

KINGDOM OF CAMBODIA
NATION RELIGION KING



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT
FOR
SIHANOUKVILLE PORT NEW CONTAINER
TERMINAL DEVELOPMENT PROJECT



PROJECT OWNER
PORT AUTHORITY OF SIHANOUKVILLE



Preparatory Survey for
Sihanoukville Port New Container Terminal Development Project
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EXECUTIVE SUMMARY

1. INTRODUCTION

The Sihanoukville Port, located at the south end of the Cambodia Growth Corridor and in Preah Sihanouk Province, is the sole international deep sea port in the Kingdom of Cambodia supporting the national economic and industrial activities.

The container transaction volume of Sihanoukville is increasing at 10% on an average over the last five years after 2009 due to strong economic growth led by the garment industry. On the other hand, the container throughput of Sihanoukville Port is reaching its handling capacity limit.

Nevertheless, the operation body of the port, the Port Authority of Sihanoukville (PAS), has a short-term plan to strengthen the handling capacity by having additional cranes. The container throughput is expected to reach the handling capacity limit in 2023. Moreover, GDP growth rate of Cambodia has steadily recorded over 7% on an annual average over the last ten years and stronger economic activity is expected after the economic convergence of ASEAN in 2015. With the above mentioned economic circumstance, the development of new container terminal and associated structures in the Sihanoukville Port is planned as a yen loan project of the “Sihanoukville Port New Container Terminal Development Project”.

The Sihanoukville Port New Container Terminal Development Project (The Project) is other PAS's project after the Sihanoukville Port Multipurpose Terminal Development Project, which is being implemented under the financing of Japan. The Project is considered as one of the new priority projects in Cambodia. Based on a feasibility study, it is found that the project could be economically viable. This means that if the project is built, the capability to lift the containers will be much better contributing to Cambodia's economic growth.

Although the project will be able to contribute to socio-economic development, however, it can cause some adversely negative impacts, requiring an Environmental and Social Impact Assessment (ESIA) to identify the potential impacts of natural resources and socioeconomic ones as stated in the Sub-Decree on Environmental Impact Assessment Process.

The study is carried out based on the MoE's general guidelines in 2009 for quantitative and qualitative approaches to submit to the MoE for review and approval.

The purpose of the study is to observe obviously current conditions of naturally environment resources and socioeconomic environment in order to analyze the possible impacts of the project activities and to prepare mitigation measures to minimize those impacts. The specific objectives are to:

- Examine environmental resources in and around the project area;
- Define scope of major positive and negative impacts by the project phases;
- Assess the potential impacts by the project phases;
- Provide mitigation measures to mitigate negative impacts;
- Prepare Environmental Management Plan (EMP) to minimize those impacts; and
- Provide a reference document for the MoE in decision-making process of the project.

The overall objective is to ensure sustainable environmental conservation and all negative impacts on natural and socioeconomic environments are acknowledged and properly considered prior to implementing the project.

2. LEGAL FRAMEWORK

Main laws related to Sihanoukville Port New Container Terminal Development Project include: law on environmental protection and natural resource management, law on land management, urban planning and construction, land law, labor law, labour law, law on road, law on land traffic, investment law, and law on amendment of investment law. Main subdecrees are: subdecree on environmental impact assessment process, sub-decree on water pollution control, sub-decree on solid waste management, subdecree on air pollution control and noise disturbance, subdecree on construction permit, subdecree on urbanization of city, municipality and urban areas. The esia study also complied with the prakas on the general guidelines for report in 2009. In addition, the study also included the national strategic plan, the rectangular strategy phase iii, international conventions and protocols, principle guidelines of JICA for social and environmental studies in 2010, and japan bank for international cooperation guidelines for confirmation of environmental and social considerations 2015.

3. PROJECT DESCRIPTION

3.1 Geographical Location

Sihanoukville Port New Container Terminal Development Project is located in Sangkat 3, Preah Sihanoukville municipality of Preah Sihanouk Province. It is about 231 km from Phnom Penh City. The project location can be reached by National Road No. 4 from Phnom Penh City to Preah Sihanoukville province about 230 km. It then turns right, which is in front of the port, and travels along by Samdech Hun Sen road about 1.3 km.

3.2 Size and Magnitude of The Project

3.2.1 Port Facility Design

3.2.1.1 Basic Concept of Design

Existing container terminal with depth of -10.5 m can accommodate only 25,000 DWT class container vessels (around 2,000 TEUs), so-called Under-Panamax size. On the other hand, the large-size trend of container vessels has been worldwide observed. In East Asia Region Route, 60,000 DWT class container vessels (around 4,000 TEUs) have drastically increased, and it is supposed that 60,000 DWT class container vessels will ply Sihanoukville Port along with steady increase in container cargoes. In order to meet the large-size vessel trend, PAS eagerly requested the berth facility to accommodate Over-Panamax size container vessels. It is fact that accommodating Over-Panamax size container vessels are considerable advantage of port sales for shipping lines.

1) Target Vessel

One Over-Panamax size container vessel for 1 berth

Maximum. 60,000 DWT: Draft =13.8 m, LOA =285 m, Beam=40.0 m

Two Under-Panamax size container vessel for 1 berth

8,000 DWT~15,000 DWT: Draft= 7.3 m~ 9.0 m, LOA= 127 m~158 m,

Beam=20.4 m~ 24.5 m

2) Container Terminal Capacity: Phase I (350 m berth length), Phases II and III (300 m berth length) Phase I: 450,000 TEUs /year

Phase II: 400,000 TEUs /year

Phase III. 400,000 TEUs/year

3) Container Handling Method

Quayside Container Crane (QC) + RTG + Tractor trailer

4) Tide

LWL=+0.0 m CDL

HWL=+1.43 m CDL

(for Multipurpose Terminal Project)

3.2.1.2 Container Berth

The four alternatives were studied for the preliminary design of container berth considering structural and construction cost, maintenance aspects, environmental impact, construction aspects and etc. The alternatives are: 1) Steel Pipe Sheet Piles Structure, 2) Concrete Deck on Steel Pipe Pile, 3) Concrete Block Method, and 4) Concrete Deck on Steel Pipe Pile and Strut Beam.

In consideration of the quay structural comparison, Concrete Deck on the Steel Pipe Pile & Strut Beam is supposed to appropriate, its typical section as shown in Figure 3-1.

However, its disadvantage should be well-considered. It is noted that other quay structure types exceed the Concrete Deck on the Steel Pipe Pile & Strut Beam in some aspects. The Consultant suggests to be adopted the Concrete Deck on the Steel Pipe Pile & Strut Beam structural method based on the comprehensive evaluation results. Especially the maintenance issues for the steel piles and the concrete deck explained that maintenance cost of the Concrete Deck on the Steel Pipe Pile & Strut Beam for 350m in length is estimated about 1.2 million USD for 50 years.

In the comparison of the quay structural method, Construction cost for 350m of Concrete block structural method could be higher about 3.7 million USD than the Steel Pipe Pile & Strut Beam structural method. Therefore, the Concrete Deck on the Steel Pipe Pile & Strut Beam is still economical in consideration with the maintenance cost for 50 years.

3.2.1.3 Reclamation and Soil Improvement

The comparatively good dredged materials such as rock layer and sandy layer will be used to fill in the reclamation area. The special soil improvement is not considered. For the seawall construction for the protection of the reclaimed area, the very soft layer is planned to replace the good sand to keep the stability of the seawalls. The plan for sand replacement for the soft layer having 6.5 m thickness at the seawall area and seawall structural section is shown in Figure 3-2.

3.2.1.4 Access Channel and Turning Basin

The general layout plan of dredging is shown in Figure 3-3. The length of access channel is approximately 4.5 km from the port entrance as Sta.0+000 to seaward up to -13.5 m contour line. The turning basin covers the area between the new container berth (Phase I) and MPT with water area of approximately 49 ha (486,000 m²). The total volume of dredging is 3.98 million m³.

3.2.1.5 Yard Layout of New Container Terminal

The Yard Layout of No. 1 Container Terminal in Phase I, is shown in Figure 3-4.

3.2.1.6 Administration Building, Maintenance Building, Gate, Inspection Facility, and Required Facilities

The required facilities and equipment for the new container terminal are:

- Administration Building: 2,500 m² , RC structure 4 stories
- Workers building: 600 m² (RC structure)
- Terminal Gate: 820 m² RC Structure (3 lanes for In, 4 lanes for out)
- Maintenance work shop: 1200 m² (RC structure, maintenance office in second stories)
- Fuel Station: 400 m² (Fuel reservoir tank & distributor)
- Generator house and sub-station : 300 m² (Three generators, panels & transformer)
- Parking Place of In-yard Car (Tractor head & Yard Chassis)
- Animal, Plant and Health Inspection Station
- Dangerous Goods Temporary Storage Plant (installed in the container storage area)
- Waiting Space for Road-chassis
- Over-height Attachment Space (Maintenance Space)
- Parking Area of Terminal-use Vehicles
- Night Lighting Tower
- Container Freight Station (CFS) (installed outside of Container Terminal)

Each scale of facilities and equipment should be determined at the detailed design stage.

