation of the surrounding coast. Dredging and dumping dredged soil will also increase water pollution.

In consideration of the above points, the study team showed coastline change prediction from the change of waves and flow conditions and examined the pollution diffusion by numerical prediction calculation model of pollution diffusion. Based on these models, the impact on the Sonadia region, the critical natural habitat area, is expected to be minor. However, experts' interests in the Sonadia region are very high and there is concern about making hasty decisions. Therefore, it is recommended to monitor the change of the natural environment and the accompanying change of the marine ecosystem sufficiently.

(3) Joint expert meeting on ecosystem

As shown in (2), from the prediction of coastline change prediction, pollution diffusion prediction and predicted values of various pollutants, the result that the change to the natural environment of the area is considered to be minor. Meanwhile, concerning the ecosystem around the project site, several rare species have been confirmed, and there have been also high interests of experts both inside and outside of Bangladesh.

Therefore, in addition to these calculation results, it is extremely important to monitor the actual situation and take flexible measures with the opinions of these experts. It is proposed to set up opportunities for joint meetings of various experts on the impact on ecosystems by this project.

(4) Waste management for the port activities

The country aims to enforce the IMO Convention Act 2018 as the domestic law that controls pollution of Port, the IMO's Marpol Convention and the Ballast Water Management Convention as early as possible. Also, as for the land waste management from the port activities, the country has joined the UN Basel Convention to limit the inflow of harmful substances, being controlled by environmental protection regulations of DoE.

However, regarding land waste generated by port activities, it is also predicted that due to the quantity and variety, individual measures and penalties by each law alone could be insufficient. In reality,

inadequate plan at Chittagong Port has shown various problems such as insufficient method of disposal of hazardous wastes and incomplete recycling are raised. The Survey Team propose CPA, the executing agency, to prepare comprehensive and sustainable waste management plan and control the port waste management by the plan, based on the lessons learned at Chittagong Port, concerning collecting, transporting, processing and recycling wastes found in the port.

6.3.2 Environmental Consideration (Access Road)

(1) Consideration for loss of mangrove forest

Mangrove forests have rich ecosystems such as providing habitats of living things, feeding sites, spawning grounds. In the access road project of Matarbari Port, 1.23 ha of mangrove forest exists under the bridge to be installed in the Kohelia River. Considering the density of mangrove forests in coastal areas of the area, it is necessary to cut down about 5,500 mangroves. Reforestation program for mangrove forests lost in the project needs to be done in appropriate location and quantity in consultation with the Forest Department (DoFo).

(2) Consideration for forest reserves, wildlife reserves, and hilly areas

Planned roads are planned carefully avoiding longitudinal traverses of various protected areas.
However, there are areas such as the Moheshkali Forest Reserve and Hilly areas, Fasiakhali Wildlife reserves in the neighborhood. The protected area is managed by the Forestry Act (1927) under the DoFo and the Environmental conservation Law amendment (2010) under Department of Environment (DoE). Based on these laws, it is recommended for the executing agency that it should consult with the DoFo and DoE to sufficiently implement mitigation measures and monitoring in the forest reserve / wildlife reserves / hilly areas around the planned roads.

6.3.3 Social Considerations

(1) Cut-off Date

In accordance with the JICA guidelines, for the Project Affected Persons not eligible for compensation under Bangladesh law, the cut-off date would be the start date of the census survey, which was February 11, 2018 for port component, and April 1, 2018 for access road component. On the other hand, the Cut-off Date for the Project Affected Persons eligible for compensation under Bangladesh law will be declared before the Joint Verification Survey at the detailed design stage. Therefore, it is necessary to make continuous coordination in order to prevent discrepancies in recognition among relevant agencies.

(2) Monitoring and Feedback of Livelihood Restoration Program

In the Adjacent Project, more than half of the PAPs interested in vocational training are attending or completed training. Some PAPs, however, could not take courses because consensus from the family on participation in vocational training is not obtained due to local characteristics or religious reasons. The following are lessons from adjacent project.

- Livelihood restoration shall be monitored, whose result needs to be fed back to livelihood restoration program.
- PAPs shall be thoroughly informed of the implementation of vocational training through INGO. Consent from family of vocational training persons shall be obtained.

Regarding livelihood restoration program in this Project, monitoring shall be implemented as follows

through INGO. Livelihood restoration program will be reviewed and updated in consultation with the concerned PAPs if necessary.

