Chapter 6. CTT Project Plan and Cost Estimation

6.1. Execution Plan and schedule for Construction Work

6.1.1. Outline of the Work Items

This construction project is recommended to be divided into two stages such as the public portion and the private portion and be divided into two stages in accordance with coal demand as mentioned in the above section.

Facility name, quantity, and outline of the work items, the coal handling equipment to be installed and buildings to be constructed in the CTT to be executed in accordance with each stage and each phase are summarised in Table 6.1.1 and Table 6.1.2.

Table 6.1.1 Facilities to be constructed in the Public portion

No.	Facility's Name	Unit	Quantity	
			1st Phase	2nd Phase
1	Construction of the Coal Unloading Berth	berth	2	1
2	Construction of the Coal Loading Berth for 5,000DWT	berth	0	4
3	Reclamation and Earth Works	ha	45	50

Source: JICA Study Team

Table 6.1.2 Facilities to be Constructed in the Private Portion

No.	Facility's Name	Unit	Quantity	
			1st Phase	2nd Phase
	Building and Civil Works			
1	Pavement	ha	36	40
2	Drainage and Utilities	L.S	1.0	1.0
3	Administration Building	L.S	1.0	1.0
4	Maintenance Shop	L.S	1.0	1.0
5	Sub-Station	L.S	1.0	1.0
6	Dust Protection Wall	km	3.0	3.4
7	Security Fence and Gate	km	2.9	3.2
	Coal Handling Equipments			
1	Coal unloading machine	Set	4	2
2	Coal loading machine	Set	0	4
3	Stacker Reclaimer	Set	6	7
4	Belt Conveyor	km	12.8	14.9

Source: JICA Study Team

Notes: Belt conveyor from CTT to CFPPs. is not included in the item of "Belt Conveyor". It was confirmed at the stakeholder meeting that those belt conveyor will be constructed under the responsibility of each CFPPs.

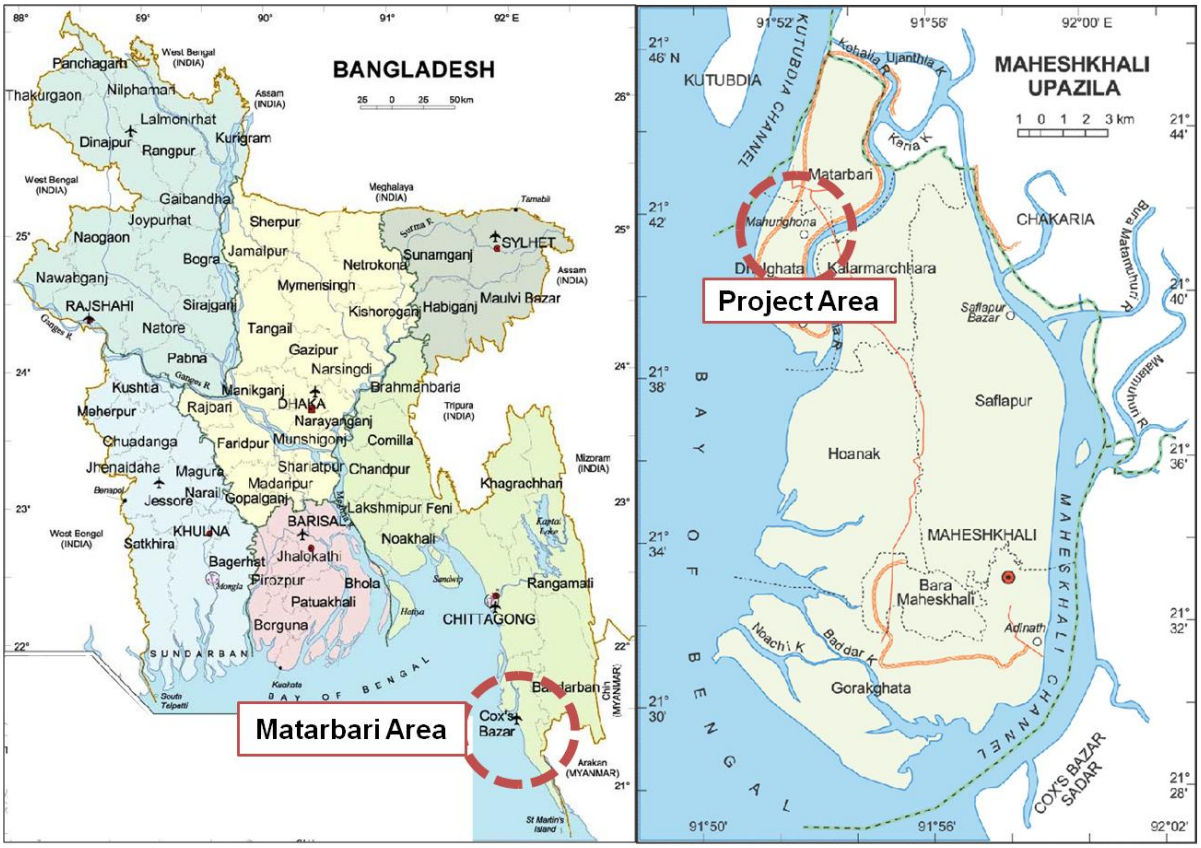
6.1.2. General Condition of the Site

Location, access, natural condition, and social condition are studied in this section. These conditions will be used for the consideration of the work execution method.

(1) Project site location and accessibility to the site

The project site is located near the Matarbari CFPP in the Matarbari area. The CTT faces the vessel turning basin and the sea channel which will be constructed for the Matarbari CFPP.

Land transportation and water transportation are possible to be used as access to the site. However, water depth near the project site is too shallow to be used as water transportation until construction of the channel and turning basin is completed. Project site is shown in Figure 6.1.1.



Source：http://www.in2bangla.com/upazilaMap.php?id=293

Figure 6.1.1 Project Site Location

(2) Natural conditions

The project site is located on the shoreline of the Matarbari area. Main characteristics of the natural condition of the site are summarised below.

Table 6.1.3 Natural Conditions

No.	Item	Condition
1	Climate	Monsoon climate
2	Rainfall	Annual rainfall is 2,106mm
3	Wind	Annual average wind velocity is 6.79m/s
4	Wave	Significant wave height higher than 1.5m is 2.5%
5	Existing ground	Subsurface ground is soft silt layer with thickness of 12m

Source: JICA Study Team

(3) Cooperation with the Matabari CFPP Project

This project has a close relationship with the Matabari CFPP Project. Therefore, the following basic conditions will be applied.

- Turning basin of the power plant will be used for operating vessels.
- Sea channel and channel navigation system of the power plant will be used.
- A part or whole of the reclamation soil will be delivered from the soil stockpile area of the CFPP project. The selected dredged sand will be used for reclamation.
- Construction of the common infrastructure such as power supply, water supply, access road and public drainage line around the project site are assumed to be completed at the construction stage of the CFPP project.
- Marine construction of the 1st Phase such as berth construction shall commence after completion of the dredging work of the CFPP project due to limitation of the working area.
- Reclamation work of the 1st Phase shall commence after completion of the reclamation work of the CFPP project because surplus selected dredged sand of the CFPP project is expected to be used.

6.1.3. Availability of Material and Equipment

Availability of materials and equipment is important for the consideration of execution plan and construction schedule. It will have an effect on the construction cost too. In this study, the available materials and equipment from local sources will be applied as much as possible and imported materials and equipment will be applied only when they are difficult to be obtained from local sources with suitable quantity and quality.

(1) Availability of materials

Considering the preliminary design of the structures, main used materials and its expected source are studied and listed in Table 6.1.4 below.

Table 6.1.4 Availability of Materials

No.	Material	Facility	Source
1	Concrete	Berth, yard, and buildings	Local
2	Stone	Berth and revetment	Local
3	Reclamation soil	Yard	Selected dredged sand of the CFPP project
4	Rebar	Berth, yard, and buildings	Local
5	PVD	Yard (soil improvement)	Imported
6	Steel Pipe Pile	Berth and trestle	Imported

Source: JICA Study Team

(2) Availability of reclamation soil

Basically, stockpiled selected dredged sand of the CFPP project will be used for the reclamation work due to the following reasons:

- Unit price of purchased reclamation sand in this area is relatively expensive.
- Capacity of purchased reclamation sand is not enough compared with its demand.
- It is difficult to obtain reclamation material from the surrounding area due to geographical reasons.

Approximately, over 5.2 million m^3 of the stockpile good soil is estimated in the CFPP project. Adding to that, dredged material in the berth construction work, maintenance dredged material of the sea channel, dredged material of other projects and a part of disposed soft soil in the CFPP project will be possible to be selected and applied to the reclamation work not only of the 1st Phase but also the 2nd Phase.

When quantity of above material is not enough for the reclamation works, reclamation sand shall be purchased in the northern part of the country.

In accordance with the soil profile data and seabed material survey result, it is expected that 37.5% of the dredged material of CFPP project are sandy material. Adding to that, in this study, it is tentatively assumed that over 20% of the disposed material will be available to use as reclamation material after five years from the completion of dredging works of the CFPP project.

The following Table 6.1.5 shows the expected balance of stocked soil and reclamation volume

Table 6.1.5 Soil Balance

No	Soil Origins	1st Phase (million m3)	2nd Phase (million m3)	Total (million m3)
1	Necessary volume for reclamation	3.78	4.20	7.98
2	Available quantity of CFPP stockpile	5.23	1.45	5.23
3	Disposed material	19.64	0.00	19.64
4	Available quantity of disposed material	0.00	3.93	3.93
5	Necessary volume to be purchased	0.00	0.00	0.00
6	Surplus volume (2+4-1)	1.45	0.27	0.27

Source: JICA Study Team

(3) Availability of equipment

Considering the preliminary design of the structures, main used equipment and its expected source are studied and listed in Table 6.1.1 below.

Table 6.1.6 Availability of Equipment

No.	Equipment	Work item	Source
1	Piling barge	Piling	Foreign
2	Crane barge (50 t class)	Berth superstructure	Foreign
3	Material barge (1,000 t)	Berth superstructure	Foreign
5	Excavator (0.7 m^3 class)	Earth works	Local
6	PVD machine (20 m)	Soil improvement	Foreign
7	Dump truck (15 t)	Earth works	Local
8	Mobile crane (50 t)	Building works	Local
9	Dredger (5,000 m^3/day)	Dredging work	Foreign

Source: JICA Study Team

6.1.4. Preliminary Execution Plan

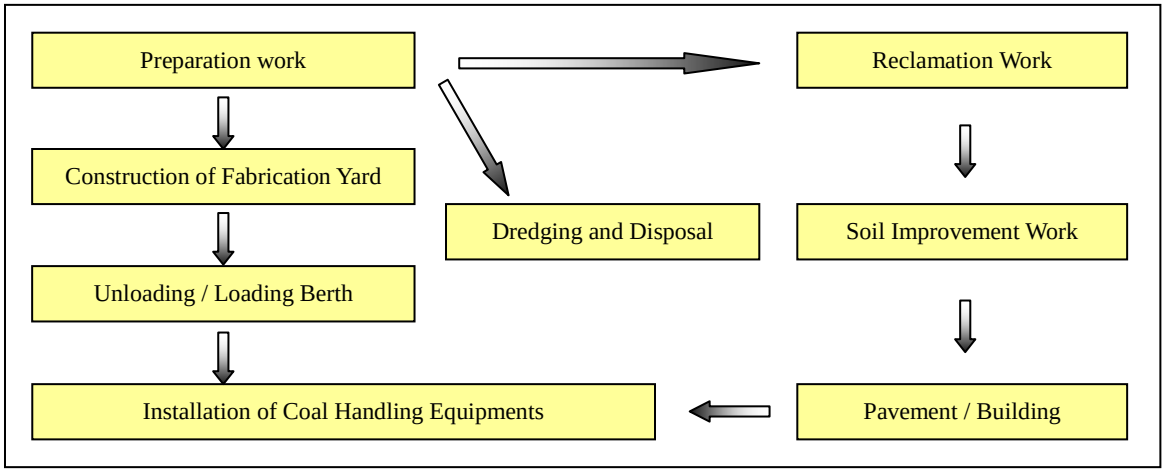
Preliminary construction method is studied in the following tentative conditions. The purposes of studying the preliminary execution plan are to calculate a reasonable and possible construction schedule and to estimate the reasonable construction cost.

<Applied conditions>

- The international experienced contractor will implement works.
- Popular and reasonable work method and materials in South-East Asia will be applied.
- Popular and reasonable work progress and activity ratio will be expected.

(1) Overall execution flow

Tentative overall execution flow of the construction is shown in Figure 6.1.2.



Source: JICA Study Team

Figure 6.1.2 Overall execution flow

(2) Execution plan of the preparation works and temporary works

Prior to the commencement of construction works, the necessary preparation works such as general survey work, installation of fence and gate, construction of the contractor's office, obtaining permissions and preparation of the method statement, and preparation of drawings shall be carried out.

Fabrication yard for the pre-cast concrete structures and splicing piles shall be constructed prior to commencement of the marine construction work.

Belt conveyer and/or temporary access road for dump truck to transport reclamation soil from the soil stockpile yard of CFPP project shall be prepared prior to the commencement of reclamation works too. Above preparation works should be completed in the preparation period for smooth commencement of the implementation of permanent works.

(3) Execution plan of the construction of the coal unloading/loading berth

The coal unloading berth and loading berth will be constructed in the harbour of the Matabari Power Plant. Piling of foundation piles will be installed by piling barge with hammer. Pile materials will be transported by material barges after splicing at the temporary yard.

After completion of the piling work, concrete superstructure will be constructed. Supporting works, formworks, and rebar works will be carried out by manpower supported by crane barge and concrete will be placed by concrete pump truck located on the existing revetment. Ready mixed concrete will be produced at the batching plant located at the temporary yard and transported by agitator trucks.

Pre-cast concrete beam and slab may be applied to shorten the construction period. They will be fabricated in the fabrication yard and be installed by crane barge.

Slope under the berth will be protected by stone layer to prevent damage by current and water flow caused by vessel's screw.

Anchor bolt and anchor plate for the coal handling equipment/belt conveyer shall be installed into the concrete structure in this stage.

(4) Execution plan of the dredging and disposal

Main sea channel and turning basin will be dredged by the CFPP project. However, dredging for port extension area and river channel for the secondary transportation may be required.

Port area and berth pocket will be dredged up to the required depth and width. A grab dredger (GD) or cutter suction dredger (CSD) may be used.

Location of the loading/unloading berth and trestle shall be dredged prior to the commencement of construction of these structures.

Dredged materials will be transported by barge or pipeline and disposed to the provided disposal area. When barge is used for transporting disposal soil, secondary transportation using pump barge will be necessary. In this study, onshore dumping area as same facility as used for the CFPP project is tentatively applied considering the relatively small volume of the dredged material. Disposed soil may be selected and used for the reclamation works.

This works may be carried out in the scope of the CFPP project to shorten the construction period of the project. Therefore, it is strongly recommended to discuss this demarcation between both projects.

(5) Execution plan of the reclamation works

Existing ground elevation is too low for the CTT in consideration of the storm surge. Therefore, reclamation will be necessary up to the required elevation. Prior to the filling sand, surface soil including organic materials and garbage will be removed by backhoe and dump truck. Temporary road and/or work stage may be required for backhoe and dump truck in some parts of the working area due to the soft ground condition.

Reclamation sand will be transported from the soil stockpile area of the CFPP project by dump truck or belt conveyor and installed to the reclamation area. Installed soil will be leveled and compacted by bulldozer. Edge of the reclamation area may be protected by stone, concrete blocks, or vegetation. Reclamation materials shall be used for the surcharge material of the soil improvement works.

(6) Execution plan of the soil improvement work

PVD method will be applied to the soil improvement for the yard area. Because this method has enough actual results in Asia and known as relatively low cost and easy construction. Adding to that, this method is suitable for huge area compared with other method in view of cost/schedule points. Necessary work items for the soil improvement by PVD method are the following:

(a) Installation of the pump well, monitoring well, and monitoring plate for settlement.

(b) Installation and leveling of the sand mat (horizontal drain) by bulldozer and dump truck.
(c) Installation of PVD by PVD machine.
(d) Installation of surcharge soil (reclamation material).
(e) Monitoring and measuring during the surcharge period.
(f) Removal of the surplus surcharge soil.

Stocked soil at the CFPP project will be used for the surcharge soil but it may not be used for the sand mat due to lack of permeability. Therefore, the purchased sand with appropriate hydraulic permeability will be used as the sand mat material.

Sand mat shall be installed as layer of the reclamation material and reclamation material shall be applied to surcharge material. Therefore, parts or whole of the surcharge material may not be required to be removed.

When shortening the schedule is seriously required, cement mixing method such as DMM method shall be applied to parts or whole area of the soil improvement.

(7) Execution plan of the pavement/building works

After completion of the soil improvement works, foundation of the coal handling equipment, buildings, utilities, and pavement will be constructed at the filled and improved yard. Mobile crane will be used for the main equipment of the building works, and earth equipment such as backhoe will be used for other works. Ready mixed concrete will be produced at the temporary yard and transported by agitator truck and installed by concrete pump truck or concrete hopper.

Foundation pile of the coal handling equipment and buildings will be installed by diesel hammer.

Utilities such as power supply line, water supply line, and drainage system should be constructed prior to the construction of the pavement.

In this study, concrete pavement is applied to the pavement type of the terminal. This type of pavement has merit on its strength and durability compared with other types. Adding to this, this type is more suitable for the climate in this location.

Sub-grade, sub-base, and base course will be installed and leveled by a bulldozer and compacted by a roller. Surface concrete will be placed by concrete hopper or concrete pump. Reinforcing bar and joints will be installed to avoid cracks and to increase its durability.

(8) Execution plan of installation of the coal handling equipment

Parts of unloader and loader will be transported by vessels and assembled on the berth. Vessel’s crane will be used for unloading and mobile crane will be used for assembling.

Parts of stacker reclaimer will be transported by vessels, unloaded to MOF of CFPP, transported to the coal storage yard by trucks and assembled by mobile crane.

Parts of the belt conveyer will be transported by vessels too. They will be assembled by crane barge and mobile crane.

6.1.5. Temporary Works

Temporary works are important items in order to estimate the construction period and the construction cost.

(1) Necessary temporary works

Necessary temporary works for this project are the following:

(a) Installation of the temporary security gate and fence
(b) Construction of the fabrication yard
(c) Temporary jetty and access road to deliver materials and equipments
(d) Temporary project office and camp

Above works should be conducted prior to the commencement of related permanent works. Therefore, careful schedule control of the temporary works will be required for the smooth implementation of the construction project.

(2) Fabrication yard

Following works will be conducted at the fabrication yard.

(a) Stockpiling and splicing of the foundation piles;
(b) Producing the ready mixed concrete;
(c) Fabrication and stockpiling of PC beam and PC slab;
(d) Stockpiling, cutting, and bending of rebar; and
(e) Stockpiling of the materials and equipment.

Ground of the fabrication yard will be filled by sand and covered by gravel. Filling sand and gravel will be compacted well by roller for vehicles to move smoothly.

Fabrication yard will be enclosed by security fence to avoid third party’s accident.

(3) Location and area of the fabrication yard

Location of the fabrication yard shall be selected considering the following factors:

- Method and required time of material transportation to the fabrication yard;

- Method and required time of material transportation from the fabrication yard to the working area;
- Required area and used period; and
- Security and safety.

Considering the above factors, behind area of the unloading berth is recommended for the fabrication yard.

Required area of the fabrication yard is tentatively estimated as follows:

- Stockpiling and splicing yard for SPP : 50m x 200m (1.0 ha)
- Concrete batching plant : 50m x 100m (0.5 ha)
- PC beam fabrication and stockpile : 50m x 200m (1.0 ha)
- Rebar storage and bending area : 50m x 50m (0.25 ha)
- Stockpile for other materials : 50m x 200m (1.0 ha)

In accordance with above estimation, approximately 4.0 ha of the fabrication yard shall be prepared.

6.1.6. Schedule of Construction Work

In this section, tentative construction schedule of each stage is estimated based on the preliminary design and preliminary execution plan. Tentative construction period will be calculated based on the work quantity, workability ratio and daily progress. Lead activity, critical path and construction period will be taken cared to determine the tentative construction schedule.

(1) Commencement date of construction

Commencement date of the work of the 1st Phase has the following conditions due to the relation with the CFPP project.

- Reclamation works of the 1st Phase shall commence after completion of reclamation works of the CFPP project, which is expected in the beginning of 2021. It is because produced and stocked soil by the CFPP project will be used for the reclamation works of the CFPP projects and surplus soil will be used for the project.
- Marine works such as dredging and berth construction shall commence after completion of dredging works by CFPP project, which is expected in the middle of 2021. It is because channel dredged by the CFPP project will be used for access and material transportation of the works. Adding to that, berth and trestle will be constructed in the area, which is dredged by the CFPP project.

Commencement date of the 1st Phase shall be determined based on its required period of preparation works and above condition.

Commencement date of the 2nd Phase is determined by estimated construction period and the target date of opening operation.

(2) Work quantity of each facility

Work quantity is calculated based on the preliminary design. Estimated work quantities are shown in the tentative construction schedule.

(3) Work activity ratio

The following work activity ratios will be applied in consideration of the site condition such as climate, wind, wave, and social condition.

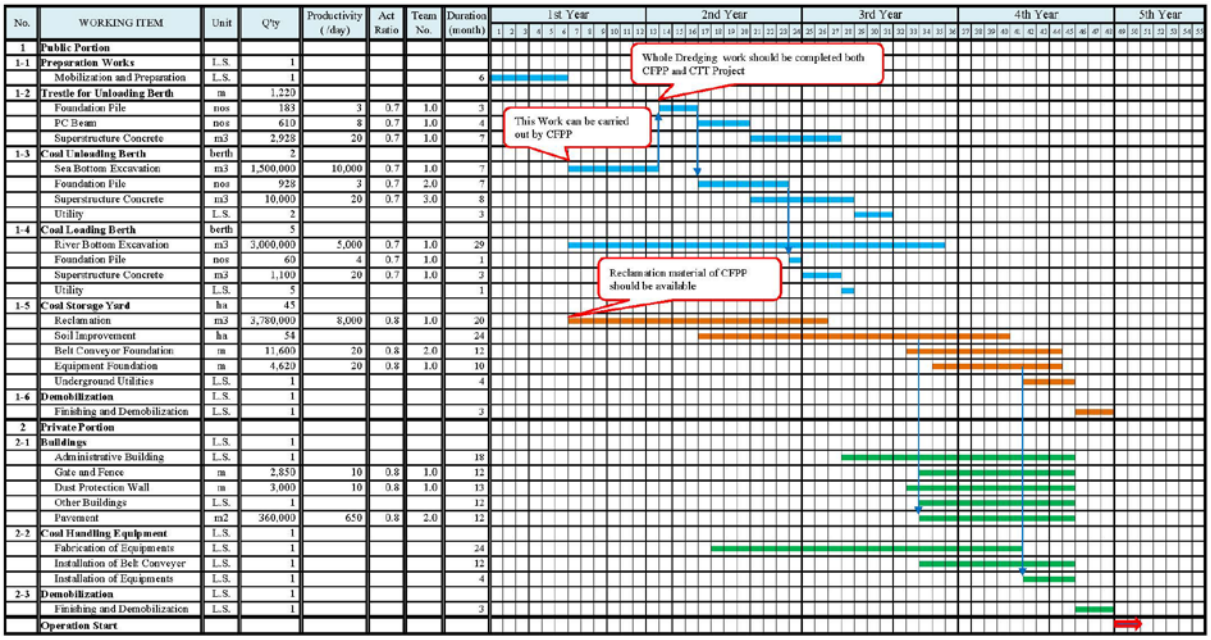
Table 6.1.7 Applied Activity Ratio

No.	Work Item	Applied Activity Ratio
1	Offshore works	0.7
2	Onshore works	0.8
3	Fabrication works	0.9
4	Other works	0.8

Source: JICA Study Team

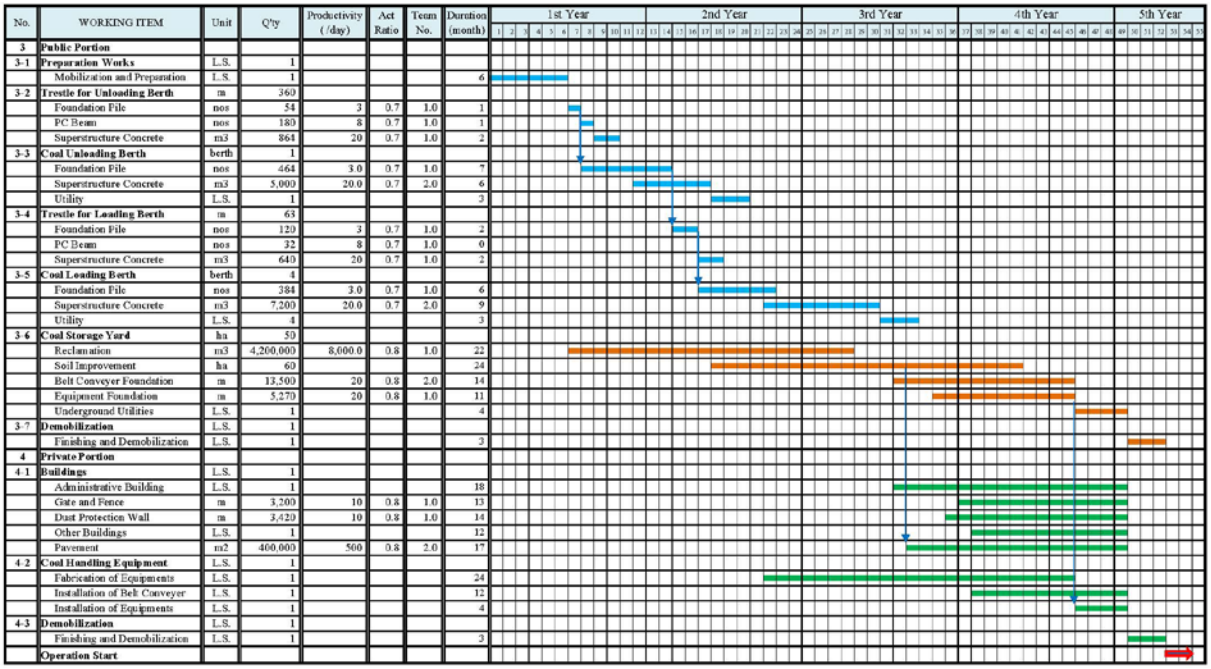
(4) Tentative construction schedule

Tentative construction schedule (1st Phase and 2nd Phase) calculated by the work quantity, activity ratio and assumed daily progress is shown in Figure 6.1.3 and Figure 6.1.4.



Source: JICA Study Team

Figure 6.1.3 Tentative Construction Schedule of the 1st Phase



No.	WORKING ITEM	Unit	Q'ty	Productivity (/day)	Act Ratio	Team No.	Duration (month)
3	**Public Portion**						
3-1	**Preparation Works**	L.S.	1				
	Mobilization and Preparation	L.S.	1				6
3-2	**Trestle for Unloading Berth**	m	360				
	Foundation File	nos	54	3	0.7	1.0	1
	PC Beam	nos	180	8	0.7	1.0	1
	Superstructure Concrete	m3	864	20	0.7	1.0	2
3-3	**Coal Unloading Berth**	berth	1				
	Foundation File	nos	464	3.0	0.7	1.0	7
	Superstructure Concrete	m3	5,000	20.0	0.7	2.0	6
	Utility	L.S.	1				3
3-4	**Trestle for Loading Berth**	m	63				
	Foundation File	nos	120	3	0.7	1.0	2
	PC Beam	nos	32	8	0.7	1.0	0
	Superstructure Concrete	m3	640	20	0.7	1.0	2
3-5	**Coal Loading Berth**	berth	4				
	Foundation File	nos	384	3.0	0.7	1.0	6
	Superstructure Concrete	m3	7,200	20.0	0.7	2.0	9
	Utility	L.S.	4				3
3-6	**Coal Storage Yard**	ha	59				
	Reclamation	m3	4,200,000	8,000.0	0.8	1.0	22
	Soil Improvement	ha	60				24
	Belt Conveyer Foundation	m	13,500	20	0.8	2.0	14
	Equipment Foundation	m	5,270	20	0.8	1.0	11
	Underground Utilities	L.S.	1				4
3-7	**Demobilization**	L.S.	1				
	Finishing and Demobilization	L.S.	1				3
4	**Private Portion**						
4-1	**Buildings**	L.S.	1				
	Administrative Building	L.S.	1				18
	Gate and Fence	m	3,200	10	0.8	1.0	13
	Dust Protection Wall	m	3,420	10	0.8	1.0	14
	Other Buildings	L.S.	1				12
	Pavement	m2	400,000	500	0.8	2.0	17
4-2	**Coal Handling Equipment**	L.S.	1				
	Fabrication of Equipments	L.S.	1				24
	Installation of Belt Conveyer	L.S.	1				12
	Installation of Equipments	L.S.	1				4
4-3	**Demobilization**	L.S.	1				
	Finishing and Demobilization	L.S.	1				3
	Operation Start						

Source: JICA Study Team

Figure 6.1.4 Tentative Construction Schedule of the 2nd Phase

(5) Tentative project schedule

Considering the implementation plan of the CTT and the construction schedule of each phase, tentative project schedule is estimated as shown in Figure 6.1.5.

This information includes trade secrets.

Source: JICA Study Team

Figure 6.1.5 Tentative Project Schedule

6.1.7. Construction Safety

Safety in any Project is the most important and serious matter for all of the concerned organizations and individuals involved. Important matters for the Safety Control are “To evaluate Safety Risk” and “To take counter measurements against the Safety Risk”. In this Study, “Safety Risk Assessment” is recommended to evaluate the Safety Risk.

Important actions to conduct the Safety Risk Assessment and recommended actions for safety control are mentioned in this section.

(1) Important actions to conduct the Safety Risk Assessment

- Possible safety risks shall be listed up.
- Safety risk shall be evaluated based on the multiple value of possibility of accident by scale of damage by the accident.
- Safety risk with high score will be determined as the important safety risk to be monitored and necessary countermeasures shall be taken.
- Detailed factors, which make the risk realise and necessary countermeasures to avoid these factors shall be analysed.
- Safety Risk Assessment shall be reviewed and revised as necessary.

(2) Recommended safety measures at the site

- Safety officer will be assigned (Safety organisation).
- Safety fence, safety path, safety stage will be installed (Safety facilities).
- Helmet, safety boots, safety glove will be used (PPG).
- Safety information should be shared by every related person (Safety meeting).
- Third party should check safety management at the site (Safety patrol).
- Near-miss study and case-study should be carried out (Safety training).
- Efficient measures in case accident happens (Emergency network and emergency plan).

6.2. Terminal Management Organisation

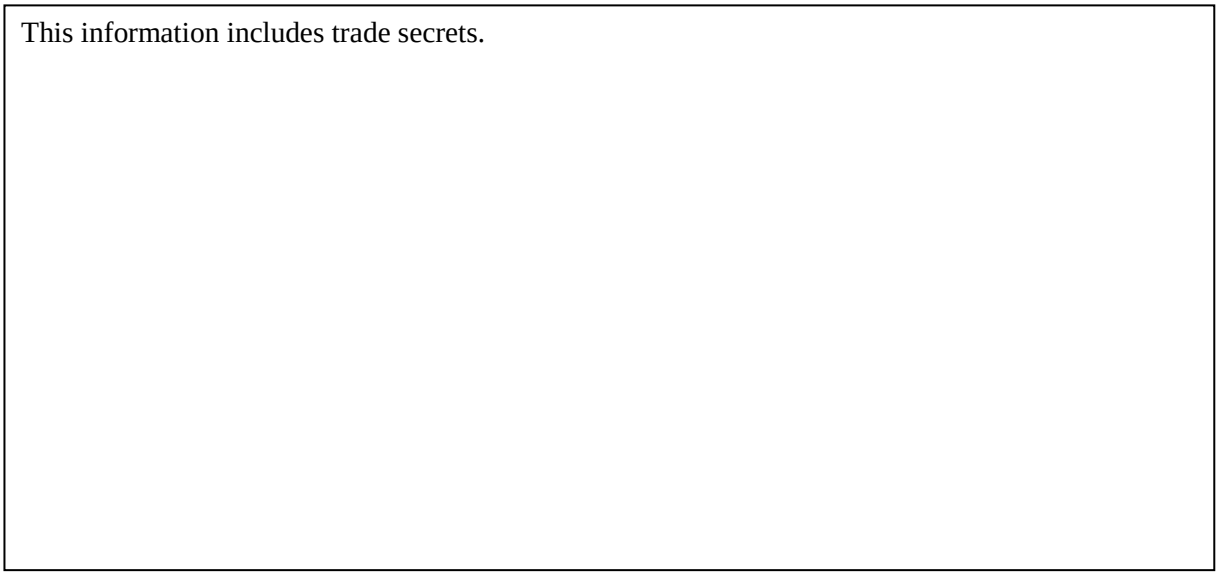
In order to make the project successful, it is important to clearly obtain project risk assignment between the government and the private sector. For this reason, it is expected that the lower part of infrastructure for unloading berth, loading berth, coal stock yard will be applied with Japanese official development assistance (ODA) as managed by the Bangladesh government, and that for the CTT project including the upper part of infrastructure will be invested and operated by the private sector. It is also expected that the private sector can obtain enough profit for promoting the project.