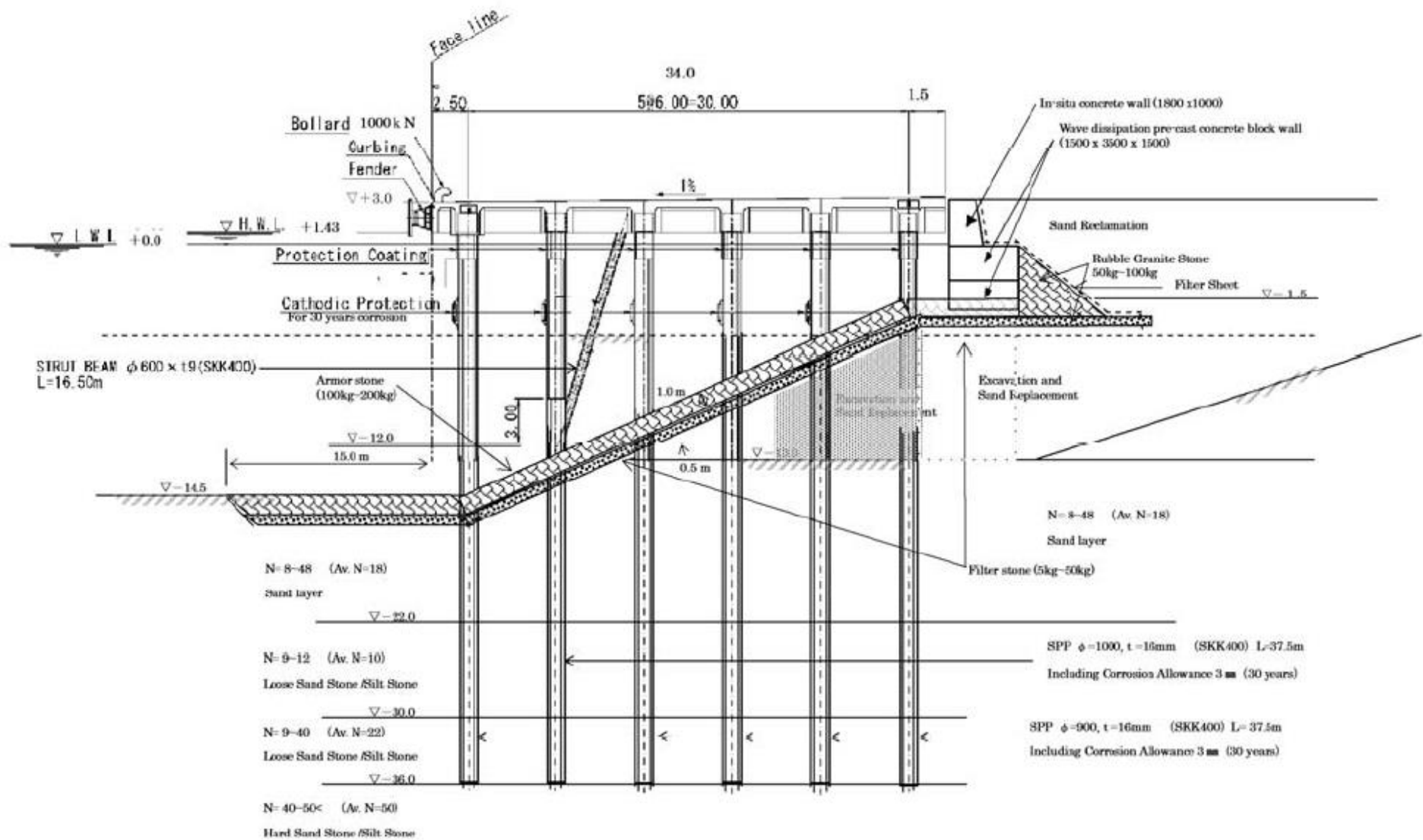


Figure 3-1: Typical Section of Quay Structure

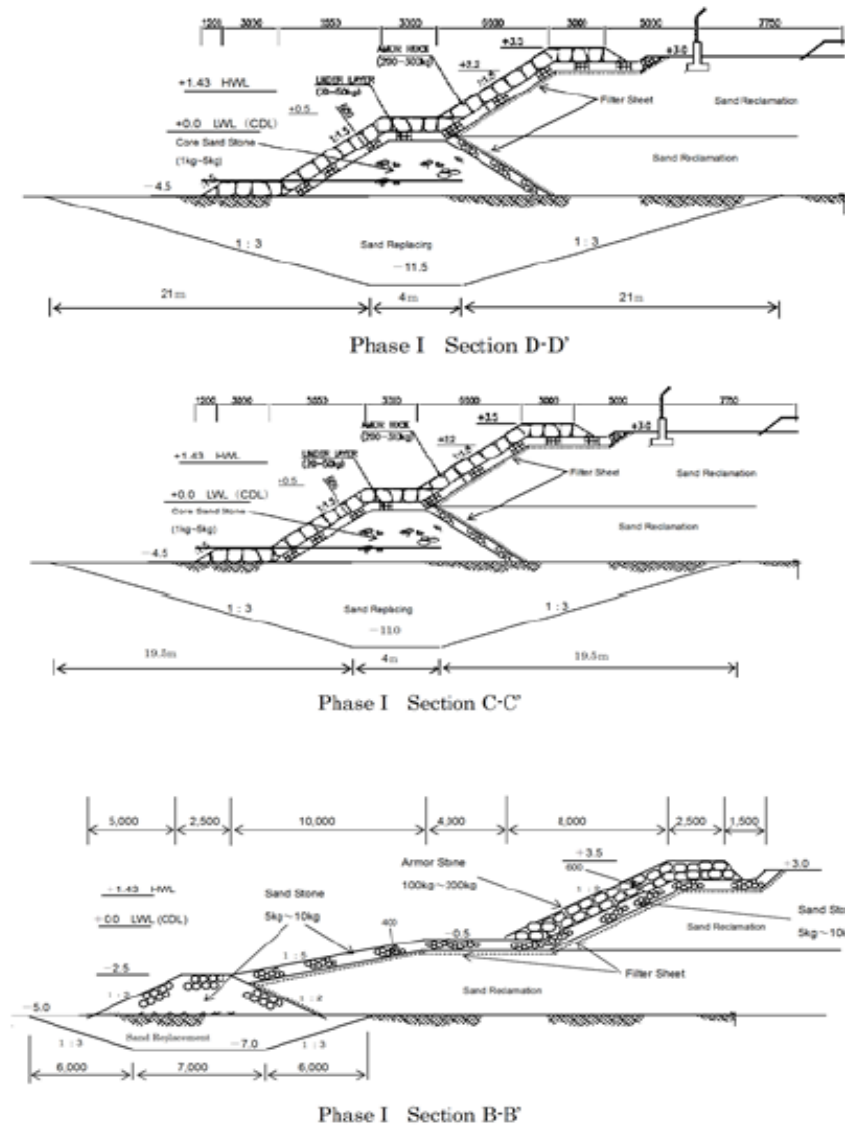
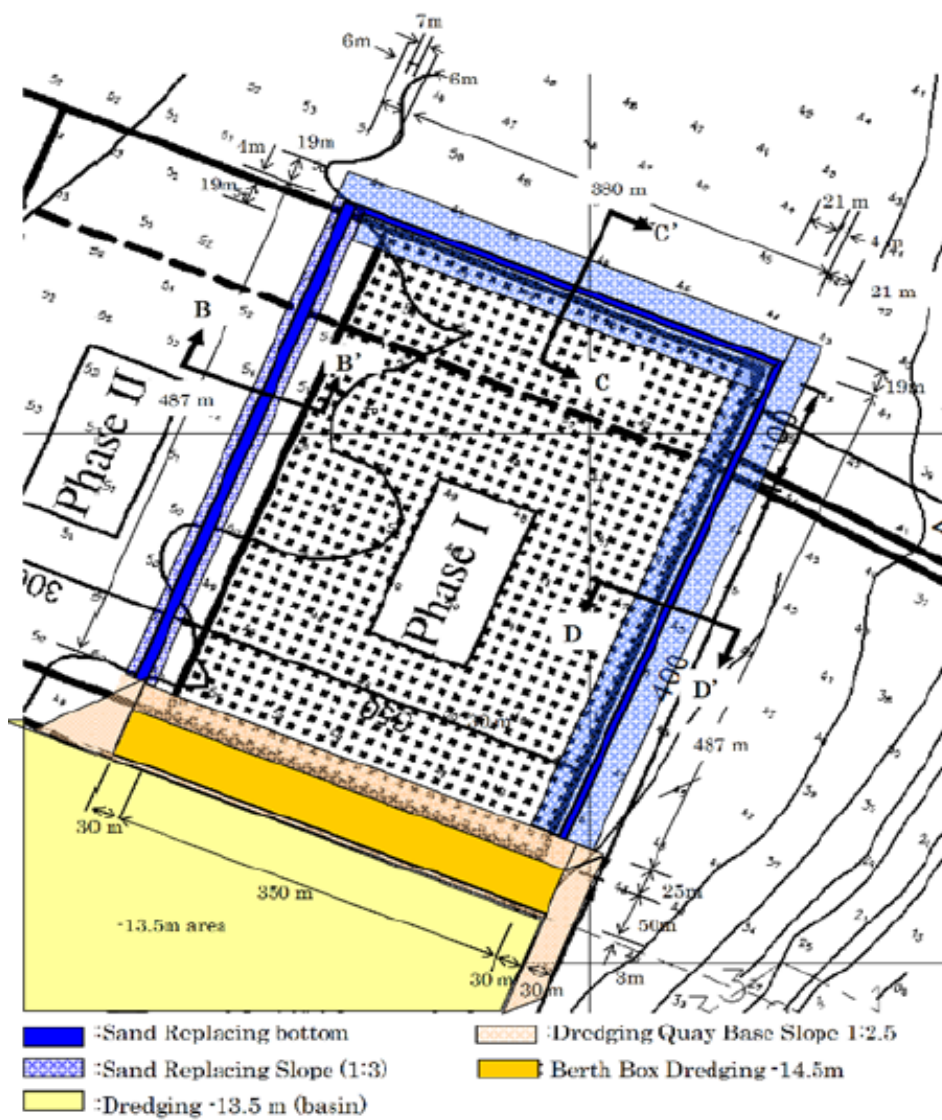


Figure 3-2: Sand Replacement Plan and Seawall Structure

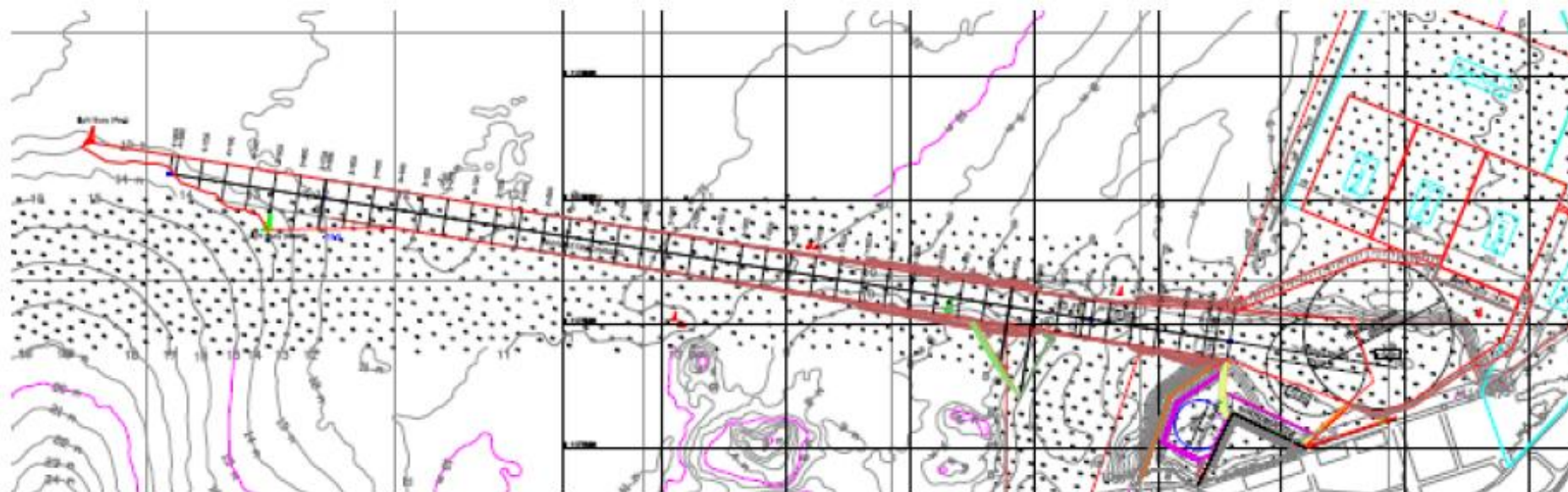


Figure 3-3: General layout plan of dredging

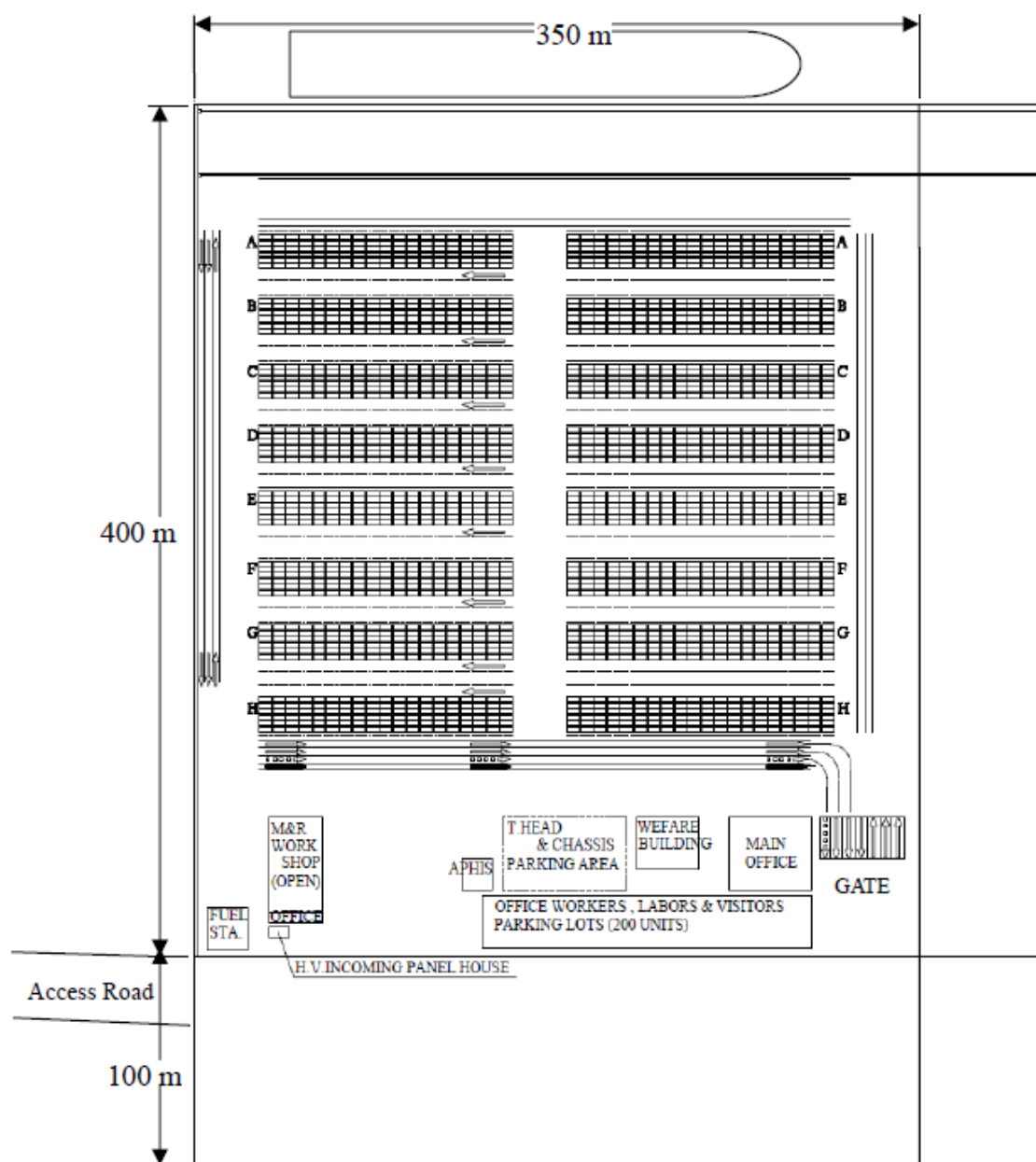


Figure 3-4: Yard Layout of Container Terminal No. 1 (Phase I)

3.2.1.7 Yard Layout of New Container Terminal

Non-destructive inspection facilities such as the X-ray inspection facility should be installed outside of the Gate of the New Container Terminal together with the gate reception house which consists of Police, Custom and CAM-CONTROL, in order to shorten waiting time of the trailers at gates of the New Container Terminal. These inspection equipment and facilities are provided by Customs, PAS will be provided the inspection yard at designated location as shown in Figure 3-5. The scale of facilities and equipment should be determined at the detailed design stage.

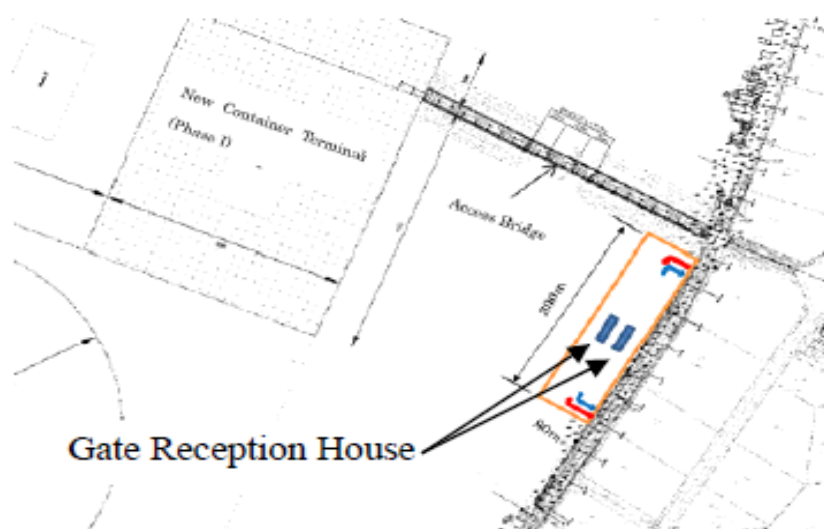


Figure 3-5: Location and Area of Customs Inspection Yard

3.2.1.8 Cargo Handling Equipment

a) Quayside Container Crane (QC)

The quayside container cranes with outreach response to the Post-Panamax-type container ships of 40 m beam (16 rows on deck) stacking 6,000 TEUs containers must be selected. The main specifications are shown in Table 3-1.

Table 3-1: Main Particulars of Quayside Container Crane (QC)

Main Particulars	Unit	Value	Remarks
Rated Load	ton	40.6	For container
		40.6	For hatch cover
		50	For cargo
Span	m	30	
Outreach		44.2	
Supply Power	A.C. 6.6 Kv, 50 Hz, 3 Phase		

b) Rubber Tyred Transfer Crane (RTG)

The main specification of the rubber tyred gantry crane is that it has the capability to stack containers 1 over 5 high, and the other specifications are shown in Table 3-2.

Table 3-2: Main Particulars of Rubber Tyred Gantry Crane

Main Particulars	Unit	Value/Remarks
Rated Load	LT	40
Type of Spreader	m	Single lift (20/40 FT Telescopic Spreader)
Span	m	30
Container Arrangement	row	6 (0 + 6) Arrangement
Power Source		Diesel-Engine Generator Sets

3.2.2 Preliminary Design of Access Road and Bridge

3.2.2.1 Alignment of Access Road and Bridge for Phase I

The road alignment has been planned to take advantage of the minimum amount of land between the road site and SEZ. Additionally, the current roadside housing and stores are not affected by this road plan. The road alignment plan is shown in Figure 3-6.



Figure 3-6: Alignment Plan of Access Road to New Port

3.2.2.2 Intersection of National Road No.4

The National Highway Route 4 intersection is selected as the starting point for the access road since it has minimal impact caused by traffic increase from the new port.

At the intersection of National Road No. 4, traffic arises due to traffic from Phnom Penh taking right turn when the traffic towards the port is concentrated. Therefore, the plan to add two more lanes for right turn towards the New Port and SEZ has been done in order to alleviate National Road No. 4 traffic. The plan is to widen the 250 m length lane and the 150m divergent lane. Intersection plan of National Road No. 4 is shown in Figure 3-7.

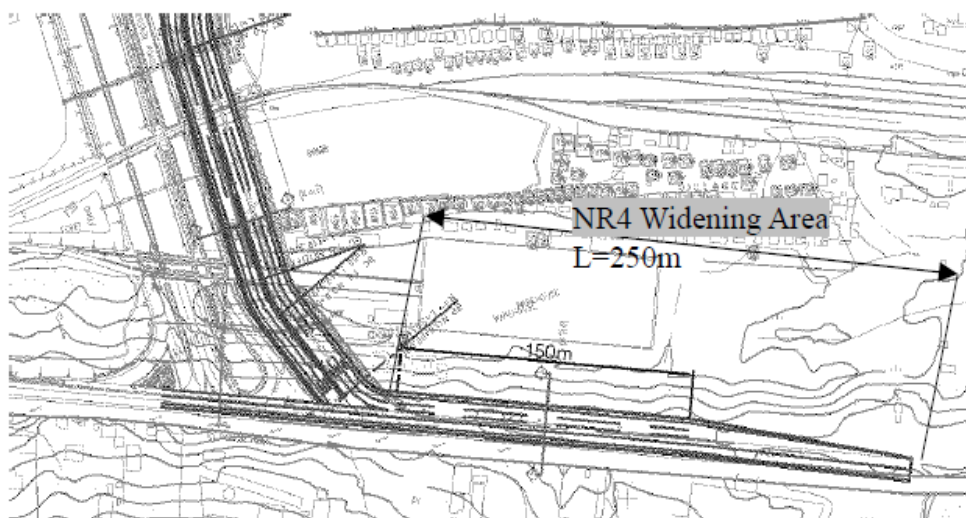


Figure 3-7: Intersection Plan of National Road No. 4

The current lane configuration is composed of #1 and #2 and #3 as indicated below. The area between #2 and #3 shall be treated as green belt. The green belt is aimed at reducing the cost impact as much as possible to the project because widening maintenance has been carried out in 2015. For this purpose, the existing 4 lanes road shall be upgraded to 5 lanes road by changing the green belt to roadway. We foresee that it shall facilitate the traffic flow by this option. Existing cross section is shown in Figure 3-8.