- Implementation status of vocational training: quarterly after the beginning of vocational training.
- Job finding: 3 months after completion of vocational training program.
- Situation of employment and livelihood recovery: Once a year from above mentioned.

INGO will conduct assistance for job finding after vocational training if necessary.

(3) Compensation and Assistance for Fisherman

Through this survey, the impact of port project on fishery are summarized as follows.

1. Impact during Construction

1-1. Since there is no additional coastline loss by this project, there is no cumulative impact on the fishing ground. In addition, dredging and offshore disposal of dredged soil will not cause significant water pollution. Consequently, no cumulative impact is expected in terms of water pollution since mitigation method as described in the environmental management plan will also be taken.

1-2. However, the possibility cannot be denied that part of the fishery around Hasher Char can be physically hampered by frequent traffic of dredger ships during dredging of the extended navigation channel.

2. Impact after Operation

2-1. Since there is no thermal discharge after operation in the Project, cumulative impact will not be expected

2-2. On the other hand, supposed that this project increases the number of vessels entering the port, fishery activities might be hindered. An immediate impact, however, will not be expected since the vessels that can be handled by the Project (Phase 1) and the Adjacent Project are approximately 340 per year (or one vessel per day, which will be reached in 2028). By utilizing Vessel Traffic Management System (VTMS), hindrance to operation of fishing boat can be avoided.

Considering the above analysis, the information of all fishermen around Hasher Char was collected through this Survey for the monitoring purpose. INGO shall conduct interview on fish catch volume and income from fishery during construction and 5 years after operation. If the decrease in the volume of fish catches is not confirmed or the living standard equivalent to the previous can be maintained by moving their fishing ground, compensation/assistance will not be required. However, in case that the volume in the current fishing ground decreased, the relation between the Project and the decrease shall be surveyed. In case that the obvious relation is confirmed and fishermen cannot move their fishing ground to the appropriate place, or when the volume is reduced even after moving fishing ground, they will be subject to cash compensation. In case that obvious relationship is not confirmed between the Project and the decrease of fish catch volume, livelihood restoration assistance shall be provided. For the survey on the relationship, advices from local experts shall be asked.

(4) Salt Farm and Shrimp Cultivation

Regarding salt farm and shrimp cultivation, even if salt farm and shrimp farm became lost by the project, the same livelihood means can be maintained because there is plenty of similar land around the affected farms. Therefore, INGOs shall identify similar land that can be utilized for salt farm and shrimp

cultivation as a substitute site.

(5) Calculation of Compensation Cost

All costs for land acquisition/resettlement and rehabilitation will be borne by the Bangladesh government. Since it is difficult to estimate land acquisition cost and resettlement costs separately for this project in this survey, which is at the initial stage of planning, expenses were estimated based on the land area, the number of resettlement households from the socio-economic survey (SES) to the Project Affected Persons (PAP), and the replacement cost of land, trees and structures. Therefore, at the detailed design stage, it will be necessary to calculate a highly accurate cost by the Property Valuation Advisory Team (PVAT).
Also, significant land price increases have been reported in the target area. Regarding the difference which is not covered by Bangladesh national laws for the reacquisition price confirmed by the Property Valuation Advisory Team (PVAT) at the DD stage, additional payment will be made at top-up value.

(6) Payment of compensation

In the Adjacent Project, payment from the executing agency has been completed in advance regarding compensation for losses on land and structures and compensation for income loss. However, due to inheritance disputes or inadequate documents submitted by PAPs, the head of household might not be identified or confirmed. Therefore, there are cases that took time to pay compensation. The following are lessons from the Adjacent Project.

- PAPs shall be informed of the documents to be submitted as well as to support documentation at an early stage.
- More support shall be given for documentation of PAPs.

Based on the above, in this Project, INGO will inform PAPs of documents to be submitted and support the document preparation. It is necessary to thoroughly enforce support to all PAPs under the supervision of the executing agency.

(7) Monitoring

CPA does not have any section specialized in social environment. For pre-construction and during construction, monitoring will be conducted through Implementing NGOs under PIU, and through an external consultant. During operation, establishment of a section in charge of monitoring needs to be considered within CPA, and monitoring will be conducted through consultants, or NGOs employed by CPA.