It is necessary for the CTT project, that a company manages the whole coal terminal operation of ship entry into port, coal unloading, conveyance to stock yard, coal storage control, loading coal to

conveyer for delivery, and loading coal to barge for secondary transportation, in order to satisfy the users' demand in timely manner.

For the CTT project, it is desirable that a company participating in management of coal terminal, a company with experience in coal sale and transportation in Bangladesh, and a company related to power generation in Bangladesh, etc., take part as equity participants, concentrate on know-how of each company, and be in charge of corporate management. The Special Purpose Company (SPC), in which a Japanese company and Bangladesh firms invest in, will perform the construction management, and operation and maintenance (O/M) of the coal terminal.

About the performance of each work, it is expected that capable companies will be selected for each work and the work will be performed under subcontract arrangement. For the organisation of SPC, the scheme shown in Figure 6.2.1 is reviewed. Manpower planning for SPC and the expected staff required for each work is described below.



Source: JICA Study Team

Figure 6.2.1 Relation of SPC and Other Related Organisations and Firms

(1) It is assumed to place three sections, namely, General-affairs Accounting Department, Business Department, and Facilities Department, under the president/chief executive officer (CEO) and a vice president/chief financial officer (CFO), as the management organisation of SPC. In order to accumulate and share know-how of the whole management of CTT, a close liaison mechanism amongst the business departments and O/M management persons in charge is important. It is assumed that subcontractors will be used for the operation of unloading, coal stockyard and loading. It is expected that the staff of SPC will understand the whole project, lead the management of operation, and improve such if needed. For this reason, acquisition of know-how on the existing CTT becomes indispensable in this business promotion in Bangladesh. It is very important to train specialists on CTT operation in Bangladesh by the consultant with know-how

on handling of imported coal and extensive experience in operation of a Japanese CTT, or to dispatch Bangladesh staff to a CTT in Japan for training.

1) General-affairs Accounting Department

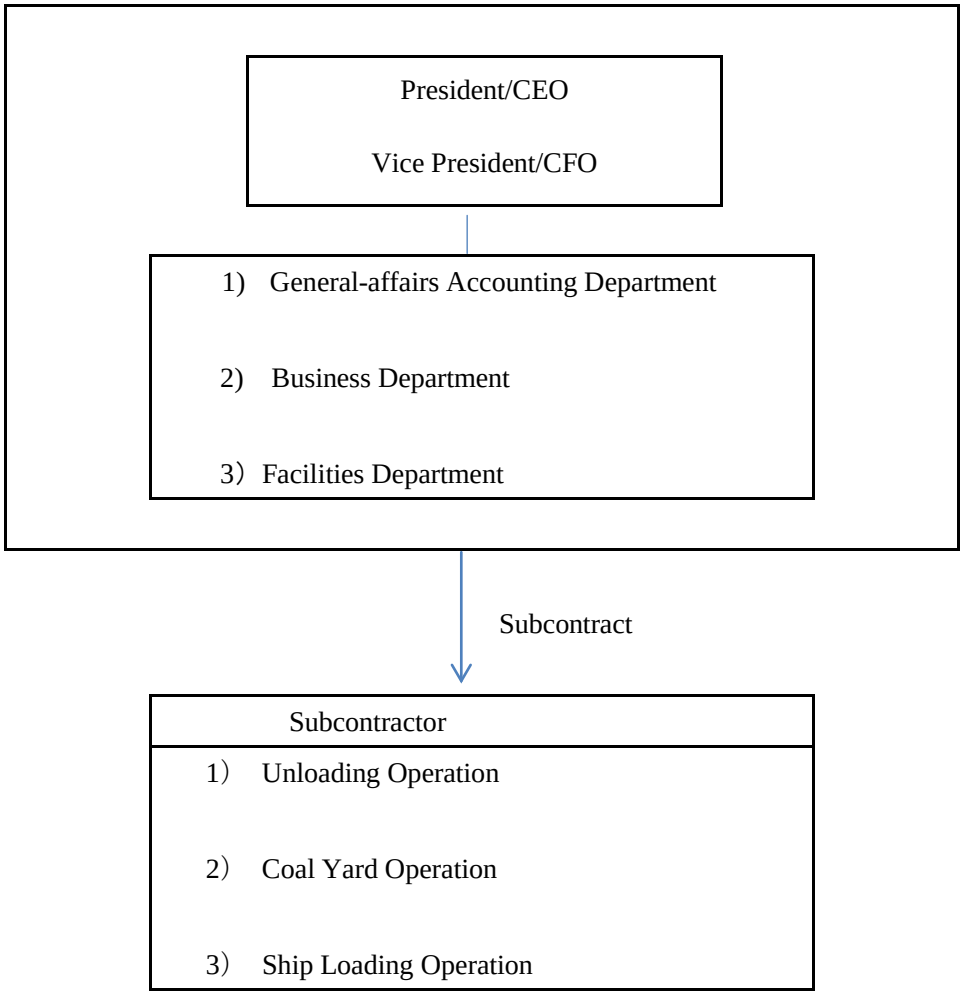
Responsible for general affairs relation, personnel relation, and accounting.

2) Business Department

Responsible for storage and delivery, shipping schedule management, inventory control, subcontractor management, and business development

3) Facilities Department

Responsible for construction, O&M of facilities, and IT-related works.



Source: JICA Study Team

Chart 6.1.2 SPC Organisation and Subcontractor

(2) The General-affairs Accounting Department performs general-affairs financial operation, and contract management of subcontracted companies.

(3) The Business Department performs storage and delivery, and inventory control for each customer, shipping schedule management of primary and secondary transport, management of subcontractors who perform the operation of unloading, yard and ship loading, fulfillment of contracts for customers, and business development. In order to grasp and share each customer's stock status and storage and delivery schedule timely, it is important to establish a suitable operation system.

1) Receipt and Delivery

For receipt and delivery operation, it is important to manage the shipping schedule, select the suitable facilities taking into account the efficiency of actual operation, operate them properly, and provide enough trainings for operators as mentioned later.

2) Yard Operation

For storage, operation taking account operational efficiency, safety, and attention to environmental aspects are important. As there will be several customers for this project and one customer will be using some kind of coal, it is necessary to make an inventory schedule of effective receipt and delivery without having to wrongly mix coal. As the imported sub-bituminous coal for this project is different from anthracite coal which has been used in Bangladesh and has the nature of spontaneous combustion during long periods of storage, it is very important to avoid the occurrence of spontaneous combustion for storage management with sufficient knowledge. In order to avoid generation of heat, temperature control, spraying of water at appropriate areas, and taking weather conditions and coal specifications into consideration must be done. In addition to those, in case when temperature is high, applying of press on coal, stock location change, spraying of water and pouring water must be done. It achieves a higher efficiency of operation and safety by maintaining a suitable shape of coal that can avoid disruption of coal pail by wind and rain. The effective use of limited storage space is also required. It is also necessary to consider environmental aspects by installing dust fences to suppress particulate scattering of coal, and recovery and recycle treatment facility of rain in the yard.

(4) For the construction stage, the Facilities Department will select, order, and install equipment that can satisfy the expected orders and demand of customers. After commencement of operation, the department will prepare the schedule and manage operation and manage O/M.

1) For the construction stage, enough training of staff operating the equipment or workers will be provided before the start of CTT operation. It will be also investigated to carry out the training through cooperation with an existing coal terminal in Japan.

2) Operation of facilities is based on three shifts and for 24 hours. The managers are allocated with main equipment in order to perform proper work management. The work will be conducted after making the work plan in advance, considering the vessel, schedule for receiving and delivering coal.

3) For CTT equipment, unloading equipment of coal, belt conveyor from berth to coal stock yard, belt conveyor in stock yard, and stacker (for stacking coal), reclaimer (for loading coal to conveyor) and feeding conveyor to a berth and a ship loader (for loading coal to barge) are needed. Taking into account the users' demand, the space of the coal stock yard and the number of equipment will be selected, and the equipment will be installed.

   In order to establish a highly-efficient management organisation, it is important to hear the opinions of users and the personnel of concerned companies, and to reflect the results of hearing at the planning stage of equipment installation.

4) It is required that these facilities are stabilised in order to perform stable operation of unloading, coal stock, and loading, for users. In order to satisfy this function, it is necessary to always maintain equipment operation in a good state. As equipment has the risk of breaking down, it is important to choose a suitable number of equipment so that operation can be complemented by other sound equipment at the time of failure. Maintenance will be done after planning both annual and middle-term maintenance. The necessary replacement parts will be purchased at the required time, and maintenance will be performed so that the service to customers may not be affected. IT apparatus-related installation, O/M will be conducted appropriately. Information control of customers, CTT, and equipment data is performed properly.

   i) Repair will be done suitably, looking at the operation condition of the equipment before commencement of daily works and also under operation. It is very important to also carry out preventive maintenance and a periodic check in order to secure the function of equipment.
      Check and repair are planned to be carried out so that the actual operation of coal handling may not be affected.
   ii) Parts with the possibility of failure should be equipped with replacement parts, and can be exchanged promptly at the time of failure. Since there are some which require a long time for delivery, advance purchase and storage of replacement parts are carried out appropriately.
      Looking for cooperation with the maker side, it is necessary to prepare the system which can perform failure correspondence on a 24-hour basis. Furthermore, it is also important to select a maker who can respond and accepts such users' request.
   iii) Efficient maintenance is carried out and it would be better to take into consideration excessive repair works and avoid it to save on maintenance costs. For example, it would be possible to simplify the maintenance method by reducing the frequency of check and maintenance of equipment that has lower influence on terminal operation and on failure of other facilities. It is

also important to set up the period of the first stage, the middle, and the second half based on the lapsed time from installation, and to adopt a maintenance management method suitable for each period.

iv) For failed parts, the cause of failure will be analysed, and check up to discover failure at an early stage and preventive maintenance will be applied. It is also important to propagate this approach to similar equipment to lower the rate of failure.

5) In case failure of equipment occurs and coal delivery is delayed, it is desirable to stock in a power station the minimum amount of coal to cover the user demand until such time that the failed equipment is repaired. Usually, in case there are replacement parts, the failure would be fixed and operation could restart in about one week or longer. A suitable amount of stock should be prepared taking into account the situation in Bangladesh.

6) It is required to carry out terminal management after mastering special knowledge and skill on such. For this reason, close and positive liaison mechanism is built between makers and terminal operator, and it is also important at failure time of equipment to combine the method of agreement for the reservation of replacement parts and on-call contract for failure correspondence which receives the dispatch of a specialist on a 24-hour basis.

7) In failure developmental time, a terminal operator should understand the facts quickly and correctly and make judgment to minimise influence on terminal operation. When a phenomenon of failure is derived, it is required to take into consideration the influence on users' demand, give a role to operators of facilities and maker staff, and judge what function is suspended and substituted with what, and by when, and how the failed equipment will restart. The complement organisation for assumed failure and trouble will be trained before the start-up of terminal, and the possibility of problem will be also actualised. From this training, the effect for minimising the influence of a trouble under actual terminal operation could be expected.

(5) The education of workers is important for all jobs for project operation. Regarding such education, there is a method for understanding the equipment well through O&M management training by the maker, on-site inspection during construction, and O&M management manuals. Moreover, operation survey or training for coal handling at another coal centre or power generation plant may be utilised. It is considered to use the support of a consultant with abundant management experience in a coal centre, from the test run of facilities to the beginning of actual terminal operation for smooth start-up.

It is also important to utilise IT systems in managing information including information on operation, maintenance plan, history, and analyse such information rationally and utilise them in order to perform more efficient O&M management.

6.3. Running Cost of CTT Operation

(1) Personnel Expenses

1) Number of Employees

The required number of employees is calculated based on coal demand as referred to in Section 4 and 5. It is divided into direct labor cost and indirect labor cost.

The number of direct labour is calculated based on the hearing information from existing CTTs in Japan, and the required number of equipment to be installed in each phase.

The number of indirect labour is calculated based on hearing information from existing CTTs in Japan and taking the volume of handling coal into consideration.

2) Unit Cost of Personnel Expenses

Unit cost of personnel expenses are calculated referring to the minimum wage in Bangladesh, which is stipulated in the Bangladesh Labor Law 2006 and information from the Japan External Trade Organization (JETRO), and hearing information through a local study.

(2) Utilities Expenses

1) Usage of Electricity

The usage of electricity is calculated by the required amount of electricity consumption of equipment to be installed in each phase.

2) Electricity Cost

Electricity costs, as shown in Table 6.3.1 below, are calculated based on the tariff stipulated by the Bangladesh Energy Regulatory Commission (BERC).

Table 6.3.1 Estimated Electricity Costs

Type	Price (BDT/kWh)
Commercial & Office	9.58
Medium Voltage User (11kV)	7.32
High Voltage User (33kV)	7.20
Very High Voltage User (132kV)	6.96

Source：Bangladesh Energy Regulatory Commission (BERC)

(3) Water Charge

The water charges are stipulated by the Dhaka Water Supply and Sewerage Authority (WASA).

Table 6.3.2 Water Charges

Type	Price (BDT/m3)
Industrial / Commercial	24.44
Retail / General Public	7.33

Source：Dhaka Water Supply and Sewerage Authority (WASA)

(4) Depreciation Cost

Useful life is based on discussion with the local accounting firm as shown in the table below.

Table 6.3.3 Depreciation Period

Main Equipments:	**Item**	**Depreciation period**
Unloader	B-22	20 years
Belt Conveyor	B-18	12 years
Stacker-Reclaimer	B-18	12 years
Ship-Loader	B-22	20 years
Handling Machinery:		
Wheel Loader	D-7	10 years
Buldozer	D-7	10 years
Truck	D-7	10 years
Power Supply & Control System		
Electricity Supply System for unloader	A-3	15 years
Central Control System for unloader	A-3	15 years
Environmental Facilities:		
Dustproof Fence	I	25 years
Drain Water Treatment Facility:	B-18	12 years

Source: JICA Study Team

(5) Maintenance Cost for Coal Handling Equipment

It is assumed that 3% of purchased cost is the maintenance cost for coal handling equipment per year according to hearing information from equipment suppliers.

(6) Insurance Cost

This information includes trade secrets.

This information includes trade secrets.

(7) Land Usage Fee

1) The lower infrastructure should be prepared by the Bangladesh government. Otherwise this project will not be feasible for private investors. Therefore, lower infrastructure is prepared and owned by the Bangladesh government, and not by SPC.

This information includes trade secrets.

3) Assumed Terms and Conditions of JICA ODA Loans

i) Terms and conditions: For least developed countries (LDC) / Low-income countries
ii) Interest rate: 0.01%
iii) Repayment period: 40 years (Grace period is 10 years.)

This information includes trade secrets.

(8) Maintenance Cost for the Lower Infrastructure

The lower infrastructure is supposed to be owned by the Bangladeshi government; however, the JICA Study Team assumed that 100% of the maintenance cost during the project term is borne by SPC, instead of the Bangladeshi government.

(9) Other Expenses

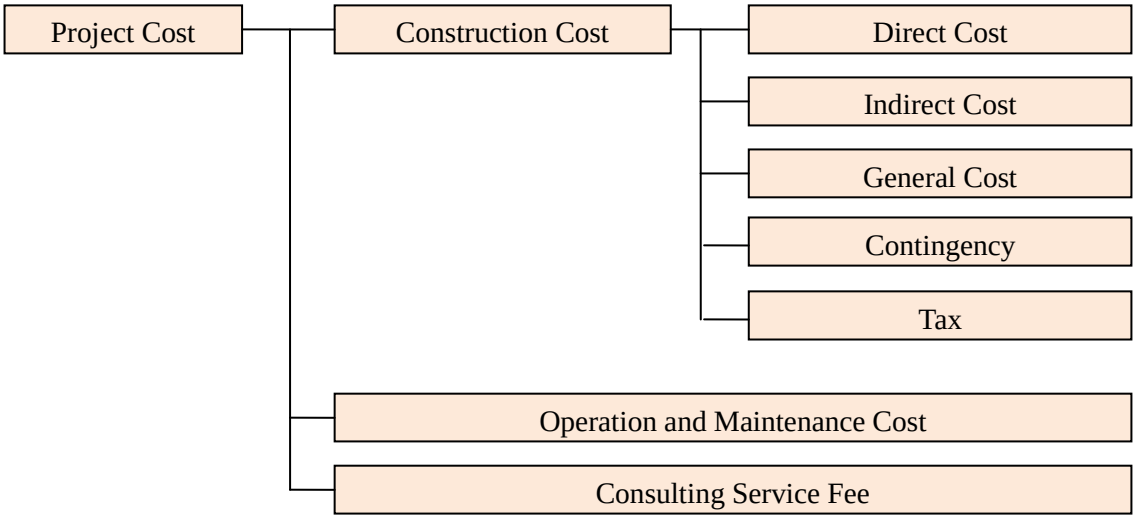
The JICA Study Team estimated other costs such as incorporation fee, training fee, waste liquid treatment cost, security cost, consumable goods expenses, and cost for consulting services from the existing CTT, based on the hearing information.

6.4. Project Cost Estimation

6.4.1. General Description

Construction cost and maintenance/operation cost will be studied and estimated in this section.

Generally, project cost consists of construction cost, operation/maintenance cost and consulting service fee as shown in Figure 6.4.1. The construction cost consists of direct cost, indirect cost and general cost. Direct cost consists of material cost, equipment cost and manpower cost. Normally, indirect cost and general cost are shown as percentage of the direct cost.



Source: JICA Study Team

Figure 6.4.1 Proportion of the Project Cost

6.4.2. General Conditions

The following are the general conditions that will be applied to the estimated project cost.

- Normal market price at the project site will be applied to unit price.
- Price fluctuation will not be considered in this section.
- Interest of the rent money will not be considered in this section.
- Unit prices of the procurement of the coal handling equipment will include indirect cost and general cost.
- The consultant's service consists of the design work, tender assistance and the construction supervision.
- Consulting service and construction works will be carried out by the experienced parties which have appropriate technical skill and experience.
- Normal and reasonable execution method and construction schedule as mentioned in Section 6.1 of this report will be applied.
- Applied exchange rate : JPY 120 = USD 1 = BDT 78 (as of October 2015)

6.4.3. Construction Cost

Construction cost will be estimated based on the work quantity and unit price. In this section, construction cost of each stage will be estimated.

1) Quantity of facilities

Facility name, quantity and outline of the work items including buildings to be constructed in the CTT and the coal handling equipment to be procured in the project are summarised in Table 6.4.1 and Table 6.4.2.

Table 6.4.1 Outline of the Facilities to be constructed in the Public Portion

No.	Facility's Name	Unit	Quantity	
			1st Phase	2nd Phase
1	Construction of the Coal Unloading Berth	berth	2	1
2	Construction of the Coal Loading Berth	berth	0	4
3	Reclamation and Earth Works	ha	45	50

Source: JICA Study Team

Table 6.4.2 Outline of the Facilities to be Constructed by Private Portion

No.	Facility's Name	Unit	Quantity	
			1st Phase	2nd Phase
	Building and Civil Works			
1	Pavement	ha	36	40
2	Drainage and Utilities	L.S	1.0	1.0
3	Administration Building	L.S	1.0	1.0
4	Maintenance Shop	L.S	1.0	1.0
5	Sub-station	L.S	1.0	1.0
6	Dust Protection Wall	km	3.0	3.4
7	Security Fence and Gate	km	2.9	3.2
	Coal Handling Equipments			
1	Coal Unloaded Machine	Set	4	2
2	Coal Loading Machine	Set	5	4
3	Stacker Reclaimer	Set	6	7
4	Belt Conveyor	km	12.8	14.9

Source: JICA Study Team

2) Work quantities of each facility

Required work quantities of each facility will be calculated based on the preliminary design as mentioned in Section 5 of this report. Applied work quantities are shown in the cost calculation sheet.

3) Unit price of the work

The JICA Study Team studied normal market price of the main materials, equipment, manpower, and coal handling equipment at the site. These unit prices shown below are reference only and will be used in estimating the unit price of the works. Applied unit prices of the works are determined considering the social condition such as balance of the supply and demand.

i) Unit price of main material

Studied unit price of main materials are shown in Table 6.4.3. These unit prices include transportation fee to the site and other related necessary cost.

Table 6.4.3 Unit Price of Main Materials

This information includes trade secrets.

Source: JICA Study Team

ii) Unit price of main equipment

Studied unit prices of main used equipment are shown in Table 6.4.4. These unit prices include the fuel fee, operator's cost, mobilisation and demobilisation cost, maintenance cost, and other related necessary cost.

Table 6.4.4 Unit Price of Main Equipment

This information includes trade secrets.

Source: JICA Study Team

iii) Unit Price of Manpower

The studied unit prices of manpower are shown in Table 6.4.5. These unit prices include social insurance, allowances and management cost of the contractor, and other related necessary cost.

Table 6.4.5 Unit Price of Manpower

This information includes trade secrets.

Source: JICA Study Team

4) Coal handling equipment

Coal handling equipment will be purchased from international supplier considering their quality and price. In this study, tentative cost will be applied to the estimated project cost.

Applied unit prices of coal handling equipment are shown in Table 6.4.6. These unit prices include transportation fee, installation fee, indirect cost, general cost, and design fee.

Table 6.4.6 Unit Price of Coal Handling Equipment

This information includes trade secrets.

Source: JICA Study Team

5) Construction cost

Construction cost is estimated based on the above work quantities and assumed unit prices. Estimated construction cost of each phase and each portion is shown below.

i) Direct Cost of the 1st Phase

Table 6.4.7 Estimated Direct Cost of the 1st Phase (Public Portion)

This information includes trade secrets.

Source: JICA Study Team

Table 6.4.8 Estimated Direct Cost of the 1st Phase (Private Portion)

This information includes trade secrets.

Source: JICA Study Team

ii) Direct Cost of the 2nd Stage

Table 6.4.9 Estimated Direct Cost of the 2nd Phase (Public Portion)

This information includes trade secrets.

Source: JICA Study Team

Table 6.4.10 Estimated Direct Cost of the 2nd Phase (Private Portion)

This information includes trade secrets.

Source: JICA Study Team

iii) Indirect Cost

Indirect cost consists of common temporary cost and site management cost. The common temporary cost shows costs of temporary works, fence and gate, access road, common equipment. The site management cost shows the cost of management staff, office operation, accommodation, and transportation.

According to the experience of the JICA Study Team in South-East Asia, 6.0% of direct cost will be applied to the common temporary cost and 14.0% of direct cost will be applied to the site management cost in this study.

iv) General Cost

General cost shows necessary cost of headquarter and/or branch of the contractor.

According to the instruction of JICA, 5.0% of direct cost will be applied to the general cost in this study.

v) Contingency

Considering the risks that stocked soil of the CFPP project is not enough relocation of residence and diversion of surrounding roads, 10% of the total of the direct cost, indirect cost and general cost are applied tentatively.

vi) Tax

Fifteen percent of the total of the direct cost, indirect cost, general cost, and contingency are applied to the necessary tax.

vii) Estimated Construction Cost

Estimated construction cost of each stage including direct cost, indirect, general cost, contingency, and tax is shown in Table 6.4.11 below.

Table 6.4.11 Estimated Construction Cost

This information includes trade secrets.

Source: JICA Study Team

6.4.4. O/M Cost

O/M cost, which occurred after the commencement of operation will be estimated in this section. This cost will be shown as an annual cost of each phase of the project. Contingency will not be considered for the O/M cost in this study.

1) Work item and quantity of the O/M cost

Explanation, quantity, unit price and annual cost of each O/M cost will be estimated below.

i) Maintenance of the constructed facilities and coal handling equipment

According to the hearing results to existing terminal operators in Asia and experience of the JICA Study Team, expected annual maintenance cost of the civil constructed facilities is calculated as 0.5% of direct construction cost except dredging works. And 1.0% of the direct construction cost for the building works, 1.5% of the purchase/installation cost for the coal handling equipment will be applied to the expected annual maintenance cost. Calculated maintenance cost of the construction facilities are shown in Table 6.4.12 below.

Table 6.4.12 Maintenance Cost of the constructed facilities

This information includes trade secrets.

Source: JICA Study Team

ii) Operation Cost

Operation cost includes manpower cost, power and water supply cost, fuel cost, and communication cost. Expected annual operation cost is shown in Chapter 6.2.

6.4.5. Consulting Service Fee

Consultant service consists of design work and construction supervision work. According to the current records of similar construction projects in South-East Asia, the following consulting service fees which include necessary tax will be considered for this project.

Table 6.4.13 Summary of the Expected Consulting Service Fees (Unit: million USD)

This information includes trade secrets.

Source: JICA Study Team

6.4.6. Disbursement Schedule

Tentative disbursement schedule estimated in this section is shown in Table 6.4.14

Table 6.4.14 Disbursement Schedule

Year	Public Portion	Private Portion
2015	Consulting fee (100% of F/S)	Consulting fee (100% of F/S)
2016	EIA study fee	
2018	Consulting fee (20% of D/D)	
2019	Consulting fee (80% of D/D) Consulting fee (20% of Tender Assistance)	Consulting fee (100% of D/D)
2020	Consulting fee (80% of Tender Assistance)	Consulting fee (100% of Tender Assistance)
2021	Construction cost (25% of 1st Phase) Consulting fee (25% of C/S 1st Phase)	
2022	Construction cost (25% of 1st Phase) Consulting fee (25% of C/S 1st Phase)	Construction cost (20% of 1st Phase) Consulting fee (20% of C/S 1st Phase)
2023	Construction cost (25% of 1st Phase) Consulting fee (25% of C/S 1st Phase)	Construction cost (40% of 1st Phase) Consulting fee (40% of C/S 1st Phase)
2024	Construction cost (25% of 1st Phase) Consulting fee (25% of C/S 1st Phase)	Construction cost (40% of 1st Phase) Consulting fee (40% of C/S 2nd stage)
2025	Construction cost (20% of 2nd Phase) Consulting fee (20% of C/S 2nd Phase)	O/M cost of 1st Phase
2026	Construction cost (20% of 2nd Phase) Consulting fee (20% of C/S 2nd Phase)	O/M cost of 1st Phase
2027	Construction cost (20% of 2nd Phase) Consulting fee (20% of C/S 2nd Phase)	Construction cost (40% of 2nd Phase) Consulting fee (40% of C/S 2nd Phase) O/M cost of 1st Phase
2028	Construction cost (20% of 2nd Phase) Consulting fee (20% of C/S 2nd Phase)	Construction cost (40% of 2nd Phase) Consulting fee (40% of C/S 2nd Phase) O/M cost of 1st Phase
2029	Construction cost (20% of 2nd Phase) Consulting fee (20% of C/S 2nd Phase)	Construction cost (20% of 2nd Phase) Consulting fee (20% of C/S 2nd Phase) O/M cost of 1st Phase and 2nd Phase
2030-		O/M cost of 1st Phase and 2nd Phase

Source: JICA Study Team

6.5. Countermeasures for earlier Opening

At the stakeholder meeting at Dhaka in Dec, 2015, the GoB requested JICA Study Team to shorten the Project Schedule as much as possible and start operation by 2021. The JICA Study Team examined the possibility of earlier opening of CTT according to the request of the CPGCBL. The study results are shown below.

Recommended countermeasures are mentioned which consists of construction stage and preparation stage. Purpose of the following study in this section is earlier opening of CTT, so countermeasures for the 2nd Phase is not considered in this study.

Construction schedules and project schedule as results of the study shown in this section are earliest schedules and actual required time of opening CTT is not considered. Reasonable time of opening and actual possibility of recommended countermeasures shall be studied in the next stage. In this report, the project plan, in which all the proposed countermeasures are applied, is named Option Plan.

6.5.1. Proposed Measure at the Construction Stage

The JICA Study Team recommends the following countermeasures at the construction stage for earlier opening of CTT.

Table 6.5.1 Proposed measure at the construction stage

No.	Bottleneck of the Original Plan	Recommended Countermeasure
1	Only the selected dredged sand of the CFPP project shall be used for the reclamation works. Therefore, reclamation works of the CTT project cannot be commenced prior to completion of reclamation of the CFPP project.	Purchased sand shall be used for reclamation and soil improvement work together with the selected dredged sand of the CFPP project. It is not necessary to wait the completion of reclamation works of the CFPP. Also, necessary reclamation material shall be supplied by the CFPP project to the CTT project even when reclamation works of the CFPP project is ongoing. So daily progress of reclamation works will increase.
2	Marine works such as construction of coal unloading berth cannot be commenced prior to completion of dredging works of the CFPP project because disposing pipe and dredgers of the CFPP project will disturb the working area of the CTT project.	Dredging work of the CTT marine construction area shall be completed prior to commencement of the CTT marine construction works and discharging pipe of the CFPP project shall be laid out not to disturb the CTT marine construction works. So commencement of the CTT marine construction works will be able to commence earlier.
3	Reclamation works take long time because of its huge work quantities.	Elevation of the CTT shall be changed from +8.0 m to +5.0 m to reduce reclamation volume. So construction period of reclamation works will reduce.
4	Soil improvement works take long time because of its huge work quantities.	Construction of the 1st Phase shall separate the Initial Stage-1 and Initial Stage-2 so as the commencement and completion of the following works become earlier.

Source：JICA Study Team

When all the above countermeasures are possible and applied, a half area of the CTT will be possible to open after 36 months from the commencement of construction, which is 12 months shorter than that of the original plan. And construction of the CTT project will be possible to be commenced three months earlier than that of the original plan due to the arrangement of the supplying reclamation soil and limitation of working area of the marine works. It shows shortening the schedule for 15 months is possible.

6.5.2. Proposed Measure at the Preparation Stage

The JICA Study Team recommends the following countermeasures at the preparation stage for earlier opening of CTT.

Table 6.5.2 Proposed measure at the preparation stage

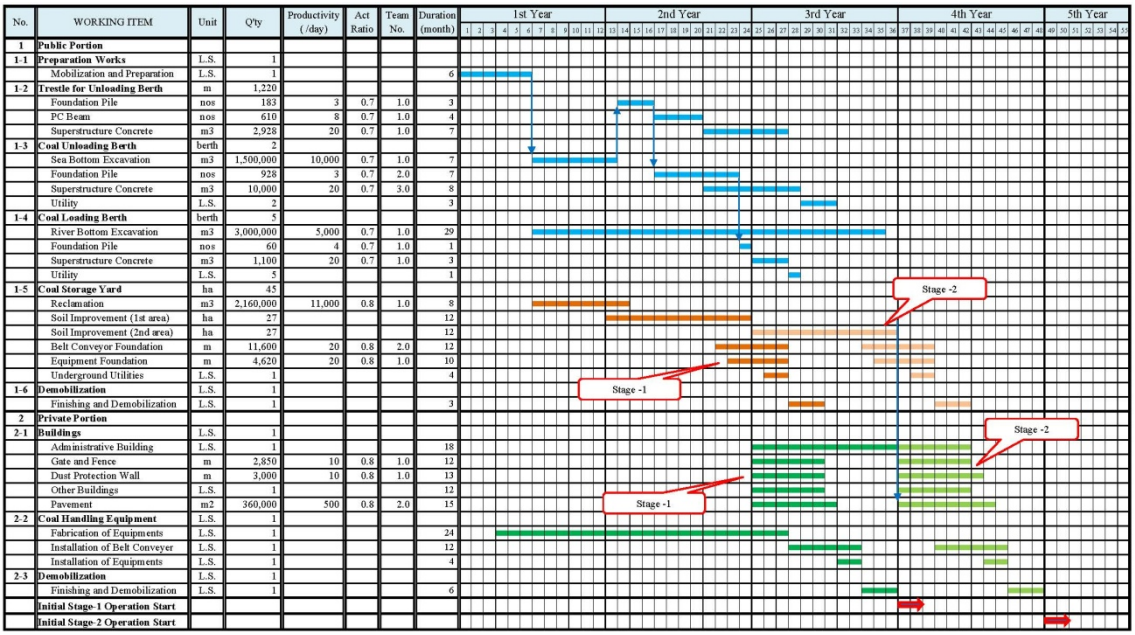
No.	Bottle neck of the original plan	Recommended counter measurement
1	Selection of the contractor takes one year.	The selection period of the Contractor may be shorten nine months if CPGCBL could prepare tender documents during detailed design work in paralell.