Figure 3-8: Plan Cross Section

3.2.2.3 Bridge Design for Phase I

An access bridge for the terminal is planned from the access road to the new container terminal, where small fishing vessels are capable to pass beneath the bridge. The bridge is planned at 18 m in width (two lanes for each way with one walkway), the bridge is 100 m in length and made by R.C. structural piers and P.C. structural beams.

- 1) Bridge Length: 100.0 m

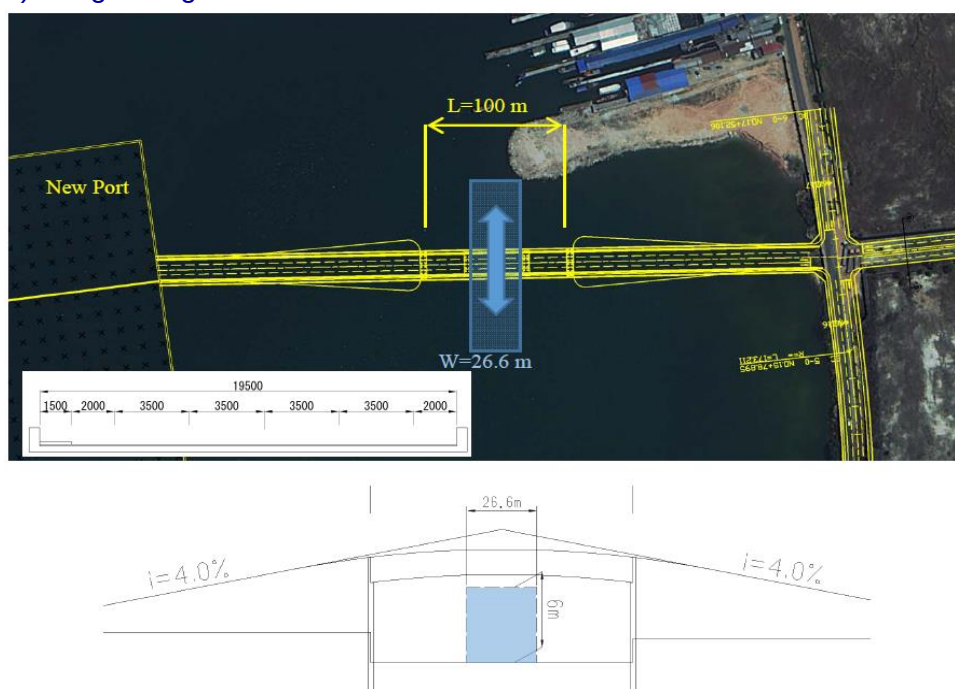


Figure 3-9: Bridge Length and Clearance Width

- 2) Design Criteria: Specifications for Highway Bridges (Japan Road Association)
3) Approach Slope Grade: 4.0%

Due to the reason that the majority of traffic is large trailer, low-gradient has been adopted in the planning.

- 4) Clearance height of under Bridge: $H=6.0$ m

Clearance of 6.0 m has been adopted for small fishing boats to pass after considering the consultation with PAS.

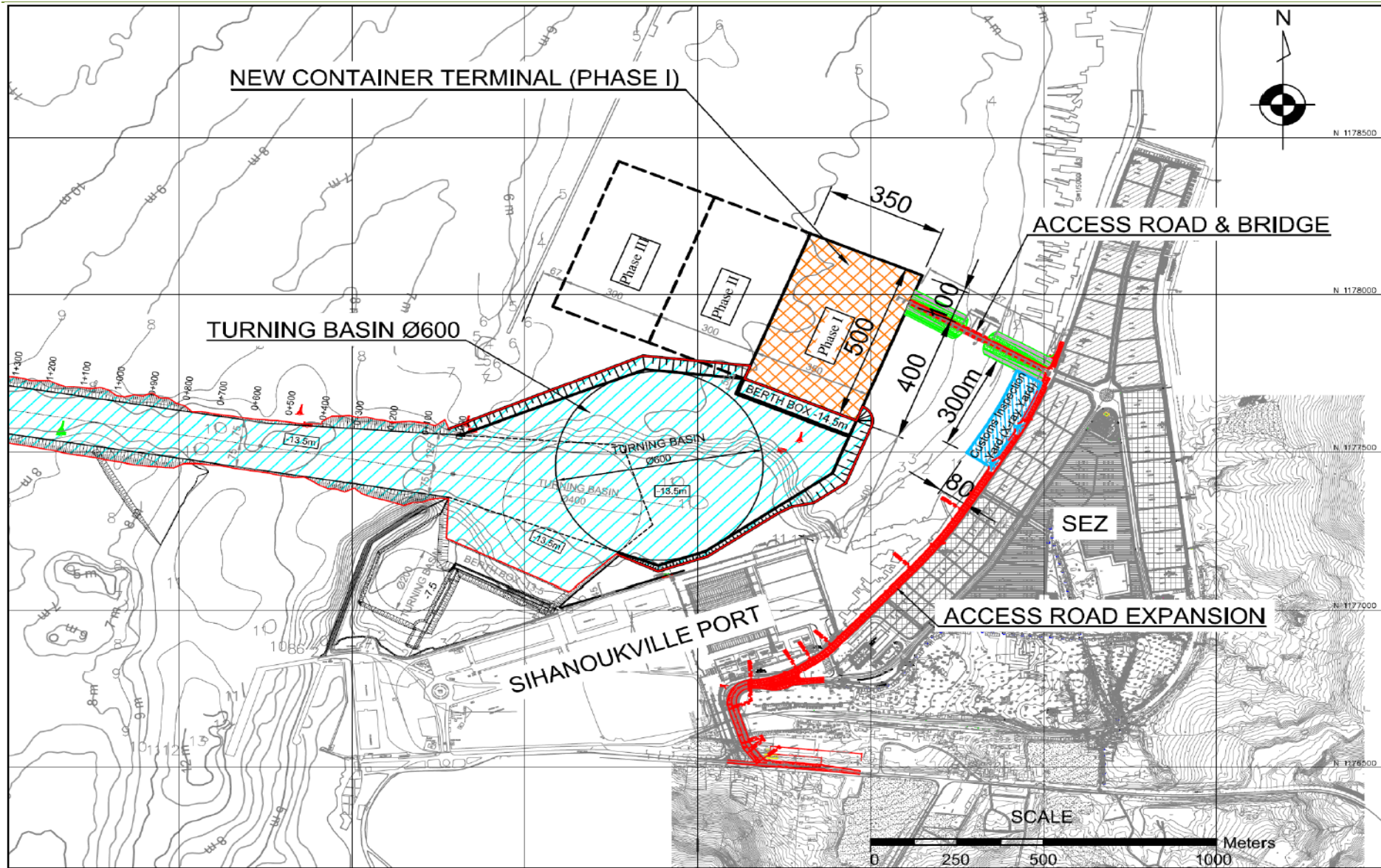


Figure 3-10: General layout plan of new container terminal

3.3 Dumping Site

3.3.1 Dumping Site of Multipurpose Terminal Project

The two sites in seaside at 5 km west of the port as shown in Figure 3-11, were designated as dumping sites for dredged material in MPT Project. The dumping sites have abundant remaining capacity even after completion of MPT Project, and are also the first choice for the dumping site of new container terminal project.

The deep spots were designated as dumping sites. The deeper site of D1 is the main dumping site with depth of CDL -52 m, and the space from the seabed to CDL -20 m is designed as the capacity. The total capacity is 10.3 million m^3 , and the designed dumping volume of MPT and new container terminal projects are 1.3 million m^3 and 3.2 million m^3 respectively. Therefore, the remaining capacity will be 5.8 million m^3 at the completion of proposed project.

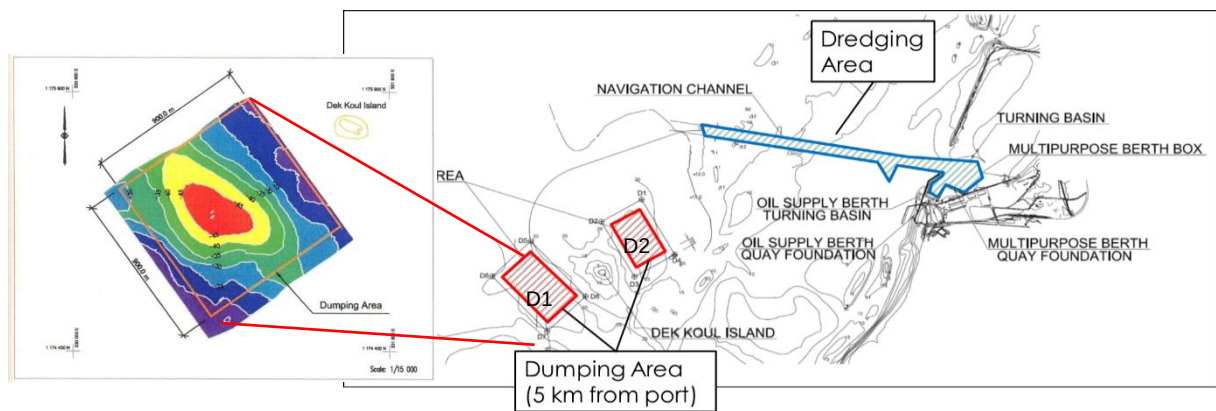


Figure 3-11: Location Map of Dumping Sites

3.3.2 Alternatives

The seaside and landside sites are alternatives for dumping sites. The moisture percentage of dredged soil is very high as shown in Figure 3-12, and seems to be more than 100%. The net dumping volume is 3.2 million m^3 , and the estimated necessary capacity of land site dump site considering water content is 6.4 million m^3 . The features of landside dumping site is preliminary estimated below.

Capacity:	6.4 million m^3
Project	
Area:	1800 m x 1800 m
Height of embankment:	2 m
Dump truck:	14 m^3 type truck x 457,143
Construction schedule:	21 months
Traffic of dump trucks:	870 trucks per day



Figure 3-12: Dredged Soil in MPT

3.3.3 Evaluation of Alternatives

The details of dumping sites will be studied in the detail design stage, however, the basic properties of alternatives summarized in Table 3-3 indicates the superiority of Plan A (seaside) in both technical and environmental aspects.

Table 3-3: Comparison of Alternatives on Dumping Site

Contents		Alternatives	
		Plan A	Plan B
Description		In seaside	In landside
Technical Evaluation	Site Selection	The remaining capacity of dumping sites of MPT Project will be used for the proposed project.	The site selection is very difficult. The sites must be near to the project site and far from residential areas, national parks, and reserved areas.
		Excellent	Bad
	Construction Equipment	The similar types of the split barge used in MPT Project can be also used in the proposed project.	A waterproof type of dump trucks are necessary to carry dredged sediments from dredging sites to dumping sites. Those trucks need to be imported and very expensive.
		Excellent	Bad
	Cost	Transportation of dredged material: not very expensive Construction of dumping site: no cost	Transportation of dredged material: very expensive Construction of dumping site: very expensive
		Excellent	Bad
	Total	Excellent	Bad
Environmental Evaluation	Pollution	The dumping causes sediment disersion. The monitoring data of turbidity in MPT Project was less than threshold.	The water quality of water discharge from dumping site will be acceptable with appropriate treatment.
		Good	Good
	Natural Environment	Serious impacts on natural environment are not expected because the monitoring data in MPT Project was less than threshold and the dumping sites are located in far from national parks and reserved areas.	The extent of impacts on natural environment is depends on site selection. In case of sites far from residential areas, the sites must be valuable areas on natural environment. In case of sites near residential areas, serious impacts on natural environment are not expected
		Good	Unknown
	Social Environment	No serious impact on social environment is expected, because the dumping sites are far from residential areas.	The extent of impacts on social environment is depends on site selection. In case of sites far from residential areas, serious impacts on social environment are not expected. In case of sites near residential areas, serious impacts on social environment are expected. Besides, transportation of dredged material is necessary in both cases. Traffic jam is expected, and leaking sediment from dump trucks soils the surface of roads.
		Good	Unknown or Bad
	Total	Good	Bad
Overall Evaluation		Recommended	Not Recommended

3.4 Sources of Materials for Project Construction

3.4.1 Sand Resource

Sihanoukville Port New Container Terminal Development Project will use sand from the sources AS mentioned in Table 3-4. This sand will be supplied by a local firm having the license from MoE and win official procurement.

Table 3-4: Source and distance from source to the project site

No.	Description	Quarry Name	From source to project site	Document Status
1	River Sand	Srae Ambel River	70 km by sea	Approved
2	River Sand	Steung River No. 5	30 km by sea	Approved
3	Mountain Sand	Kbal Chhay	25 km by land	Approved
4	Mountain Sand	Otres	15 km by land	Approved

3.4.2 Steel and Cement

Steel will be imported from Japan. The other materials for the project construction including cement and others will be bought from local markets.

3.5 Quantities of Materials for Project Construction

Quantities of materials needed for the project are summerized as in tables 3-5 and 3-6.

Table 3-5: Quantities of materials for the project construction (Package 1)

Construction Work Items (Package 1)			Unit	Quantity
1	Temporary works			
	1.1	Mobilization and demobilization	lump sum	1
	1.2	Temporary works	lump sum	1
2	Dredging works			
	2.1	Dredging access channel (-13.5m)		
		1) Dredging Soil	m ³	1.207.000
		2) Dredging weathered rock	m ³	93.000
		3) Dredging rock	m ³	16.000
	2.2	Dredging port basin (-13.5m)		
		1) Dredging Soil	m ³	2.551.000
		2) Dredging weathered rock	m ³	80.000
		3) Dredging rock	m ³	12.000
	2.3	Dredging berth box (-14.0m)		
		1) Dredging soil	m ³	18.000
	2.4	Transport and disposal dredged materials	m ³	3.177.000
3	Reclamation works			
	3.1	Reclamation of dredged materials	m ³	800.000
	3.2	Reclamation of sand materials (including settlement volume)	m ³	700.000
4	Revetment works			
	4.1	Base dredging	m ³	162.096
	4.2	Base sand replacement	m ³	162.096
	4.3	Core sand stone	m ³	33.600
	4.4	Sand stone (5-10kg)	m ³	16.517

Construction Work Items (Package 1)			Unit	Quantity
4.5	Under layer stone		m ³	8.064
4.6	Amor stone		m ³	17.312
4.7	Filter sheet		m ³	33.344
5	Berth construction			
5.1	Dredging			
	1) Dredging from quay line to under the quay deck		m ³	73.500
	2) Dredging for sand replacement		m ³	71.750
5.2	Sand replacement		m ³	71.750
5.3	Piling works			
	1) Supply and delivery steel pipe pile (1000mm T=16, L=30 – 37.5m)		ton	1.005
	2) Supply and delivery steel pipe pile (900mm T=16, L=30 – 37.5m)		ton	4.516
	3) Driving steel pipe pile (1000mm)		m	2.588
	4) Driving steel pipe pile (900mm)		m	12.938
5.4	Strut Steel Pipe Work			
	1) Supply and delivery strut steel pipe (5.2t/set x 50 sets)		ton	269
	2) Installation of strut pipe beam		set	50
5.5	Corrosion protection			
	1) Cathodic corrosion protection		number	450
	2) Petrolatum lining, Petrolatum lining corrosion protection		m ²	1.875
	3) Urethane coating, Urethane coating corrosion protection		m ²	950
5.6	Slope protection			
	1) Slope leveling work		m ²	15.750
	2) Filter sheet		m ²	18.550
	3) Filter stone		m ²	9.100
	4) Amor stone		m ³	16.000
5.7	Deck concrete work			
	1) Pile cap concrete (Re-bar 120kg/m ³)		m ³	1.785
	2) Beam concrete (Re-bar 130kg/m ³)		m ³	5.300
	3) Slab concrete (Re-bar 145kg/m ³)		m ³	5.950
	4) Fender wall and other		m ³	300
5.8	Retaining concrete block wall			
	1) Wave dissipation concrete block		number	246
	2) In-situ concrete wall		m ³	600
	3) Rubble backing stone		m ³	3.300
	4) Filter sheet		m ²	4.200
5.9	Berth Fitting			
	1) Fender		number	35
	2) Bollard		number	18
	3) Ladder		number	2
	4) Crane rail		m	650
	5) Crane rail accessories		lump sum	1
5.10	Other small works		Lump sum	1
6	Access road works			
6.1	Base and filling of access road for bridge			
	1) Base dredging		m ³	83.755
	2) Base sand replacement		m ³	83.755