Source: JICA Study Team

When all the above countermeasure is possible and applied, the construction of the CTT project will be possible to be commenced three months earlier. However, the countermeasure at the preparation stage will not be effective when the countermeasures at the construction stage are not applied because construction of the CTT project should wait completion of dredging works and reclamation works of the CFPP project.

6.5.3. Construction Schedule of the Option Plan

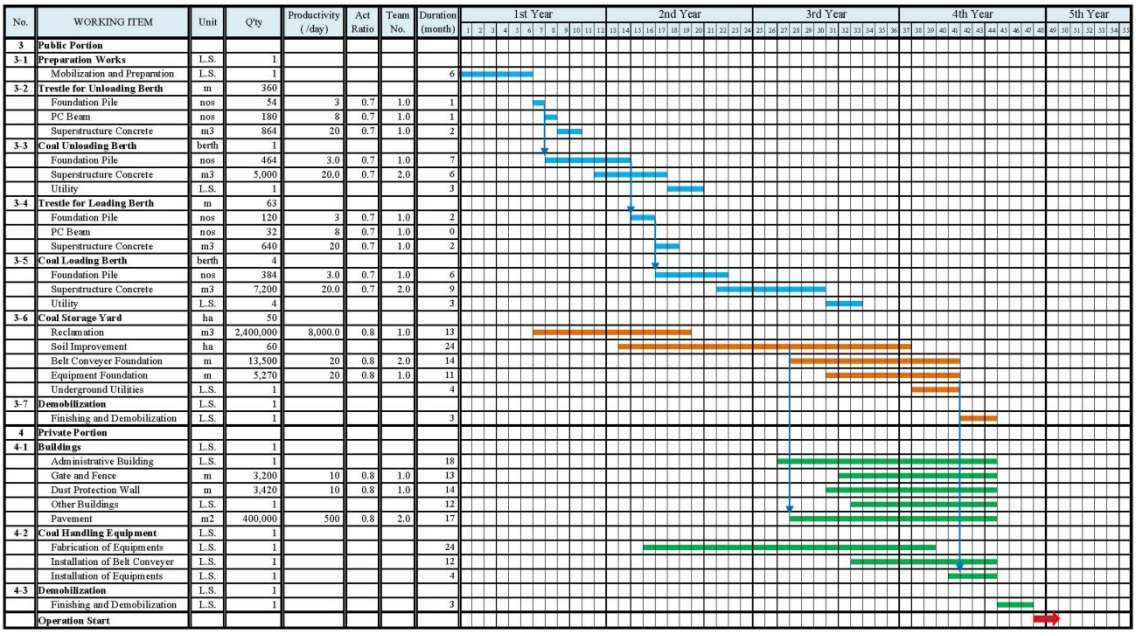
Revised construction schedule in which all the above countermeasures are applied is shown below. Total construction period of the 1st Phase is 48 months, which is same as the original plan but the construction of a half area will be completed 12 months earlier due to dividing 1st Phase to Stage-1 and Stage-2. Construction period of the 2nd Phase become 47 months, which is five months shorter against the original plan because reclamation volume become smaller due to change of its elevation from MSL+8 m to MSL+5 m.



No.	WORKING ITEM	Unit	Q'ty	Productivity (/day)	Act Ratio	Team No.	Duration (month)
1	**Public Portion**						
1-1	**Preparation Works**	L.S.	1				
	Mobilization and Preparation	L.S.	1				6
1-2	**Trestle for Unloading Berth**	m	1,220				
	Foundation Pile	nos	183	3	0.7	1.0	3
	PC Beam	nos	610	8	0.7	1.0	4
	Superstructure Concrete	m3	2,928	20	0.7	1.0	7
1-3	**Coal Unloading Berth**	berth	2				
	Sea Bottom Excavation	m3	1,500,000	10,000	0.7	1.0	7
	Foundation Pile	nos	928	3	0.7	2.0	7
	Superstructure Concrete	m3	10,000	20	0.7	3.0	8
	Utility	L.S.	2				3
1-4	**Coal Loading Berth**	berth	5				
	River Bottom Excavation	m3	3,000,000	5,000	0.7	1.0	29
	Foundation Pile	nos	60	4	0.7	1.0	1
	Superstructure Concrete	m3	1,100	20	0.7	1.0	3
	Utility	L.S.	5				1
1-5	**Coal Storage Yard**	ha	45				
	Reclamation	m3	2,160,000	11,000	0.8	1.0	8
	Soil Improvement (1st area)	ha	27				12
	Soil Improvement (2nd area)	ha	27				12
	Belt Conveyor Foundation	m	11,600	20	0.8	2.0	12
	Equipment Foundation	m	4,620	20	0.8	1.0	10
	Underground Utilities	L.S.	1				4
1-6	**Demobilization**	L.S.	1				
	Finishing and Demobilization	L.S.	1				3
2	**Private Portion**						
2-1	**Buildings**	L.S.	1				
	Administrative Building	L.S.	1				18
	Gate and Fence	m	2,850	10	0.8	1.0	12
	Dust Protection Wall	m	3,000	10	0.8	1.0	13
	Other Buildings	L.S.	1				12
	Pavement	m2	360,000	500	0.8	2.0	15
2-2	**Coal Handling Equipment**	L.S.	1				
	Fabrication of Equipments	L.S.	1				24
	Installation of Belt Conveyer	L.S.	1				12
	Installation of Equipments	L.S.	1				4
2-3	**Demobilization**	L.S.	1				
	Finishing and Demobilization	L.S.	1				6
	Initial Stage-1 Operation Start						
	Initial Stage-2 Operation Start						

Source: JICA Study Team

Figure 6.5.1 Tentative Construction Schedule of the 1st Phase (Option Plan)



No.	WORKING ITEM	Unit	Q'ty	Productivity (/day)	Act Ratio	Team No.	Duration (month)
3	**Public Portion**						
3-1	**Preparation Works**	L.S.	1				
	Mobilization and Preparation	L.S.	1				6
3-2	**Trestle for Unloading Berth**	m	360				
	Foundation Pile	nos	54	3	0.7	1.0	1
	PC Beam	nos	180	8	0.7	1.0	1
	Superstructure Concrete	m3	864	20	0.7	1.0	2
3-3	**Coal Unloading Berth**	berth	1				
	Foundation Pile	nos	464	3.0	0.7	1.0	7
	Superstructure Concrete	m3	5,000	20.0	0.7	2.0	6
	Utility	L.S.	1				3
3-4	**Trestle for Loading Berth**	m	63				
	Foundation Pile	nos	120	3	0.7	1.0	2
	PC Beam	nos	32	8	0.7	1.0	0
	Superstructure Concrete	m3	640	20	0.7	1.0	2
3-5	**Coal Loading Berth**	berth	4				
	Foundation Pile	nos	384	3.0	0.7	1.0	6
	Superstructure Concrete	m3	7,200	20.0	0.7	2.0	9
	Utility	L.S.	4				3
3-6	**Coal Storage Yard**	ha	50				
	Reclamation	m3	2,400,000	8,000.0	0.8	1.0	13
	Soil Improvement	ha	60				24
	Belt Conveyer Foundation	m	13,500	20	0.8	2.0	14
	Equipment Foundation	m	5,270	20	0.8	1.0	11
	Underground Utilities	L.S.	1				4
3-7	**Demobilization**	L.S.	1				
	Finishing and Demobilization	L.S.	1				3
4	**Private Portion**						
4-1	**Buildings**	L.S.	1				
	Administrative Building	L.S.	1				18
	Gate and Fence	m	3,200	10	0.8	1.0	13
	Dust Protection Wall	m	3,420	10	0.8	1.0	14
	Other Buildings	L.S.	1				12
	Pavement	m2	400,000	500	0.8	2.0	17
4-2	**Coal Handling Equipment**	L.S.	1				
	Fabrication of Equipments	L.S.	1				24
	Installation of Belt Conveyer	L.S.	1				12
	Installation of Equipments	L.S.	1				4
4-3	**Demobilization**	L.S.	1				
	Finishing and Demobilization	L.S.	1				3
	Operation Start						

Source: JICA Study Team

Figure 6.5.2 Tentative Construction Schedule of the 2nd Phase (Option Plan)

6.5.4. Project Schedule of the Option Plan

Revised project schedule in which all the above countermeasures are applied is shown in Figure 6.5.3 below. Opening date of the 2nd Phase is not revised from the original plan.

This information includes trade secrets.

Source: JICA Study Team

Figure 6.5.3 Tentative Project Schedule (Option Plan)

6.5.5. Soil Balance of the Option Plan

Revised soil balance in which all the above countermeasures are applied is shown in Table 6.5.3 below.

In this plan, only surplus selected dredged sand of the CFPP project will be used for reclamation works and disposed material of CFPP project is not required to be used.

Table 6.5.3 Soil Balance for Option Plan

No	Soil origins	1st Phase (million m3)	2nd Phase (million m3)	Total (million m3)
1	Necessary volume for reclamation	2.16	2.40	4.56
2	Available quantity of CFPP stockpile	5.23	3.07	5.23
3	Necessary volume to be purchased	0.00	0.00	0.00
4	Surplus volume (2-1)	3.07	0.67	0.67

Source: JICA Study Team

6.5.6. Construction Cost and Project Cost of the Option Plan

Estimated construction cost and maintenance cost in which all the above counter measurements are applied is shown below. In this plan, construction cost of public portion will be reduced due to the change of reclamation volume and construction cost of private portion will not be changed.

Table 6.5.4 Estimated Direct Cost of the 1st Phase (Option Plan Public Portion)

This information includes trade secrets.

Source: JICA Study Team

Table 6.5.5 Estimated Direct Cost of the 1st Phase (Option Plan Private Portion)

This information includes trade secrets.

Source: JICA Study Team

Table 6.5.6 Estimated Direct Cost of the 2nd Phase (Option Plan Public Portion)

This information includes trade secrets.

Source: JICA Study Team

Table 6.5.7 Estimated Direct Cost of the 2nd Phase (Option Plan Private Portion)

This information includes trade secrets.

Source: JICA Study Team

Table 6.5.8 Estimated Construction Cost (Option Plan)

This information includes trade secrets.

Source: JICA Study Team

Table 6.5.9 Estimated Maintenance Cost (Option Plan)

This information includes trade secrets.

Source: JICA Study Team

6.5.7. Disbursement Schedule of Alternative Plan

Tentative disbursement schedule in which Option Plan is applied is shown in Table 6.5.10 below.

Table 6.5.10 Disbursement Schedule of Option Plan

Year	Public Portion	Private Portion
2015	Consulting fee (100% of F/S)	Consulting fee (100% of F/S)
2016	EIA study fee	
2018	Consulting fee (25% of D/D)	
2019	Consulting fee (75% of D/D) Consulting fee (30% of Tender Assistance)	Consulting fee (100% of D/D)
2020	Consulting fee (70% of Tender Assistance) Construction cost (10% of 1st Phase) Consulting fee (10% of C/S 1st Phase)	Consulting fee (100% of Tender Assistance) Construction cost (5% of 1st Phase) Consulting fee (5% of C/S 1st Phase)
2021	Construction cost (30% of 1st Phase) Consulting fee (30% of C/S 1st Phase)	Construction cost (25% of 1st Phase) Consulting fee (25% of C/S 1st Phase)
2022	Construction cost (30% of 1st Phase1st Phase) Consulting fee (30% of C/S 1st Phase)	Construction cost (25% of 1st Phase) Consulting fee (25% of C/S 1st Phase)
2023	Construction cost (30% of 1st Phase) Consulting fee (30% of C/S e1st Phase)	Construction cost (25% of 1st Phase) Consulting fee (25% of C/S 1st Phase) O/M cost of 1st Phase
2024	(Maintenance Dredging)	Construction cost (20% of 1st Phase) Consulting fee (20% of C/S 1st Phase) O/M cost of 1st Phase
2025	Construction cost (10% of 2nd Phase) Consulting fee (10% of C/S 2nd Phase) (Maintenance Dredging)	O/M cost of 1st Phase
2026	Construction cost (25% of 2nd Phase) Consulting fee (25% of C/S 2nd Phase) (Maintenance Dredging)	Construction cost (10% of 2nd Phase) Consulting fee (10% of C/S 2nd Phase) O/M cost of 1st Phase
2027	Construction cost (25% of 2nd Phase) Consulting fee (25% of C/S 2nd Phase) (Maintenance Dredging)	Construction cost (40% of 2nd Phase) Consulting fee (40% of C/S 2nd Phase) O/M cost of 1st Phase
2028	Construction cost (25% of 2nd Phase) Consulting fee (25% of C/S 2nd Phase) (Maintenance Dredging)	Construction cost (40% of 2nd Phase) Consulting fee (40% of C/S 2nd Phase) O/M cost of 1st Phase
2029	Construction cost (15% of 2nd Phase) Consulting fee (15% of C/S 2nd Phase) (Maintenance Dredging)	Construction cost (10% of 2nd Phase) Consulting fee (10% of C/S 2nd Phase) O/M cost of 1st Phase and 2nd Phase
2030-	(Maintenance Dredging)	O/M cost of 1st Phase and 2nd Phase

Source: JICA Study Team

Chapter 7. Economic and Financial Analysis

7.1. Economic Analysis

7.1.1. Objective and Method of the Economic Analysis

(1) Objective

The purpose of this section is to evaluate the project from the viewpoint of the national economy. The economic analysis is carried out to study economic benefits as well as economic costs arising from the project, and to evaluate whether the benefits of the project exceed those that could be obtained from other investment opportunities in Bangladesh.

(2) Method

Economic analysis will be carried out by comparing the “with the project” to the “without the project” case. All the benefits and cost differences between the “with” case and “without” case will be calculated, and the economic internal rate of return (EIRR) will be used to evaluate and appraise the economic feasibility of the project. The EIRR is a discount rate which makes the costs and the benefits of the project during the project life equal.

7.1.2. Assumptions of Economic Analysis

(1) Base year

The “Base Year” here means the standard year in the estimation of costs and benefits. In this study, 2015 is set as the “Base Year”.

(2) Component of the development plan in the analysis

Main objective of this economic analysis is to evaluate the project, namely “Construction and Operation of Imported Coal Transshipment Terminal (CTT) Project in Matarbari Area.” The planned terminal will handle approximately 10.40 million tons (Mt) and 25.60 Mt imported coal during the 1st Phase (2025～2028) and 2nd Phase (2029~2054), respectively.

The scope of CTT’s business is unloading imported coal from the vessel, inventory control, and loading for a secondary transshipment to the CFPP.

The project includes dredging of the channel and basin up to -16 m, construction of a coal unloading berth, coal storage yard, and coal loading berth for a secondary transshipment to the CFPP, and installation of a coal unloader, ship loader, and belt conveyor as well as other related terminal facilities and systems (Project contents are detailed in Chapter 4 and Chapter 5). As to the secondary transshipment to CFPP, assumptions for each phase are as follows:

1st Phase： Belt conveyor system will be used for the CFPP planned to be developed within 10 km from the CTT.

2nd Phase： Small barges will be used for CFPP planned to be developed in a distant place from CTT. Barges used for secondary transshipment are assumed to be 5,000 DWT due to the limited water depth of the routes (Water depth of the routes are detailed in 4.1 of Chapter 4).

(3) Project life

The period of calculation (project life) in the economic analysis is assumed to be 25 years from the year 2029 when operation of the CTT in the 2nd Phase of the project is expected to commence.

(4) Foreign exchange rate

The exchange rates adopted for this analysis are the same as those adopted for the project cost estimation (refer to Chapter 6).

7.1.3. Project Case

(1) "With the Project" Case

In the "with the project" case, facilities such as the imported coal unloading berth capable of accommodating large vessels, coal loading berth for secondary transshipment and the coal storage yard will be constructed and coal handling equipment such as unloader/ship loader will also be installed for operation of the CTT.

(2) "Without the Project" Case

In the "without the project" case, the above mentioned facilities and equipment will not be installed; therefore, each CFPP shall be responsible for unloading coal from larger size vessels to small size vessels at offshore and receiving coal at CFPP. Crane barge is considered to be used for unloading at offshore and a breakwater also is considered necessary to ensure unloading works can be conducted during the monsoon season.

Unloading works at offshore are described in Rampal CFPP F/S Report as follows.

There is a deep sea area alongside of the Outer Bar, which is called the Akram Point where Panamax vessels are passable. Imported coal shall be unloaded from Panamax vessels to barges (5,000 DWT ~ 10,000 DWT) and transported to each CFPP.

Akram Point is situated offshore although it is located at the landside of the Outer Bar, therefore the decline in efficiency of coal unloading works is expected during monsoon and the capacity of coal

stockyard is designed for 90 days operation (additional space for coal stockyard sufficient for 180 days operation is secured)

In Bangladesh, prevailing wind direction is southerly to southwesterly from the months of May to September and the wave condition is severe. Therefore, without wave control facility such as a breakwater, working efficiency of coal unloading works inevitably declines during this season. Breakwater shall be constructed in order to make the water area calm to secure sufficient working efficiency during this season.

According to the F/S report of Rampal CFPP, large scale coal stockyard for long term operation is planned to be constructed within the CFPP compound, however, there is a possibility of spontaneous combustion in case of long term storage. Therefore, appropriate breakwater is introduced to secure working efficiency for unloading works. From October to April, sufficient working efficiency of unloading is secured even if no breakwater is provided.

The estimated main facilities and the estimated construction cost for "Without" case are shown in below.

Table 7.1.1 Estimated direct cost for main facilities of "without the project"

	Quantity	Million USD	Million USD
Breakwater (Depth -18m)	2.9 km	170	493
Floating Equipment (800t/h)	18 unit	15	270
Unloading Facilities at CFPPs (*including berth, unloader, trestle, administration building, etc)	6 unit	17	102
Handing Equipment at CFPPs	18 unit	6.4	116
Coal Stock Yard at CFPPs	90 ha	2.2	202

Source: JICA Study Team

7.1.4. Benefits of the Projects

(1) Estimation of Benefits

Cost reduction of secondary coal transport is a major component of the benefits in this project. The benefits are quantified by calculating the difference in transport cost as described in sections 7.1.2 and 7.1.3. Transport cost will be calculated in each phase as follows:

Phase	"With the project" case	"Without the project" case
1st Phase :	(1) transport cost by large size vessel to CTT + (2) secondary transshipment cost to CFPP via belt conveyor	(1) transport cost by large size vessel to unloading point at offshore + (2)secondary transshipment cost to CFPP + (3) Construction cost of breakwater and other facilities

2nd Phase :	(1) transport cost by large size vessel + (2) secondary transshipment cost to CFPP via belt conveyor + (3) secondary transshipment cost to CFPP via small size barge	(1) transport cost by large size vessel to unloading point at offshore + (2) secondary transshipment cost to CFPP + (3) Construction cost of breakwater and other facilities

7.1.5. Cost of the Projects

Construction costs consist of (1) civil structure, (2) coal handling equipment, (3) maintenance, (4) operation and (5) consultant service fee. Specific items are shown as follows:

(1) Civil structure

Initial dredging, port facilities (coal unloading berth, coal loading berth for secondary transshipment), coal storage yard, and other facilities

(2) Coal handling equipment

Port facilities (coal unloader, coal ship loader), belt conveyor, stacker, and other equipment

(3) Maintenance

Maintenance dredging, maintenance of constructed facilities, maintenance of coal handling equipment and other equipment

(4) Operation

Manpower (direct, indirect), electricity, insurance, and other running costs

(5) Consulting service fee

Design work, and construction supervision work

7.1.6. Sensitivity Analysis

(1) Calculation of EIRR

The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the economic feasibility of the project. EIRR is a discount rate which makes the costs and benefits of a project equal.

It is calculated by using the following formula.

$$\sum_{i=1}^{n} \frac{Bi - Ci}{(1+r)^{i-1}} = 0$$

Where, n; Period of economic calculation (project life= 36years)

Bi; Benefits in i-th year

Ci, Costs in i-th year

r; Discount rate

(2) Sensitivity Analysis

In order to see whether the project is still feasible when some conditions change, a sensitivity analysis is made with the following assumptions.

Assumption :Both the costs increase by 10% and the benefits decrease by 10%, and

:Both the costs increase by 20% and the benefits decrease by 20%

(3) Evaluation

EIRR of the project is estimated as follows:

Table 7.1.2 Project EIRR

This information includes trade secrets.

Source: JICA Study Team

Project feasibility is generally evaluated by whether the EIRR of the project exceeds the social discount rate (SDR) or the opportunity cost in the target country or not. The JICA Study Team applied 12% for the evaluation, which is generally adopted in the case of Bangladesh by donor agencies such as JICA.

Therefore it is considered that the planned project is economically feasible. However, the following points shall be taken into consideration.

Point (1) Currently, no coal handling facilities are in operation nor coal transportation is carried out in Bangladesh, therefore, the analysis in this chapter shall be understood as a cost/benefit analysis rather than the economic analysis

Point (2) The so called “Without Case” in the economic analysis could lead to utilisation of ports in neighboring counties and land transportation. In such a case, EIRR will definitely

yield a huge value and the project will be economically feasible with no doubt.

Point (3) From the result of the analysis in this chapter, CTT project (Alternative 1) is more economically favourable than offshore unloading (Alternative 2). On the other hand, it shall be noted that the project feasibility is sensitive to changes in conditions.

Table 7.1.3 EIRR of Base Plan (Base Case)

This information includes trade secrets.

Source: JICA Study Team

Table 7.1.4 EIRR of Sensitivity Analysis (Base Plan, Cost+10%、Benefit－10%）	Table 7.1.5 EIRR of Sensitivity Analysis (Base Plan, Cost+20%、Benefit－20%）
This information includes trade secrets.	

Source: JICA Study Team

Table 7.1.6 EIRR of Option Plan (Base Case)

This information includes trade secrets.

Source: JICA Study Team

Table 7.1.7 EIRR of Sensitivity Analysis (Option Plan, Cost+10%、Benefit－10%）	Table 7.1.8 EIRR of Sensitivity Analysis (Option Plan, Cost+20%、Benefit－20%）
This information includes trade secrets.	

Source: JICA Study Team

7.1.7. Project EIRR depends on Phased Plan

If coal demand will not increase as predicted, the project would be implemented up to the 1st Phase without developing the facilities for the 2nd Phase. The JICA Study Team also estimated the EIRR of such cases, which is valuable in terms of risk evaluation.

(1) 1st Phase

This information includes trade secrets.

Table 7.1.9 Project EIRR in the Case of 1st Phase

This information includes trade secrets.

Source: JICA Study Team

7.2. Financial Analysis

7.2.1. Applicable Project Scheme

(1) Investment Structure of SPC

This information includes trade secrets.

(2) Anticipated Role Sharing between the Public and Private Portions

The private sector can only expect their investment return in case most of the lower infrastructure such as coal loading/unloading berth and coal storage yard are expected to be constructed by the public sector using the official development assistance (ODA) yen loan, and the upper infrastructure such as

coal loader and unloader are to be constructed by the private sector. The JICA Study Team analysed Case 1, Case 2, and Case 3 below, and set Case 2 as the base case. Case 1 was assumed to obtain ODA funding for a part of the upper infrastructure, however, it is difficult to find any reason to apply ODA to fund only a part of the equipment. Case 3 is not included in the analysis since the construction cost of the coal loading/unloading berth are too high, which would result in a high tariff, thus giving a big burden on the Bangladesh government.

Table 7.2.1 Anticipated Role Sharing between the Public and Private Portions

Port and Terminal Facilities	Case 1	Case 2	Case 3
Coal Unloading Berth	ODA	ODA	Private
Coal Loading Berth	ODA	ODA	Private
Loader and Unloader	ODA	Private	Private
Breakwater and Training Dike	ODA	ODA	ODA
Coal Storage Yard	ODA	ODA	ODA
Conveyer Belt, Stacker, Reclaimer	Private	Private	Private
Landside facilities (Administration Building, Coal Mixing Equipment, Substation, Workshop, etc.)	Private	Private	Private
Dredging	ODA	ODA	ODA
Aids for Navigation	ODA	ODA	ODA
Access Road	ODA	ODA	ODA

Source: JICA Study Team

7.2.2. Financial Analysis

The JICA Study Team simulated the financial model for the SPC established by the Bangladeshi and Japanese entities, with some assumptions written in the following chapters. Feasibility is evaluated by calculating the terminal handling charge (THC) per ton, which fulfills the equity internal rate of return (IRR) of the SPC required by the private investor.

This information includes trade secrets.

7.2.3. Assumptions

(1) Description of Business

Scope of business of SPC in the financial analysis is unloading from vessels, inventory control, and loading to small barges for secondary transshipment to the CFPPs. The secondary transshipment cost is not included in this analysis. The cost of the secondary transshipment is mentioned in Chapter 4 above.

(2) Term of the Project

The term of project is 34 years. From the start of the 1st Phase in 2021 to 25 years from the start of the 2nd Phase in 2030, which is 2055.

(3) Exchange Rate (reference rate as of June 2015)

USD 1 ＝ BDT 78
USD 1 ＝ JPY 122.0

(4) Demand of Coal Handling

In accordance with the draft PSMP 2015, the CTT handles all coal volume mentioned in Chapter 3.

(5) Operation and Maintenance (O/M) Cost

As mentioned in Chapter 6 above.

(6) Land Usage Fee

As mentioned in Chapter 6 above.

(7) Tax Cost

1) Corporate Tax
Corporate income tax for the SPC is 35%.
2) Value-added Tax (VAT)
VAT of 15% is included in this analysis for the EPC construction costs.

(8) Capital Expenditure

- Investment plan is mentioned in Chapter 6 above.
- It is planned to expand CTT and invest in the upper infrastructure at each phase.
- Major equipment such as unloader, loader, stacker-reclaimer, dust protection wall and belt conveyer are planned to be used for 25 years. Other equipment are planned to be replaced by their deprecation period.

(9) Financing Plan

1) It is assumed that 30% of the total project costs be funded by equity and 70% of the total project costs be funded by debt.

This information includes trade secrets.

3) Amount of Funds and Loans

Table 7.2.2 Amount of Funds and Loans

This information includes trade secrets.

Source：JICA Study Team

7.2.4. Business Income / Terminal Handling Charge (THC)

(1) Basic Concept

This information includes trade secrets.

This information includes trade secrets.

Table 7.2.3 THC Structure

This information includes trade secrets.

Source：JICA Study Team

2) Price Adjustment Factor

THC has to be adjusted by inflation and foreign exchange fluctuation. The rule of adjustment will be agreed among related parties in a take-or-pay contract. In this financial analysis, the impacts of fluctuation of inflation and foreign exchange fluctuation are not considered since it is assumed that such fluctuation risk will be borne by CFPPs or the Bangladesh government.

3) THC by Each Phase

The CTT is supposed to be expanded by each phase, and the required investment cost and fixed cost of the CTT will be different in each phase. Therefore, the capacity charge will also be different in each phase. The capacity charge in each phase is calculated by the required income of SPC to justify the investment in each phase.

(3) THC

The THC based on the assumptions above is shown in Table 7.2.4 below. In case the coal demand in each phase will not increase during the project term, the prices in each phase as given by the table will be applied through the project term.

Table 7.2.4 Terminal Handling Charge (THC)

This information includes trade secrets.

Source: JICA Study Team

The following is a sensitivity analysis of the THC when the EPC Cost is increased by 10% and decreased by 10%.

Table 7.2.5 Project FIRR

This information includes trade secrets.

Source: JICA Study Team

Although the lower infrastructure is assumed to be procured by the Bangladesh Government using ODA Loan, as mentioned in Chapter 6, if the repayment of the ODA Loan for the lower infrastructure would be included in the THC for the CTT Project, the THC would be as follows.

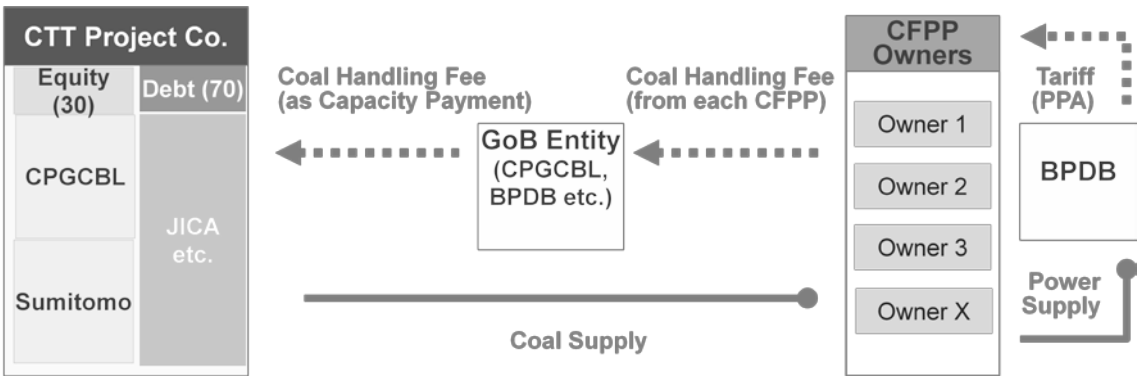
Table 7.2.6 THC including Lower Infrastructure

This information includes trade secrets.

Source: JICA Study Team

The terms of the repayment of the ODA Loan is mentioned in Chapter 6, and since the repayment of the ODA Loan is longer than the operation period of the CTT Project, only the repayment of the ODA Loan during the operation period is considered.

7.2.5. Financing and Payment Flow



Source: JICA Study Team

Figure 7.2.1 Financing and Payment Flow

Chapter 8. Concerned Local Laws and Regulations

8.1. Concerned Local Laws and Regulations

8.1.1. General Legal Framework for PPP

(1) General

(a) Currently, projects developed jointly by the private and public sector, whether as a build-operate-transfer (BOT), build-own-operate (BOO), build-own-operate-transfer (BOOT) or otherwise, are subject to Bangladeshi Law generally. Whilst exemptions may be negotiated with the government on a project by project basis e.g. with respect to public procurement, transfer restrictions, and foreign exchange rules etc. there is currently not yet a dedicated legal regime for PPP projects.

(b) The government issued in August 2010 the Policy and Strategy for Public-Private Partnership, 2010 and related guidelines for the formulation, appraisal, and approval of PPP projects with a view to creating a more streamlined and consistent framework and procedure for developing PPP projects.

(c) In 2014, the cabinet approved the draft PPP Law, reflecting the broad principles laid down in the 2010 PPP Policy, which is now being considered by the parliament. Once enacted, the PPP Law will replace and repeal the 2010 PPP Policy and associated guidelines. Based on information to date it is expected that the PPP Law will be passed during 2015.

(d) The PPP Law and related secondary legislation will create a special legal regime which will apply to PPP projects and which will hopefully create a more favourable investment environment for private investors and address some of the issues for which specific exemptions have to be sought currently. It is not certain when the secondary legislation which will set out the detailed procedures and exemptions would be enacted, but it can be reasonably expected that they would largely follow the current policies, guidelines and procedures in relation to PPP.

(e) Based on the indicative time schedule of the project, it is likely that the PPP Law would have been passed by the time the CTT project is being tendered, but it is uncertain to what extent secondary legislation would have been promulgated at that point.

(2) Applicable Legal Texts

(a) Policy and Strategy for Public-Private Partnership, 2010

(b) Guidelines for Formulation, Appraisal and Approval of Large Projects, 2010

(c) Guidelines for Formulation, Appraisal and Approval of Medium Projects, 2010

(d) Guidelines for Formulation, Appraisal and Approval of Small Projects, 2010

(e) Guideline for Public-Private Partnership Technical Assistance Financing, 2012

(f) Guideline for Viability Gap Financing for Public-Private Partnership Projects, 2012

(g) Procedure for Implementation of PPP Policy and Strategy for Unsolicited Proposals, 2014

(h) Draft of the Public Private Partnership Act

(i) Draft of the Public Private Partnership Rules

(3) Outline of the PPP Policy

(a) The 2010 PPP Policy sets out the government's general policies with respect to promoting public private partnerships in order to achieve its "Vision 2021" goal of becoming a middle income country by 2021. The 2010 PPP Policy replaces the Bangladesh Private Sector Infrastructure Guidelines, 2004.

(b) The 2010 PPP Policy is merely a policy, not a law, therefore it is judicially non-binding, and any existing law, rule or regulation covering some of the same matters as the 2010 PPP Policy would take precedence. However, public authorities would in practice try to give effect to the 2010 PPP Policy and to take it into account when taking executive actions and decisions, to the extent that they are permitted to do so under existing laws, rules and regulations.

(c) Set out below is a summary of the main content of the 2010 PPP Policy:

i) **Objectives** – The objectives of the 2010 PPP Policy are to (a) spell out the principles of partnership with the private sector for undertaking various projects related to infrastructure as well as public service delivery; (b) define an institutional framework, which is conductive and efficient in handling the PPP projects as well as effective in protecting the public interest; and (c) ensure balance between risk and reward for both the government and private sector partners whilst aiming to keep the undertaking attractive for the private sector.

ii) **Applicability**– Any project that generates public goods and services (other than outsourcing of a public service, creating a government-owned enterprise or providing sovereign debt) may be considered under the PPP scheme, if any one of the following apply:

A) Iimplementation of the project is difficult using the financial resources or expertise of the government alone;

B) Private investment would increase the quality or level of service or reduce the time to implement compared with what the government could accomplish on its own;

C) There is an opportunity for competition, where possible, among prospective private investors, which may reduce the cost of providing a public service;

D) Private investment in public service provides an opportunity for innovation; and

E) There are no regulatory or legislative restrictions in taking private investment in the delivery of public service.

iii) **Sector Coverage** – Certain sectors are considered "priority sectors" for PPP, including transmission and distribution of coal, power generation and deep sea port development. The CTT project would be considered a "priority sector" PPP for the purpose of the 2010 PPP Policy.

iv) **Eligibility of Private Sector** – The private sector entity participating in the PPP can be a Bangladeshi or a foreign entity but, at the time of contract awarding, any foreign entity is required to be registered as a legal entity in Bangladesh (i.e., foreign investors must set up a subsidiary in Bangladesh as the project company).

v) **Classification of Projects by Size** – PPP projects are classified into three groups depending on the total investment value (as identified in the pre-feasibility report and excluding on-going capital for expansion):

A) Large – above BDT 2.5 billion (approximately USD 32 million);

B) Medium – between BDT 500 million and 2.5 billion (approximately USD 6.4 – 32 million); and

C) Small – below BDT 500 million (approximately USD 6.4 million).

The thresholds above are subject to change.

vi) **Financial Participation of the Government** – Depending on the nature and the PPP model of the project, the government may provide:

A) Technical assistance financing: financing of project start-up costs such as in relation to the preparation of feasibility studies, RFPs, contract regulation etc.;

B) Viability gap financing: capital grant or annuity payment, payable after "private investment" has been expended as stipulated in the concession agreement; or

C) Infrastructure financing: financing facilities (debt or equity) through the Bangladesh Infrastructure Finance Fund and Infrastructure Development Company Limited, subject to necessary budget provision

vii) **Linked Components** – Depending on the nature of the PPP project involved, the line ministry/implementing agency involved can consider the financing and implementation of linked activities such as acquisition of land, rehabilitation and re-settlement, and provision of utility services, etc. in the following two forms:

A) Financing will be part of the PPP project (the implementation may be done by the private investor or by the relevant line ministry/implementing agency, as appropriate), or

B) Financing as well as the implementation will be done by the government using government funds.

viii) **Incentives to Private Investor** – Fiscal and non-fiscal incentives may be available from the government to private investors for launching PPP projects in priority sectors, including reductions in import tax on capital items and tax reduction or exemption on operating profit for a period of time.

ix) **Institutional Framework** – This section describes the various government bodies involved in the identification, formulation, appraisal, approval, monitoring and financing of PPP projects and delineates their respective roles to ensure a more streamlined PPP process.

x) **Formulation, Appraisal and Approval of the PPP Projects** – Given that the CTT project is likely to be a "Large Project", the final approval authority would be the Cabinet Committee on Economic Affairs (CCEA). The detailed procedures will be set out in the relevant guidelines. In relation to the appraisal and approval of unsolicited proposals, competitive bidding, such as the "Bonus System", the "Swiss Challenge System" or another appropriate method, must be followed (please see Section 8.1.2(5)).

(d) **Exit Policy** – This section provides that the PPP contract will specify the terms and conditions of exit of a current private investor, possible transfer of ownership to a new investor, or partial or

complete divestiture of ownership to capital markets and identify a minimum lock-in period after the commercial operation date.

8.1.2. Public Procurement

(1) Applicable Legal Texts

(a) Public Procurement Act, 2006

(b) Public Procurement Rules, 2008

(c) Quick Supply of Power and Energy Enhancement (Special Act) Law, 2010

(d) 2010 PPP Policy

(e) Guidelines for Formulation, Appraisal and Approval of Large Projects, 2010

(f) Unsolicited Proposals Procedure

(2) General

(a) Currently, any public procurement (as described in section 3 of the Public Procurement Act) must be carried out in accordance with the Public Procurement Laws, unless specific exemptions are agreed with the government. However, the Public Procurement Laws allow the government to develop BOT/BOO/BOOT projects in accordance with other guidelines and directives issued by it, notwithstanding anything in the Public Procurement Laws.

(b) The government would in practice follow the process set out in the 2010 PPP Policy and the applicable guidelines and procedures in relation to PPP projects.

(c) Upon enactment of the PPP Law, the procurement and award of PPP contracts (as defined in the PPP Law) will be exclusively governed by the PPP Law and related secondary legislation and will override the Public Procurement Laws and the 2010 PPP Policy and associated guidelines.

(3) Public Procurement Procedure under the Public Procurement Laws

(a) Under Section 33 of the Public Procurement Act, the procuring entity may undertake public procurement by way of an open international procurement method in accordance with the Public Procurement Act where it is not feasible to undertake procurement by inviting competitive tenders within Bangladesh, i.e. the government should generally try to procure projects domestically first before opening them to international tender.

(b) The general procurement process under the Public Procurement Laws can be summarised as follows:

i) Publication of expression of interest;

ii) Preparation of tender documents;

iii) Publication of tender documents;

iv) Pre-bid conference;

v) Amendment of tender documents in light of the outcome and findings of the pre-bid conference (if applicable) and notification thereof;

vi) Opening of tender and evaluation of offers; and

vii) Notification of award.

(4) Procurement Procedure under the 2010 PPP Policy and Guidelines

The approval procedures vary depending on the size of the project. For "Large Projects", the following procedures should be followed:

(a) **Project Identification** – A project is identified by the line ministry/implementing agency itself, through the PPP Office, or through an unsolicited proposal submitted by a private investor. The PPP Office and the line ministry/implementing agency will conduct pre-feasibility studies, if necessary.

(b) **"In Principle" approval by CCEA** of proposals recommended by the PPP Office.

(c) **Feasibility Study and Preparation of Documents** – the PPP Office, together with consultants, prepares a detailed feasibility study as well as the Request for Qualification (RFQ) and Request for Proposal (RFP) (including draft concession agreements). The Finance Division appraises the requirements of Viability Gap Financing in consultation with the responsible line ministry/implementing agency.

(d) **Request for Qualification** – The line ministry/implementing agency calls for an RFQ and the QTEC established by the line ministry/implementing agency shortlists investors based on screening criteria as provided in the RFQ documents (other than for unsolicited proposals).

(e) **Request for Proposal** - The line ministry/implementing agency issues an RFP to the private investors shortlisted as a result of the RFQ process. The QTEC evaluates the investors' proposals first for compliance with the technical criteria or specifications and then prepares an RFP evaluation report ranking the technically compliant proposals based on the financial evaluation

criteria. The line ministry/implementing agency notifies the selected bidder to initiate the negotiation process

(f) **Negotiation and Contract Award** – The line ministry/implementing agency negotiates the contract with the selected bidder. The concession agreement must be then vetted by the Legislative and Parliamentary Affairs Division and be approved by the CCEA before it can be entered into.

The indicative timing set out in the Guidelines for Formulation, Appraisal and Approval of Large Projects, 2010 is as follows:

#	Phase	Indicative Time Frame
1	Project identification	On-going
2	'In Principle' Approval by CCEA	2—4 weeks
3	Feasibility Study	8—20 weeks
4	Request for Qualification	4—8 weeks
5	Request for Proposals	8—12 weeks
6	Negotiation and Contract Award	4—8 weeks

(5) Unsolicited Proposals

This information includes trade secrets.

This information includes trade secrets.

This information includes trade secrets.

8.1.3. Principal Project Agreements with the Government

(1) Concession Agreement

(a) Form of the Concession Agreement

This information includes trade secrets.

This information includes trade secrets.

(b) Parties to the Concession Agreement

This information includes trade secrets.

(c) Who will be bound by the Concession Agreement

This information includes trade secrets.

(2) Coal Transshipment Service Agreement (if separate from Concession Agreement)

This information includes trade secrets.

(3) Sovereign Guarantee (if separate from Concession Agreement)

This information includes trade secrets.

This information includes trade secrets.

(4) Land Lease Agreement

The relevant government entity which is a party to the CTSA, would also enter into a Land Lease Agreement to lease the site to the project company.

(5) Port Use Agreement

(a) For use of the deep sea port the project company will have to enter into an agreement with the relevant port authority responsible for the Matarbari deep sea port or the Ministry of Shipping.

(b) The Ministry of Shipping is responsible for sea ports other than Chittagong and Mongla. Each port is headed by a conservator (port officer, harbor master, etc.). However, pursuant to Section 7(4) of the Ports Act, 1908: "The conservator shall be subject to the control of the government, or of any intermediate authority which the government may appoint." The Ports Act, 1908 is neutral on the issue of private sector participation in sea ports (or in any port in general).

(c) The Bangladesh Water Transport Policy 2000, whilst acknowledging that sea ports will continue to be built, operated and maintained by state bodies, states that the construction, operation and maintenance of such ports will be open in the future to both the public and private sectors. The government's hope is that over time port authorities will be limited to planning and regulatory responsibilities whilst the services will be provided by commercial enterprises on the basis of leases or contracts. The participation of national and foreign private entrepreneurs in the provision of container services and the operation of related facilities will be encouraged.

(d) Therefore, it is likely that a specific port authority would be created for the Matarbari Deep Sea Port, and that the project company would have to execute the port use agreement with that port authority with permission from the Ministry of Shipping.

8.2. Risk Analysis and Security Package

Implementing a large infrastructure project such as the CTT Project will involve various kinds of project risk. The principal categories of risks are as follows:

- Country/political risks;
- Natural risks;
- Legal risks; and
- Commercial risks.

These are the typical types of risks which investors would carefully consider and which should be carefully allocated as between the government and the private investor in order to ensure the commercial viability and bankability of the CTT project.

8.2.1. Country/Political Risks

The CTT project could be affected by a wide range of political risks applicable to Bangladesh. Whilst private investors could seek to allocate some of these risks to the government under the Concession Agreement, as with all PPP projects, a certain degree of political risk will often have to be accepted by the private investors.

(1) Uncertainties in the PPP Legal Framework

(a) Whilst the Government of Bangladesh (GOB) is in the process of developing a specific legal framework for PPP projects, it is likely that during the timeframe in which the CTT project is intended to be developed, the precise legal framework will still be in the process of being developed through secondary legislation, guidance and procedures. In addition, government entities themselves will require some time to become accustomed to new procedures and practices.

This information includes trade secrets.

This information includes trade secrets.

(2) Change in Law

This information includes trade secrets.

(c) Private investors should, at the very least, seek protections against change in law that is discriminatory, i.e. focused on the CTT project or this type of project, for instance through rights and remedies under the Concession Agreement, such as extension of time for the project company's obligations, compensation for increased costs, and adequate termination payments.

(d) Private investors could also seek additional protection through a "most favoured nation" clause in the Concession Agreement which would place an obligation on the government to accord the same or better treatment to Japanese investors in the CTT project as investors from other countries, and by choosing a foreign law as the governing law of the Concession Agreement (see Section 8.2.3(1)).

(e) The provision of the 2010 Special Power Act has precedence over other laws, thus any change in laws shall not affect the development of this project through the 2010 Special Power Act.

(3) Government Authorisations

(a) The project company may be unable to develop or construct the CTT project or to enter into operation on time (or at all) or may not be able to secure project financing if it cannot obtain the required government authorisations.

(b) Various government authorisations will be required by the project company to do business and implement the CTT project. There is currently no "one-stop-shop" regime for obtaining all governmental authorisation. Even if private investors negotiate and agree with the exemptions and consents of the government in the Concession Agreement, specific exemptions will need to be sought from the relevant responsible government entities, who will have their own procedures and requirements that will need to be followed, and may have certain discretions to refuse government authorisations required by the project company

(c) Usually for PPP projects, it would be preferable for necessary government authorisations to be issued at the beginning of the project for the entire life of the project. To the extent this is not possible for the CTT project, the private investor should seek firm undertakings from the government in the Concession Agreement to support the project company in managing the approval process and to procure, or at least use its best endeavours to procure the necessary government authorisations to be issued and renewed in a timely manner.

(4) Government Breach of Project Agreements

(a) Implementing the CTT project may require project agreements with various government entities, e.g., the MoPEMR, CPGCBL, the relevant port authority operating the deep sea port, etc.

(b) Breach by any of those government entities of their obligations under the respective project agreements, or repudiation by such government entities of the relevant project agreement could lead to significant losses for the Project Company and delays to the CTT project, and in the worst case scenario, termination of the Concession Agreement.

(c) However, it may not be appropriate to include remedies in each Project Agreement; therefore the normal treatment is for remedies for breach or repudiation of any Project Agreement by any government entity to be comprehensively addressed in the Concession Agreement.

(d) Including a mechanism for receiving termination payments, which would be calculated to cover the private investors investments including their returns, if there is a breach of contract by the Government, would be a way to mitigate such Government Breach risks.

(5) Political Force Majeure Events

(a) Force majeure events of a political nature could include war, armed conflict, terrorism, civil war, widespread strikes, or expropriation or nationalisation of any part of the CTT project.

(b) Recently, political tension within the government has led to civil unrest and wide-spread national strikes. The JICA Study Team also understands that there have been a number of public protests in relation to coal related projects in the past, although this may be less of an issue if the CTT project is situated in an area of low environmental and social impact. Therefore, such risks are relevant and should be carefully considered by private investors seeking to develop projects in Bangladesh.

(c) Often in PPP projects governments will want to limit political force majeure events to a finite, short list in order to put pressure on private investors to bear risks which are not strictly force majeure or to address such risks through insurance. The JICA Study Team understand that commercial insurance for political risks is not readily available in Bangladesh at commercially reasonable rates. Therefore international private investors may wish to seek political insurance from non-commercial sources, such as multilateral agencies or export credit agencies.

(6) Policy Change

(a) More generally, the JICA Study Team understand that the government's current policy is to shift from using natural gas to coal for power generation and that as a result, a large number of CFPPs are currently being planned.

(b) Future shifts in government policy away from use of coal, e.g. due to change in government, or increase in coal prices in the future, may affect the viability of the CTT project, although given Bangladesh's acute need for power generation and the recent drop in coal prices, this risk may be remote, at least in the near future.

(7) Land

(a) Acquiring the necessary land ownership and land rights is often a major obstacle and risk in many infrastructure projects. The JICA Study Team understands that the land acquisition will probably be carried out by the government through a compulsory acquisition process under Bangladeshi Law, and that the relevant land will then be leased to the project company.

(b) Whilst this ensures that the land required for the CTT project will be made available, compulsory acquisition often brings with it risks of legal challenge and disruption by the previous inhabitants, especially if the price paid for the land is not adequate or reflective of market price.

(c) In addition, in order to enable international project financing, such compulsory acquisitions must be carried in accordance with international social standards. In the case of the CTT Project, in order to benefit from the use of JICA's ODA loan, any resettlement must be conducted in compliance with the JICA Environmental and Social Guidelines.

(d) The JICA Study Team understand that the optimal location of the Project will be studied as part of the FS, taking into account potential need for resettlement and impact on local inhabitants and communities. In addition, if it is necessary to relocate people, a resettlement action plan will be prepared in compliance with Bangladeshi laws and the JICA Environmental and Social Guidelines.

(e) If it is contemplated that debt financing might be sought from other sources, such as international commercial banks or export credit agencies it would be prudent for any resettlement to be carried out in a manner which is also consistent with those institutions' environmental and social guidelines.

Considering Bangladesh's geography, the current Matarbari location is the most feasible location for constructing a deep sea port, and with the land already acquired for the adjacent Matarbari CFPP, the Bangladesh Government is familiar with the land acquisition process in this area, thus the risks that the land acquisition would not be done is rather limited.

8.2.2. Natural Risks

(1) Natural Force Majeure

(a) Natural force majeure are generally natural events which are outside the control of either parties, including epidemic, plague and quarantine; explosion, accident, contamination, radiation, fire; acts of God; and accidents of navigation, air crashes, shipwrecks, etc. Such risks could cause significant delays to, damage to or even total loss of the CTT Project, both during construction and operation.

(b) Natural force majeure risks should be considered when choosing the optimal location for the CTT Project. Private investors will seek protection from such risks through insurance and risk allocation under the Concession Agreement, although it can be expected that such risk, at least to the extent not insurable, would be shared to some degree between the Government and the private investor.

(c) To mitigate some of the natural force majeure risk, such as flooding due to monsoon and cyclones, the CTT Project is proposed to be constructed at a height of +8 m from M.S.L. This height of +8 m from M.S.L. was decided based on the flooding data of previous years in the surrounding areas, which is described in more detail in Chapter 5.

(2) Environment

(a) Construction of the CTT Project may have an adverse impact on the environment. The CTT Project will have to comply with both Bangladeshi environmental laws, as well as the environmental and social criteria of any Project Lenders.

(b) The JICA Study Team understand that an initial environmental survey will be carried out in accordance with the JICA Environmental and Social Guidelines, and that when choosing the location of the CTT Project, the potential impact on the environment will be carefully considered.

(c) If it is contemplated that debt financing might be sought from other sources, such as international commercial banks or export credit agencies it would be prudent for any resettlement to be carried out in a manner which is also consistent with those institutions' environmental and social guidelines..

8.2.3. Legal Risks

(1) Governing law

(a) The JICA Study Team understand that in relation to government contracts the Government generally prefers to use Bangladesh law as the governing law and tends to resist attempts to use any foreign law as the governing law. Bangladeshi law is primarily derived from English law and India law and Bangladesh courts are able to draw on English and Indian jurisprudence in relation to the interpretation of the law. As such, it will be similar to English law in many respects.

(b) Nevertheless, from the private investor's perspective it would be preferable to use English law as the governing law as it is well developed and certain, supported by a strong body of case law, and more familiar to international players, especially in relation to PPP projects, and to protect themselves further against change in law risk. Particularly where the intention is to use international contractors who are likely to want to use English law as the governing law of their contracts (e.g. the Engineering, Procurement and Construction (EPC) contract or O&M contract) it would best to align the governing laws to ensure the back-to-back position with the Concession Agreement. That being said, investors often do get comfortable with Bangladesh law as the governing law, provided that relevant contracts, mostly where such contracts provide for international arbitration as the dispute resolution mechanism (see Section 8.2.3(2)) and certain other further risk mitigants, such as stabilisation arrangements.

This information includes trade secrets.

(2) Dispute Resolution

(a) The JICA Study Team understand that in the contracts between the Government and international investors, arbitration is commonly specified as the dispute resolution mechanism, rather than litigation in the Bangladeshi courts or the courts of a third country (although the JICA Study Team understand that judgments of a foreign court, such as an English court, would be enforceable).

(b) It is not uncommon for the Government to agree to arbitration under international arbitration rules such as International Chamber of Commerce (ICC) or Singapore International Arbitration Centre (SIAC) rules. However, increasingly, the Government insists on the "place" of arbitration being in Bangladesh. It is not entirely clear whether this means that (i) the "seat" of the arbitration would be Bangladesh, i.e. the arbitration would be subject to the arbitration laws of Bangladesh, namely the Arbitration Act 2001, and/or (ii) that the arbitration would physically be held in Bangladesh. It seems though that the Government's primary aim seems to be to have the arbitration physically take place in Bangladesh and that the Government has accepted to specify a foreign seat of arbitration in the past.

(c) It would generally be preferable for private investors to provide for the seat of arbitration, i.e. the jurisdiction whose laws should apply to the arbitration, to be in a predictable and familiar jurisdiction such as England or Singapore, even if the arbitration proceedings would be physically held in Bangladesh.

(d) Foreign arbitral awards are enforceable in Bangladesh, subject to certain exceptions, including if enforcement of the arbitral award would be contrary to public policy. Therefore there is a theoretical risk that arbitration awards against the Government could be set aside on public policy ground, although the JICA Study Team understand this to be extremely rare..

(e) Considering the past projects of IPP's, in past projects Singapore has been accepted as the place for arbitration, thus negotiating for acceptance of Singapore would be preferable.

(3) Foreign Exchange Regulations

(a) There are a large number of legal restrictions on the Project Company's ability to incur foreign debt, transact in foreign currency, remit funds abroad, operate offshore accounts etc. that require special permission from the Bank of Bangladesh and Bangladesh Board of Investment.

(b) Whilst exemptions may be readily granted in relation to loans provided by JICA due to JICA's strong relationship with the Government, such restrictions may render it difficult to seek debt financing from other international lenders.

(c) Certain restrictions on repatriation of funds abroad could also restrict the ability of private investors in the CTT Project to extract their equity investment from Bangladesh.

(d) However, given that the BIT provides expressly for the freedom of payments, remittance and

transfer of funds or financial instruments between Japan and Bangladesh (including in respect of payments, loans, proceeds of sales and process of the total or partial liquidation of an investment), and that exchange restrictions may only be imposed in exceptional financial and economic circumstances, private investors from Japan would be in a good position to negotiate exceptions from a number of or even all of those foreign exchange restrictions.

(4) Mandatory listing requirement

(a) The JICA Study Team understand that under Bangladeshi law, it is likely that the Project Company will need to be converted into a public limited company (once its share capital exceed approximately USD 5 million) and that it would also become subject to a mandatory listing requirement (within one year of its share capital exceeding approximately USD 6.4 million).

(b) Whist it may be acceptable for the Project Company to be a public limited company (and may even have certain advantages such as lower tax rates), private investors would normally want to seek an exemption from the mandatory listing requirement.

8.2.4. Commercial Risks

(1) Capacity Payments

This information includes trade secrets.

(2) Demand Risk

This information includes trade secrets.

(3) Credit risk and sovereign guarantee

This information includes trade secrets.

This information includes trade secrets.

(4) Related Infrastructure

(a) The construction, completion and operation of the CTT is dependent on the successful construction, completion and operation of a number of ancillary facilities, such as the deep sea port and the harbour, dredged access channels, roads, electricity, gas, water, and lower infrastructure related to the transport of coal to the end-users (**Related Infrastructure**). The private investor should ensure in the Concession Agreement that the Government is comprehensively responsible for such Related Infrastructure. Nevertheless, since the viability of the CTT Project is dependent on major infrastructure works such as the port, harbour, dredging and lower infrastructure which requires high capital investment, it may not be sufficient to rely on contractual protections alone, but careful coordination with and monitoring of the development and financing of such other projects may also be required.

(b) Unlike the CFPPs mentioned above, which affect the ultimate demand for the services provided through the CTT Project (but which the Project Company will largely be protected against through availability payments), the CTT's interface and dependency on the Related Infrastructure mentioned above is much higher.

(c) During the construction phase, delays in the construction of the Related Infrastructure could cause significant delays to the construction of the CTT Project, for example if the necessary access roads or electricity lines cannot be completed in time needed for the construction of the CTT Project. This would need to be addressed through careful construction planning, if necessary with

the contractors implementing the related projects, and protections against delays in the construction and completion of such Related Infrastructure in the Concession Agreement and the construction contracts, e.g. provisions for extension of time, coverage for increased construction costs due to delay, etc.

(d) During the operational phase, operation and maintenance of the Related Infrastructure could affect the availability and performance of the CTT. In particular, the operational interface with the port and harbour, as well as downstream transportation to the CFPPs, will be high. Such risk can be addressed in the CTSA through "deemed availability payments", i.e. the Project Company would still be paid if the lack of availability was caused by inadequate operation or maintenance of such Related Infrastructure. However, if the Government cannot receive revenues from the end-users due to poor operation of a Related Infrastructure, it may ultimately lead to default under the CTSA and termination of the Concession Agreement. Such risk may be mitigated through careful drafting and risk allocation under the Concession Agreement under other project agreements (including construction contract, O&M agreement and financing agreements).

(5) Shared Facilities

This information includes trade secrets.

(6) Currency Risk

(a) If the revenues received by the Project Company under the CTSA are in Taka, whereas it project costs (including financing costs) are payable in a foreign currency, e.g. yen or USD, the Project Company may be subject to exchange rate risk between Taka and such foreign currency.

(b) The JICA Study Team understand that the Government has accepted in certain other PPP projects with international investors to make capacity payments in USD, which may remove some of the

foreign exchange risk for the private investor if its costs are also payable in USD or if it is able to hedge against exchange risk vis-a-vis USD. An alternative approach to shifting exchange risk to the Government is to include an adjustment mechanism under the CTSA which would allow for adjustments to the availability payments to compensate the Project Company for large fluctuations in exchange rate from the exchange rate which was used in the initial financial model.

(c) Even if the Government were to agree to payments under the CTSA to be denominated in a foreign currency, it may not be able to make such payments if it does not have sufficient foreign currency reserves. Although Bangladesh's international reserves has improved for the last few years according to IMF reports, the FS should consider the potential availability of foreign reserves, especially if the Government is intending to develop a number of other projects at the same time which will also require payments to be made in foreign currency.

This information includes trade secrets.

(7) Inflation Risk

(a) Bangladesh has in the past experienced high rates of inflation. Although in recent years inflation rate has been reduced significantly, private investors should take into account the risk of potentially rising inflation rates in the future.

(b) Availability payments under the CTSA should be adjusted for inflation, in order to ensure that the Project Company is adequately compensated if the inflation rates are higher than those assumed in the initial financial model.

This information includes trade secrets.

Chapter 9. PPP Project Assessment

9.1. Investment Structure for the Coal Transshipment Terminal (CTT) Project

(1) Investment Structure for CTT Project

As mentioned in Chapter 8, currently, projects developed jointly by the private and public, whether as a BOT, BOO, BOOT or otherwise, are subject to Bangladeshi law generally. Whilst exemptions may be negotiated with the Government on a project by project basis e.g. in respect of public procurement, transfer restrictions, foreign exchange rules etc. there is currently not dedicated legal regime for PPP projects yet.

Based on the indicative time schedule of the project, it is likely that the PPP Law would have been passed by the time the CTT Project is being tendered, but it is uncertain to what extent secondary legislation would have been promulgated at that point.

(2) Coverage of Government Support

This information includes trade secrets.

This information includes trade secrets.

This information includes trade secrets.

9.2. Project Execution Plan

This section proposes the project execution structure during the construction and operation phase.

(1) Project Execution Structure (Upper Infrastructure)

The SPC is supposed to be founded by joint investment of the Government entity and private company. SPC will raise the funds for the construction cost of the upper infrastructure of the CTT and will construct the upper infrastructure of the CTT. Debt financing under the JICA Private Sector Investment Finance (PSIF) which is long-term and low interest non-recourse project finance, referred to in chapter 9.4 below, is the most probable option to improve the profitability of the Project. Then, SPC will be responsible for its management and operation after completion of the construction.

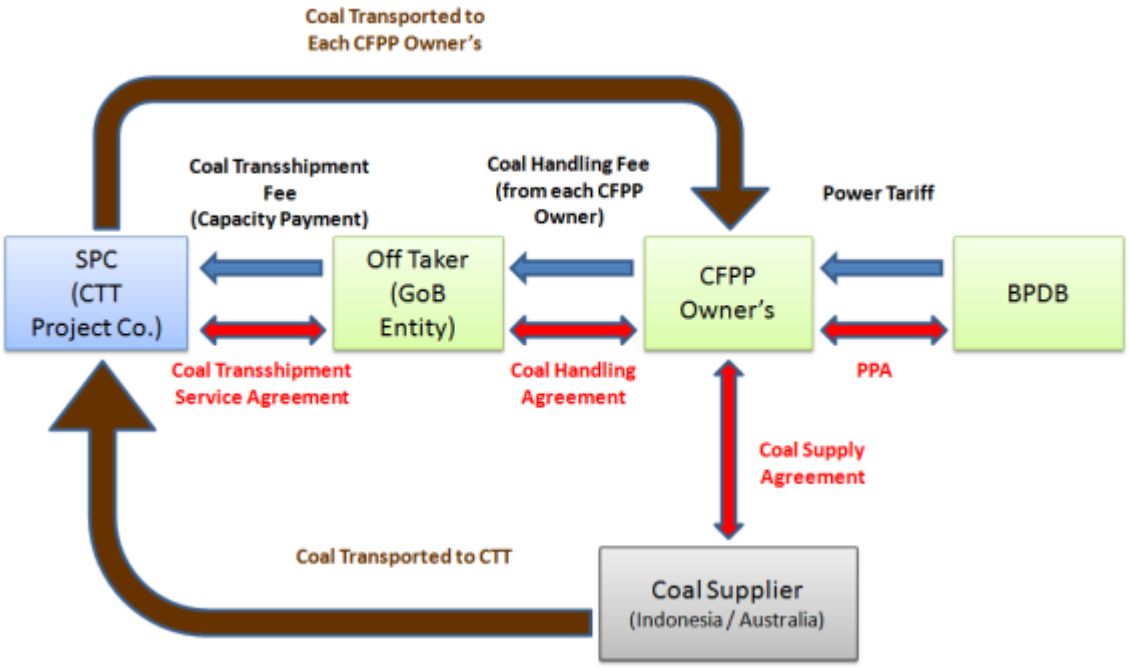
The scope of the service of SPC under the Coal Transshipment Agreement concluded between PSC and Off-taker will be receiving, stocking and making shipment of coal to a designated area of the coal transshipment terminal. (Secondary transshipment to CFPPs is not included as the scope of SPC.) The project execution structure is shown in Figure 9.2.1 below.

This information includes trade secrets.

Source: JICA Study Team

Figure 9.2.1 Project Execution Structure for the Upper Infrastructure of the CTT

The coal and cash flow in the project is shown in Figure 9.2.2 below.



Source: JICA Study Team

Figure 9.2.2 Coal and Cash Flow of the Project

(2) Principal agreements to be concluded by SPC

The SPC will make contracts stipulating the construction of the upper infrastructure of the CTT and its operation and management with the Government of Bangladesh, referred to in chapter 9.1(2) above, and will order the construction, engineering, and procurement of the CTT to the EPC contractor. SPC will order the operation and maintenance of the CTT as necessary. Principal agreements to be concluded by SPC are shown in Figure 9.2.3 below.

This information includes trade secrets.