Construction Work Items (Package 1)		Unit	Quantity
	3) Core sand stone	m ³	18.488
	4) Under layer stone	m ³	5.885
	5) Amor stone	m ³	9.400
	6) Filter sheet	m ²	12.473
	7) Reclamation	m ³	175.400
6.2	Access bridge (2 spans continuous post-tensioning PCT-section)	m	100
6.3	Expansion of the existing access road		
	1) Road pavement for new area	m ²	26.576
	2) Road pavement for existing road (only surface R.C coarse)	m ²	13.620
	3) Sidewalk pavement	m ²	3.526
	4) Medial strip	m	400
	5) Box culvert (L=54m), U Ditch (1,041m), RC pipe, drainage	lump sum	1
	6) Replacement of the existing block wall	m ²	1.200
7	Utilities		
7.1	Yard and road drainage		
	1) Main drainage (φ 800 ~ φ1200 PCP with MH)	m	1.200
	2) Branch drainage (φ 300 ~ φ600 PCP with MH)	m	1.400
	3) Drainage around fence (V ditch)	m	1.350
7.2	Water supply and distribution		
	1) Distribution main pipe (φ150) HDPE	m	1.450
	2) Distribution branch pipe (φ50 - 100) HDPE	m	50
	3) Meter and valves	lump sum	1
	4) Water reservoir and pumping facilities (800 tons)	Lump sum	1
	5) Outside connection with SEZ water supply system (φ150) HDPE	m	950
7.3	Power supply system		
	1) Transformer 6000 v – 400 v	number	3
	2) Transformer 22000 v – 6000 v	number	1
	3) Switch gear + panel	lump sum	1
	4) 6000 v cable	m	2.280
	5) 400 v cable	m	900
	6) Street lighting system	number	50
	7) Yard lighting pole and lights	set	6
	8) 22kv Cable connection	m	2.600
7.4	Sewerage treatment system and pipeline		
	1) Sewer treatment tank (200 persons)	unit	1
	2) Sewer treatment tank (30 persons)	unit	2
	3) Pipeline installation	lump sum	1
7.5	Telecommunication system	lump sum	1
7.6	Container reefer rack, panel and plug	set	144
7.7	Other works		
	1) Boundary fencing	m	1.260
	2) Road fencing and other utilities	m	385
8	Yard Pavement		
8.1	RTG Traversing lane		
	1) Horizontal lane (P.C Plate)	m ²	6.240
	2) Vertical lane (P.C Plate)	m ²	3.450
8.2	RTG Repairing lane (P.C Plate)	m ²	180
8.3	Parking		

Construction Work Items (Package 1)			Unit	Quantity
	1) Tractor and chaises parking (heavy duty)		m ²	1.500
	2) Officer, visitor, worker car parking (light duty)		m ²	2.800
	3) Other motorbike (light duty)		m ²	100
8.4	Heavy duty yard pavement			
	1) Apron pavement		m ²	8.925
	2) Container yard and road pavement		m ²	71.000
8.5	Container sleeper			
	1) Size 1500 x 300 x 16.2m		m ²	6.600
	2) Size 750 x 300 x 16.2m		m ²	390
8.6	Light duty yard pavement			
	1) Office area		m ²	1.000
	2) Between container sleeper		m ²	22.000
8.7	Walkway			
	1) Road curb		m	1.400
	2) Light duty pavement (t=50)		m ²	1.800
8.8	Outside road pavement in reclamation area			
	1) Container trailer road and parking		m ²	31.000
	2) Walkway		m ²	850
	3) Center island landscape area		m ²	1.500
	4) Road curb		m	1.500
8.9	Other works			
	1) Road marking and yard marking and other small works		lump sum	1
9	Architectural works			
9.1	M&E workshop		m ²	1.200
9.2	Administration office		m ²	2.500
9.3	Fuel station		m ²	400
9.4	Sub-station and generator house		m ²	300
9.5	Main gate and weighing bridge		m ²	820
9.6	Worker building		m ²	600
10	Navigation Aids			
10.1	Light buoy		number	3
11	Customs Inspection Yard (X-ray yard)			
11.1	Reclamation for inspection yard		m ³	108.000
11.2	Boundary fence construction		m	710
11.3	Slope protection			
	1) Under layer stone		m ³	2.500
	2) Amor stone		m ³	6.000
	3) Filter sheet		m ²	6.900

Table 3-6: Quantities of materials for the project construction (package 2)

Package 2			Unit	Quantity
1	Cargo Handling Equipment			
1.1	Quayside gantry crane (Post-Panamax, 16 rows)		unit	3
1.2	Rubber mounted yard gantry crane (6 rows, 1 over 5, Hybrid type)		unit	9
1.3	Reach Stacker (10 tons)		unit	2
1.4	Tractor & Chassis (40'container)		unit	16
1.5	CCTV system		set	1
1.6	Emergency generator 1500 KVA		unit	3

Package 2			Unit	Quantity
	1.7	Terminal Operation System (TOS)	set	1

3.6 Waste Management

3.6.1 Solid Waste Management

3.6.1.1 Construction Phase

Most of the solid wastes are kitchen waste (from workers camps), leaves, wood residuals, debris from construction materials, office waste and waste from construction materials such as iron, polyethylene plastic pipe, plastic, wood, cement, lime, paint etc. To manage solid waste, the construction contractor will take measures to isolate solid waste by categories. The construction contractor will have waste management plan in cooperation with the authority and make a contract with the company to collect and transport those wastes to the disposal site as approved by MoE and local authority.

3.6.1.2 Operation Phase

The waste will originate from office such as: paper, old stationery, carton/foam, wooden board, plastic and garbage produced by ships in the port area. Solid wastes generated at this stage are mostly from kitchen where serves a large number of port workers and some materials.

To properly manage these wastes, PAS plans to put trash bins in the main areas of the project and advises their employees and workers to dispose of waste at those locations. Moreover, PAS will take more measures to classify solid wastes by category and pack and store in the defined locations. PAS will make a contract with a local company for collecting and transporting wastes to dumping area.

3.6.2 Liquid waste management

3.6.2.1 Construction Phase

Liquid waste is generated from construction activities and workers camp. To properly manage the liquid waste, the construction contractor will prepare the sewer system and the septic tank nearby the workers camp, project office, and construction areas.

3.6.2.2 Operation Phase

Liquid waste will be generated from the project area which originates from service offices, kitchen of workers and staffs, and other areas with the project area. To deal with these issues the project will construct 2 septic tanks and pipeline systems.

3.7 Total Investment for Project

Sihanoukville Port New Container Terminal Development Project will use concession loan from Japanese government, which is approximately US\$ 205.4 million.

3.8 Construction Schedule

The project construction schedule is 36 months.

4. DESCRIPTION OF ENVIRONMENT

4.1 Physical Resource

4.1.1 Topography

Based on the study on Topographical Map, it shows that the project area is on the sea with the depth from -4 to -5m. It also shows that the project area is on the sea and its surrounding areas have altitudes of 10 to 18 m above mean sea level (a.b.m.s). Eastern parts of the project area are highland with low mountains and cover altitudes of up to 140 m a.b.m.s. Based on the study on Slope Map, it indicates that the surrounding project areas have angles from 0-1.3 degree.

4.1.2 Geology

The study on geology is to know about the age and history of soil formation, and can also show its natural activities include: ascent, volcanic eruptions etc.

Based on the geological study Scale, it indicates that the project area is the sea. Eastern parts of the project area which is about 1.5 km were occurred in the Secondaire which is form Jurassic-Cretaceous sandstone which about 150-200 million years ago.

4.1.3 Soil Type

Based on Charles D.Crocker 1963, which was analyzed by GIS indicates that at the eastern part of the project area within a radius of 1.5 km there is only one type soil (acid Lithosols). This soil type includes all young soil that are descended from the acid stones include: Gré, Ryolithe and Granite. This soil has different texture from one main stone to another. But the soil profil which represent this type of land is originated from Gré.

Soil profile: gray-brown sand mixed, sometimes with Gré pebbles, pH 5-5.5 at the upper layer from 0-20 cm or 30 cm. The next layer is larger stone blocks with depth not more than 30 cm.

4.1.4 Climate

The project area shares the same climate as other areas in the country. It is influenced by tropical monsoon and is divided into two seasons, dry and rainy seasons. a 6-month dry season lasts from November to April, and is divided into two small seasons: summer and windy. Windy season starts from November to January, bringing cold air from Siberia and the summer started from February to April. The rainy season also lasts 6 months, starting from May to October. The wind flows from southwest, bringing moisture from the Indian Ocean and provides rainfall, which is critical for irrigation of agricultural crops and other plants.

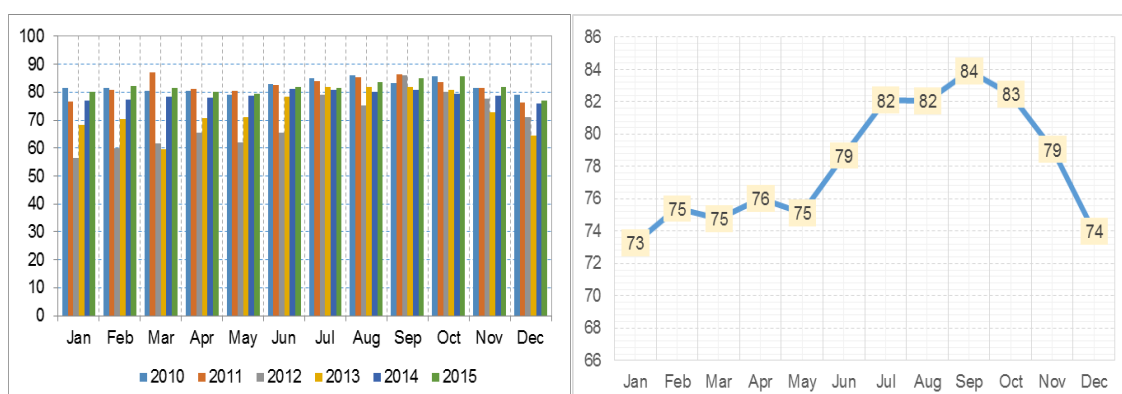
4.1.4.1 Rainfall

Rainfall generally varies from year to year. Total annual rainfall in Preah Sihanoukville province during the last 6 years is 2,175.6 2,346.7 2,758.4 2,682.2 2,725.6 2,504.3 mm for 2010, 2011, 2012, 2013, 2014 and 2015, respectively.

4.1.4.2 Humidity

Humidity rates change according to the season. The highest moisture month is in September and the driest month is January. Humidity rates in Preah Sihanoukville station

within the last 6 years are as shown in Graph 4-1. It is generally observed that the rate of humidity is high at night throughout the year.



Graph 4-1: Monthly Humidity from 2010-2015 in Preah Sihanoukville province

4.1.4.3 Temperature

Maximum temperature in Preah Sihanoukville ranges from 33.1 to 44 °C. The hottest month is June. The minimum temperature ranges from 14.4 to 24.1 °C. The coldest months are January and February.

4.1.4.4 Wind Speed and Wind Direction

Wind speeds vary from month to month and from year to year. Generally in Preah Sihanoukville province lowest wind speeds are from October to December. While highest wind speed are from August to September.

4.1.5 Air Quality, Noise and Vibration Levels

4.1.5.1 Air Quality

2 locations were selected for air quality analysis and then analyzed in the MoE's laboratory. As a result, it shows that the parameters CO NO₂ SO₂ and TSP are not exceeded the MoE's standard. As for PM2.5 and PM10, they are higher than standard of WHO due to traffic activities. The result is concluded the atmospheric environment in the project area is fairly good.

4.1.5.2 Noise Level

Result from noise level measurement shows that maximum noise level is higher than the MoE's standard at 2 sampling sites especially from 9.00-10.00 for site 1, from 10.00-11.00 for site 2 and from 04.00-05.00 for both sites. Likewise, the average noise level is higher than the MoE's standard at site 2, especially from 9.00-10.00 at site 1, from 10.00-11.00 at site 2 and from 04.00-05.00 for both sites. This is because of the heavy traffic.

4.1.5.3 Vibration Level

Result from vibration level measurement shows that maximum vibration level is lower than the Japan's standard during the 24-hour measurement for site 1 and is higher than the standard during night time for site 2. Overall, the average vibration level of both locations is lower than the standard either daytime or nighttime.

4.1.6 Hydrology

4.1.6.1 Waterway System

Based on JICA data source 2002 and direct observation, it shows that there is no waterway around the project area.

4.1.6.2 Sea Current

Sea current in the dry season is calm. In the rainy season, sea current moves into waves due to strong winds. The result of sea current measurement showed that the sea current from South to North is predominant in the two measuring points. Maximum speed of the sea current in the northern access channel is about 40 cm/sec occurring for both directions: the south and the north. The speed of the sea current in the southern access channel is stronger than in the northern part. Maximum speed of the southern current is sometimes up to 60 cm/sec.

4.1.6.3 Wave

From general survey in the dry season, sea surface is calm with very few waves, whereas there may be a height of about 0.4 – 0.7 m. But in the rainy season, waves seem to occur often that a height ranging from 0.5 – 0.9m, and sometimes there may be up to 1.5–2m. Wave direction depends on wind direction.

4.1.6.4 Flood Tide/ Ebb Tide

Generally, flood tide and ebb one can occur twice a day. Usually ebb tide occurred in the morning while flood tide began in the afternoon until night. In Sihanoukville Province average height of flood tide is from 0.5 – 1 m, but during the windy season the flood tide height can be slightly higher, up to 1–1.5 m, which can be seen from November to January of each year. Generally, the average ebb tide height ranged from 0.5 – 0.8 m compared to the sea level.

4.1.7 Water Quality

4.1.7.1 Sea Water Quality

6 sampling locations were identified for sea water quality analysis. The sampling was conducted on August 17, 2016 and analyzed at the MoE's laboratory. The result shows that most of the parameters don't exceed the MoE's standard for biodiversity conservation. But the parameters:

- Oil and grease exceeds the MoE's standard level at the sampling site 6, due to the human activities (illegal people living in the port area) such as discharging oil-contained liquid waste into the sea.
- Total Coliform also exceeds the MoE's standard level due to taking samples in the rainy season, resulting soil erosion washed away by rain into the sea and considering as the main source of higher Coliform.

Overall, the result of water quality analysis can be concluded that sea water quality is fairly good.

4.1.7.2 Ground Water Quality

During the study period, 3 boreholes were selected for groundwater analysis. The result shows that all parameters don't exceed the MIH's standard for drinking water quality.

The result can be concluded that the groundwater quality is very good for drinking and cooking purposes.

4.1.8 Seabed Mud Quality

2 locations were selected for seabed mud quality analysis. The result shows that the value of all parameters were not in the standard set by the Ministry of Environment. All parameter will, therefore, be used as a reference data in case there will be suspected pollution occur from the seabed mud during construction phase.

4.1.9 Numerical Simulation of Dispersion of Disposed Soil

The objective of Numerical Simulation of Dispersion of Disposed Soil is to confirm the extent of suspended soil after disposal of dredged materials during the proposed new container terminal construction works, simplified numerical simulation was carried out.

4.1.9.1 Numerical Model and Input Conditions

MIKE21, which was one of the world-famous two-dimensional numerical models, was applied for this numerical study. This model can simulate advection and diffusion of suspended soil due to disposal of dredging materials into the sea under fluctuated tidal current field. The nested model was employed to conduct appropriate simulation at the limited target area.