Source: JICA Study Team

Figure 9.2.3 Principal Agreements to be Concluded by SPC

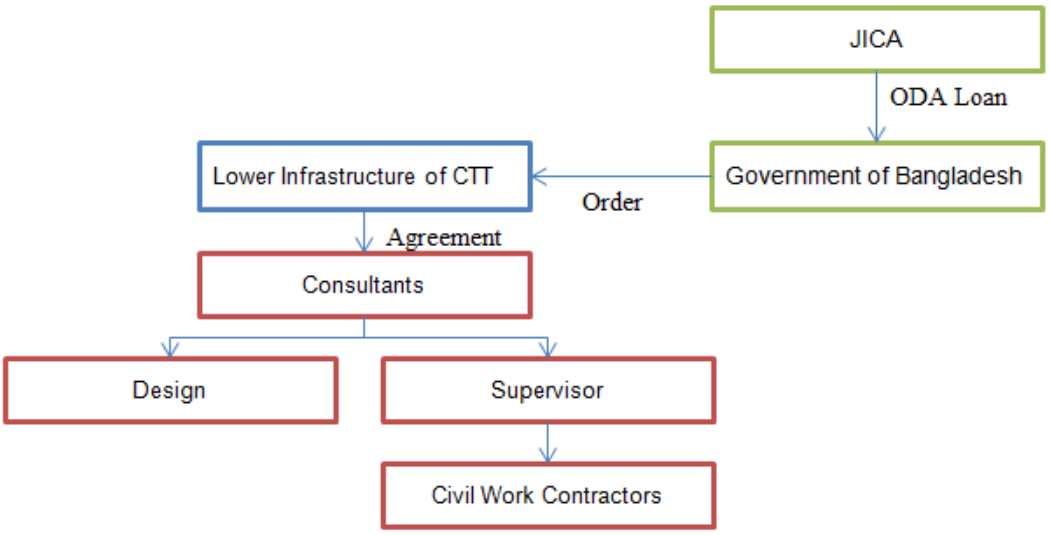
(3) Investor of SPC

It is recommended that the SPC, which raises funds, constructs, manages, and operates the upper infrastructure of the CTT, should have an experience of operating and managing the CTT in Bangladesh or some other countries and of procuring and supplying coal domestically and internationally and is a coal user, such as IPP operators.

(4) Project Execution Structure (Lower Infrastructure)

Utilising public funds, such as ODA, the Government of Bangladesh will raise the funds for the construction cost of the lower infrastructure of the CTT and then construct it. After completion of the construction, the Government of Bangladesh will maintain, manage, and operate it.

The project execution structure of the lower infrastructure of the CTT is shown in Figure 9.2.4. The Government of Bangladesh will order the operator of the lower infrastructure of the CTT. The operator of the lower infrastructure of the CTT will hire a consultant who is responsible for the design and construction management of the lower infrastructure of the CTT. The operator will enter into civil construction contract with each civil contractor. The consultant will support the procurement activities related to invitation of tenders, evaluation, and selection of the successful bidders. After completion of the lower infrastructure of the CTT, the operator will manage and operate it.



Source: JICA Study Team

Figure 9.2.4 Project Execution Structure for the Lower Infrastructure of the CTT

This information includes trade secrets.

9.3. Project Execution Plan

This information includes trade secrets.

This information includes trade secrets.

This information includes trade secrets.

Figure 9.3.1 Tentative Project Schedule

9.4. Operation and Effectiveness Index

Table 9.4.1 shows the operation and effectiveness index in terms of technologies, economics and finances, investment regime, and environmental and social considerations.

Table 9.4.1 Operation and Effectiveness Index

Item	Before Project Execution	Project Execution Phase
Objective	Evaluating the possibility of project execution	Securing sustainability of the project
Technologies	Validity of plan, design and selection of equipment	-
	Validity of construction techniques	-
	Validity of maintenance and management plan	-
Economic and Finance	Benefits to economics in Bangladesh (Economic IRR: min. 12%)	Maintaining benefits directly or indirectly by the project
	Investment possibility by private investors	Maintaining profitability, financial stability, and effectiveness of assets
	Validity of price decision based on forecasting precise demand	Appropriate action for changes based on forecasting precise demand
	Validity of investment and operation cost	Additional investment depending on demand increment, management of investment cost, and continuous operation improvement
Investment Regime	Compliance with Bangladesh Laws	Action for change in law
	Validity of risk allocation Risk mitigation (Support from the government)	Action for risks
	Selection of JV partners	Validity of role allocation of the private and public sectors
Environmental and Social Considerations	Consideration on social environment	Consideration on social environment

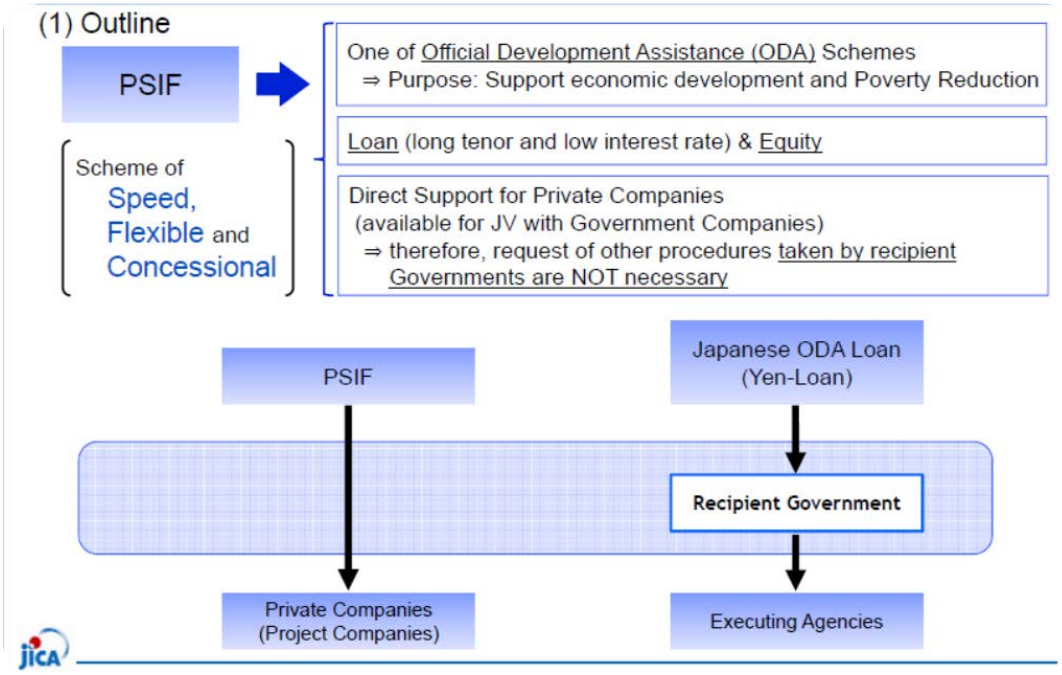
Source: JICA Study Team

9.5. Possibility of Private Sector Investment Finance

(1) JICA Private Sector Investment Finance

The JICA Private Sector Investment Finance (PSIF) supports projects which contribute to development in developing countries by the private sectors through its financing and investment. The aim is that JICA, which has a lot of experiences in investments in developing countries, makes the

projects viable when the projects cannot receive financial supports from the private banking sectors through taking risks by JICA.



Source: JICA

Figure 9.5.1 JICA Private Sector Investment Finance (JICA)

(2) Feature of PSIF

As shown in Figure 9.5.1, JICA PSIF is a long-term and low interest loan. Unlike ODA, JICA PSIF does not need governmental guarantee and provides loans equivalent to non-recourse project finance. The project can get JICA PSIF on the condition that Japanese private sectors join the project. The maximum financed amount of JICA PSIF is 70% of the total investment cost.

Table 9.5.1 Principal conditions of PSIF and ODA loan

This information includes trade secrets.

(3) Merits of PSIF

PSIF is able to improve the profitability of the private sectors as its interest is lower than the long-term loan interest of commercial banks in Bangladesh. Improvement of the profitability will increase the investment amount by the private sector, which will then reduce the investment amount by the public sector. Therefore, PSIF can reduce the amount where the public sector has to bear in the PPP infrastructure project. This can also reduce the amount where the Government of Bangladesh has to bear in the Project as well as improve the profitability. As PSIF can also provide 20 years (maximum 25 years) long-term loan, it is desirable for the CTT Project which lasts for many years.

(4) Other Possible Options in Raising Funds

Other than the loan directly lent to SPC by JICA, another option is the two-step loan in which SPC obtains loan through commercial banks in Bangladesh. However, considering the huge investment amount required in the CTT Project, it is difficult for commercial banks in Bangladesh to lend this amount taking their capital capacity in finance into account.

It may be another option to use the Export Credit Agency (ECA), such as International Finance Corporation, but it may require very rigorous review to fund coal-fired power plant-related projects given that the World Bank, European Investment Bank, and European Bank for Reconstruction and Development are following the policy of the "National Climate Change Action Plan" of the United States of America.

It is also difficult to find non-recourse project finance from Japanese commercial banks because they will have difficulty taking risks for huge and long-term loan in a developing country without any guarantee from ECA, and obtaining the guarantee from ECA will be difficult as explained above.

Considering the above, it is very important to utilise JICA PSIF in order to realise the CTT Project.

(5) Subjects of JICA PSIF

As JICA PSIF is denominated in yen only, the private sector receiving this loan will manage to transfer the exchange rate risks to the Government of Bangladesh or off-takers as it is impossible for the private sector to bear exchange rate risks. JICA studies the possibility of introducing PSIF denominated in local currency. However, the Bangladesh currency is not subject to this consideration by JICA. It is expected that loan denominated in US dollar is realised at an early date as it is also the agenda for the Government of Bangladesh to bear exchange rate risks.

Chapter 10. Proposed Plan of CTT

10.1. Unified Management of Coal Handling Facilities of Matarbari CFPP and CTT

The recommendation plan is proposed for efficiency of the CTT project. The plan is to manage coal handling facilities of Matarbari CFPP No.1 and No.2 and the CTT integrally. The Matarbari CFPP No.1 and No. 2 plan to construct coal unloading berth and coal stockyard of which capacity have leeway of operation. Therefore, it is possible to make the operation more efficient by unified management of the CFPP and CTT.

The detail of proposal plan is as follows.

(1) Unloader capacity installed for Matarbari CFPP is improved to 2,500t/h

(2) Coal unloading berth and coal stock yard for Matarbari CFPP are shared with CTT project

(3) CTT supplies fuel coal to Matarbari CFPP.

One of the advantages of the proposed plan is to reduce quantities of coal handling facilities for CTT. The facilities which can be reduced and quantities of the facilities are shown as follows. The detailed comparative study of each facility is shown in the next section.

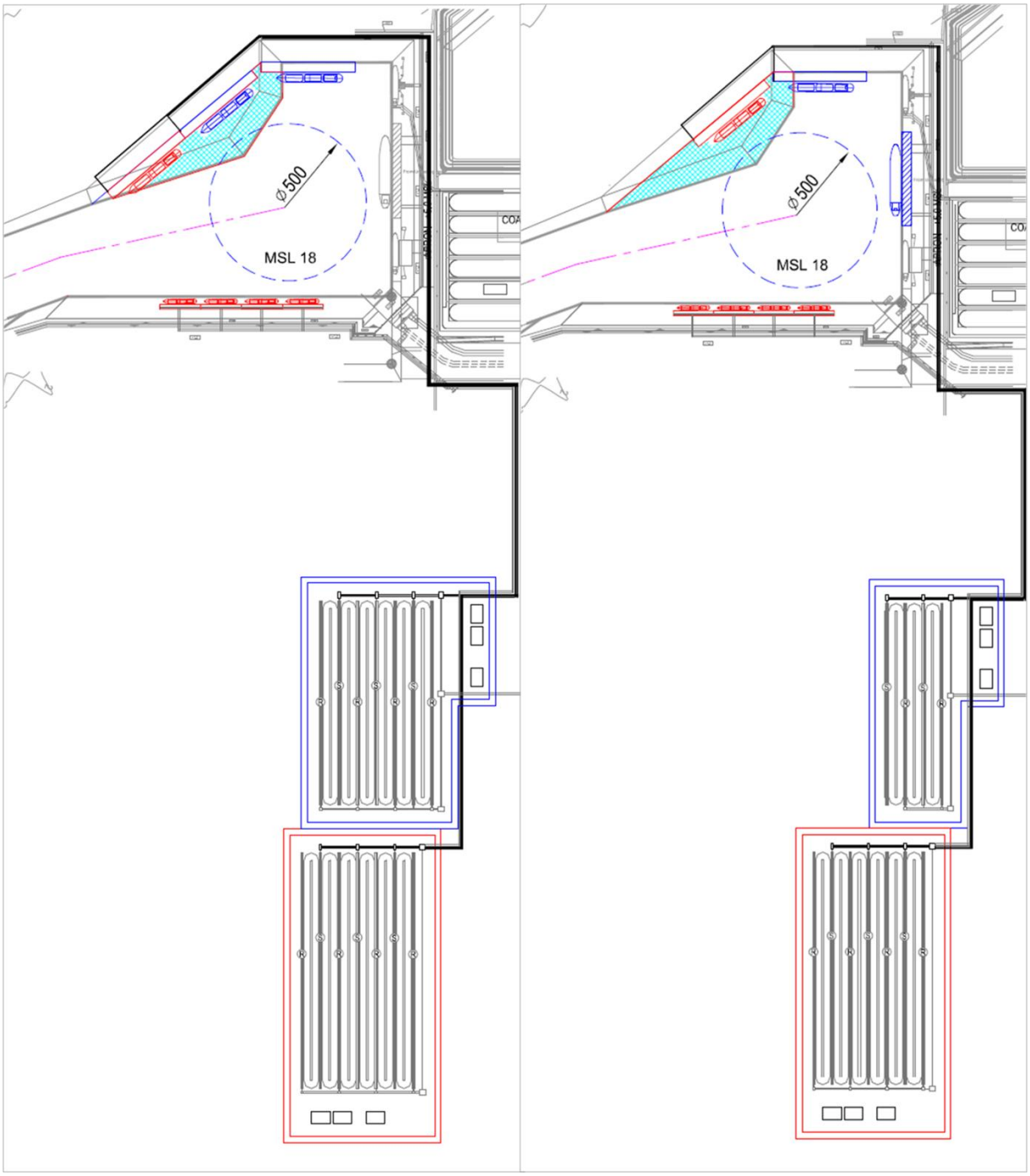
The investment cost of the project at the initial phase is also reduced with decreasing quantities of the facilities. The expected reduction cost is roughly estimated as follows:

		Current Plan (non-shared)		Unified Management Plan
Unloading Berth	(Unit)	4	⇒	3
Unloader	(Unit)	8	⇒	6
Coal Stockyard	(ha)	120	⇒	105
Stacker / Reclaimer	(Unit)	18	⇒	16

The advantage of the unified management plan is explained as follows. It is possible to save initial investment cost.

1. Save of Initial Construction Cost

Direct Cost	non-shared	929 mil USD	⇒	shared	831 mil USD
				Save	98 mil USD



Source：JICA Study Team

Figure 10.1.1 Layout of CTT Facilities （Left：non-shared、Right：shared）

10.2. Comparative Study of Each Coal Handling Facility

10.2.1. Port Planning under Common Use

The coal unloading berth of the Matabari CFPP is equipped with two unloaders, each with a capacity of 800t/h. The capacity of this berth is sufficient to meet the demand if this berth is dedicated only to

the CFPP. However, this berth has only 1/3 of the capacity of the ones of the CTT. If the port facilities and terminal facilities are utilised commonly and the CTT provide fuel coal even for the CFPP No1~No2, the efficiency of terminal operation could be vastly improved. The total investment cost could also be reduced.

Coal handling demand of the CTT is estimated as below in case the CTT provides fuel coal to the Matabari No.1 and No.2 CFPP.

Table 10.2.1 Import and Transshipment Volumes of Coal (unit: million tonnes)

Year	Import Volume	Supply by Land Transportation	Transshipment Volume
2025	13.5	13.5	0
2029	29.0	21.1	8.0

Source: JICA Study Team

(1) Required Number of Coal Unloading Berths

1) 1st Phase: Handling volume of coal is 13,500,000 t/year.

Total number of calling vessels in a year is 178 (13,500,000/76,000 = 177.6)

Two berths are necessary to meet the UNCTAD Standard. The berth occupancy rate is 39.7% ((178x1.49/350=0.758)/2=0.379) and the average waiting time drops to between 0.06~0.13 days.

By common use of the port facilities of the CFPP and the CTT, the required number of coal unloading berths could be reduced. Then only one coal unloading berth is required.

	λ (=178/350)	μ (=1/1.49)	ρ	wQ
M/M/1	0.5086	0.671	0.562	1.911
M/D/1	0.5086	0.671	0.562	0.956
M/M/2	0.5086	0.671	0.281	0.128
M/D/2	0.5086	0.671	0.281	0.064

2) 2nd Phase: Handling volume of coal is 29,000,000 tonnes.

Design vessel and the method to determine the number of berths are the same as in the 1st Phase.
Average berthing days: 1.49 days
Number of calling vessels per year: 382 (29,000,000/76,000=381.6)
Number of berths: 3 ((382 x 1.49) / 350=1.626)/3 =0.542)

Therefore, the number of berths is three and berth occupancy ratio becomes 54.2 % which satisfies the criteria of UNCTAD. The average waiting time of vessels is calculated to fall within a range of 0.15 to 0.31 days. The required number of coal unloading berths in the 2nd Phase is set as three. Therefore, one additional berth will be developed to accommodate Panamax-size vessels.

	λ (=382/350)	μ (=1/1.49)	ρ	wQ
M/M/2	1.091	0.671	0.813	2.905
M/D/2	1.091	0.671	0.813	1.452
M/M/3	1.091	0.671	0.542	0.308
M/D/3	1.091	0.671	0.542	0.154

(2) Required Number of Coal Loading Berths

The coal loading berths are exclusively used by the CTT instead of the CFPP, and thus the required number of coal loading berths would be the same as in the case of independent operation. In case the oil berth of the CFPP could also be used as a coal loading berth, the number of coal loading berths could be reduced.

10.2.2. Staged Plan (Port Facilities of the CFPP are Under Common Use)

The staged plan for port and terminal planning is proposed as follows. The plan is divided into 2nd Phases depending on the increasing coal demand.

(a) 1st Phase Development Plan

The 1st Phase Development Plan with the target year of 2025 is shown below.

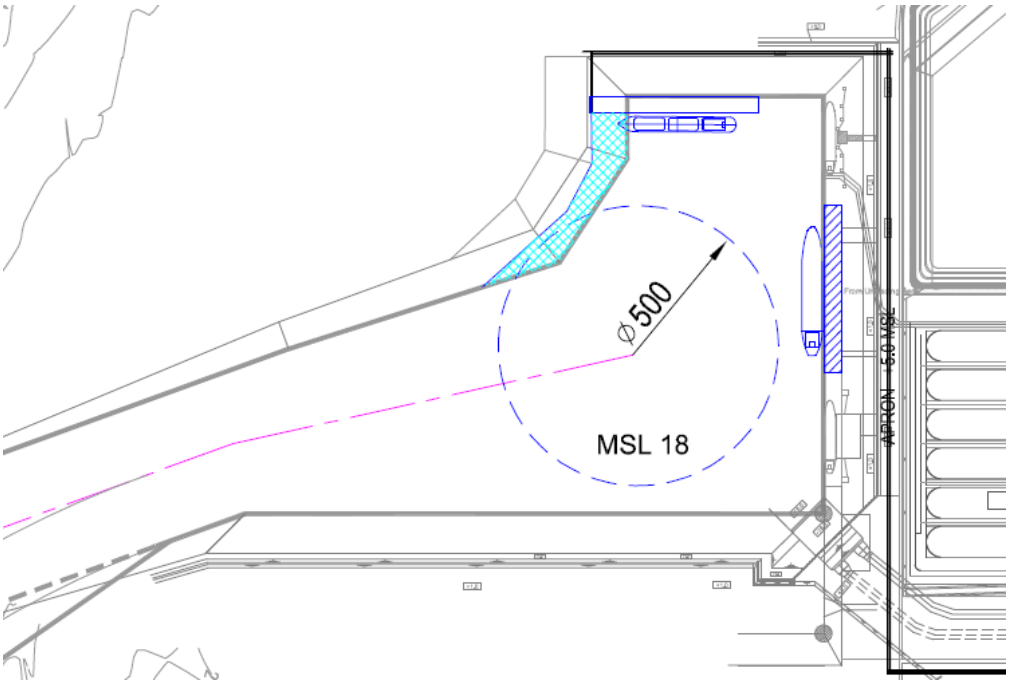
Table 10.2.2 Short Term Development Plan (excluding the CFPP)

Coal Demand		1,350 million tonnes	
Port Facility		Unloading Berth	Loading Berth
	Design Vessel	Over Panamax (80,000DWT)	－
	Berth (Number, Length Depth)	(2,300m,16m)	(－,－)
	Approach Channel (Breadth, Depth)	(250m,16m)	－
	Turning Basin (Depth)	16.0m	－
	Handling Equipment	Unloader 4 Capacity 2,500t/h	－
Layout of Port and Terminal		Figure 10.2.1	

Source: JICA Study Team

The number of the coal unloading berths could be reduced by one. The coal unloading berths can be located at the north side of the turning basin (Area A) as shown in Figure 10.2.1. Since all the large ship berths will face the turning basin, effective berthing/leaving becomes possible. In addition, the distance between the berths and coal stock yard could be minimised. Since more than one large vessel will stay in the port, it is necessary to secure a turning basin that is 50 m apart from the quay wall in

order to let a large vessel turn whilst another vessel is at berth. Expansion of the water area of 5.0 ha is necessary.



Source: JICA Study Team

Figure 10.2.1 1st Phase Coal Loading Berth Layout Plan (1)

(b) The 2nd Phase Development Plan

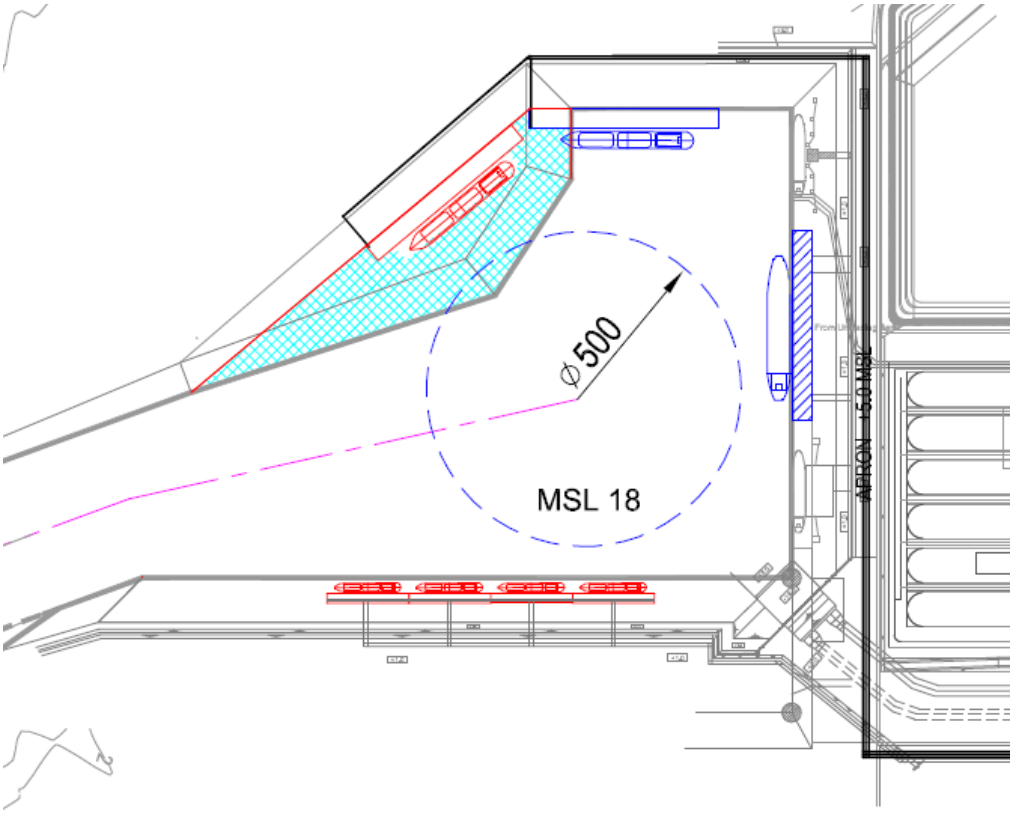
The 2nd Phase Development Plan with the target year of 2029 is shown below.

Table 10.2.3 Short Term Development Plan (excluding the CFPP)

Coal Demand		29.0 million tonnes	
Port Facility		Unloading Berth	Loading Berth
	Design Vessel	Over Panamax (80,000DWT)	5000DWT-
	Berth (Number, Length Depth)	(3, 300m, 16m)	(4, 130m, 7.5m)
	Approach Channel (Breadth, Depth)	(250m ,16m)	–
	Turning Basin (Depth)	(16.0m)	(7.5m)
	Handling Equipment	Unloader 6 Capacity 2,500t/h	Loader 4 Capacity 1,500t/h
Layout of Port and Terminal		Figure 10.2.2	

Source: JICA Study Team

In the 2nd Phase Development Plan, one more coal unloading berth is required in addition to the one constructed in the 1st Phase Development Plan. It is possible to secure the necessary length of the water front line and water area of the mooring basin for the new berth as shown in Figure10.2.2.



Source: JICA Study Team

Figure 10.2.2 2ndPhase Coal Unloading Berth Layout Plan (1)

In case the berths cannot be located at the north side of the turning basin due to the close proximity to inhabited areas or the channel for discharging heated water, large ship berths could be located along

the north side of the main channel by expanding the main channel northward as shown in Figure10.2.2. Expansion of the water area of 6.0ha is necessary. In this plan, it takes a long time for the large ships to berth since the new berth is located far from the turning basin. On the other hand, leaving the berth is easy and takes less time. The distance between the new berth and the coal stock yard would be longer than the other layout plan

10.2.3. Terminal Planning under Common Use Plan

The coal stock yard for Matarbari CFPP No1 and No2 are planned to storage coal of which volume is equivalent to consumption of coal used for electric generation at Matarbari CFPP under condition of 100% of continuous operation for 60 days. The volume of storage capacity is 830,000 tonnes and area of stock yard is 25 ha.

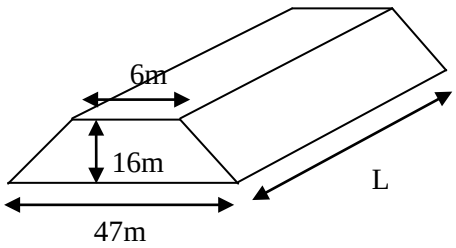
The following conditions for terminal planning are set up.

- Coal handling volume at terminal (stock): 13.5 million t/year (Phase 1), 30 million t/year (Phase 2)*
- Specific gravity: 0.9
- Coal stock volume at terminal: for 30 days
- Yard operation efficiency: 0.75
- Unloader: continuous type 2,500t/h
- Ship loader: 1,500t/h
- Stacker / reclaimer: 5,500t/h, 3,000t/h
- Belt conveyor (unloading): 6,000t/h
- Belt conveyor (discharging): 3,600t/h

* Supply coal volume for Matarbari CFPP No1 and No2 is estimated as 3.5 million ton.

(1) Required Coal Stock Volume at 1st Phase

The dimensions of stock pile are determined as illustrated below.



The sectional area is calculated as follows. A＝(6 + 47) x 16 ÷ 2＝424 m^2.

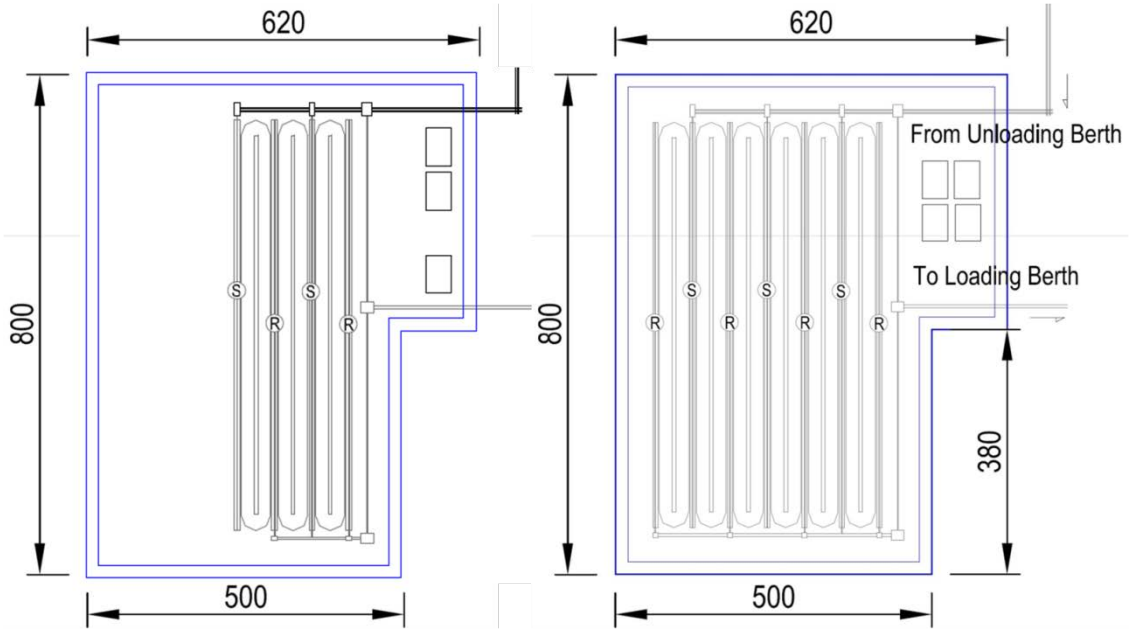
Coal stock volumes, length, and number of stock piles and the required terminal areas for the 1st Phase plan are computed and summarised below. It is assumed that coal will be transported with belt conveyor from unloading berth to coal fired power plant, which Singapore enterprise has a plan to invest and develop.

Table 10.2.4 Required Area (1st Phase)

	Coal Stock Volume	Efficiency of Coal Stock	Length of Stock Pile (m)	Number of Stock Pile	Required Area (ha)
	Total：125 CFPP：83 CTT：42	0.75	CFPP：540 CTT：600	6 3	CFPP：25 CTT：30

Source：JICA Study Team

Required area for coal stock yard of CTT is 31 ha, and it is possible to reduce 14 ha compared with the case under non-common use. The volume of stock pile and equipment such as stacker or reclaimer are also reduced.



Source：JICA Study team

Figure 10.2.3 Layout of Coal Stockyard（1st Phase　Left：Shared、Right：Non-shared）

(2) Required Coal Stock Volume in the 2nd Phase

Coal stock volumes, length and number of stock piles and the required terminal areas for the 2nd Phase plan are computed and summarised below.

Table 10.2.5 Required area (2nd Phase)

	Coal Stock Volume	Efficiency of Coal Stock	Length of Stock Pile (m)	Number of Stock Pile	Required Area (ha)
1st Phase	Total：130 CFPP：83 CTT：47	0.75	CFPP：540 CTT： 600	CFPP：6 CTT：3	CFPP：25 CTT：30
2nd Phase	CTT：125	0.75	CTT： 700	CTT：6	CTT：50

Source：JICA Study Team

Chapter 11. ENVIRONMENTAL AND SOCIAL CONSIDERATION

11.1. ENVIRONMENTAL CONSIDERATION

11.1.1. Legal and Policy Framework related to Environmental Assessment in the Country

The Bangladesh Environmental Conservation Act, 1995(amended 2010) provides environmental protection of Bangladesh as the principal law. An Environmental Clearance Certificate (ECC) is obligated to obtain prior to any project implementation. Under the act, environmental assessment process is provided by the Environmental Conservation Rules, the ECR, 1997 and its amendment. For the first step of the environmental application, Initial Environmental Examination (IEE) level information is required even for the environmental impact assessment (EIA) required projects (subscribed in the Environmental Conservation Rules (ECR) 1997). Then, other steps such as approval of EIA TOR and EIA submission can be continued within the process. Major legislation related to currently proposed projects are shown below (Table 11.1.1). Regarding the Natural environment, there are no significant gaps between legislation related to environmental assessment in Bangladesh (provided in Environmental Conservation Rule 1997 and others) and the JICA Guidelines for Environmental and Social Consideration 2010 (JICA Environmental and Social Guidelines 2010) in terms of the objectives of the EIA.

The naturally important areas in the country such as environmentally critical area ecologically critical area (ECA) are provided in the Environment Conservation Act 1995. The other protected areas are provided in the Wildlife (Conservation and Security) Act, 2012. In the act, various sanctuaries, National parks, community conservation area, safari park, eco-park, botanical garden and wild animal breeding center are defined.

Besides the above mentioned areas, Forest Act 1927 (amended 2000) provides protection to forests in the country. This act defines various protected forests such as “Reserved Forest”, “Protected Forest” and “Village Forests” and providing those forest management including penalties and procedures.

Table 11.1.1 Major Legislation to Environmental Assessment

Legislation	Contents
Environment Conservation Act (ECA)1995	The act is the principal law for general environment in the country. The act, including 21 articles, stipulates (1) the conservation of the environment, (2) the authority to regulate development and environmental pollution, (3) the setting of ambient and discharge standards, (4) clearance certificates, (5)inspection of factories and production facilities, and (6) violation penalties.
Environment Conservation Rules (ECR)1997	The rules provide detail environmental process under the ECA and it stipulates (1) the setting of national standards for air and water quality, discharges of gas and water for industries, and noise and vehicle exhaust; (2) the process of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA); and (3) the designation of specific areas that are important for environment conservation.
EIA Guidelines for Industries, 1997	This is a handbook of guidelines outlining procedures for preparing EIAs and for reviewing them. The handbook consists of the following: • EIA procedures • Screening of industrial projects • Application for Environmental Clearance • Review of EIA Report • Methodology for the EIA Process.
Environment Court Act, 2000	The aim and objective of the Act is to materialize the Environmental Conservation Act, 1995 through judicial activities. The main features of this Act are: • The Government will establish Environmental Courts, one or more in every Division • Jurisdiction of the Courts • Procedure of activities and power of the Courts • Right of Entry for judicial inspection, and • Appeal and constitution of Appeal Court.
Wildlife (Conservation and Security) Act, 2012 (Act No. XXX of 2012)	This is an act to provide for the conservation and safety of biodiversity, forest and wildlife of the country. The previous Wildlife (Preservation) Order, 1973 was repealed with enactment of the act. Sanctuaries such as wildlife sanctuary, elephant sanctuary, wetland dependent animal sanctuary, marine protected area, national parks, community conservation area, safari park, eco-park, botanical garden and wild animal breeding center.
Forest Act 1927 (amended 2000)	This is an act to consolidate the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest-produce. This act consists of 13 chapters defining protected forests such as “Reserved Forest”, “Protected Forest” and “Village Forests” and providing those forest management including penalties and procedures. The act includes declaration process for the reserved forests and protected forests from forest lands or waste land.

Source: JICA Survey Team, FAO Lex,

The environmental legislation in the country, Bangladesh is analysed in line with the principles of the JICA Environmental and Social Guidelines as shown in the table below.

Table 11.1.2 GAP Analysis between the JICA Environmental and Social Guidelines and Environmental Legislation in the Country, Bangladesh

Items	JICA Guidelines (Environmental and Social Considerations Required for Intended Projects)	Environmental Legislation in Bangladesh	Measure to be held in the Current Project
1. Underlying Principles	1. The earliest possible environmental assessment to incorporate the avoidance/minimization /mitigation of the impact into the project plan. 2. Quantitative and qualitative analysis covering social and environment harmonizing economic, financial, institutional, social and technical analysis. 3. Consideration on provision of alternatives and mitigation measures. EIA report for the large adverse impact. 4. Organizing a committee of experts for the particularly large adverse impacts)	Principally, all project activities are mandatory for the conduct of environmental studies to mitigate impacts prior to project implementation. The details of principles are described in the ECA 1995. The assessment covered the evaluation of the impact depending on the scale of the projects which is categorised into four as mentioned below. The process is provided in the laws, namely: ECA 1995, ECR 1997, and also the guidelines from the Department of Environment (DoE) (in this CTT case, EIA Guidelines for Industries). Alternative study is also included as an item to be reviewed by DoE in the EIA Guidelines for Industries (Section 5). In the EIA Guideline for industries (1.7 Methodology for EIA Process) describes the responsibility of the DoE to review the report by themselves or with the Environmental Assessment Committee appointed by DoE.	No particular large gap in between.
2. Examination of Measures	1. Examination of the multiple alternatives to avoid, minimize mitigate of the impact.) 2. Preparation of appropriate follow up plans and systems such as monitoring plans and environmental management plans.	The assessment covered evaluation of the impact depending on the scale of the projects, which is categorised into four as mentioned below. The process is provided in the laws, namely: ECA 1995, ECR 1997, and guidelines from the Department of Environment (in this CTT case, EIA Guidelines for Industries). Alternative study is also included as an item to be reviewed by DoE in the EIA Guidelines for Industries (Section 5). The requirement of the follow-up plans such as EMP and EMoP are described in the EIA guideline for Industries. Also, the plans are followed up at the process of the annual extension of the Environmental Clearance Certificate (ECC) and annual environmental audit.	No particular large gap in between.

3. Scope of Impacts to Be Assessed	1. Impacts on human health and safety, as well as on the natural environment, transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. 2. Examining derivative, secondary, and cumulative impacts indivisible from the project.	The contents of assessment covered evaluation of the impact depending on the scale of the projects which is categorised into four as mentioned below. The process is provided in the laws, namely; ECA 1995, ECR 1997, and the guidelines from the Department of Environment (in this CTT case, EIA Guidelines for Industries). Alternative study, cumulative impact and secondary impact as project caused impact are also included as items to be reviewed by DoE in the EIA Guidelines for Industries (Section 5).	No particular large gap in between.
4.Compliance with Laws, Standards, and Plans	1. Compliance with the laws, standards, policies, and plans. 2. Avoidance of the protected and conservation area of natural or cultural heritage designated by laws and ordinances. 2. Avoidance of the protected and conservation area of natural or cultural heritage designated by laws and ordinances.	Legal compliance is one of the items to be evaluated by the authority and these are: -Comparison with laws, regulations, or accepted standards; - Reference to pre-set criteria such as protected sites, features, or species; -Consistency with government policy objectives; -Acceptability to the local community or the general public; -Severity of the impact (reversible or irreversible); -Prevalence (eventual extent of impact); -Duration and frequency of the activity causing adverse impact; -Risk (probability of serious environmental effects); -Importance (local, regional, or national) -Mitigations (are solutions available to prevent or reduce severity of adverse impact to acceptable level).	No particular large gap in between. The environmental study can be conducted in accordance with the Bangladesh legislation and JICA Environmental and Social Guidelines (2010).
5. Social Acceptability	1. Adequate social coordination for their acceptance. In case of a large impact, sufficient consultation with local stakeholders via information disclosure at the early stage to be incorporated into the project plan.) 2. Consideration of the vulnerable people	Public participation is required in the EIA process to be incorporated into the EIA report (4.11 Public Participation in EIA Guidelines for Industries). It recommends to communicate with the public, as many people as possible, as early as possible, and through many different ways as possible.	Overall recognition of the importance of the public participation such as public consultation meeting are shared. Referring the other project experiences, adequate public consultation (public participation) should be conducted/considered.
6. Ecosystem and Biota	1. Avoidance of degradation of the natural resource 2. Avoidance of illegal logging	Section 2, Criteria for Locating Industrial Plants, in the EIA Guidelines for Industries, “environmentally or otherwise sensitive area” is listed as one of the most important factors for consideration in site selection. Also, clearly described as “forest land or prime agricultural land should be	No particular large gap in between.

		avoided as far as practical".	
7. Involuntary Resettlement	1. Avoidance and minimisation of involuntary resettlement 2. Sufficient compensation to project affected persons (PAPs) with timely manner 3. Appropriate participation of PAPs throughout the planning, implementation, and monitoring of the RAPs with appropriate grievance mechanisms 4. In a large-scale involuntary resettlement, advance information disclosure to the PAPs should be made in an understandable way covering the elements in the World Bank Safeguard Policy, OP 4.12, Annex A.)	Section 2 in the EIA Guidelines for Industries, "human settlement" is listed as one of the most important factors for consideration in site selection. Also, the resettlement is described in the checklist of the EIA guidelines as an important environmental component. However, there is no particular description on the minimisation of the resettlement.	No particular large gap in between. The compensation scheme should include proper compensation to the informal occupants in the area in accordance with the JICA Environmental and Social Guidelines (2010). There is a concern that the informal occupants in the area do not properly obtain eligibility of compensation.
8. Indigenous Peoples	1. Avoidance and minimising impacts to indigenous people 2. Respect for indigenous people's right obtaining their consent in a process of free, prior and informed consultation 3. Adequate measure to the adverse impact for indigenous people in the Indigenous Peoples Plan must be made in an understandable way covering the elements of the World Bank Safeguard Policy, OP4.10, Annex B.	There is no particular description in the EIA assessment. However, in the country, the matters on indigenous peoples including their rights are generally applied in the legislation on the Chittagong Hill Tracts such as the CHT Accord of 1997 and the CHT Regional Council Act of 1998 (Act XII of 1998).	No particular large gap in between.
9. Monitoring	1. Adequate monitoring of the predicted mitigation measures and occurrence of unforeseeable situation. 2. Feasible monitoring plan at the planning stage 3. Available monitoring process to local project stakeholders 4. Resolving problems through discussion and examination in public with sufficient stakeholder's participation	Monitoring program is recognized as one of the most important contents of the EIA (Section 4 in EIA Guideline for Industries 1997).	No particular large gap in between.

Source: JICA Study Team based on the JICA Environmental and Social Guidelines 2010, Environment Conservation Act (ECA)1995, Environment Conservation Rules (ECR)1997 and EIA Guidelines for Industries, 1997

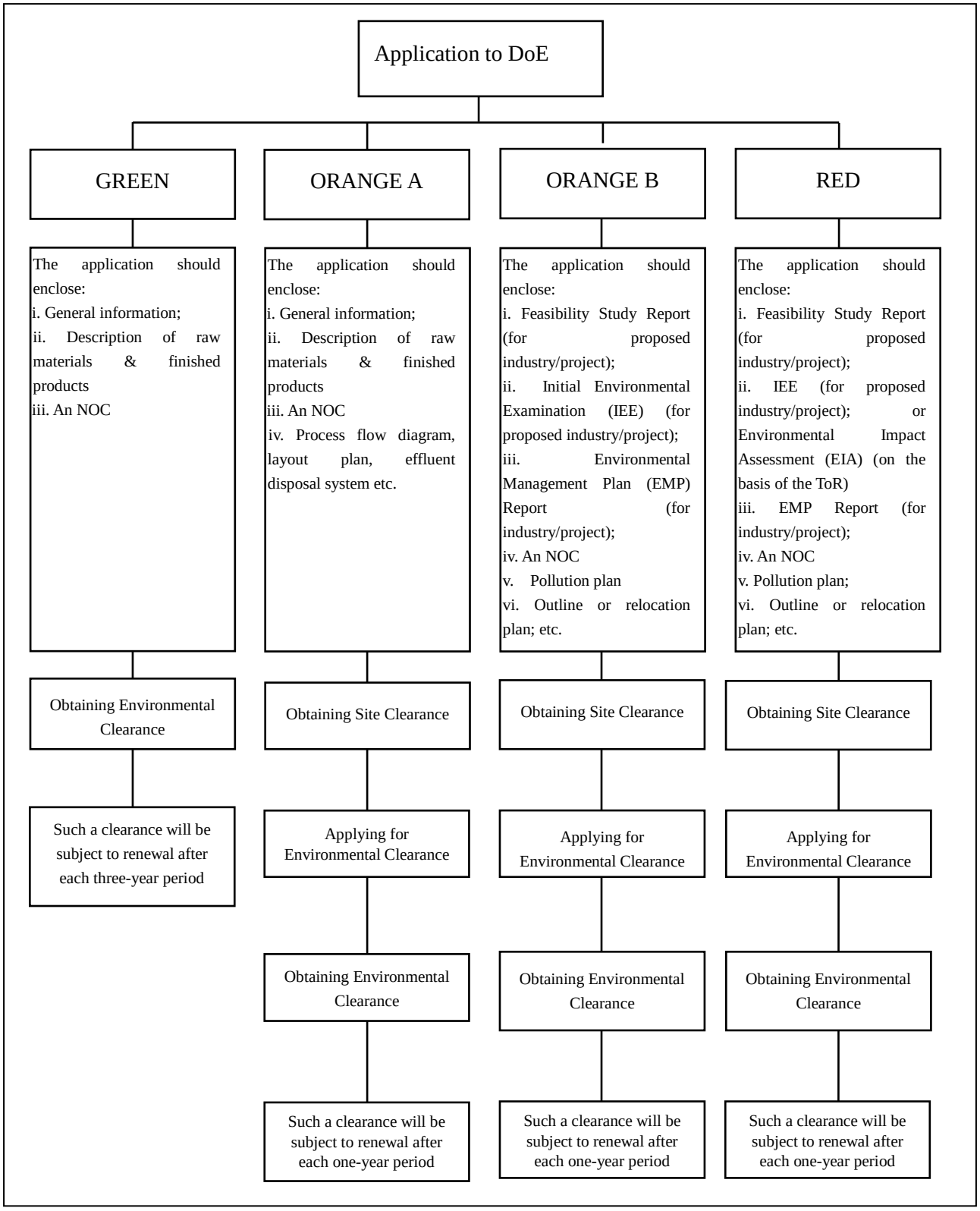
11.1.2. Environmental Assessment Process

The Department of Environment (DoE), and the Ministry of Environment and Forests (MOEF), are in charge of all the environmental assessment processes in the country. The Environmental Clearance Certificate (ECC) application process should be implemented according to the category into which the proposed project falls in line with the schedules stipulated in the Environmental Conservation Rules 1997(ECR 1997) and its amendments. The categories for industrial units and projects have been classified into four categories depending on the environmental impact and location. The DoE determines category for the proposed project at the project application. The categories and those required information are shown in Table 11.1.3 and the flow of the process in each category is shown in Figure 11.1.1.

Table 11.1.3 Category and Requirement of Each Category Provided in ECR 1997

Categories in BD.	Required Information
(a) Green	General information, no objection certificate (NOC) from the local authority, etc.
(b) Orange A	General information, NOC, Process flow diagram, Layout plan showing Effluent Treatment Plant (ETP), Waste discharge arrangement, Relocation plan if any
(c) Orange B	Feasibility Study(F/S), Initial Environmental Examination(IEE), EMP, NOC, ETP, etc.
(d) Red	F/S, IEE including TOR for Environmental Impact Assessment(EIA), ETP, EIA, EMP, NOC, etc.

Source: Environmental Conservation Rules 1997



Source: EIA Guidelines for Industries

Figure 11.1.1 Steps Involved in Environmental Clearance

11.1.3. Environmental Standard

Details of the environmental standards applicable in Bangladesh are described in the Environmental Conservation Rules (ECR) 1997. Regulated areas cover all industries, and regulated items are air quality, water quality (surface water, drinking water), noise (boundary, source), emissions from motor vehicles or ships, odor, sewage discharge, waste from industrial units and industrial effluents or emissions. In relation to the current Coal Transhipment Terminal Project, depending on the proposed project scheme, applicable standards should be followed referring to the ECR 1997(Appendix 2).

11.2. SOCIAL CONSIDERATIONS

11.2.1. Preparatory Social Survey

In order to identify a footprint of candidate CTT sites, the JICA Study Team undertook a preparatory social survey in the southern area of Matarbari CFPP and its associated port excavation with a local sub-consultant. It was observed that around the proposed area several villages and houses sporadically existed. The main purposes of the preparatory social survey are to map out the villages and houses and to count the number of residents/houses in the area around the candidate locations. It was confirmed that there are four villages with 467 households and 2,576 people in the south side of Matarbari CFPP development (see the following figure and table). Each of the villages is fairly populated. If a footprint of the CTT site overlaps one of the villages, large-scaled involuntary resettlement would take place.

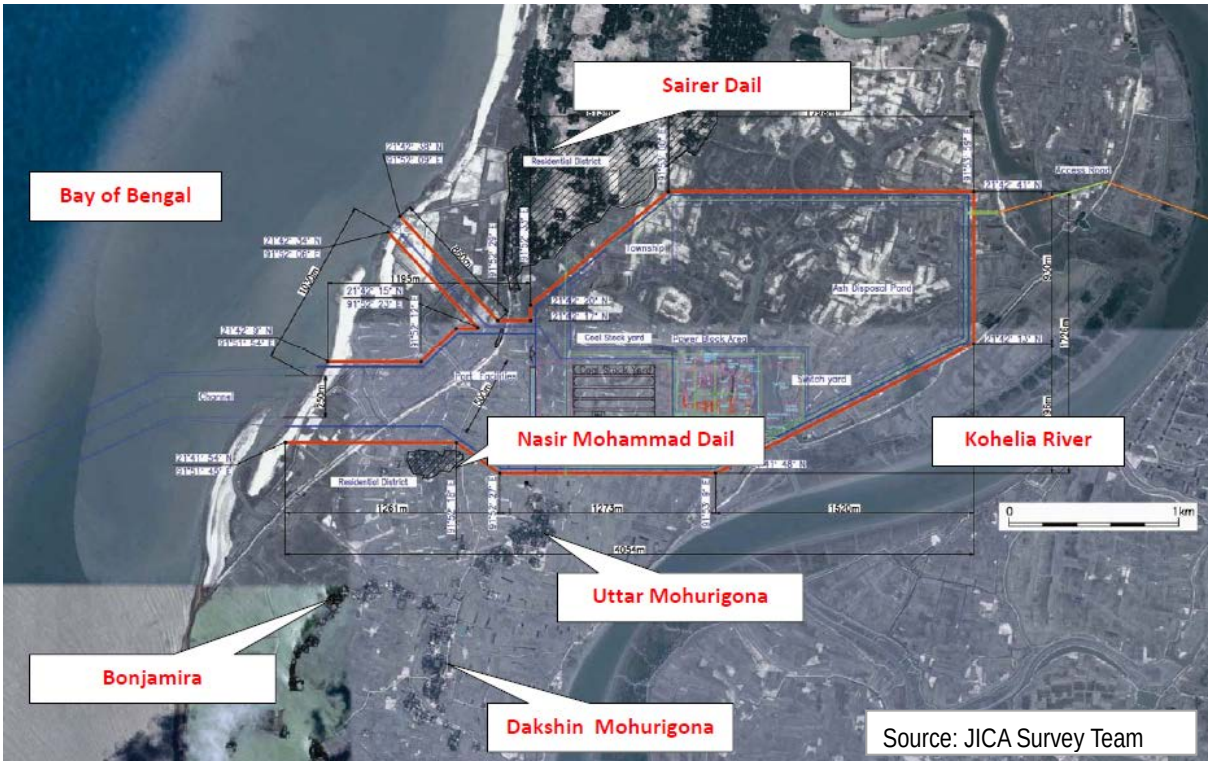


Figure 11.2.1 Villages Location Map near Matarbari CFPP

Table 11.2.1 Number of Households and People Living in the Four Villages in Dhalghata Union

Sl. No.	Name of Village	Union	Total number of households	Total number of population
1.	Nasir Mohammad Dail	Dhalghata	99	601
2.	Uttar Mohurigona	Dhalghata	211	1123
3.	Dakshin Mohurigona	Dhalghata	40	228
4.	Bonjamira	Dhalghata	117	624

Source: JICA Survey Team

Based on the results of the preparatory survey, the JICA Study Team has selected the area in the south of Matarbari CFPP avoiding Uttar Mohurigona Village, where there is possibility of large-scale involuntary resettlement, on the right bank of the Kohelia River is the most promising candidate site for the coal storage field, the main facility of CTT.

11.2.2. Legal/Regulatory Framework for Social Considerations

As of November 2015, there is no explicit legal or regulatory requirements for social considerations for a development project except for land acquisition in Bangladesh. Involuntary resettlement, land acquisition, and compensation for loss of livelihood of project affected persons (PAPs) are anticipated during the implementation of a project, the environmental authority, DOE, recommends that the project proponent formulates a Land Acquisition and Resettlement Action Plan (LARAP) in line with guidelines for environmental and social considerations of International Financial Institutions (IFIs) such as the World Bank (WB) and Asian Development Bank (ADB) as well as key donor agencies from advanced economies such as JICA and the United States Agency for International Development (USAID). The framework fills the gap between existing legal requirements in the country and IFI standard for social considerations. The LARAP for the proposed CTT Project is as follows. Details of the framework shall be attached in the Draft Final Report of the Project.

11.2.3. Land Acquisition, Resettlement and Compensation for Loss of Livelihood

The proposed CTT Project consists mainly of coal transhipment facilities, such as unloading berth, internal coal transporting, coal storage, and loading/unloading equipment, and secondary transport facilities such as belt conveyors connected to coal-fired thermal power plants nearby in the north and the same or barge for power plants located in the south of CTT. Regarding the footprint of the CTT, as the site selection plan in the previous chapter indicates, the JICA Study Team has selected among several alternatives an area avoiding any involuntary resettlement in the Phase I development. Coal storage field requires 45 hectares (ha). And for the Phase II development, as is shown in the layout

map in Figure 4.2.6 in Chapter 4, the expansion with additional plot of land, which again avoids large-scale involuntary resettlement, is envisaged.

Land ownership for the selected area will be confirmed with MOUSA map in the course of the survey. However, referring to the on-going economic activities through the year, salt production in the dry season and shrimp cultivation in the wet season, it is estimated that the land around the proposed CTT site belongs to the private owner(s). In case that the land owners and the beneficiaries are different, it is required to formulate a policy framework for compensation for loss of livelihood of the beneficiaries in addition to the framework for land acquisition.

The survey formulates the outline of framework for land acquisition, resettlement and livelihood compensation with reference to the Acquisition and Requisition of Immobile Property Ordinance of 1982 (the Ordinance 1982), which stipulates requirements for acquisition of private land for the development project in Bangladesh. In case that there is any significant deviation between the requirements for land acquisition, resettlement, and livelihood compensation set out in the Ordinance 1982 and the JICA Environmental and Social Guidelines (2010), the Survey proposes a revision on the framework outline. The framework outline will be applicable both to the 1st Phase and 2nd Phase. Details of the framework will be elaborated and finalized in the upcoming LARAP Study.

11.2.4. Access Road to the Southern Area of Moheshkhali Island

The construction of CTT facilities adjacent to Matarbari CFPP completely blocks land surface access to Dhalghata Union in the south of Moheshkhali Island. However, the current plan locates the loading/unloading berths and coal storage yards separately with each other. By installing the belt conveyor over the existing access load, the division of the two unions is avoided.

11.3. Scope of Environmental Study

11.3.1. Environmental Situation of the Current Project

(1) Project Categorization

The current study was categorised by JICA as category B because the environmental impacts are not significantly critical adverse impacts and they are site-specific and mitigable by normal mitigation measures. Considering the case with small-scale resettlement at the planning stage, the study covers the environmental study at the IEE level and the framework of the resettlement action plan (RAP), and the term of reference (TOR) for the required study such as EIA and RAP.

(2) Current environmental situation

In the 1st trip in April 2015, the settlement situation in the candidate project site and natural environment were observed in the field. Also, the required environmental procedure was consulted

through the interview with the Director in the Department of Environment in MoE. According to the director, it is highly possible to be classified into RED if the project involves large scale resettlement although the project scale is small. The brief environmental condition is summarized in the following table and there is no any significant reason to revise the previously classified "category B" at this stage (Table 11.3.).

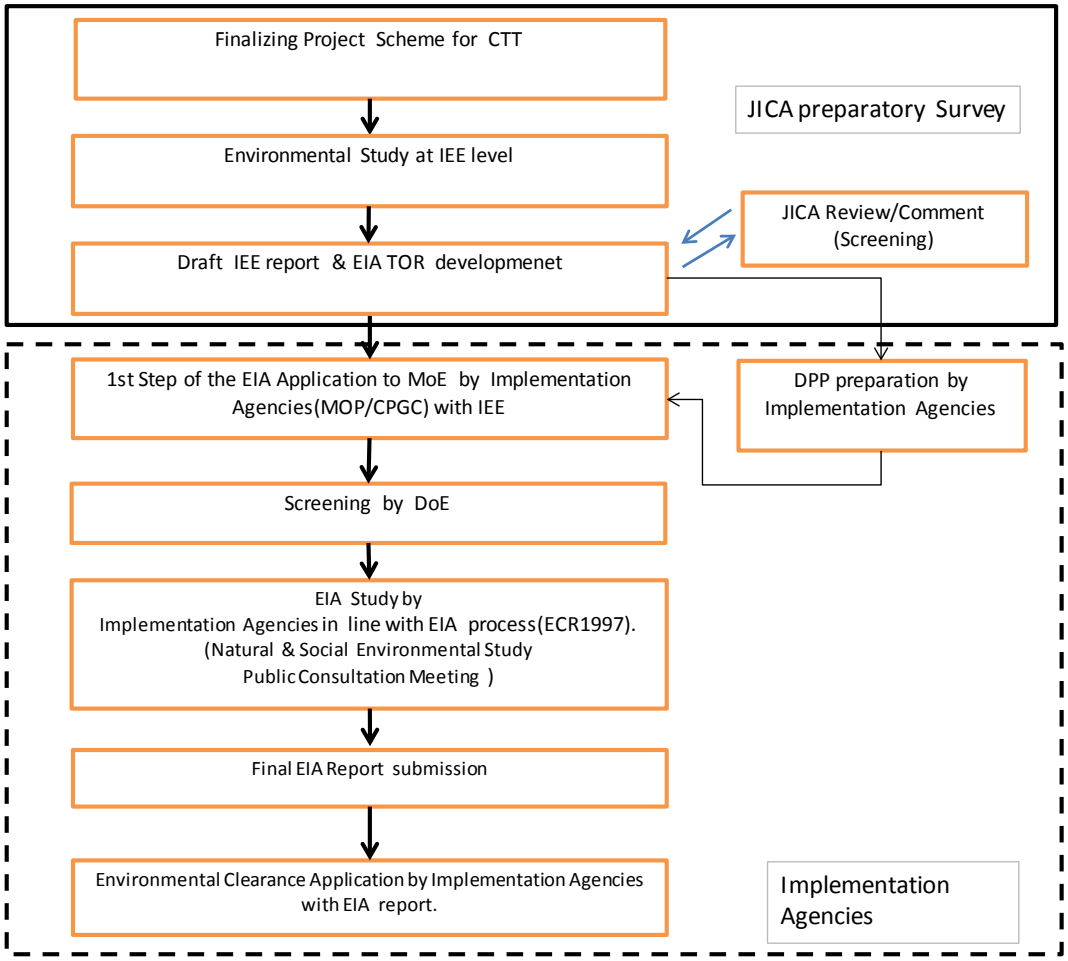
Table 11.3.1 Environmental Items to be Considered at the Project Screening

Environmental Items	Sub-items	Situation
Environmentally Sensitive items	Involuntary resettlement Large scale groundwater pumping Large scale Land reclamation, land development, and/or land-clearing Large scale Logging	At the Coal Thermal Power Station Project sites in the Matabari Island, DhalghataUnion, Uttar Mohiraghona, Nasir Mohammaddhil and Banjamila villages in DhalghataUnion are located at the south side. Also, Sairer Dail Village in Matabari Union is located at the north side of the project. Involuntary resettlement should be considered to be avoided/minimized at the planning stage. Currently, the CTT project for 1st Phase is planned at the south side of the thermal power project area, in the saltpan at the east side of Uttar Mohiraghona Village. The CTT project for 2nd Phase is also planned at saltpan the south side of the 1st Phase. There is no any structure identified in the area at the moment based on available satellite image and involuntary resettlement is not associated.
Environmentally sensitive area	＜Natural Environment＞ 1) Protected area (national parks, etc.) 2)Primeval forests, tropical natural forests 3)Ecologically important habitats 4)Habitats of endangered species protected under local laws or international treaties 5)Areas that run the risk of a large scale increase in soil salinity or soil erosion 6)Remarkable desertification areas	In the EIA study for thermal power project, the habitats of the sea turtle and spoon-billed sandpiper as endangered animal species were concerned. The project site selection and mitigation measures were considered based on the continuous field monitoring study conducted in different seasons. Current study for the CTT project is considered to avoid/minimise those environmental impacts. The project is principally been planning not to affect the coastline through avoiding large scale land reclamation and land development.
	＜Social Environment＞ 1)Areas with unique archeological, historical, or cultural value 2)Areas inhabited by ethnic minorities, indigenous peoples, or nomadic peoples with traditional ways of life, and other areas with special social value	No particular impact has been identified in the area at the moment.
Permits and Explanation		All infrastructure project basically requires to obtain an Environmental Clearance Certificate (ECC) prior to construction. At the registration of the project, IEE report, pre-F/S report and TOR for EIA study should be submitted to DoE. After the current CTT study, official process and EIA study may be required.

Source: JICA Study Team

11.3.2. Applicable Environmental the Study for Current Study

The current JICA CTT project study aims to grasp the overall environmental situation which is affected by proposed project scheme. To meet the requirements of official process on the EIA, the environmental study should be continued by the implementation agency after the current JICA study by submitting IEE report and TOR for EIA to obtain DoE's approval. The environmental study applicable for the current study is briefly explained in the following chart (Figure 11.3.1).



Source: JICA Study Team

Figure 11.3.1 Expected Environmental Study for CTT project

11.4. Result of the Environmental and social consideration study

The environmental and social consideration study at the IEE level was conducted to grasp the environmental situation associated with the presented Coal Transmission Terminal Development in Matabari area during the current JICA study.

11.4.1. Summary of Project Components

Project components include construction of port facilities, coal stockyard, control terminal etc., related to the coal transshipment and those operations including secondary ship operation. The location of the facility is at southern side of the planned Matarbari CFPP and Port area in Matarbari Union. The area is expected to have two locations in the Matabari area for approximately 45-50 ha of stock yard to accommodate above mentioned facilities and the detail of the facilities are shown below.

Table 11.4.1 Project Component

No.	Project Components	Specification/ Quantities	Remarks
1	Port Facilities	Unloading Berth L: 300 m, D:16.0 m 3 unit Unloader C: 2,500 t/h 6 unit Loading Berth L:130 m, D:7.5 m 5 unit Ship Loader C: 1,500 t/h 5 Unit	Unloading berth is planned to construct at the northern side of harbour of CFPP. Loading berth is planned to be constructed at the southern side of harbour of CFPP.
2	Coal Stockyard	Coal handling volume: 11.0 mil t/year Area：45ha (1st Phase) Coal handling volume: 26.5 mil t/year Area : 50ha (2nd Phase), Total 95ha(1st and 2nd Phase) Stacker/Reclaimer total of 14 unit Belt Conveyor : approximately 2.5 km(only internal transport between harbour and CTT) Facilities of disaster prevention or dust control	Coal stockyard is planned to be constructed around the southern side of the power plant
3	Control tower, maintenance shop	Building Maintenance yard	Control tower of maintenance shop is planned to be constructed in the coal stockyard around the power plant
4	Dredging and land reclamation	Expand of inner harbor : Approximately 8.5ha and 1.7 million m3. Secondary transportation in the river (if any) Land reclamation for coal Stockyard: 95ha for 1st and 2nd phases with the height of 5m	
5	Handling vessel at operation of the CTT	Handling Vessel : Phase -1: 171 vessels for Panamax Phase-2: 375 vessels for Panamax 1,600 vessels for 5,000t	

Source: JICA Study Team

11.4.2. Alternative Comparison

It is planned to acquire the land of about 95 ha for the proposed Coal Transshipment Terminal (CTT). "Without Case" is studied in Chapter 7.1 "Economic Analysis". Utilization of neighboring counties port for coal unloading and transportation by land is considered. Therefore, it is estimated that the impact of "Without Case" affect to large area comparing with the "With Case".

The three sites to accommodate CTT facilities with the approximately 100 ha was proposed in this alternative comparison. The proposed sites are as follows:

Site-1: This site will be located along the Bay of Bengal stretching from the southern (west) boundary of the Matarbari CFPP to Shekhpara Village bypassing Nasir Mohammad dail village, alongside the flood protection dyke.

Site-2: This site will be located along the Kohelia River stretching from the southern part of Uttar Mohurigona Village to south-east corner of Dakshin Mohurigona Village. Both uttar Mohurigona and Dakshin Mohurigona Vllages will be bypassed.