4.1.9.2 Relationship between Turbidity Dispersion and Tidal Current

The computation results of turbidity dispersion for suspended soil and tidal current at 20minutes, 2 hours and 4 hours after the dumping activity. The concentration of turbidity is dispersed and moving to downstream side due to change in tidal current. The area of turbidity is just nearby dumping area and no adverse effect to the outside of dumping area was observed.

4.1.9.3 Density of Suspended Soil at Evaluation Points

Figure 4-1 shows time variation of the density of suspended soil for 36 hours. As the reference, the change in tide elevation and current speed are also shown in Figure 4-2 and Figure 4-3.

- Just after the dumping, high turbidity is observed at center point with 10 NTU. However, high turbidity suddenly decreases and becomes less than 1 NTU within several ten minutes due to advection and dispersion effect of tidal current.
- The peak values of turbidity at each evaluation points are different due to spatial variation of tidal current. The peak values for both points are less than 5 NTU. The results fulfill the environmental control criteria during the dumping activity.
- The high turbidity is disappeared within 2 hours after the dumping. This means that 6 hours interval is sufficient to ease the turbidity effect.

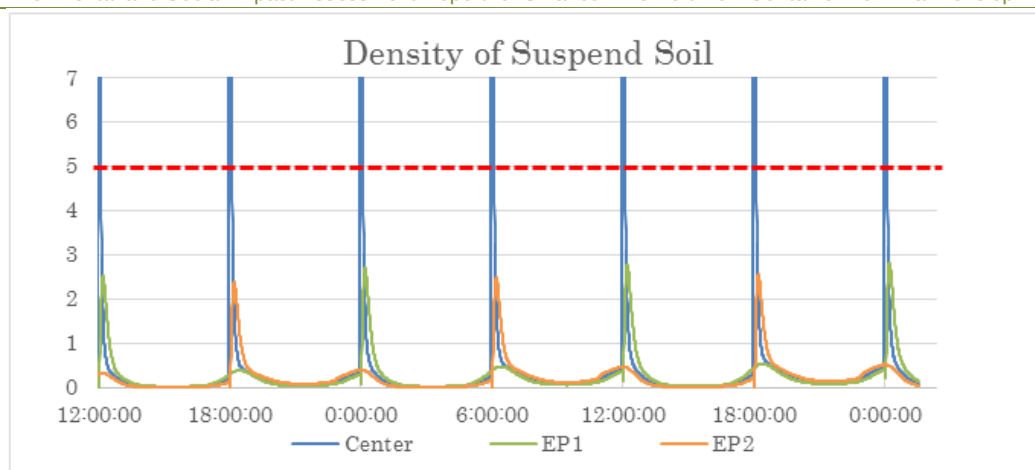


Figure 4-1: Density of Suspended Soil at Evaluation Points (Unit: NTU)

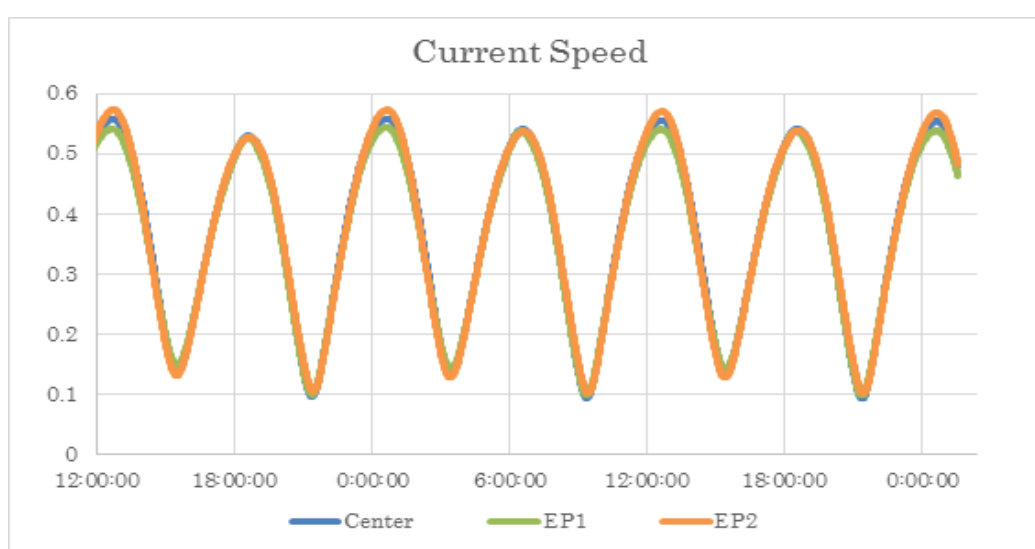


Figure 4-2: Tide Level (Unit: m)

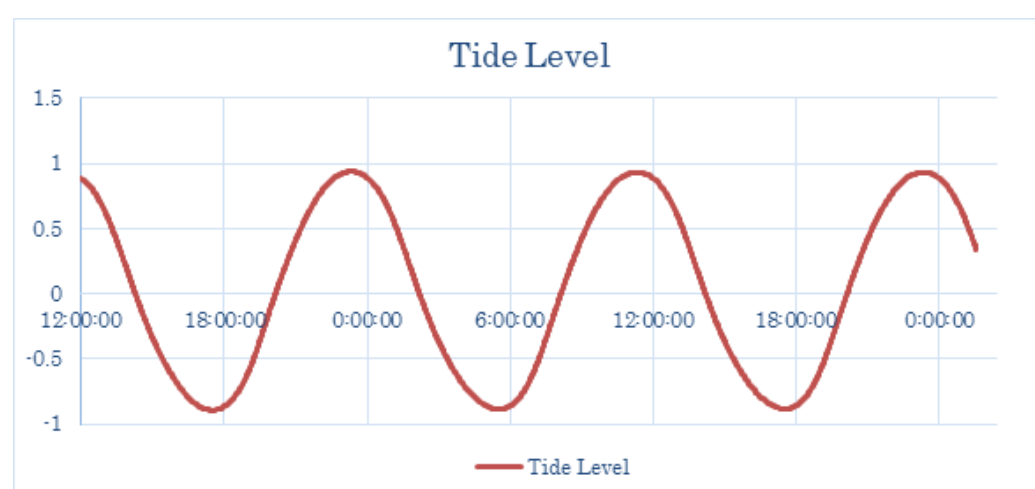


Figure 4-3: Current Speed

4.1.9.4 Conclusion

The dispersion of suspended soil after disposal of dredged materials during the proposed new container terminal construction works will occur only in limited area according to the results of numerical analysis. The JICA Survey Team concluded that the possibility of serious environmental impacts on the surrounding area of dumping site due to the disposal works was low.

4.2 Biological Resource

4.2.1 Forest Resource

There were 169 species of flora recorded in the field survey. Of those species, 13 were in Cambodia's wood quality classification system. Most of them were classified as least concern in IUCN Red List. According to Annex 2 of the Prakas on Timber Product and by-product to be prohibited from harvest of the Ministry of Agriculture, Forestry and Fisheries, 2005, there were three species: Tatrao, Thnong and Angkanh found in the survey area.

4.2.2 Aquatic Plant Resource

Aquatic plant resource is rarely seen in this development zone because it has been actively developed since the 1960s. On the other hand, it is not a protected area or conservation area. However, there are block of rock next to the sea with white sand and some seaweed and this is an active port area. But there are some coral grows in the sea, about 8 km from the beach which is far from the project location.

4.2.3 Wildlife Resource

Wildlife resources were conducted through interviews with residents. As a result, there were 72 birds, 24 mammals, 26 reptiles, and 10 Amphibians. Most of them are least concern

4.2.4 Fisheries Resource

4.2.4.1 Current Situation of Fishing Activity

a) Experiences in Fishing Activity

Since they have been living on the sea, they have often conducted fishing activities for their daily livelihoods, and some of them have such activities as their main income source as well. Fishing activities for those people have been implemented for a long time. Amongst the 90 interviewees, their experiences over 6 years are 81%, while the rest have experiences between 3 and 5 years.

b) Fishing Gears

There are 5 fishing gears are used by fishermen, all of which are net, Shrimp Net, Seine, Crab hoop, and Octopus hoop. Generally, net and shrimp net are the most popular fishing gears contributing of 60% and 23%, respectively.

c) Species of Fish and Aquatic Fauna

There are 61 fish species and 6 aquatic fauna species and their present conditions that fishermen have caught.

d) Yields of Fish and Aquatic Fauna

The survey results showed that the total annual yields of fish and aquatic fauna is 28,095 tons. During the dry season, the yields are 10% more than that in the rainy season. The yield by fishing gear is presented in Table 4-1.

Table 4-1: Fish yield caught by fishermen

Fising gears	No. of Faminly	Duration of Fishing			Size (m ² or hoop)	Capacity (gr/h/100m ² or hoop)	Yield (t)
		h/d	d/m	m/y			
The Rainy Season							
Net	520	11	20	6	4,100	148	4,165
Shrimp Net	199	11	20	6	4,900	241	3,102
Seine, Trawler	87	10	20	6	250	13,905	3,629
Crab hoop	52	11	24	6	1,400	1,393	1,606
Octopus hoop	9	8	28	6	60	20,833	151
Total							12,654
The Dry Season							
Net	520	11	20	6	4,100	267	7,514
Shrimp Net	199	10	20	6	4,900	237	2,773
Seine, Trawler	87	10	20	6	250	13,013	3,396
Crab hoop	52	11	24	6	1,400	1,393	1,606
Octopus hoop	9	8	28	6	60	20,833	151
Total							15,441
Total Yield							28,095

Note: h = Hour, m² = square meter, gr = gram, and t = Ton

e) Conclusion

The study of fishery resources for the project can be concluded that the development project will not provide any significant impacts on fishing activities. However, daily fish raising activities may have impact during the project construction. This should be considered by PAS. In case of any impact by the project, proper compensation should be made. In general, the fishermen expressed their support for the development project.

4.2.4.2 Current Situation of Aquaculture

a) History of Aquaculture

The chief of village/mondul reported that 20 families used to carry out fish raising near the project area. Currently, only 8 families are running fish raising. It is notable that fish raising has been implemented 13 years ago, since 2003. The other 12 families stopped their fish raising due to losses caused by water pollution from the plants which is close to the sea, causing fish to die. Among the interviewed 8 families, 5 families have more than 10 years of experience and 3 other families are within 5 years of experience.

b) Type of Fish

4 fish species are being raised, all of which are Trey Ptouk (*Rachycentron canadus*), Trey Spung (*Lutjanus argentimaculatus*), Trey Toek Ke (*Cephalopholis* sp.) and Trey Chap Sor (*Pampus sparrows argeteus*). The fish raising method is incorporating two or three types of fish together into one fish cage. Most of fish species were bought from local fishermen.

c) Income from Fish Raising Activities

Based on the interviews, two families lost from fish raising activities in 2015 because of fish death, resulting from diseases and those fish could not be cured on time. However, they will continue raising fish in the next year. The other families have been profiting from such activities, ranging from US\$ 2,196 to US\$ 24,000 per year.

Table 4-2: Income from Fish Raising Activities

No.	Owner name	Farm Size (m ²)	Expense(USD)	Income(USD)	Profit(USD)
1	Nguon Sarat	75	2,900	2,500	-400
2	Chror Sun	300	19,262	15,000	-4,262
3	Yi Borous	270	33,600	40,600	7,000
4	Hak Ponleu	225	15,000	18,000	3,000
5	Nhoem Sakhon	380	34,600	58,600	24,000
6	Hon Sophary	320	20,125	24,225	4,100
7	Kim Heang	360	29,000	34,000	5,000
8	Seng Doung	360	39,575	41,771	2,196

4.3 Socio-Economic Environment

4.3.1 Demography and Settlement Pattern

4.3.1.1 Demography

Preah Sihanoukville province has a total area of 2,536,68 km², 4 districts /municipalities, 27 communes/Sangkat and 111 villages/Centers, with total families of 45,066 households and total population of 211,526. In Sihanoukville municipality, there are 17,250 families and total population of 78,380. The demographic characteristics are shown in Table 4-3. Population by village/mondul related to the project is shown in Table 4-4, while detailed population in village/mondul related to the project area is shown in Table 4-5.

Table 4-3: Demography in Sihanoukville Municipality

Description	Year		
	2013	2014	2015
Number of family	17,003	18,034	17,250
Number of total population (person)	77,657	82,048	78,380
Annual growth rate (%)	3.2	5.7	-4.5
Total female	39,554	41,942	39,656
Comparing female to 100 males	103.8	104.6	102.4
Percent of female as head of family (%)	10.8	13.9	13.2
Average size of family (persons/family)	4.6	4.5	4.5
Number of population aged 0-17 years old	28,307	30,561	24,617
Number of population aged 18-60 years old	44,901	46,659	48,665
Number of population aged over 61 years old	4,449	4,829	5,098

Table 4-4: Population by village/mondul related to the project

Sangkat	Village/Mondul	Total family	Total population	
			female	male
Sangkat 3	Mondul 3	2,102	4,564	4,571

Sangkat	Village/Mondul	Total family	Total population	
			female	male
Sangkat 1	Mondul 3	2,537	5,735	5,522
Total		4,639	10,299	10,093

Table 4-5: Detailed population in village/mondul related to the project area

Sangkat	Mondul	Group	Total family	Number of population	
				Total	female
Sangkat 3	Mondul 3	Group 1	25	125	66
		Group 2	11	49	25
		Group 3	19	81	39
		Group 4	54	217	111
		Group 5	31	143	63
		Group 6	67	268	137
		Group 7	98	453	235
		Group 8	117	498	252
		Group 9	79	365	179
		Group 10	93	415	220
		Group 11	73	308	160
		Group 12	95	404	207
		Group 13	123	500	253
		Group 31	452	1,719	829
Sangkat 1	Mondul 3	Group 11	28	116	67
		Group 20	40	217	103
		Group 21	27	107	50
		Group 22	49	201	107
		Group 23	33	148	84
		Group 24	45	191	102
		Group 25	51	229	123
		Group 26	40	188	92
		Group 27	42	190	84
		Group 28	40	177	80
		Group 29	16	65	29
		Group 30	13	50	21
		Group 31	43	189	95
		Group 34	42	173	87
Total			1,846	7.786	3.900

4.3.1.2 Settlement Pattern

Based on the observations in the studied area, local people's settlement pattern is concentrated along National Road No.4 (A), in the port area (B), and near the proposed project (C) (Figure 4-4). People living in the port area are considered as illegal dwellers and will resettle in the future.

4.3.2 Tradition and Religion

People living in Sangkat 3 and Sangkat 1 are mostly Khmer. Therefore, Buddhism is the main. Meanwhile, most of the interviewees were Cambodian (92.4%) and the rest were Vietnamese. Buddhism is the main religion as well.

Prepared by Phnom Penh International Consultants Co., Ltd.

4.3.3 General Information from Respondent

Of the 329 interviewed households, there are 240 persons or 72.9% are women and about 92% are household heads and spouses of household heads. The others are the son/daughter of the household heads. These people aged between 17 and 77 years old. Mostly their educational levels are from primary school to high school and 19% have never attended school. Family members vary between 3 and 15 people/households, with an average of 5 persons per household.

The wealth that own by most families are motorcycles, bicycles, fans, telephone, and televisions. Some families have also car, pumping machine, sewing machine, and washing machine. Regarding animal raising, people raise mostly chicken/ducks ranging from 20 to 100 heads, while pig raising ranging from 7 to 10 heads. Only one household raises 60 oxen/cows.

4.3.4 Socio-economic Setting

The economic situation mentioned here refers to the employment and income of the people in the studied area. Employment is an income source for supporting family economy. Generally, the more of income sources, the stronger family economy is.

4.3.4.1 Employment

The majority of people employment in Sihanoukville municipality is in the service sector followed by the agriculture sector (main occupations and secondary occupations), as detailed in Table 4-6 and Table 4-7.