Site-3: This site will be located along the southern boundary of the Matarbari CFPP covering Nasir Mohammad Dail and Uttar Mohurigona Village.

Table 11.4.2 Comparative Statements of Alternative Sites

Sl. No.	Description of Item	Site-1	Site-2	Site-3
1.	Location	Southern side of Matarbari CFPP along the Bay of Bengal	Southern side of Matarbari CFPP along the Kohelia River	Southern side of Matarbari CFPP
2.	Area in ha	100	100	100
3.	Affected number of households	45	0	392
4.	Affected number of Population	274	0	2,134
5.	Proximity to Moheshkhali Energy hub	Far	Nearby	Nearby

Source: JICA Study Team

From the above comparative statement, no permanent residents will be affected in Site2. Moreover, this site is very close to Moheshkhali Energy Hub where several coal fired power plants will be installed. Hence, it may be concluded that Site -2 is the suitable site for the proposed CTT.

11.4.3. Current Status of the Natural and Social environment

(1) Social Environment

The proposed CTT will be located in Dhalghata Union of Moheshkhali Upazila under Cox's Bazar District on the west bank of the Kohelia River. The required area for CTT is 95 ha in total, which will

be acquired in a two-phased manner. The project site encroaches over the three unions, namely: Matarbari, Dhalghata and Kalarmarchara of Moheshkhali Upazila. Under this survey, an IEE field study was carried out in those three unions, which will be indirectly affected through CTT preparation, construction and operation. Socio-economic statistic data and the status of existing infrastructure in the three unions are summarized in the following table.

Table 11.4.3 Basic Socio-economic Information in Dhalghata, Matarbari, and Kalarmarchhara

Sl. No.	Item description	Unit	Quantity		
			Dholghata Union	Matarbari Union	Kalarmarchhara Union
1	Area	Ha	2,077	2,630	2,744
2	Villages	Nos.	14	21	33
3	House Holds	Nos.	2,250	8,168	8,930
4	Population	Nos.	12,877	44,936	49,268
	a. Male	Nos.	6,688	22,801	25,615
	b. Female	Nos.	6,189	22,135	23,653
5	Average Family Size	Nos. per family	5.72	5.5	5.51
6	Literacy	%	31.7	27.7	33.1
	a. Male	%	29.8	26.1	32.2
	b. Female	%	33.8	29.1	34.1

Source: BBS Population Census 2011

表 11.4.4Basic Existing Information in Dhalghata, Matarbari, and Kalarmarchhara Unions

Sl.No	**Name of Institute**	**Name of Union Parishaed**			**Total (Nos.)**
		Matarbari (Nos.)	**Dhalghata (Nos.)**	**Kalarmarchhara (Nos.)**	
1	Primary School	2	4	3	9
2	High School	3	1	1	5
3	Junior High School	1	0	0	1
4	Madrasha	1	2	1	4
5	FWC(Health Service)	1	1	1	3
6	Community Clinic	3	1	4	8
7	NGO*	3	1	6	10
8	Mosque	6	4	5	15
9	Eidgaon	1	0	1	2
10	Eatimkhana	3	2	1	6

Sl.No	Name of Institute	Name of Union Parishaed			Total (Nos.)
		Matarbari (Nos.)	Dhalghata (Nos.)	Kalarmarchhara (Nos.)	
11	Graveyard	1	2	1	4
12	Temple	2	1	1	4
13	Tomb	2	0	1	3

Source : Upazila Office and Union Information Center.

* Name of NGO : BGS,Protashe,Grameen,RICk,S.R.P.D,WFP,Codake

Notes: Madrasha: Islamic Educational Institute, Eidgaon: Religious Festival Site, Eatimkhana: Orphanage

During the IEE study, socio-economic survey was undertaken in August 2015. The outline of the survey findings are described in the following sections.

(a) Education and Literacy

About 51% of the household members are literate and 43% of the household members are illiterate. The educational level of the household members in the project area is shown in Table 11.4.5.

Table 11.4.5 Education Level of the Residents

No.	Education Level	Nos.	%
1	Do not Read & Write	480	42.55
2	Only Can Sign	38	3.37
3	Class I-V (primary school)	199	17.64
4	Class VI-X (secondary school)	211	18.71
5	S.S.C (post-X-grade certificate)	87	7.71
6	H.S.C (high school graduate certificate)	51	4.52
7	BA/Fajil (Bachelor's of Art)	43	3.81
8	M.A/Kamil (Master of Art)	16	1.42
9	Hafez (Those who have memorized all the Koran chapters)	3	0.27
Total		1128	100.00

Source : JICA Study Team

(b) Occupation

In the project site, most of the house hold heads do salt cultivation in their entitled land in the dry season and shrimp cultivation as secondary occupation in the rainy season. About 152 household (HH) heads (72%) are salt cultivators in the dry season and 103 HH heads out of the 152 salt cultivators (46% of the total HH heads) are shrimp cultivators in the rainy season. Twenty HH heads (9.4% of the total) are slat field laborers. Apart from the above occupation, the house hold heads are involved in many other occupations.

Table 11.4.6 Occupation of Houehold Heads

Sl.No	Name of Occupation	Nos of HH	%
1	Salt Cultivator/Shrimp Cultivator	152/103	71.70
2	Salt Laborer	20	9.43
3	Salt Mazi (Leader of Salt Laborers)	7	3.30
4	Business	12	5.66
5	Teacher	4	1.89
6	Imam	1	0.47
7	House Wife	6	2.83
8	Abroad	2	0.94
9	Fisher Man	1	0.47
10	Driver	1	0.47
11	Quack	3	1.42
12	Service	2	0.94
13	Electrician	1	0.47
		212	100.00

Source: JICA Survey Team

(c) Source of Drinking Water

Approximately 98.6% of the households use tube well and 1.4% of the households use traditional well as source of drinking water.

(d) Types of Latrine

Thirty-three percent of the household use katcha latrines with wooden board walls, 54.72% slab and 29.72% Pucca latrines with concrete structure.

(e) Building Materials

The roof of 83% of the houses are made up of tin. Walls of 74% of houses are made up of bamboes and floor of 83% of the houses are made up of soil/earth.

(f) Household Assets

In the survey, it has been observed that about 96% have mobile phones, 42% radio, 19% television, 39% native-boats, 77% farming tools, 43% fans, 10% safe drinking water machine, 10.85% engine boat, 6% stitching machine, 3% bicycle, 5% motorbike, 5% computer, 6% refrigerator, and 3% washing machine. Some households even own rickshaws and CNG auto-rickshaws. Due to the production of salt and fish farming, the financial status of the people in the area are strong, hence,

penetration rates for mobile phones and house electric appliances are relatively higher in those unions.

(g) Household Monthly Income

The monthly income of 23.58% of households is in the range of BDT 10,001 to BDT 20,000; 18.87% of households in the range of BDT 40,001 to BDT 50,000 and 16.51% in the range of BDT 20,001 to BDT 30,000. The number of low income group households (BDT 5,000- BDT10,000) and high income group (BDT 60,000 and above) are very less. Most of the households are of medium income group (BDT 10,001 to BDT 50,000).

(2) Natural Environment

(a) Climate

The proposed Coal Transshipment Terminal (CTT) is located in Matarbari island of Moheshkhali upazila which lies in the south-eastern part of Bangladesh, where monsoon comes in July and recede in late October. The monthly minimum temperature was 10.3°C in Cox;s Bazar. It is observed that the average relative humidity in Cox's Bazar area varies from 62% to 91% and in Kutubdia from 67% to 92%. The total yearly rainfall varies from 3,821 mm to 4,707mm in Cox's Bazar and from 2,320 mm to 4,677 mm in Kutubdia. Rainfall is concentrated between May and October; while very little or no rain is recorded from November to April. Wind directions in the project area are mostly from the south during the period from March to September and from the north during the period from October to February.

(b) Air quality

Air quality was tested in the dry season and rainy season at the Matarbari 1200MW CFPP site in 2012 and 2013 in its EIA study. The three aspects, i.e., SPM, SO2 and NO2 were monitored. The values were retained under the standard values.

(c) Water quality

As available water quality in the area, the water quality of the river (Kohelia River), sea water, and groundwater, near the power plant site was surveyed in the rainy season and dry season in 2012 in the EIA for CFPP. The result showed that no particular water contamination was observed and the value of salinity suggested that the surveyed area has brackish water that is under the influence of sea water in the rainy season. Suspended solids (SS) (only in the rainy season) and chemical oxygen demand (COD) showed high concentration levels similar to the sea water quality survey results. Also, the results of the groundwater analysis (CFPP area in both rainy and dry seasons) in the aspects of Ch, un-ionised ammonia (NH3), iron (Fe), hardness (Ca), arsenic (As), dissolved oxygen (DO), biochemical oxygen demand (BOD), COD, SS, and coliform satisfied the drinking water

standards of Bangladesh except a slight lower case of DO (detail water quality data is shown in Appendix 3).

(d) Noise in the area

As available information of the noise in the area, actual survey in both rainy and dry season in 2012 was conducted in the EIA study for CFPP. The noise measurement results indicated that the day time noise level was above the environmental standards for residential areas at one sampling point. Matarbari Island is, as cited above, not an industrial area and therefore vehicles used for local transportation were the noise source. These vehicles are not used during the night.

(e) Natural Hazard (Cyclone, Seismicity)

The southeastern region of Bangladesh is cyclone prone area. Severe cyclones like cyclones in 1970 and 1991 damaged the structures. Enough protection against cyclones is required to avoid accidents. Bangladesh and northeast Indian states have long been one of the seismically active regions of the world, and have experienced numerous large earthquakes during the past 200 years at an average rate in every 30 years.

(f) Topography

The area is generally flat without any particular topographical feature. The project site is located in the flat area on the coastal peninsula developed at the east side of the Bengal Bay, namely; Matarbari Island. Elevation is almost the same as the sea level approximately +1 m in general.

(g) Land Use and Ownership

The proposed CTT site is located in Dhalghata Union. Dhalghata Union comprised one mouza having an area of 2,077 ha of which the net cultivable land is only 78ha (4%), (the detail PAP's occupations such as tenant-farmer are shown in Table 11.4.6 Occupation of HH Heads). The areas under salt cultivation are about 1,163ha (56%). The land use of the project site is categorized as "Salt-Shrimp Area".

About 90% of the lands of the proposed CTT project are owned by private owners and 10% of the lands are owned by the Government of Bangladesh. The government owned lands are mostly canal, roads, embankment etc. Salt fields are mostly owned by the private owners. The detailed study should be done in the EIA study.

(h) Biological resources

Biological resources in the area is considered not particularly rich because the area is generally used by local peoples for shrimp farming and salt pans to the area over several generations. As available information, four endangered sea turtle species, Olive ridley turtle (*Lepidochely solivacea*), Loggerhead turtle (*Caretta caretta*), Green turtle (*Chelon iamydas*), and Hawksbill

turtle(*Eretmochelys imbricate*) were observed in the dry season, December-March in 2012 at the sandy beach in Cox's Bazar including the area in front of the Matarbari 1200MW CFPP Project. The area is used for spawning by those species. Also, Spoon billed sandpiper (*Calidris pygmaea*), an endangered migratory bird was observed in the area in the dry winter season. Fishery resources on the coastal area and river mouth are 29 species of freshwater fishes and 29 species of marine fishes. Based on the detailed survey in the rainy season and dry season, the CFPP Project proposed mitigation measures.

(i) Protected area

In Bangladesh, there are seven kinds of protected area and these are: national park, wildlife sanctuary, game reserve, botanical gardens, eco-parks, reserved forests, and protected forests which are declared under the Wildlife (Conservation and Security) Act, 2012. Surrounding areas of the Matarbali Island, are the Moheshkhali Reserve Forest which is 5 km away from the project site and Sonadia Ecologically Critical Area (ECA) located about 15 km away from the project site and no significantly large impact is identified.

11.4.4. Environmental Evaluation based on the IEE study

Based on the result of IEE study, the anticipated environmental impacts are assessed. For each environmental items, anticipated impacts are described below (Table 11.4.7). Also, related to the assessed impacts, the JICA Environmental Checklist and Screening Form are shown in Appendix 4 and 5. The Checklist and Screening Form should be updated and revised if necessary prior to the JICA environmental review on the project.

Table 11.4.7 Anticipated Environmental Impact on the CTT Project at IEE Study Phase

(Result of scoping for CTT)

Item	No.	Impact	Rating		Reason and Description for Evaluation
			Pre- / construction Phase	Operation Phase	
Pollution Control	1	Air Quality	B-	B-	**Construction phase:** Generation of dust by land preparation and other construction work is expected, but the impact will be temporary. Generation of air pollutant (SOx, NOx, and others) from operation of heavy machines and trucks is predicted, but the impact will be limited only within the surrounding area. Watering the access road and construction site, especially in the dry season, and using cover sheets on trucks for the transportation of soil will be undertaken to reduce dust generation. Periodic machineries and management of all the construction machinery and vehicles will be conducted to reduce exhaust gas discharged from construction machineries and vehicles. **Operation phase:** Associated with CTT operation such as loading and unloading of coal from the vessel, air pollution mainly coal dust is anticipated in windy condition. The countermeasure to minimize the dust dispersion such as frequent watering and prevention net should be taken.
	2	Water Quality	B-	B-	**Construction phase:** Soil runoff from the exposed soil of the embankment and cut slope may increase turbidity of water at the downstream area of the Kohelia River in the rainy season. Earth work in the rainy season should be limited to controllable area. **Operation phase:** Water pollution may occur on the downstream of the surrounding river due to run off coal dust in the rainy days, during loading and unloading of coal. Adequate erosion prevention/control measures such as vegetation and terracing should be applied.
	3	Waste	B-	B-	**Construction phase:** General waste and hazardous waste such as paints, solvents /motor oil/ batteries etc are generated by the construction work. Proper disposal of the waste should be applied. Some dredged earth material should be disposed if these are unsuitable for construction use. Those are expected to be treated on the site dumping place in the project area of CFPP. **Operation phase:** General waste and hazardous waste sre generated. Proper disposal of the waste should be applied.

Item	No.	Impact	Rating		Reason and Description for Evaluation
			Pre- / construction Phase	Operation Phase	
	4	Noise and Vibration	B-	B-	**Construction phase:** Impact of noise and vibration is predicted caused by operation of heavy machines and trucks, but will be limited to the surrounding area. Regular maintenance of the equipment should be conducted. Low-noise/low vibration machinery will be applied. **Operation phase:** Impact of noise and vibration is predicted caused by plant operation of equipment and machineries used for loading, unloading and transportation of coal. Regular maintenance of the equipment should be conducted. Low-noise/low vibration machinery will be applied.
	5	Odor	B-	B-	**Construction and Operation phases:** In case domestic waste from the workers' camp is not appropriately treated, bad odors of rotten waste may occur.
	6	Soil Quality	B-	B-	**Construction phase:** Possibility of soil pollution caused by leakage of lubricants and fuel oil from construction vehicles and machinery. **Operation phase:** Possibility of soil pollution caused by penetration of coal dust water into the soil from the coal pile.
	7	Sediment	B-	B-	**Construction phase:** Possibility of sediment pollution in case construction wastewater flows into the sea and surrounding rivers. **Operation phase:** Possibility of sediment pollution in case CTT wastewater and domestic wastewater flows into the surrounding rivers.
Natural Environment	8	Protected Areas	D	D	**Construction phase:** Moheshkhali Reserve forest is 5 km away from the project site and Sonadia Ecologically Critical area is also located about 15km away from the project site. No impact of air pollution, noise and vibration due to construction work is anticipated. **Construction and Operation phases:** Sonadia ECA has been designated pursuant to the Environmental Protection Law in Bangladesh, located 15km south of the proposed project site.
	9	Ecosystem	B-	B-	**Construction phase:** Four endangered sea turtle species, Olive ridley turtle (*Lepidochely solivacea*), Loggerhead turtle (*Caretta caretta*), Green turtle (*Chelonia mydas*), and Hawksbill turtle(*Eretmochelys imbricate*) were observed in the dry season, December-March on the sandy beach in Cox's Bazar including the area in front of the Matarbari 1200MW Thermal Power Station Project. The area is used for spawning by these species and

Item	No.	Impact	Rating		Reason and Description for Evaluation
			Pre- / construction Phase	Operation Phase	
					detailed study was conducted to minimize the impact in the EIA study oh the Thermal Plant. The CTT site was selected to avoid disturbance of the beach. Spoon billed sandpiper (*Calidris pygmaea*), a migratory bird was observed in the area in the dry winter season. Fishery resource on the coastal area and river mouth were found with 29 species of freshwater fishes and 29 species of marine fishes. The habitat of these species may be affected. **Operation phase:** The impact of air pollution, water pollution, noise and vibration due to operation of heavy equipment and conveyor belt during loading and unloading of coal is anticipated on the terrestrial and aquatic ecosystem.
	10.	Geography and geology	C	C	The impact is unknown. Geo-technical investigation of the CTT area may be conducted during EIA study.
Social Environment	11.	Land acquisition and Resettlement	B-	D	**Pre-construction phase**: Approximately 100 ha of land will be acquired. It was observed that there were no permanent households in the project area. But about 9/10 houses were available beside the project boundary occupying more than one family in each house. Only three temporary sheds for security people employed for fish (shrimp and other fishes) cultivation were available in the project area. Land owners to be identified in the conduct of topographic survey in the EIA study will lose their lands. Employers/ employees of salt farms, shrimp farms, and fishermen will lose their means of livelihood.
	12	Disturbance to Poor People	C	C	**Pre-construction phase:** In the area, approximately 8.49% of the population are living under the poverty line. These poor people may lose their livelihood if the CTT is constructed. **Construction phase:** There are poor households who will lose their means of livelihood. However, their living conditions will not deteriorate compared with their current ones, and they will have job opportunities at the construction site. **Operation phase:** Poor people who currently have deteriorated living standards without proper facilities will have better access to social services throughout the year if roads are improved along with the construction of the power plant, especially access during the rainy season.

Item	No.	Impact	Rating		Reason and Description for Evaluation
			Pre- / construction Phase	Operation Phase	
	13	Disturbance to Ethnic Minority Groups and Indigenous People	D	D	There are no ethnic and indigenous people found in or around the project site.
	14	Deterioration of Local Economy such as Losses of Employment and Livelihood Means	C	C	**Pre-construction phase:** It is anticipated that employers/ employees of salt farms, shrimp farms, and fishermen will lose their means of livelihood. Fishing activities around the site will also be affected due to water pollution and restriction of fishing. **Construction phase:** Although some poor households may be worse off by losing their means of livelihood, local people will be employed for construction work. **Operation phase:** There will be permanent losses or reduction of livelihood means in salt farming, shrimp farming and fishing activities. Employment opportunities will be offered at CTT for local people.
	15	Land Use and Utilization of Local Resources	C	C	The acquisition of 100 ha land currently dedicated to salt/shrimp cultivation and fishing will change the traditional land use pattern and utilization of local resources.
	16	Disturbance to Water Usage, Water Rights, etc.	C	C	**Construction phase:** Local economy may be affected by the turbid water discharged from the construction site. Outflows of street dust and oil whilst it rains may also cause certain effects. **Operation phase:** Local economy may be affected by the discharged water from the CTT into the Kohelia River..
	17	Disturbance to the Existing Social Infrastructure and Services	C	C	**Construction phase:** Material and equipment transportation will be mainly conducted by ship, so that increased marine traffic may disturb the existing marine traffic including fishing boats. In addition, commuting of CTT workers will increase the traffic volume of the surrounding roads, possibly leading to traffic jams. **Operation phase:** Traffic volume will increase. Road improvement will increase local access to social services and markets throughout the year, especially during the rainy season.
	18.	Social Institutions such as Social Infrastructure and Local Decision-making Institutions	B-	D	**Pre-construction phase:** The Deputy Commissioner's Office of Cox's Bazar District is responsible for taking the initiative to conduct local consultations and detailed measurement surveys for land acquisition and resettlement, and these actions will affect social infrastructure and local decision-making institutions.

Item	No.	Impact	Rating		Reason and Description for Evaluation
			Pre- / construction Phase	Operation Phase	
	19.	Misdistribution of Benefits and Compensation	B-	B+	There may be feelings of resentment, because people living around the project site will benefit through the improvement of social infrastructure and services. People those who lose their means of livelihoods will receive certain compensation.
	20	Local Conflicts of Interest	B-	B-/B+	**Pre-construction phase**: People to be resettled and those who will lose their means of livelihoods will receive certain compensation. Local conflicts of interest may occur between residents, and between local administration bodies and local political leaders. **Construction phase:** Conflicts between local residence and external workers may occur because of changes in local customs if the external workers cannot understand local customs. People living around the project site will benefit through improvement of social infrastructure and services. Those who will lose their means of livelihoods will receive certain compensation. Local conflicts of interest may occur between employers and employees of salt farms, shrimp farms and fishing industry, and between local administration bodies and local political leaders. **Operation phase:** There may be feelings of resentment and reconciliation, because people living around the project site will benefit through the improvement of social infrastructure and services. People who lose their means of livelihood will receive certain compensation. Conflicts amongst local residents may occur if such benefits were misdistributed.
	21	Cultural Heritage	D	D	There is no historical, cultural and archaeological property and heritage existing on or around the site.
	22	Landscape	C	C	Loading/unloading berths are part of normal port facilities, leading to no serious impact on landscape. On the other hand, depending on how closely the coal storage yards is located from residential areas, there may be adverse impact on landscape.
	23	Gender	B-/B+	B+	**Pre-construction phase:** There are women who will lose their livelihood. Wives of men who lose their land or jobs may suffer from adverse effects on their household economy. **Construction phase:** Amongst those who will lose their livelihood are women. However, their living conditions will not deteriorate compared with their current living conditions. **Operation phase:** Women will have better access to social services throughout the year if roads are improved

Item	No.	Impact	Rating		Reason and Description for Evaluation
			Pre- / construction Phase	Operation Phase	
					along with the construction of the CTT, especially access during the rainy season without relying on heavy vehicles or boats.
	24	Children's Rights	B-	B-/B+	**Pre-construction phase:** There are children who will lose their livelihood. 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 rights to go to school may further deteriorate if the access way to their school is physically blocked by the construction site. The number of children who drop out of school may increase because of the huge demand of unskilled workers at the construction site. **Operation phase:** The number of children who drop out of school may increase if there are no age restrictions of unskilled workers at the CTT site. Children will have better access to social services throughout the year if roads are improved along with the construction of the CTT, especially access during the rainy season.
	25	Infectious Diseases such as HIV/AIDS	B-	D	**Construction phase:** A temporary influx of migrant labor during the construction period may increase the risk of sexual transmitted diseases, etc.
	26	Work Environment (Including Work Safety)	B-	B-	**Construction phase:** High risk rate of accidents is predicted in the construction work. **Operation phase:** Work accidents of workers may occur.
Others	27	Accidents	B-	B-	**Construction phase:** Marine traffic and land traffic accidents may occur if there is no proper safety education. **Operation phase:** Marine traffic and land traffic accidents may occur. Fire caused by spontaneous ignition of stored coal may occur, and traffic accidents due to increased traffic may occur.

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

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

C+/-: Extent of positive/negative impact is unknown. (Further examination is needed, and the impact may be clarified as the study progresses.)

D: No impact is expected.

11.4.5. Environmental Mitigation Measure (Tentative Environmental Management Plan)

Based on the IEE study, the Environmental Management Plan (EMP) should be finalized at the time for EIA process in accordance with the further detailed study. Here, EMP at IEE stage is tentatively presented as outlined below and details are shown in the Appendix 6.

Table 11 4.8 Outline of Environmental Management Plan for Transmission Lines (Nov. 2015 Tentative Version and this Should be Revised with EIA Process)

Environmental Item	Environmental Management Plan
Air Quality	**[Construction phase]** - Taking preventive measures for air pollution
Water Quality	**[Construction phase]** - Taking preventive measures for water pollution **[Operation phase]** - Taking preventive measures for soil runoff
Noise and Vibration	**[Construction phase]** - Taking preventive measures for noise and vibration
Ecosystem	**[Construction phase]** - Appropriate construction activity time and method should be selected in consideration of the behavior of the precious species. **[Operation phase]** - Taking preventive measures for undisturbed ecosystem
Topography and Geology	**[Construction phase/ Operation Phase]** - Preventing soil loss by stabilizing any slopes of construction area with concrete, as necessary based on geological survey
Land acquisition and compensation	**[Pre-construction Phase]** - Land acquisition for CTT to be done with proper compensation - Compensation should be conducted in compliance with relevant laws and regulations
Deterioration of Local Economy such as Losses of Employment and Livelihood Means	**[Pre-construction phase/ Construction phase]** - Compensation should be conducted in compliance with relevant laws and regulations **[Operation phase]** - Employ as many local residents as possible
Land Use and Utilization of Local Resources	**[Construction phase]** - Employ as many local residents possible
Disturbance to Water Usage, Water Rights etc	**[Construction phase]** - Taking preventive measures for water pollution **[Operation phase]** - Taking preventive measures for dustl runoff
Social Institutions such as Social Infrastructure and Local Decision-making Institutions	**[Pre-construction phase]** - Compensation should be conducted in compliance with relevant laws and regulations
Cultural Heritage	**[Construction phase]** - If potential impact of the project on historical, cultural and archaeological property and heritage is predicted, protective measures should be taken.
Infectious Diseases such as HIV/AIDS	**[Construction phase]** - Development of occupational health plan during construction phase.
Working Environment (including Work Safety)	**[Construction phase]** - Development of occupational health plan during construction and operation phase.
Accidents	**[Construction phase/ Operation phase]** - Taking preventive measures for soil runoff during construction and operation phase - Prevention/Evacuation measure at the time of spontaneous ignition.

Source: JICA Study Team

11.4.6. Tentative Environmental Monitoring Plan

With the same manner as the EMP, Environmental Monitoring Plan (EMoP) should be finalised at the time for EIA process in accordance with the further detailed study. Here, EMoP at IEE stage is tentatively presented in Appendix 7 and 8.

11.4.7. Feedback from Stakeholder

In the current study, prior to interviewing the abovementioned stakeholders, representatives of local residents, opinions of the relevant governmental officials and experts who know the situation of project site, were referred. The received comments from the relevant governmental officials and expert are shown below (Table 11.4.10).

Table 11.4.10 Feedback from Relevant Governmental Officials and Experts

		Comment on the project
DoE Cox's Bazar District Office	29 July,2015	- About the EIA of coal power generation in Matarbari At the time of EIA process of the coal power generation, the office is concerned with the discharging water from the plant so as not to influence fishery in the area. Also, some suggestions for greenbelt establishment surrounding the project area were consider to prevent noise and dust impact to the residential areas. -About Sonadia ECA The office is in charge of the management of the Sonadia ECA. The office recognised that the Matarbari area is far enough from the Sonadia ECA. There is no particular guideline on allowable distance for development activities in the area. However, the area is surrounded with mangrove vegetation functioning as a buffer zone of the area and it cannot be damaged physically.
Moheshlaki Upazila Office	1 August 2015	-Local people's view for the development projects In general, feeling of the local people on the development project in the Matabari area is supportive and acceptable now. At the beginning, they are confused with the activities. After getting compensated at CFPP, gradually they changed their minds and became supportive. -Availability of the land for resettlement There are some vacant lands in Moheshkali Upazilla (some belong to the government). In case of resettlement is required, those land may be utilised. Close to the project area, Kalamasala Union at the east side of the Kohelia River may be one of the possible locations. -About suspension of the land transfer in the Moheshkali area There are 31 land administration units in Moheshkali area. Amongst those 31 *mouza*, 16 *mouza* are for land transfer suspension. The major development plan in the Moheshkali area are: power generation plant in northern Matabari, special economic zone (SEZ) in south Dalgata, Chinese thermal power plant at the east side of the Koheli River and deep sea port in southern Moheshkali. -Concerns about the projects Pollution such as dust generation from the new CTT, should be minimised applying the Japanese technologies that are already used in the country. In case of Japan, the coal terminal can be maintained

		in clean condition even under open storage with systematically sprinkling of water and wind protection fencing. -About natural environment There are Sonadia ECA and reserve forest in Pahalmuza as environmentally important areas in Moheshkali. The project area for thermal power plant in Matarbari is already recognised that the distance from these important areas is far enough.
Cox's Bazar District Office Deputy Commissioner	1 August 2015	-About the development in the Matabari area The development of the area is recognised as one of the most important projects in the country. The Deputy Commissioner (DC) expressed that the District Office have intention to assist in the JICA's study to their full extent. -About the environmental study Although the people in the Matarbari area became supportive to the large-scale development in the area, environmental consideration is required. The DC suggests the importance of sensitive analysis on the environment. -About the security in the area Currently, the security in the area is stable and no security problems are expected. However, if the JICA Study Team requires security, the district will assist them for safety. -Compensation to illegal occupants The necessity of compensation based on the JICA Environmental and Social Guidelines is understandable. However, there are many illegal occupants in the governmental land in Bangladesh and majority of these are deliberately occupied by people who are not poor and in bad faith. So, it is difficult to deal with illegal occupants in regard to compensation but the DC has no objection for what the CPGC or JICA will give as compensation to the people in the Matabari area even if they are illegal occupants.
Additional Deputy Commissioner (Revenue) Cox's Bazar Resettlement Department	3 August 2015	-Problems in land acquisition in the area Related to the land acquisition of the Coal Thermal Power Project, there were some confusions encountered by the local people at the beginning. However, through continuous communication from the government, the people became supportive now. And no difficulties for land acquisition are expected. -About restriction of land transfer in Moheshkali Upazilla The circular was issued in February 2015 with seven fast track development projects. In the circular, the land transfer in the 16 *mauza* (administration units) is restricted.
Mr. Mohammad Muslem Uddin, Assistant Professor of Marine Science and Fisheries, University of Chittagong	3 August 2015	-About the ecological survey and EIA of the Coal Thermal Power Station The field survey was conducted in the surrounding areas of the thermal power project from March-April (40 days) in the EIA of the Coal Thermal Power Project. The study covered the breeding season of the sea turtles. Two species of sea turtles, Hawksbill (*Eretmochelys imbricata*) and Olive ridley (*Lepidochelys olivacea*) which are listed in the red list of IUCN were found. Near the area, at the sandbar at the southern edge of the Dalghata Union, the highest number of turtles amongst the survey points is found. -Mitigation measure for sea turtles Sea turtles are generally sensitive during spawning. Although currently, the proposed project avoids disturbing the coastline, it is better to consider minimising further impacts. Especially, in the area to be developed further, in addition to the Coal Thermal Power, long-term monitoring even after the

		operation is recommended. Awareness raising on the ecological conservation, alternative hatch ground can be one of the mitigation measures. Therefore, a new project also may require some study related to those fauna and flora in the area. -Study requirement for the CTT project As mentioned, some ecological study related to the CTT may be required. Especially, fishery environment can be considered in the new project if the project site is determined on the river side of the Koheri River. Recently, the government banned fishery activities on the coastal and river mouth during breeding season to protect fish biodiversity because the biodiversity in the coastal area is recognised as very important issue due to declined yield. -Fishing Ban (May, June 2015) Fishing in the whole coastal area in Bangladesh is banned for about two months (20 May–23 July 2015) in order to protect fish species in breeding season. The regulation may be continued having certain period each year. -Conservation activities in ECA in Cox's Bazar There are three ECAs in Cox's Bazar, i.e., Sonadia, St. Martin, and the Teknaf Peninsula. Amongst these, there was a natural conservation activity conducted by an NGO in Sonadia for five years and it was already finished. Some improvement works in the ECA are still needed. If the area will be developed further influencing the flora and fauna, conservation works for those ECA can be improved through hard and soft measures, e.g.; Awareness raising of the wild animal conservation (sea turtle) to prevent poaching, construction of fence to protect sea turtles from dogs, artificial incubation of the eggs to increase their survival rate, etc. One of the reasons for poaching by local people is to sell the turtles and eggs to the tribal people not to be consumed by themselves. Also, dogs can be another enemy of the turtles in the area eating eggs, as well as hunters. -Balance between ecology and economy The economic development in Bangladesh is important. However, it may be needed to take a balance with ecology for sustainability. -Mitigation measures for the activities Monitoring is important. Also, afforestation programs including mangrove species can be considered to prevent impact to the residence and also protection of the facility from erosion.

Source: JICA Study Team

11.4.8. Tripartite Meeting

In December 2015, in order to share outline of the draft IEE Report, a tripartite meeting among the project implementing agency (CPGCBL), the environmental clearance authority (DOE) and the Consultant was held. Additional items to be considered in the proposed EIA process such as the impact of polluted water due to maintenance of coal vessels were pointed out. DOE stressed that it was important for the project proponent to finalize the IEE and submit formally to DOE immediately. The minutes of meeting are attached in Appendix 9

11.5. Land Acquisition and Involuntary Resettlement

11.5.1. Necessity of Land Acquisition· Resettlement

Although the proposed CTT location requires permanent and temporary land acquisition, there is no involuntary resettlement envisaged. Coal storage yards (approximately 45 ha for the 1st Phase and 50 ha for the 2nd Phase, in total of 95 ha) and the right of way (ROW) for the belt conveyor from the loading/unloading berths to the storage (20 m wide and 2,500 m long, thus 50,000 m^2, or 5 ha) will be acquired. The construction period for the belt conveyor is 12 months, during which, in addition to the ROW, use of the land for access roads for the construction may prevent land owners and users from undertaking any commercial activities. The land owners will lose opportunities for income generation out of cropping or production during the construction period, whilst labourers such as share croppers, waged cultivators, and seasonal workers will lose opportunities for labour temporarily.

The project proponent will formulate the land acquisition and resettlement action plan (LARAP) after having thoroughly surveyed in light of Bangladesh legal requirement as well as JICA Environmental and Social Guidelinesns. In the following sections, the framework for land acquisition, resettlement and livelihood compensation based on the findings in the IEE Study undertaken in the Survey is outlined. Draft ToRs for the LARAP will be attached in Appendix 10.

11.5.2. Legal Framework for Land Acquisition· Resettlement in the country

(1) Key Legislations in Bangladesh

The Acquisition and Requisition of Immovable Property Ordinance of 1982 and its subsequent amendments in 1993 and 1994 and the Electricity Act 1910 provide the key legal instrument for the acquisition of private land for development activities in Bangladesh. Salient provisions of the Ordinance which show tangible gaps with the JICA Environmental and Social Guidelines are as follows:

Avoiding/ minimizing land acquisition: The Ordinance only implicitly discourages unnecessary acquisition as land acquired for one purpose cannot be used for a different purpose. There are, however, no mechanisms to monitor if this condition is actually adhered to.

Eligibility for compensation: The Ordinance stipulates compensation only for persons who appear in the land administration records as the owners (i.e., titleholders). It does not recognize the rights of those without legal title to the land, who live in or make a living from it.

Compensation paid for: The Ordinance provides for compensation of land and other objects built and grown on it (structures, trees and orchards, crops and any other developments on the land like ponds,

built amenities, etc.). There are no provisions to assess and restore lost income streams or income sources caused by the land acquisition to the PAPs.

Compensation standards: Landowners receive compensation under the law (CUL) as per the market value of the property at the publication date of the notice[1] with a premium of 50% on the assessed price. Any damage to standing crops or trees on the property, expenses incidental to compelled changes to the residence or place of business, and reduction of profits of the property in the acquisition period are also entitled to a sum of 50% on top of such market value[2]. The 1994 amendment made provisions for payment of crop compensation to tenant cultivators (*"bargadar"*). Although the Ordinance stipulates 'market prices' of the acquired land as just compensation, the legal assessment method almost always results in prices far below the actual market prices. Certain pricing standards, which are regarded as unrealistic, are used to assess other losses like structures and various built amenities, trees, and crops, etc.

Relocation of homestead losers: There is no legal obligation to relocate, or assist with the relocation of, those whose homesteads have been acquired.

Ensuring payment/ receipt of compensation: Even with the given legal provision, the compensation process is time-consuming. There is, moreover, no certainty as to when an affected landowner will obtain the stipulated compensation or whether he will obtain it at all. Land is legally acquired and handed over to the project proponent as soon as the acquisition authority identifies the owners ('awardees') by examining the records, and sends a legal notice advising them to claim compensation ('awards'). And it also turns out that it is an obligation of the PAPs to prove that the acquired land legally belongs to them.

Socio-economic rehabilitation: The provisions are so restricted that the Ordinance shows no concern about the long-term socio-economic changes the PAPs might undergo in the post-acquisition period. Except for the compensation at the legal 'market price', there are no other provisions in the acquisition or other-laws that require the government to mitigate the resultant adverse impacts caused by the acquisition. Socio-economic rehabilitation of the involuntarily displaced persons is absent in the legal regime of Bangladesh.

(2) JICA's policy on land acquisition and resettlement

The key principles of JICA policies on involuntary resettlement are summarized below:

(a) Avoidance or minimization of land acquisition and involuntary resettlement

Land acquisition and involuntary resettlement will be avoided where feasible, or minimized, by identifying possible alternative project designs that have the least adverse impact on the communities in the project area.

(b) Entitlement and assistance for restoration and improvement in social and economic conditions.

Where displacement of households is unavoidable, all PAPs (including communities) losing assets, livelihoods or resources will be fully compensated and assisted so that they can improve, or at least restore, their former economic and social conditions.

(c) Compensation and rehabilitation support

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 standards of living, income opportunities and production levels to pre-project levels.

(d) Application of the principle of the replacement cost

Compensation must be based on the full replacement cost as much as possible.

(e) Actions prior to displacement

Compensation and other assistance required for relocation should be given prior to displacement. Acquisition of assets, payment of compensation, and the resettlement and start of the livelihood rehabilitation activities of PAPs, should be completed prior to construction activities, except when a court of law orders so in expropriation cases. Sufficient civic infrastructure must also be provided at relocation sites before displacement takes place.

(f) Assistance in transition period

Resettlement assistance will be provided not only for immediate loss, but also for a transition period needed to restore livelihoods and standards of living of PAPs. Such support could take the form of short-term jobs, subsistence support, salary maintenance, or similar arrangements.

(g) Assistance to the vulnerable

The needs of those most vulnerable to the adverse impacts of resettlement are to be fully considered. Assistance should be provided to help them improve their socio-economic status.

(h) Consultation and participation of the Affected People

In preparing a resettlement 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. Appropriate participation of affected people must be promoted in the planning, implementation, and monitoring of resettlement action plans.

(i) Grievance Mechanisms

Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

In addition, as the JICA Environmental and Social Guidelines maintain that a JICA project must be in line with the World Bank's Safe Guard Policies, aforementioned JICA policies have to be supplemented with the OP 4.12. Based on the WB OP 4.12, what needs to be augmented are as follows:

(a) 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 advantage of such benefits;

(b) 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 the 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;

(c) Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based;

(d) Provide support for the transition period (between displacement and livelihood restoration);

(e) Particular attention must be paid to the needs of vulnerable groups among those displaced, especially those below the poverty line, the landless, elderly, women and children, ethnic minorities etc.; and

(f) For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, an abbreviated resettlement plan is to be prepared.

In addition to the above core principles of the JICA policy, it also lays 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.

In terms of categories of PAPs and types of lost assets, the gaps in the existing legal framework of Bangladesh and requirements of the JICA Environmental and Social Guidelines are identified as presented in the table below.

Table 11.5.1 Gap Analysis between Bangladeshi Laws and JICA Environmental and Social Guidelines

No.	JICA Environmental and Social Guidelines	Laws of Bangladesh	GAP between JICA GL/ WB OP and Laws of Bangladesh	Remarks
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	Under "the acquisition and requisition of immovable property ordinance 1982 and amendments", the land can be acquired for the public interest in spite of involuntary resettlement and loss of means of livelihood unless any complaints raised by the PAPs.	A significant gap between JICA GL & laws of Bangladesh. GOB can acquire any land for the interest of public if no complaints are raised by the legal land owner.	A series of public consultation meetings will be held in the course of EIA/LARAP in order to gain understanding of PAPs' on necessity of land acquisition and the magnitude of loss of livelihood means for the Project and formulate fair land acquisition and compensation packages.
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	Effective measures to minimize the impact and to compensate for losses should be taken.	No gap between JICA GL & laws of Bangladesh	
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 their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	The involuntary resettlement and restoration of livelihood means of the PAPs should be compensated as much as possible.	A minor gap between JICA GL & Laws of Bangladesh In Bangladesh, restoration of livelihood means of the PAPs is done for restoring up to certain level. It can be not at pre-project level or above.	LARAP will define livelihood restoration and improvement plan to raise the PAPs' living standard to an acceptable extent.
4.	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	Compensation is 1.5 times the average market value in the last 12 months.	A minor gap between JICA GL & Laws of Bangladesh Replacement cost under JICA GL may be different from the practice adopted in Bangladesh	The gap identified is somewhat satisfactory in that compensation refers to the average market value and some top-up (50%). Therefore, the Project accept the application of the national requirement.
5.	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	Compensation and other kinds of assistance are provided or deemed to have paid prior to displacement or acquisition.	A minor gap between JICA GL & Laws of Bangladesh. Compensation is supposed to be provided before the land acquisition in Bangladesh. But	the responsible party confirm compensation and other kinds of assistance to be undertaken well before land acquisition and displacement.

No.	JICA Environmental and Social Guidelines	Laws of Bangladesh	GAP between JICA GL/ WB OP and Laws of Bangladesh	Remarks
			sometimes, compensation is provided after land acquisition	
6.	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL) For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	Resettlement Action Plan should be prepared if land acquisition or involuntary resettlement of any number is required.	Minor gap between JICA GL, WB OP4.12 & Laws of Bangladesh RAP is must if land acquisition and involuntary resettlement is to be done in Bangladesh.	LARAP Study will be performed.
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)	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	No gap between JICA GL & laws of Bangladesh	
8.	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.	No gap between JICA GL & laws of Bangladesh	
9.	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.	No gap between JICA GL & laws of Bangladesh	
10.	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.	No gap between JICA GL & laws of Bangladesh	
11.	Affected people are to be identified and recorded as early as possible in order to establish their eligibility	Affected people are to be identified and recorded as early as possible in order to	No gap between WB Op 4.12 & laws of Bangladesh	

No.	JICA Environmental and Social Guidelines	Laws of Bangladesh	GAP between JICA GL/ WB OP and Laws of Bangladesh	Remarks
	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 OP4.12 Para.6)	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		
12.	Eligibility of benefits includes, 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. (WB OP4.12 Para.15)	Eligibility of benefit includes the PAPs who have legal rights to land only.	A significant gap between WB Op 4.12 & Laws of Bangladesh. Only legal owners are eligible for benefits in Bangladesh	LARAP will ensures that 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 be eligible for compensation.
13.	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based	No gap between WB Op 4.12 & laws of Bangladesh	
14.	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	Provide support one time only.	A significant gap between WB Op 4.12 & Laws of Bangladesh. In Bangladesh, support is provided at one time only.	LARAP will define livelihood restoration and improvement plan to raise the PAPs' living standard to an acceptable extent.
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 minorities etc. (WB OP4.12 Para.8)	No particular attention is paid for vulnerable groups irrespective of vulnerability.	A significant gap between WB Op 4.12 & Laws of Bangladesh. In Bangladesh, no particular attention is paid to all legally affected people irrespective of	LARAP will formulate specific measures including income rehabilitation assistance to be provided to vulnerable groups.

No.	JICA Environmental and Social Guidelines	Laws of Bangladesh	GAP between JICA GL/ WB OP and Laws of Bangladesh	Remarks
			vulnerability.	

Source: JICA Study Team

As per Bangladesh law, no illegal occupiers of the land are compensated. But according to JICA Environmental and Social Guidelines, illegal occupiers should also get compensation. In order to meet the JICA's requirement, compensation for the illegal occupiers can be assessed at cutoff date and the project proponent may be asked to allocate the budget for compensation. This compensation funds can be disbursed to the illegal occupiers through the district administration.

(3) Land Acquisition Procedure

Under the Ordinance of 1982, the DC at the District level is entrusted to acquire land for agencies requiring land for any public or private infrastructure projects. The procedures of land acquisition will follow the following steps:

Step 1: After identifying and selecting the exact ground locations of the required land, the project proponent will carry out the detailed engineering surveys and design the construction work and lay them out on mouza maps. The project proponent will prepare the land acquisition proposals to obtain administrative approval by the line ministry.

Step 2: The project proponent, after obtaining the approval of the administrative ministry, will make a request to the DC, with sufficient information including the amount of land to be acquisitioned from each plot, and the ownership status such as private and public lands, for the acquisition of the land as per the proposal.

Step 3: Within 90 days, the DC will appraise the application through a) site observation, b) consultation with local politicians and residents, c) develop project profiles, and d) cost estimates. The DC will then develop and submit a proposal on land acquisition to the Ministry of Land for an appraisal by the central government within 90 days.

The DC will publish a notice as stipulated in Section 3 of the Ordinance of 1982 stating that there is a proposal for the property to be acquired. The persons to be displaced may submit an objection to the land acquisition to the DC within 15 days after the notice is served. All the legal titleholders will be advised to show their identification (ID) cards and other documents that verify their rights. For those with no registrations, the DC Office will call for circumstantial evidence from community leaders, local elite people, and religious leaders, etc., to add these people to the list.

The DC will consult with the Public Works Department (PWD), Forest Department (BFD), Department of Agricultural Marketing (DAM) and Department of Fisheries (DOF) to assess the value of structures, trees, crops and aqua products for their existing rates.

Under Section 6, a second public notice will be served stating the GOB's decision on the land acquisition and taking possession thereof. The DC Office will confirm the PAPs, exact land area and size for acquisition, number of relocated houses, agriculture land, forestry and fishing areas that will be lost. The persons to be displaced will be requested to submit their statements of property, amounts and particulars of the claims to compensation after 15 days of the second notice being served. The DC Office will respond to any grievances made by the PAPs in order to agree to the assistance package.

The project proponent shall deposit the estimated amount of the award of compensation with the DC within 60 days from the receipt of the estimate given by the DC.

Upon serving the last notice (Section 7), the DC shall pay the amount to the owners of the acquired property within another 60 days from the date of deposit by the project proponent. The DC will take possession of the property after completion of the compensation payment to the PAPs and immediately declare this in the official gazette, and hand the property over to the project proponent.

11.5.3. Scope and Area of Land Acquisition and Resettlement

There is no involuntary resettlement envisaged out of the CTT project. Land acquisition and compensation for losses of livelihood are foreseen on the coal stockyard (approximately 90 ha) and belt conveyer corridor (approximately 5 ha). The following entitlement matrix shows eligible persons for land acquisition and compensations, their rights and responsible entities for implementation of land acquisition and compensations.

Table 11.5.2 Entitlement Matrix for CTT

No.	Type of Loss	Entitled Persons (EP)	Entitlements (Compensation Package)	Responsible Organizations
1	Permanent loss of private land	Legal land owner	Compensation under Law (CUL) for all private land: average of the last 12 month's sales values of same kind of land plus 50 % premium	Implementation : DC, LAO Monitoring: CPGCBL
			Top-up grant to cover ✓ Gap between the average of the last 12 months' sales values of same kind of land, and the current market value of the private land ✓ Maximum allowable replacement value (RV) to purchase new land with equal productive value, preparation cost, and registration cost (such as stamp duty and tax)	Implementation : Contractor Monitoring: CPGCBL Advisor: DC
		Tenants and	✓ Provision for another land	

No.	Type of Loss	Entitled Persons (EP)	Entitlements (Compensation Package)	Responsible Organizations
		Leaseholders	✓ One-time assistance for lost income based on three years' harvest/production sales	LAO
		Sharecroppers	✓ Provision for another land ✓ One-time assistance for lost income based on three month's income and sharecropping	
2	Loss of khas land	Occupants	✓ Provision for another land ✓ One-time assistance for lost income based on three month's income at minimum wage rates	Implementation : DC, LAO Monitoring: CPGCBL
3	Permanent loss of means of livelihood / source of income	Legal tenants / bargadars (sharecroppers) / employers of salt farms, shrimp farms and fishing sites	✓ One time assistance for annual cropping volume (three years) ✓ Support in transitional period	Implementation : DC Monitoring: CPGCBL
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 ✓ Option to compensated for entire structure if remaining structure is no longer viable ✓ Provision of all taxes, registration costs and other fees incurred for replacement structure ✓ Shifting allowance based on actual cost of moving	Implementation : DC (in cooperation with Public Works Department: DWP) Monitoring: CPGCBL
		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 erected by the tenant / leaseholder ✓ Reconstruction / repair of the remaining structure ✓ Shifting allowance based on actual cost of moving	
		Unauthorized Occupants	✓ Cash compensation equivalent to replacement cost of structure (or part of structure) for the portions of the structure erected by the displaced person ✓ Reconstruction / repair of the remaining structure ✓ Shifting allowance based on actual cost of moving ✓ Additional allowance equivalent to 50% of structure value.	
5.	Loss of standing crops at home	Owner/ Sharecroppers/	✓ CUL and 50% premium according to the estimated current market values	Implementation : DC

No.	Type of Loss	Entitled Persons (EP)	Entitlements (Compensation Package)	Responsible Organizations
	garden, shrimp and fish	Lessee/ unauthorized occupant of land	✓ Cash grant as transition allowance equivalent to one year income	Monitoring: CPGCBL
6.	Loss of timber and fruit bearing trees	Legal owner of land / non-titled user of land	✓ CUL and 50% premium according to the estimated current market values ✓ Cash grant that covers the difference between CUL and the current replacement cost	Implementation : DC Monitoring: CPGCBL
7.	Temporary Loss 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	Implementation : Contractor Monitoring: CPGCBL
8	Temporary Loss of access to land, structure, 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 Temporarily requisitioned land will be returned to owners rehabilitated to original or preferably better condition	Implementation : Contractor Monitoring: CPGCBL
9.	Temporary loss of livelihood/ source of income during construction	Business owners, tenants, leaseholders, employees, vendors	✓ Provision of alternative sites for continued economic activities ✓ One-time assistance for lost income for the actual period of disruption in income / tax statement, minimum wage rates or based on actual income, verified through incomes of comparable businesses in the area.	Implementation : Contractor Monitoring: CPGCBL

Source: JICA Survey Team

It should be noted that this entitlement matrix is tentative and the matrix shall be revised and finalized, as necessary, in the course of the LARAP Study, through a series of public consultations and consensus-making processes.

11.5.4. Methods of Valuing Affected Assets and Compensation Framework

Compensation for legal land owners will be based on the principle of replacement costs. Replacement costs are the amounts calculated before displacement which are needed to replace any affected assets without depreciation and without deduction for taxes and/or costs of transaction.

The Land Acquisition Officer (LAO) of the Deputy Commissioner's Office and Land Officer of Upazila Nirbahi Office will support the sub-registrar's office in determining the price of land.

Land price averages from the sub-registrar's office for the previous one year from the date of the notice given under Section 3 of the Ordinance of 1982 are considered for the land valuation. The transacted price, recorded price, existing prices and expected prices should be averaged to reach the replacement value (RV).

A land and property valuation survey based on the prices recorded from formal and informal sources as shown below will determine the RV of land and structures:

- Government price
- Potential sales price
- Potential buyer price
- Enumerated price collected in the socioeconomic survey
- Price deemed appropriate as quoted by a retired government officer living in the vicinity
- Price deemed appropriate as quoted by local intellectuals
- Price deemed appropriate as quoted by religious leaders

CPGCBL will allocate budget to fill the difference between the RV and the cash compensation under law (CUL) as the top-up payment. In the case of any depreciation costs deducted from affected structures in the CUL by the DC, CPGCBL will pay the same as additional construction grants to re-settlers. It will also pay stamp duty and land registration fees when replacement land purchase is confirmed.

Once the budget for land acquisition and livelihood compensations is secured, CPGCBL makes relevant payment to the Cox's Bazar DC's Office. Then the DC's Office kicks off the official disbursement process for the land acquisition and livelihood compensations stipulated in Ordinance 1982 and Land Acquisition Act 1870.

11.5.5. Grievance Mechanism

Endorsed by the Ministry of Power, Energy and Mineral Resources (MPEMR), a formal grievance redress committees (GRCs) will be formed at the union level for any grievances involving resettlement benefits, relocation and other assistance. The purpose of establishing GRCs is to promptly address the concerns and complaints using a process that is accessible and transparent to the PAPs. GRCs can comprise the following members whose standing is neutral and independent:

- CPGCBL Officer
- Resettlement Officer
- Representative from local NGOs

- Head of Union Committee
- Representatives of Displaced Persons
- Local intellectuals
- Legal advisor.

The core function of GRC will be further discussed and determined in due course.

11.5.6. Institutional Framework for Land Acquisition· Resettlement Implementation

CPGCBL is the implementing agency of the project, and the Deputy Commissioner's Office of Chittagong District is the immediate organization for affected people to consult with regard to compensation as stipulated in the Ordinance 1982.

CPGCBL will prepare and submit an application for administrative approval to MPEMR and make a request to DC of Chittagong for taking necessary actions in estimating the degree of land acquisition and cost. It will also prepare and submit an action plan for land acquisition and livelihood compensation to MoPEMR.

CPGCBL will submit the Development Project Proposal (DPP) to GOB for allocation of the required budget for cash CUL and an additional grant for 'top-up payment', which shall be approved by the GOB.

11.5.7. Implementation Schedule for Land Acquisition and Resettlement

The LARAP, which the project proponent formulates as necessary, shall outline an implementation schedule for land acquisition and resettlement including livelihood compensation.

11.5.8. Cost and Budgetary Source

The land acquisition cost is roughly estimated at BDT 7.2 million, based on actual payment made under the Matarbari Coal-Fired Thermal Power Plant Project. As for the cost of livelihood compensation, it is far too difficult to specifically estimate as of now due to its locally specific nature. Detailed costs for land acquisition as well as livelihood compensation will be calculated in the LARAP Study. It is very important that the project proponent secure enough budget for land acquisition and livelihood compensation during the agreed implementation schedule.

In addition to compensation requirements set out in the Ordinance 1982 as well as the Electricity Act 1910, all the compensation will be undertaken according to the principle of replacement cost, which will require CPGCBL to pay any gap between CUL and the replacement value (top-up).

Table 11.5.3 Land Acquisition and Livelihood Compensation Cost（Unit：BDT million）

Area		Land Acquisition		Livelihood Compensation				Total
				Permanent Losses		Temporary Losses		
		CUL	Top-up	CUL	Top-up	CUL	Top-up	
1	Phase I Land （45ha）	166.7	50.0	N/A	N/A	N/A	N/A	N/A
2	Phase II Land (50ha)	185.3	55.6	N/A	N/A	N/A	N/A	N/A
3	Belt Conveyor RoW (5.0ha)	18.5	5.6	N/A	N/A	N/A	N/A	N/A
Total		370.5	111.2	N/A	N/A	N/A	N/A	N/A

(Source: JICA Survey Team)

11.5.9. Monitoring Form

Appropriate reporting (including auditing and redress functions), monitoring and evaluation mechanisms, will be identified and set in place as part of the management system of land acquisition and livelihood restoration. An external monitoring group will be hired by the Project and will evaluate the whole process and final outcome.

An Environmental Management Plan (EMP) has been prepared to provide guidelines for the monitoring during pre-construction, construction and operation activities of the CTT Project.

The purposes of creating an EMP are as follows:

- Confirm that the mitigation measures shall reduce any negative impacts on the environment to allowable levels during the construction and operation phases.
- Set up an organization that is responsible for the implementation of monitoring plan.
- Perform appropriate monitoring during the construction and operation phases.

The environmental components that will be monitored are those that will be positively or negatively affected, or expected to be affected.

11.5.10. Public Consultation

The PAPs and their communities will be consulted about the Project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to all extents possible be involved in the decision-making process concerning land acquisition.

PAPs will be involved in the process of developing and implementing the LARAP. The PAPs will receive prior notification of the compensation, relocation and other assistance available to them.

CPGCBL will be responsible, in close coordination with the DC, for holding and conducting a number of consultations with primary and secondary stakeholders and information dissemination on the following issues:

- Rrelevant details of the project

- LARAP and various degrees of project impact
- Details of entitlements under the LARAP and what is required of PAPs in order to claim their entitlements
- Compensation process and compensation rates
- Relocation and resettlement site development operation in order to obtain agreement and support of affected people in participating in these operations
- Implementation schedule and timetable for the delivery of entitlements

Public participation will be spontaneously performed and information will be made available during preparation and implementation of the Action Plan and, at the minimum, include community meetings and focus group discussions.

11.6. Recommendation for Further Study

11.6.1. Environmental and Social Consideration Study (Draft TOR for the Environmental Impact Assessment)

The draft TOR for further study is proposed in the IEE report. The study includes public consultation meeting to the project affected persons (PAPs) and stakeholders in the area. Items which will be surveyed are shown below. The information should be updated in the study and some environmental aspects such as socio-economic survey of PAPs in social environment, biological survey in natural environment, air quality, water quality, noise and vibration in pollution control require further detailed site specific survey in the study area. Also, a tentative table of contents (TOC) for the EIA report based on the guideline provided by the Department of Environment in Bangladesh is shown in Table 11.6.3.

Table 11.6.1 Environmental Aspect to be studied in EIA (2015 Nov. tentative version)

Category	Aspects	Items to be surveyed	Methodology
Social Environment	Involuntary Resettlement	Number of household and persons to be resettled and their economic condition	- Collecting information through Information Population Census and Socio-economic baseline survey(Census for all PAPs and Socio-economic survey at least 20 % of PAPs in the area)
	Local Economy	Regional economic condition	
	Land Use	Existing condition of land use	
	Transportation	Existing traffic condition	
	Social Infrastructure	Existing social infrastructure condition	
	Splitting of Communities	Distribution of local community	
	Indigenous Peoples	Distribution of tribes and low-level income group	
	Heritage	Distribution of heritages	
	Religious facility	Distribution of religious facilities	
	Water right	Record of water right	
	Risk of infection disease	Regional infection rate	
	Accident	Number of traffic accidents	
Natural	Topography and	Regional topographical and geological	- Field survey for flora and fauna

Environment	Geology	condition	at the project site -Result of topographic survey in the project area
	Soil Erosion	Regional soil condition	
	Water System	Regional river system	
	Flora, fauna, and Biodiversity	Local flora and fauna Distribution of recorded forest	
Pollution	Air Pollution	Air quality condition around the project site	-Monitoring of air, waster and noise at the project site
	Water Pollution	Water quality condition in the river system around the project site	
	Solid Waste	Local management system of municipal and hazardous solid waste	
	Noise and Vibration	Noise and vibration condition around the project site	

Source: JICA Study Team

Table 11.6.2 Expected TOC of EIA Report (2015 Nov. tentative version)

Chapters	Contents
1. Executive summary.	□
2. Introduction	Brief description of background, scope of study, methodology, limitation, EIA team, references.
3. Legislative, regulation and policy consideration	Covering the potential legal, administrative, planning and policy framework within which the EIA will be prepared.
4. Project Description 4a. Project activities: 4b. Project schedule: 4c. Resources and utilities demand 4d. Map and survey information	4a: A list of the main project activities to be undertaken during site clearing, construction and operation, Project Plan, Design, Standard, Specification, Quantification, etc. 4b: The phase and timing for development of the Project. 4c: Resources required to develop/support the project, such as soil and construction material and demand for utilities, as well as infrastructure (road, drains, and others). 4d: Location map, Cadastral map showing land plots, Topographical map. Geological map.
5 Analysis of Suitability for Different Alternatives	-
6. Baseline Environmental Condition:	• Physical Environment- Geology, Topology, Geomorphology, Land-use, Soils, Meteorology, and Hydrology • Biological Environment- Habitats, Aquatic life and fisheries, Terrestrial Habitats and Flora and Fauna • Environment Quality -:Air, Water, Noise, Vibration, Soil and Sediment Quality • Relate baseline in both Quantitative and Qualitative term with the anticipated outcomes, achievement of goals, objectives and changes due to project interventions.
7. Socio-economic environment	• Population: Demographic profile and ethnic composition • Settlement and housing • Traffic and transport • Public utilities: water supply, sanitation and solid waste • Fisheries: fishing activities, fishing communities, commercial important species, fishing resources, commercial factors. • Economy and employment: employment structure and cultural issues in employment
8. Identification, Prediction and Evaluation of Potential Impacts	Identification, prediction and assessment of positive and negative impacts likely to result from the proposed project.
9. Management Plan/Procedures:	An outline of the Environmental Management Plan shall be developed for the project covering technical and financial aspects. In the Environmental Monitoring Plan, a detail technical and financial

	proposal shall be included for developing an in-house environmental monitoring system to be operated by the proponent's own resources.
10. Consultation with Stakeholders/Public Consultation	Consultation with interested parties and the general public will take place and their views taking into account in the planning and execution of the project. Beneficial Impacts summarizing the benefits of the project to the Bangladesh nation, people and local community.
11. Risk assessment	Risk management, system of valuation of environmental and properties damage, damage compensation issues shall be addressed.
12. Conclusion and Recommendations.	-

Source: Based on the EIA Guidelines for Industries, 1997 compiled by JICA Study Team

11.6.2. Formulation of the Land Acquisition and Resettlement Action Plan (LARAP)

In the IEE report, terms of reference (ToRs) for the LARAP Study was drafted. The LARAP Study includes public consultation meetings amongst PAPs and stakeholders for the CTT Project. The outline of scope of the IEE Study is shown as follows:

- Social Impact Assessment
  - Socio-economic Survey (demographic census, property/land/asset assessment, field survey for social minority, etc.) and focused group discussions
  - Assessment outline
  - Assessment results
  - Detailed description on social impacts and categories of PAPs
- Anticipated Social Impact
  - Pre-construction phase and construction phase
  - Operation Phase
  - Entitlement for Different Types of Losses
  - Livelihood Restoration and Improvement Plan
  - Cut-off date setting
- Organizational Responsibilities and Implementation Procedures
  - Finalization of LARAP
  - Data collection and entitled persons (EP) identification
  - Local consultation and information management
  - Finalization of budget for land acquisition, resettlement and compensation
  - Implementation of land acquisition and resettlement
  - Monitoring
- Grievance Redress Mechanisms
- Specific Measures provided to Vulnerable Groups and Income Rehabilitation Assistance
- Estimated Land Acquisition and Resettlement Cost
- Local Consultation, Participation, Monitoring and Evaluation Procedures

It should be ensured that LARAP Study undertakes a socio-economic survey and update/review/revise the entitlement matrix proposed in this survey based on the socio-economic survey results. In addition, it is also prerequisite that the LARAP Study holds a series of public consultation meetings on the socio-economic survey and the land acquisition/compensation framework and reaches consensus by reflecting opinions of local people to the final framework.

11.6.3. Additional Impact associated with the CTT in the Operation Phase

The current plan is designed on the assumption of adequate planning of the secondary transportation such as belt conveyor, barge, and tracks under the responsibility of the coal consumer, i.e.; thermal power plants. Those additional facilities related to the expanding transportation from the CTT should be environmentally and socially considered in the construction of these new facilities referring to the JICA Environmental and Social Guidelines, if the facility recognised as inseparable. The consideration should be made under the responsibility of a new thermal power station. One of the possible transportation is that coal will be transported to the proposed CTT from the Matarbari CFPP Harbour by a conveyor belt. It is also planned that the coal will be transported from the proposed CTT to Moheshkhali Energy Hub by conveyor belt crossing the Kohelia River. Another conveyor belt will be used to transport coal from the Matarbari CFPP Harbour to North Matarbari 700 MW CFPP. The proposed lengths of the route of conveyor belts are as follows:

Table 11.6.3 Anticipated Impact associated with Additional Facilities to the CTT at Operation Phase

Possible Route of Secondary Transport Directly Connecting CTT	Potential Impact
Matarbari CFPP Harbour to North Matarbari 700MW CFPP	**Construction phase:** · Temporary Loss of land · Trees to be cut · Infrastructure (house/ shops) to be relocated · Salt cultivation and shrimp cultivation to be affected **Operation phase:** · Air pollution · Noise pollution · Accidents
CTT to Moheshkhali Energy Hub	**Construction phase:** · Temporary Loss of land · Temporary loss of Mangrove forest · Infrastructure (house/ shops) to be relocated · Salt cultivation and shrimp cultivation to be affected **Operation phase:** · Air pollution · Noise pollution · Accidents

Source: JICA Study Team