Table 4-6: People's main occupation in Sihanoukville municipality

Description		2013	2014	2015	
		Percent (%)	Percent (%)	Percent (%)	Population
Whose main occupation are in services		89.4	89.1	90.1	41,675
As	Sell and Trade	29.6	28.8	27.3	12,628
	Repair	1.5	1.9	2.1	927
	Transportation	7.9	7.0	7.4	3,422
	Employed in agriculture/construction	10.9	12.2	11.9	5,504
	Employed in private sector (factory, staff, NGO)	27.0	26.6	30.7	14,200
	Government employed	12.4	12.5	10.7	4,949

Table 4-7: Secondary occupation in Sihanoukville municipality

Description		2013	2014	2015	
		Percent (%)	Percent (%)	Percent (%)	Population
Whose secondary occupation are in agriculture		20.2	18.9	32.0	1,593
Female whose secondary occupation are in agriculture		7.9	8.3	13.5	673
Whose secondary occupation are in services		2.4	5.2	5.6	279
Female whose secondary occupation are in services		0.9	2.9	1.7	87
Whose secondary occupation are in craftwork		77.4	75.9	62.4	3,108
Female whose secondary occupation are in craftwork		31.9	30.9	25.1	1,250

Similarly, among the 329 interviewed households, most of them were service providers. In addition, the study also focuses on the people's secondary occupations. As a result,

among the interviewed households, there are 73 households with secondary jobs. The main and secondary occupations are shown in Table 4-8.

Table 4-8: Occupation of household head in the survey area

No.	Description	Respondent	Percent (%)	No.	Description	Respondent	percent(%)
Main occupation				Secondary occupation			
1	Small-scale business owner	94	30.3	1	Small-scale business owner	20	27.4
2	Fishermen	41	13.2	2	Motor taxi driver	11	15.1
3	Staff of private company	32	10.3	3	Government employee	9	12.3
4	Fishing worker	26	8.4	4	Factory worker	4	5.5
5	Motor taxi driver	26	8.4	5	Construction worker	4	5.5
6	Government employee	24	7.8	6	Staff of private company	3	4.1
7	Construction worker	19	6.1	7	Bussiness man	2	2.7
8	Factory worker	8	2.6	8	Carpenter/repairer	2	2.7
9	NGO staff	4	1.3	9	Fishing worker	1	1.4
10	Carpenter/repairer	4	1.3	10	Other	17	23.3
11	Bussinessman	2	0.6	Total		73	100
12	Other	49	9.7				
Total		329	100				

4.3.4.2 Income and Expenditure

Based on the interviewed results indicates that people can earn income by different types of employments. The highest source of income is fisherman (\$150 - \$3,000/month). Of the 329 households, the median income per household is 1,600,000 Riels or UD\$ 400 per month. The total expenditure per household is 1,000,000 Riels or UD\$ 250 per month. Incomes by occupation are as shown in Table 4-9.

Table 4-9: Income of household head by occupation

Main Occupation	Respondent	Total Monthly Income	
		Riel	USD
Small-scale business owner	94	600.000-6000.000	150-1500
Fisherman	41	600.000-12.000.000	150-3.000
Staff of private company	32	600.000-6000.000	150-1.500
Fishing worker	26	520.000-4.000.000	130-1.000
Motor/Taxi driver	26	600.000-3.000.000	150-750
Government employee	24	500.000-6.800.000	125-1.700
Construction worker	19	500.000-2.000.000	125-500
Factory worker	8	400.000-1.200.000	100-300
NOGs/IOs staff	4	800.000-2.800.000	200-700
Carpenter/repairer	4	400.000-2.400.000	100-600
Bussinessman	2	3.000.000-6.000.000	750-1.500
Other	49	500.000-6.000.000	125-1.500
Average monthly income/family		1,600,000	400

4.3.5 Land Use

According to land area recorded by Sihanoukville provincial department of planning as of 2016 indicates that Sangkat 1 has an area of 4,552 ha while Sangkat 3 has an area of

1,323 ha. Land use type in these Sangkats have not yet been classified. However, farming land was not found during the survey period.

According to land use map, there are 14 land types. The type and size of the land use in the project related sangkat is shown in table 4-10. Based on the interviews of 329 households indicates that their residential land has an average of 70 m²/ households and farmland ranging from 0.01 to 1 ha per household with an average of 0.11 ha.

Table 4-10: Land use type and its areas in the project related sangkat

No.	Type of Land Use	Land use area by Sangkat (ha)	
		Sangkat 1	Sangkat 3
1	Residential land	-	209.09
2	Abondant field covered by grass	0.07	-
3	Evergreen Forest	0.83	91.11
4	Bamboo forest and secondary shrub	1,134.70	43.89
5	Beach	8.1	0.62
6	Grass field	2,042.18	506.11
7	Bush	1,028.55	151.32
8	Sweet water surface	1.45	18.99
9	Infrastructure	0.02	0.35
10	Stone surface	27.43	43.39
11	Rubber plantation	324.05	-
12	Crops in the garden	-	112.66
13	Fruit tree	-	23.18
14	Other (Sea, gulf)	32.47	156.02

4.3.6 Water Consumption and Sanitation

4.3.6.1 Water Consumption

As of December 2015, residents of Preah Sihanoukville municipality have access to pond, borehole, mixed well, and dug well (Table 4-11). As for residents living in the project related Sangkats, most of households have access to public water supply, borehole, mixed wells, dug well and pond (table 4-12). Regarding drinking water sanitation, since 2013 the drinking water conditions in the municipality have been improved (Table 4-13).

Table 4-11: Water consumption sources in Preah Sihanoukville municipality

Water Source	2013	2014	2015
Number of pump well or mixed well	1,190	1,218	1,114
Number of protected dug well	554	823	730
Number of unprotected dug well	570	250	240
Number of ponds	3	5	5

Table 4-12: Number of families using water from different sources in project related Sangkat

Water Source	Total by Sangkat	
	Sangkat 3	Sangkat 1
Number of families usually uses water from public water supply	3,956	1,430
Number of families usually uses water from pump well or mixed well	177	517
Number of families usually uses water from protected dug well	190	981
Number of families usually uses water from pond	-	946

Table 4-13: Hygiene of drinking water in Preah Sihanoukville municipality

Description	2013	2014	2015
Number of families regularly uses ~~tape water~~ or pure water for drinking	10,531	11,385	11,974
Number of families regularly uses water filter for drinking	923	889	861
Number of families regularly boil water for drinking	4,586	4,176	3,808
Percentages of families regularly drink clean water (%)	94.3	91.2	96.5

Based on the survey results, the source of water for cooking and cleaning/washing is not so different. The slight difference is that bottled drinking water is used as a supplementary for drinking and cooking because they think the quality is better than the other sources.

The cost of water consumption per household is an average of 26,000 Riels/month. Regarding drinking water, among the interviewed 329 households there are 233 or 70.8% are used to drink boiling water. The rest drink water directly without any treatment.

4.3.6.2 Sanitation

The use of sanitary latrine has been improving steadily since 2013 in Preah Sihanoukville municipality). Table 50 describes the number of families use sanitary latrine in Preah Sihanoukville municipality.

Based on the survey results shows that amongst the 329 interviewed households there are only 280 (85.1%) that have access to sanitary latrine, while the rest go to bush where is around their house compound or defecate directly to the sea.

4.3.7 Solid Waste Management

Under the sub-decree No 36 on waste management is under the control of the MoE. In addition, the RGC has also drafted sub-decree No. 113 on the management of solid waste in the city on August 27, 2015 with the aim at improving waste management of urban solid waste, transparency and accountability to ensure aesthetics, public health and environmental protection. An important part of this sub-decree is that garbage of solid waste from the town must be carried out, separation and packaging of solid wastes that can be recycled or recycled separately from solid wastes which are disposed of according to the instructions of the Municipal/District Administration Department.

Based on the survey results shows that amongst the 329 interviewed households there are only 26 (7.9%) that have access to solid waste collection service. For people having not received the service, they normally applied traditional ways (burning and/or burying).

4.3.8 Energy Consumption

As of December 2015, in Preah Sihanoukville people mostly use electricity (13,439 families or 98%) followed by the use of batteries as sources for lighting.

Based on the interviews, it is found that regarding sources of lighting all the families use electricity (the cost is from 610-4,500 Riels/kwh). On the average basis, they spend 60,000 Riels per month per households.

Regarding energy for their daily cooking, based on the interviews found that gas and charcoal are the main energy sources for cooking and other relevant purposes. On the average basis, the expenditure for firewood is 40,000 Riels per household per month.

4.3.9 Infrastructure

Preah Sihanoukville province consists of a number of high-quality transport infrastructures such as roads, waterways and airports that are actively working to support national economic development. These included:

Road: there are two main lines, National Road No. 3 and National Road No.4. The National Road No. 4 connecting Phnom Penh to Sihanoukville is about 230 kilometers. But if we travel on National Road No. 3, it is about 260 km. The provincial roads are 443.8 km.

Railway: It connected from Phnom Penh city through Takeo, Kampot and Sihanoukville provinces which is about 264 km long and was built between 1960 and 1969.

Sea Port: the largest international deep seaport in the Kingdom of Cambodia, with the increase of capacity to transport goods and carry goods every year.

Airport: Preah Sihanoukville province has an International Airport that has been operating until today.

4.3.10 Traffic Condition

PAS is the cargo distribution center consisting of combination of all kinds of multi-transport systems for the provision of import and export services to the customers and port users. The transport networks connected from Sihanoukville Province to Phnom Penh by land are: (1) National Road No.4 (2) National Road No.3 and Rail Road.

Number of motorbikes start busy in the morning (07:00 - 08:00, working hour and school time), at noon (11:00 -12:00 ending of working hour and school time) and in the evening (05:00 - 08:00, working hour and school time)

Number of motor-trailor start having their activities mostly at day time but the peak time starts from 12:00 to 16:00.

Passenger cars start having activities from early morning since 06:00 am until 20:00 evening but the peak time was observed from morning at 10:00 until evening at 19:00. The peak time of the passenger cars. However, the number of trips for passenger cars starts decreasing their activities from early night at 20:00 until morning at 07:00.

Peak time of pick-up car moving stable from morning at 07:00 until evening at 18:00 but the peak time for pick-up car start increasing sharply from evening at 14:00 until 18:00.

Truck <4 tones and >4 tones, usually, start having activities in early morning at 06:00 until evening at 19:00. The peak time for both trucks is at noon from 13:00 to evening at 16:00.

Bus <25 seats start having activities from early morning until evening but the peak time is from morning at 09:00 until noon time 12:00. However, the bus >25 peak time is at early morning 06:00 to 07:00 and late afternoon from 17:00 until evening at 19:00.

Container truck starts having activities from morning at 08:00 until night at 22:00 but the peak time is in the afternoon at 14:00 until night at 20:00.

Vehicles are tourism car is in the first priority followed by (2) container truck, (3) pick-up car, (4) truck <4 tones, (5) bus < 25 seats, truck > 4 tones, and bus > 25 seats, respectively. On the average basis per hour there are 260 trips of vehicles went across the traffic count location.

The survey result can be concluded that traffic and/or transportation activities on National Road No. 4 were very busy. On the average basis per hour there are 260 trips of vehicles went across the traffic count location. This can be observed by-type vehicle activities. The container truck peak time is in the afternoon at 14:00 until night at 20:00, the bus <25 seats peak time is from morning at 09:00 until noon 12:00 and the bus >25 peak time is at early morning 06:00 to 07:00 and late afternoon from 17:00 until evening at 19:00,

the peak time for both trucks less than and above 4 tones is at noon from 13:00 to evening at 16:00, the peak time for pick-up car is at 14:00 until 18:00 and the peak time for passenger car is from morning at 10:00 until evening at 19:00. This National Road plays an important role in transporting goods and passengers from and to Sihanoukville since economic activities have been improving. Such traffic condition can be an indicator for development related plan in the future.

4.3.11 Education

Educational sector has been improving in Cambodia. The number of schools has been increasing along with improvements in the educational sector, which are being conducted nationwide framework. According to the Ministry of Education, Youth and Sport 2014-15 report showed that there are 12,505 schools across the country, of which 143 are in Preah Sihanoukville province.

It is generally said that people need to go to school at least 5th grade of primary school for simple reading and writing, and to 9th grade of secondary school for accurate writing. In the survey area, the enrollment rate and the illiteracy situation is shown in Table 4-14.

Table 4-14: Enrollment rate and illiteracy situation in the project related sangkat

Sangkat	Enrollment				Illiteracy	
	Population (6-14 years old)		Attended school (6-14 years old)		(15-45 years old)	
	2014	2015	2014	2015	2014	2015
Sangkat 3	4,203	2,916	4,109 (97.76%)	2,892 (99.18%)	0.5%	0.4%
Sangkat 1	3,801	3,761	3,682 (96.87%)	3,690 (98.11%)	0.2%	0%

4.3.12 Health and Public Well-Being

The health sector plays an important role in promoting the welfare of people in both urban and rural areas. Generally, people's public health services include health center in commune/sangkat, referral/operational hospital in district, and provincial hospital. Through collaborations with international organizations, the health sector has been improving the quality of health services, in particular, reduces costs for the majority of the poor. According to the 2014 Demographic and Health Survey report, indicate that from 2010 on living cost of urban residents were still higher than rural residents. However, the cost of rural residents fell from \$ 74.79 in 2010 to \$ 41.76 in 2014, while the expenditure of rural household increased from \$ 23.55 in 2010 to \$ 34.95 in 2014. The health center of the commune/sangkat covers all the villages in the commune/sangkat and plays an important role for the health service of the people living.

In Sangkat 1, there are 1 Health Center, while in Sangkats 3 there is no health center. However, all residents living in Sangkat 3 also received health services from Sangkat 1 Health Center. According to a report of the Sangkat 1 Health Center showed that acute diarrhea, acute myocardial infarction, High blood pressure, upper respiratory infections and pneumonia are the most common diseases.

4.3.13 Tourism Site

According to statistics from the Ministry of Tourism in 2015, the number of tourists visiting Cambodia has increased from 2011 to 2015) with an average stay of 6.8 days per tourist.

As of the first semester of 2016, Preah Sihanouk province received a total of 1,032,881 tourists, an increase of 16.65% over the first half of 2015, of which 809,784 are local tourists, increased 21.03% and 223,097 international tourists, increased 3.12%.

4.3.14 Natural Heritage and Archaeological Site

Based on data provided by provincial department of culture and fine arts and field observations, there is no physical cultural resource will be affected by the proposed project. According to the Sangkat councils, no chance finds of archaeological/historical relics have yet been experienced or reported.

4.3.15 Natural Protected Areas

At approximately 26 kilometers away from the project site, there is Ream National Park which is a protected and conservative area. In addition, there are many multipurpose, Kbal Chhay area, which is about 18 kilometers from the project site. However, there are no protected areas around and near the project area.

5. PUBLIC CONSULTATION MEETING

Provincial authority, provincial departments, civil society, and local people have been aware of the project during consultative meetings as well as public meetings with the PPIC study team. Overall, provincial authority, provincial departments, civil society and local people expressed welcome and full support for the Sihanoukville Port New Container Terminal Development Project. However, some points have been requested to the project owner, all of which are as follows:

- During Pre-Construction Phase
 - 1) The project owner should provide acceptable compensations to the affected households in advance prior to starting the project construction;
 - 2) PAS should consider about daily traffic for passengers in front of the new port to National Road No. 4;
 - 3) Project information dissemination should comprehensively be conducted for local residents; and
 - 4) PAS should arrange suitable parking area for containers to avoid traffic congestion to be impacted on local and international tourists visiting Preah Sihanoukville province.
- During Construction Phase
 - 1) PAS must install all traffic signs for fishing boat and tourism boat;
 - 2) The project construction company must manage solid and liquid waste properly;
 - 3) The project construction company should buy sand from licensed companies;
 - 4) The project construction company must provide personal protective equipment (PPE) such as glove, footwear, and helmet to workers; and
 - 5) The project construction company must Respect MoE's law and other relevant laws in Cambodia.

6. ENVIRONMENTAL IMPACT AND MITIGATION MEASURE

6.1 Design Phase

At the project design phase, there are no specific activities that cause environmental impacts. What we states here is just a forecast. At this phase, many working groups have studied on all the project related aspects. However, it is also important requiring each group to consider all the project technical aspects to avoid or minimize any potential impacts that may occur during the construction phase and the operation one.

6.1.1 Physical Resource

6.1.1.1 Topography

The project will change topographical conditions at seabed due to dredging of channel, turning basin and berth and sand/land reclamation on an area of 17.5 ha.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.*
- *The project owner/ PAS will require the project construction contractor to have rubble base, precast concrete block, precast wave dissipated concrete block and in-situ coping concrete so as to prevent from sand dispersion.*

6.1.2 Biological Resource

6.1.2.1 Aquatic plants and animals

The project could impact on aquatic plants and animals in and around the project area; especially affect more than 1,000 fish cages in Tomnub Rolok area as a result of dredging of channel, turning basin and berth and sand/land reclamation. At the same time, transportation of dredged wastes to the dumping sites near Koh Dekol will impact on aquatic plants and animals in those areas. In addition, oil spill from construction machinery, if not properly managed, will also impact on water quality.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to dredge channel, turning basin as in the plan and to monitor water quality daily during dredging of channel, turning basin and transportation of dredged wastes to the dumping sites.*
- *The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose wastes to the sea and to cooperate with local waste collector for waste disposal at the dumping sites as defined by Provincial Department of Environment and local authorities.*
- *The project owner/ PAS will require the project construction contractor to conduct a routine monitoring for the transportation of wastes to the dumping sites.*

6.1.3 Socio-economic Resource

6.1.3.1 Traffic Condition

Traffic congestion by vehicles may occur around the construction sites and Samdech Hun Sen road. This can cause disruption to local people and people passing through.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to inform local authorities about the construction period.*
- *The project owner/ PAS will require the project construction contractor to install traffic signs at the construction sites in particular traffic lights at night time to avoid accidents.*
- *The project owner/ PAS will require the project construction contractor to implement traffic management plan around the construction sites and Samdech Hun Sen road in cooperation with local authorities.*
- *The project owner/ PAS will require the project construction contractor to educate all the drivers to respect law on traffic in the Kingdom of Cambodia.*

6.1.3.2 Danger (Risks)

The project site is close to the coastal area. Historically, it is reported that the Sihanoukville port used to transport ammunition and tie up by military ships. Moreover, during the Civil War (1970-1975 and 1979-1993) the port area may also have the remaining ammunition dropped at that time. Mines and unexploded ordnance would be hazardous to workers and local residents during the project construction.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to cooperate with the Cambodian Mine Action Centre (CMAC) to monitor the project area to ensure that UXO is cleared before the project construction activities begin.*

6.2 Construction Phase

6.2.1 Physical Resource

6.2.1.1 Topography

The project changes topographical conditions at seabed due to dredging of channel, turning basin and berth and sand/land reclamation on an area of 17.5 ha.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor must have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.*

6.2.1.2 Soil Erosion

Soil erosion and/or land slide might occur due to land/sand reclamation for the project. In the rainy season, soil erosion will be more seriously as a result of additional rainfalls which lead to release sediment into the sea.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to have rubble base, precast concrete block, precast wave dissipated concrete block and in-situ coping concrete so as to prevent from sand dispersion prior to starting the project construction.*
- *The project owner/ PAS will require the project construction contractor to have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.*

6.2.1.3 Soil Quality

Soil pollution caused by oil spills at the storage site and by spillage from vehicles and machineries. On the other hand, solid waste at the worker camps such as materials waste, office waste, plastic packaging, and food waste from workers, etc., will cause soil pollution if not properly managed.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to take proper care of and monitor vehicles and machineries to avoid any spillage and to regularly monitor fuel storage at all the construction sites to avoid any spillage.*
- *The project owner/ PAS will require the project construction contractor to properly keep all kind of solid wastes in the prepared bins. The wastes will be collected and then disposed at the dumping site/s where the local authority or the Provincial Department of Environment has determined.*
- *The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose of wastes to the sea.*

6.2.1.4 Surface Water Quality

Land/sand reclamation, dredging of channel, turning basin and berth and transportation of dredged wastes to the dumping sites will impact on water quality. It is notable that source of sea pollution that is critically important is dredging of channel and turning basin. Such works may have pollutants from seabed which lead to water pollution in the project area and its surrounding areas.

Wastewater from daily water consumption of management and construction personnel and waste oil may be the sources of sea pollution if not properly managed. Meanwhile, there are residual wastes from offices and other materials. In the case that the project construction contractor does not properly clean the wastes, those wastes will impact on sea water quality.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to monitor sea water quality regularly at the locations as in the design phase by taking samples to MoE's laboratory. In case that unusually high concentration of any parameter, necessary mitigation measures will then be implemented.*
- *The project owner/ PAS will require the project construction contractor to educate workers and staff not to throw away wastes into the sea and to provide sanitary latrine in the worker camps. The project construction contractor have to make sure that human wastes and construction ones will be packed and kept at the proper locations. Also, the project construction contractor will have to cooperate with local waste collecting company to transport and dispose of wastes at the dumping site.*
- *The project owner/ PAS will require the project construction contractor to clean tools and equipments at the prepared location with sedimentation tank.*
- *The project owner/ PAS will require the project construction contractor to properly prepare fuel storage location, ensuring that no any spillage occurs.*
- *The project owner/ PAS will require the project construction contractor to check sanitary latrine, avoiding any discharge to the sea.*
- *The project owner/ PAS will require the project construction contractor to select high quality dredging tools with minimal sedimentation dispersion.*
- *The project owner/ PAS will require the project construction contractor to minimize dredging time so as to minimize turbidity.*

- *The project owner/ PAS will require the project construction contractor to select high quality transportation means for dredged materials to avoid any spillage.*
- *The project owner/ PAS will require the project construction contractor to regularly monitor pollutants from dredging activities.*

6.2.1.5 Air Quality

Emission of toxic gases such as: Total Suspended Particulate (TSP), carbon dioxide (CO), sulfur dioxide (SO₂), and NO₂ caused by the traffic of vehicles and other heavy machineries will cause disruptions (dust and air pollution) to villagers in the surrounding project area. Due to the long-term project construction, up to 36 months, this negative impact must be considered with due diligence.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to take proper care of vehicles and machineries and to use high quality fuels. The project construction contractor will completely avoid overload transportation and congestion of vehicles, causing air pollution.*
- *The project owner/ PAS will require the project construction contractor to cover materials during transportation to reduce dust.*
- *The project owner/ PAS will require the project construction contractor to spray water regularly along the road to be expanded to reduce dust from the mobilization of vehicles and machineries.*
- *The project owner/ PAS will require the project construction contractor to monitor dust air pollution and complaint from local residents. If any complaint, the project construction contractor have to reconsider the applied technical aspects and find the ways to solve those issues.*
- *The project owner/ PAS will require the project construction contractor to prepare and to strictly implement traffic management plan at the construction sites.*

6.2.1.6 Noise and Vibration Levels

The traffic of vehicles and other machineries in large quantities to serve the project activities will cause disturbance (noise and vibration) directly to the local residents, especially for those living near the project area. Due to the project construction period lasts for 36 months, so this negative impact must be taken into account seriously.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to use vehicles and machineries with low noise and vibration and to take proper care of vehicles and machineries before the project construction.*
- *The project owner/ PAS will require the project construction contractor to have a clear timetable for working hours: morning from 07.00 until 11.00 am and afternoon from 13.00 to 17.00 pm.*
- *The project owner/ PAS will require the project construction contractor to advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and nearby places of residence. No driving will be allowed at night time.*

6.2.2 Biological Resource

6.2.2.1 Aquatic plants and animals

The project could impact on aquatic plants and animals in and around the project area; especially affect more than 1,000 fish cages in Tomnub Rolok area as a result of dredging of channel, turning basin and berth and sand/land reclamation. At the same time, transportation of dredged wastes to the dumping sites near Koh Dekol will impact on aquatic plants and animals in those areas.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to dredge channel, turning basin as in the plan and to monitor water quality daily during dredging of channel, turning basin and transportation of dredged wastes to the dumping sites.*
- *The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose of wastes to the sea and to cooperate with local waste collector for waste disposal at the dumping sites as defined by Provincial Department of Environment and local authorities.*
- *The project owner/ PAS will require the project construction contractor to conduct a routine monitoring for the transportation of wastes to the dumping sites.*

6.2.3 Socio-economic Resource

6.2.3.1 Local Economic Activity

The project activities will impact on local residents' occupation and income of fishermen living nearby the project area. This is due to the fact that during the dredging channel, PAS will inform to local people especially people who conduct fish raising to prolong their activities due to high turbidity. As for fishermen, some channels that they used to travel for fishing are prohibited.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to prioritize fishermen as workers and/or staff during the construction phase.*
- *The project owner/ PAS will require the project construction contractor to install traffic signs at the dredging zones.*
- *The project owner/ PAS will require the project construction contractor to comprehensively disclose information regarding the project construction to local residents so as to let them know the project activities.*

6.2.3.2 Traffic Condition

Traffic congestion by vehicles may occur around the construction sites and roads. This can cause disruption to local people and people passing through.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to inform local authorities about the construction period.*
- *The project owner/ PAS will require the project construction contractor to install traffic signs at the construction sites in particular traffic lights at night time to avoid accidents.*
- *The project owner/ PAS will require the project construction contractor to implement traffic management plan around the construction sites in cooperation with local authorities.*

- *The project owner/ PAS will require the project construction contractor to educate all the drivers to respect law on traffic in the Kingdom of Cambodia.*

6.2.3.3 Work Safety

The project activities can impact on staff and workers' health due to the negligence of staff-workers including vehicle control and careless use of equipments and so on. On the other hand, the provision of inappropriate accommodation, no clean water, and living without hygiene will impact on their health as well.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments.*
- *The project owner/ PAS will require the project construction contractor to implement all safety working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works.*
- *The project owner/ PAS will require the project construction contractor to construct sanitary latrine for staff and workers equiped with septic tanks and to provide clean water for general consumption.*
- *The project owner/ PAS will require the project construction contractor to educate staff and workers on sexually transmitted diseases. The project construction contractor will cooperate with provincial department of health for epidemics prevention around the project area.*

6.3 Operation Phase

6.3.1 Physical Resource

6.3.1.1 Surface Water Quality

Liquid waste and solid waste will be increased due to general operations of the port including the release of liquid waste from toilets of PAS offices, waste from kitchen, cartons etc. Besides, solid waste and liquid waste will be generated from ships transporting goods to and from Cambodia.

Mitigation Measure

- *All liquid waste from the port will be discharged to sewage system and then go to water treatment plan. This waste will be checked in advance before discharging to public sewage system.*
- *The project owner/ PAS will monitor sea water quality regularly (the sampling sites will be the same as the before-construction sampling sites) by taking samples and send them to the MoE's laboratory. In case of any parameter increase in the abnormal conditions, some mitigations will be implemented.*
- *The project owner/ PAS will educate workers and staff not to throw away wastes into the sea and will make sure that human wastes and construction ones will be packed and kept at the proper locations.*
- *The project owner/ PAS will properly prepare fuel storage location, ensuring that no any spillage occurs.*

6.3.1.2 Air Quality

During the project operation there will be more transportation activities by large ships to and from Cambodia and by truck. At the same time, there are cranes and cargo for handling goods and other machinery, which all are sources of increasing of carbon dioxide (CO₂) emissions. Increase of traffic density due to port operation will provide gas emissions, resulting in air pollution as well.

Mitigation Measure

- *The project owner/ PAS will regularly monitor air quality in and around port area and respect the subdecree on the Control of Air Pollution and Noise Disturbance 2000.*
- *The project owner/ PAS will add more waste storage sites and cooperate with local waste collecting company to transport and dispose of wastes at the dumping site.*
- *The project owner/ PAS will educate workers and staff about energy saving so as to reduce air pollution.*
- *The project owner/ PAS will have tree-seedling nursery and green space for those trees.*

6.3.1.3 Noise and Vibration Levels

The traffic of vehicles and other machineries in large quantities to serve the project activities will cause disturbance (noise and vibration) directly to the local residents, especially for those living near the project area.

Mitigation Measure

- *The project owner/ PAS will use vehicles and machineries with low noise and vibration and take proper care of vehicles and machineries. Some mitigation measures will be applied to minimize noise and vibration.*
- *The project owner/ PAS will advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and nearby places of residence.*

6.3.2 Biological Resource

6.3.2.1 Aquatic plants and animals

Maritime transportation and land one during daytime and nighttime will provide impact on aquatic lives. Moreover, any oil spillage from ships and solid waste disposal to the sea will provide impact on marine biodiversity.

Mitigation Measure

- *The project owner/ PAS will monitor solid waste and liquid one on ships regularly.*
- *The project owner/ PAS will consider more measures to minimize/eliminate the impact on aquatic plants and animals.*

6.3.3 Socio-economic Resource

6.3.3.1 Occupation and Income

Fishing activities are expected to be declined due to some areas around the project areas are prohibited. The issues might occur for some families only.

Mitigation Measure

- *The project owner/ PAS will clearly define zone for fishermen passing through for fishing activities.*
- *The project owner/ PAS will prioritize job opportunities for fishermen, in particular for those workers and/or staff who used to work during the construction phase.*

- *The project owner/ PAS will prepare social security fund for supporting vulnerable people by the project implementation.*
- *The project owner/ PAS will provide trainings based on labour markets around the port area.*

6.3.3.2 Marine Transportation and Land Transportation

In this phase, marine transportation and land transportation will be more active and will then increase traffic density around the project area.

Mitigation Measure

- *The project owner/ PAS will monitor traffic in and around the project area so as to take action if any traffic congestion (particularly at the intersection of National Road No.4) occurs.*
- *The project owner/ PAS will cooperate local traffic police and local authority to manage traffic conditions and will educate drivers about law on land traffic.*
- *The project owner/ PAS will instruct ships to respect marine transportation regulations such as duration for parking etc.*
- *The project owner/ PAS will install all traffic signs for marine traffic around the project area for safety.*

6.3.3.3 Work Safety

The project activities can impact on staff and workers' health due to the negligence of staff-workers including vehicle control and careless use of equipments and so on. On the other hand, the provision of inappropriate accommodation, no clean water, and living without hygiene will impact on their health as well.

Mitigation Measure

- *The project owner/ PAS will provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments.*
- *The project owner/ PAS will implement all safety working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works.*
- *The project owner/ PAS will construct sanitary latrine for staff and workers equipped with septic tanks and to provide clean water for general consumption.*
- *The project owner/ PAS will establish health center in the port area equipped with medical supply and will have doctors. The project owner/ PAS will cooperate with provincial department of health for epidemics prevention around the project area.*

7. ENVIRONMENTAL MANAGEMENT PLAN

The environmental management plan (EMP) for the project has been prepared by the project owner. The EMP will serve as the framework for the environmental management, commencing from the detailed design phase through the operation phase. The full implementation of the EMP by the works contractor will ensure that adequate protection measures are in place to avoid or mitigate the project impacts.

The general EMP is included as part of the Special Provisions of the Specification and Performance Requirement (One of the Sections in the documents for procurement contracts for civil works). The works contractor will incorporate the EMP into his/her planning and site control and will be required to prepare an EMP for the works and report periodically.

7.1 Training Program

The training program is one of the important parts of the EMP. In this regard, Sustainable development needs to have adequate human resources to work either in technical works or environmental works. Therefore, the project owner/PAS will require the project construction contractor to train staff and workers on the following topics:

- The use of machineries and vehicles at the beginning of construction period to all related staff and workers;
- Techniques for the construction of project related infrastructure
- Work safely;
- Environmental protection in and around the construction site;
- Solid waste management in and around the construction site; and
- Sexually transmitted diseases and other diseases.

7.2 Environmental Monitoring Program

The environmental monitoring to be occurred during pre-construction, construction, and operation phases is an important work. Responsible institutions and budgets for this work are included in the Environmental Monitoring Program. The budget for environmental monitoring in the construction phase is the responsibility of the project construction contractor. During the operation phase, the environmental monitoring is the responsibility of the project owner.

The implementation of EMP for this project is the direct responsibility of the project construction contractor. The contractor has to conduct its own monitoring and follow-up monitoring of the working groups, including:

a) National working group

- Ministry of Environment
- Ministry of Public Works and Transport
- National Committee on Coastal Area Management and Development

b) Sub-national working group

- Provincial authority of Preah Sihanoukville province
- Provincial Department of Environment
- Provincial Department of Public Works and Transport
- Provincial Department of Water Resources and Meteorology
- Provincial Department of Mines and Energy
- Provincial Department of Labour and Vocational Training
- Provincial Dep. of Land Management, Urban Planning, and Construction
- Provincial Department of Agriculture, Forestry and Fisheries
- Authority of Preah Sihanoukville Municipality
- Authority of Sangkat 1 and Sangkat 3.

Cost estimates for the EMP are US\$ 14,200 /year and US\$ 17,500 for the construction phase and for the operation phase, respectively.

8. ECONOMIC ANALYSIS AND ENVIRONMENTAL VALUE

8.1 Economic Cost of the Project

8.1.1 Project Costs

The economic analysis of the Project indicates the cost necessary for the national economy. Import duties and VAT are therefore excluded from economic costs. Since the initial cost estimated in section 10.2 excludes import duties but includes VAT in local cost, economic analysis is made based on cost estimates without VAT and it is converted into economic price by using standard conversion factor. The results from the conversion and deduction are summarized in table 8-1.

Table 8-1: Project Cost in Economic Price ('000 USD)

Year	2019	2020	2021	2022	2023	Total
Construction (Package 1)	770	50,069	44,127	30,465	84	128,305
1) Construction Cost	327	48,361	41,460	28,092	0	118,239
2) Engineering Service	444	1,708	2,667	2,373	84	10,066
Equipment (Package 2)	0	12,726	30,077	17,857	0	60,659
1) Buildings & Equipment	0	12,726	30,077	17,857	0	60,659
Source: JICA Survey Team					Grand Total	188,964

8.1.2 Operation and Maintenance Costs

Cost of items for management / operation and maintenance are assessed as table 8-2:

Table 8-2: Operation and Maintenance Cost

Operating Expenses	Unit	New Terminal
1) Fuel and motor oil for operation	USD/box	26.2
2) Supplies for Workshop & Spare-parts	USD/box	4.9
3) Annual Salaries and Bonus	USD/person/year	20,382*
<i>Number of employees</i>		<i>314 (450,000TEU)</i>
4) Maintenance Cost of Infrastructure	USD/year	0.3-2% of the initial investment
Maintenance Cost of Equipment		1-3% of the initial investment
5) Administration & Others	USD/box	11.9

8.1.3 Operation Renewal Investment Costs

Renewal investment is conducted at the year when the lifetime of each equipment is reached. The lifetime is set at 10, 15 and 25 years for trailer/chassis/top-lifter, RTG and QC, respectively.

8.2 Economic Evaluation of the Project

8.2.1 Result of EIRR

The result of EIRR is shown in Table 9-6. The estimated EIRR is at 15.76%, and a discount rate as threshold of the EIRR is set at 10.0% which is generally used for infrastructure projects. Thus, the Project can be said to be feasible.

8.2.2 Sensitivity Analysis

In order to see whether the project is still feasible if some conditions change, a sensitivity analysis is made for the following three alternatives.

Case 1: Project cost increases by 10%

Case 2: Benefit volume decreases by 10%

Case 3: Both Case 1 and Case 2 occur simultaneously

The results of the sensitivity analysis are derived as follows.

Table 8-3: Economic Result of Sensitivity Analysis

Case	Base	Case 1	Case 2	Case 3
EIRR	15.76%	13.98%	13.79%	12.06%

Even in Case 3 of sensitivity analysis, the economic feasibility of the Project is exceeding threshold value i.e. EIRRs are above 10.0%. Therefore, the Project is recommended to be implemented as early as possible from the viewpoint of the national economy.

8.2 Environmental Value

Environmental values in and around the project area is hard to make an estimation. However, in order to support the estimation of environmental value PPIC study team uses Inter-ministerial Prakas No. 410 on Basic Price Determination of Natural Resources for Restoration was signed on August 18, 2017. This Prakas aims to set Basic Price Determination of Natural Resources for Restoration. It needs to be implemented for law enforcement and to prevent and crack down natural resources illegal activities. In the Prakas, There is one item called **For Illegal Activities on Fisheries Resource**, specifically point No. 47 Seagrass. This item means that the project owner must pay 2.5-12.5 USD/m² for natural resources restoration to the government.

Based on the nature of the project area having no any seagrass and no any significant environmental value, the minimal value 2.5 USD/m² was calculated. As a result, the environmental value to be impacted by the project area (17.5 ha) is about **USD 87,500**. This value is excluded the locations of access channel and dumping sites.

9. CONCLUSION

The project aims to construct a deep sea port on an area of 17.5 hectare and other related structures in Sangkat 3, Preah Sihanoukville Municipality, Preah Sihanoukville province in order to improve economic growth. Environmentally and socioeconomically, the positive impacts will much surpass the limited negative ones. Due to type of the project and the existing environmental conditions in and around the project area, the project will provide impacts as follows:

During the design phase *the project will cause high impacts on physical resource such as topography, and cause small impacts on biological resource and socioeconomic one.*

During the construction phase, *the project will cause high impacts on physical resources such as topography and cause medium impacts on air pollution, noise and vibration disturbance, water quality, soil quality, and provincial roads. Besides, the project will cause small impacts on physical and biological resources.* Moreover, the project will cause small impacts on socioeconomic resources such as local economic activities, public

infrastructure, work safety and public health conditions, and *cause medium impacts on traffic condition*.

During the operation phase, the project will also cause medium impacts on physical resources such as *air quality, noise and vibration disturbance, water quality, traffic condition* that require more attention from the project owner/PAS.

The environmentally negative impacts will be limited or minimized due to the implementation of the mitigation measures. Overall, the final project impacts will be limited due to the implementation of the mitigation measures.

Based on public consultation meetings with relevant stakeholders, the project is welcomed from relevant provincial authority, provincial departments, local authorities as well as local people. Meanwhile, the proposed development project will provide long term numerous beneficial impacts to individuals, communities as well as to the entire province. During the construction phase, three beneficial impacts are identified, all of which are (i) Employment Generation, (ii) Skill Enhancement, and (iii) Local Trade and Business Opportunity. During the operation phase, the presence of the project will become a new international port with a better quality, services, security as well as better environment in parallel with international standard and can compete with other ports in Asian countries. Moreover, the project will play an active role as international gateway which is able to facilitate import-export goods from and to Cambodia. This will contribute to poverty reduction and improve economic growth.

In conclusion, the proposed project can be implemented in the environmentally and socioeconomically acceptable manner.

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Acronyms and Abbreviation

Kg	:	Kilogram
CBA	:	Cost benefit analysis
cm	:	Centimeter
EIRR	:	Economic Internal Rate of Return
EMP	:	Environmental Plan Management
ESIA	:	Environmental and Social Impact Assessment
Ha	:	Hectare
h	:	Hour
IUCN	:	International union for conservation of nature
JICA	:	Japan international cooperation agency
GDP	:	Gross Domestic Product
GOJ	:	Government of Japan
Km ²	:	Square kilometer
m	:	Meter
m ²	:	Square meter
m ³	:	Cubic meter
m ³ /s	:	Cubic meter per second
m/s	:	Meter per second
mg/l	:	milligram/liter
mm	:	Milimeter
MoE	:	Ministry of Environment
MRC	:	Mekong River Commission
NPV	:	Net Present Value
RGC	:	Royal Government of Cambodia
PAS	:	Port Authority of Sihanoukville
SPSS	:	Statistical Package for the Social Sciences
ToR	:	Terms of Reference

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

1.1.1 Background

The Sihanoukville Port, located at the south end of the Cambodia Growth Corridor and in Preah Sihanouk Province, is the sole international deep sea port in the Kingdom of Cambodia supporting the national economic and industrial activities.

The container transaction volume of Sihanoukville is increasing at 10% on an average over the last five years after 2009 due to strong economic growth led by the garment industry. On the other hand, the container throughput of Sihanoukville Port is reaching its handling capacity limit.

Nevertheless, the operation body of the port, the Port Authority of Sihanoukville (PAS), has a short-term plan to strengthen the handling capacity by having additional cranes. The container throughput is expected to reach the handling capacity limit in 2023. Moreover, Gross Domestic Product (GDP) growth rate of Cambodia has steadily recorded over 7% on an annual average over the last ten years and stronger economic activity is expected after the economic convergence of ASEAN in 2015. With the above mentioned economic circumstance, the development of new container terminal and associated structures in the Sihanoukville Port is planned as a yen loan project of the “Sihanoukville Port New Container Terminal Development Project”¹.

The Sihanoukville Port New Container Terminal Development Project (The Project) is other PAS's project after the Sihanoukville Port Multipurpose Terminal Development Project, which is being implemented under the financing of Japan. The Project is considered as one of the new priority projects in Cambodia. Based on a feasibility study, it is found that the project could be economically viable. This means that if the project is built, the capability to lift the containers will be much better contributing to Cambodia's economic growth.

Although the project will be able to contribute to socio-economic development, however, it can cause some adversely negative impacts, requiring an Environmental and Social Impact Assessment (ESIA) to identify the potential impacts of natural resources and socioeconomic ones as stated in the Sub-Decree on Environmental Impact Assessment Process. According to the sub-decree, The Project Owner has suggested Japan International Cooperative Agency (JICA) survey team represented by Nippon Koei Co., Ltd. to prepare the ESIA study. Based on experience of local consulting firms and official procurement, Nippon Koei Co., Ltd. selects PPIC Co., Ltd. to conduct a study and prepare an ESIA report and submit to Ministry of Environment (MoE) for approval. It should be noted that the PPIC Co., Ltd. is the local consulting firm which was registered on July 03, 2009 from the Ministry of Commerce and was permitted for the study on and the preparation of Environmental and Social impact Assessment Report by the MoE dated July 18, 2014.

The study is carried out based on the MoE's general guidelines in 2009 for quantitative and qualitative approaches to submit to the MoE for review and approval.

¹ Project Draft Final Report, November 2016

1.1.2 Purpose of the Study

The purpose of the study is to observe obviously current conditions of naturally environment resources and socioeconomic environment in order to analyze the possible impacts of the project activities and to prepare mitigation measures to minimize those impacts. The specific objectives are to:

- Examine environmental resources in and around the project area;
- Define scope of major positive and negative impacts by the project phases;
- Assess the potential impacts by the project phases;
- Provide mitigation measures to mitigate negative impacts;
- Prepare Environmental Management Plan (EMP) to minimize those impacts; and
- Provide a reference document for the MoE in decision-making process of the project.

The overall objective is to ensure sustainable environmental conservation and all negative impacts on natural and socioeconomic environments are acknowledged and properly considered prior to implementing the project.

1.1.3 Structure of the ESIA Report

This report is prepared in accordance with the guidelines of the Ministry of Environment 2009 and is divided into 10 chapters, all of which are as follows:

- Chapter 1 Introduction, Purpose of the Study, and Structure of the ESIA Report;
- Chapter 2 Methodology;
- Chapter 3 Legal Framework;
- Chapter 4 Project Description;
- Chapter 5 Description of the Environment;
- Chapter 6 Public Consultation Meeting;
- Chapter 7 Environmental Impact and Mitigation Measure;
- Chapter 8 Environmental Management Plan;
- Chapter 9 Project Economic Analysis and Environmental Values; and
- Chapter 10 Conclusion and Recommendation.

CHAPTER 2

METHODOLOGY

2.1 INTRODUCTION

According to MoE's general guidelines in 2009, the methodology focuses on natural environment including physical environment, biological environment and socioeconomic environment which is mainly based on primary data. It is designed to make precise results in terms of determining both environmentally positive and negative impacts for the project. In view of this, scope of the study and the methodology are consecutively described as in 2.2 and 2.3 below.

2.2 SCOPE OF THE STUDY

The project location and its related infrastructure are the main point to define scope of the study. Through Terms of Reference approved by the MoE, the scope of the ESIA study covers physical environment, biological environment, and socioeconomic environment. Impacts that will likely occur by project phase, type of impacts, environmental and social values are also included in the scope.

Before being able to determine the scope, project site investigation was conducted by PPIC studyteam and Nippon Koei Study one in collaboration with PAS, hereinafter called The Project Owner. Meanwhile, there is also discussion with local authorities to get realistic aspects for the ESIA study. Based on field investigations, project feasibility report, and related documents, scope of the study is defined as follows:

2.2.1 Physical Resource

- Geology/Topography/land slope;
- Soil type/Soil Classification;
- Meteorology during the last 6 years (2010-2015) at Preah Sihanouk province;
- Air quality, noise and vibration;
- Hydrology;
- Water quality (surface water and ground water); and
- Sedimentation Modelling.

2.2.2 Biological Resource

- Forestry resource;
- Aquatic plants resource;
- Wildlife resource; and
- Aquatic life resource.

2.2.3 Socio-Economic Resource

- Demography and settlement pattern;

- Tradition and religion;
- Socio-economic conditions (employment and income);
- Land use;
- Water consumption and sanitation;
- Energy consumption;
- Public infrastructure;
- Education;
- Health;
- Archaeological/Cultural site;
- Tourism zones and tourists; and
- Security and social order.

2.3 METHODOLOGY OF THE STUDY

2.3.1 Review of Existing Document

Laws, sub-decrees, Prakas/declarations, national strategic plan, rectangular strategy phase III, policy, feasibility study report, detailed engineering report, and other related documents were collected and reviewed. This involved thorough review and analysis of literature for acquisition of the data.

2.3.1.1 Physical Resource

2.3.1.1.1 Topography, Geology, Soil Type, and Land Slope

- The study on topographical data of the project and on Topographical Map, Scale 1/100.000 (Data source: Mekong River Commission 2000).
- The study on geology of the project and on Geological Map, Scale 1/100.000 (Data source: Japan International Cooperation Agency 2002).
- The study on soil type using soil classification map Scale 1/100.000 (Data source: Charles D. Crocker 1962).
- The study on Land Slope in the project area and its surrounding areas using Digital Elevation Model (DEM) recorded in 2012 and SRTM 90m Digital Elevation Database of NASA.

2.3.1.1.2 Meteorology

- The study on Meteorology during the last 6 years (2010-2015) such as monthly and yearly rainfall, monthly and yearly temperature, monthly and yearly humidity, monthly wind speed and direction, yearly wind speed and wind direction (Data source: Provincial Department of Water Resources and Meteorology, Preah Sihanoukville province).

2.3.1.1.3 Hydrology

- The study on hydrology was based on the existing hydrological data with radius 3 km from the proposed project area.
- Tide/Current: data from Sihanoukville Port Multipurpose Terminal Development Project was collected. During that time, a 15 day-survey was conducted in 2005 at two different sites of port seawaters: one is located in the port entrance of the northern channel and the other is located near by Koh Pos Island of southern

channel. This tide/current survey was conducted at –1m draft under the sea and +1m above the seabed in both sites. The result of this tide/current survey indicated that the flow of southern tide/current into the northern tide/current is overlapped. Maximum speed of tide/current at the northern channel is approximately 40 cm/s occurs at both directions of the northern and southern channels. Moreover, the speed of the tide/current at the southern channel is higher than the northern channel. Maximum speed of tide/current at the southern channel is sometimes up to 60 cm/s.

2.3.1.2 Biological Resource

2.3.1.2.1 Forestry Resource

Existing data of forestry resource which are able to describe the project area and its surrounding areas were collected from institutions in the forms of digital file and hard copies. Such kind of data were reviewed and compared to The International Union for Conservation of Nature (IUCN) Red list.

2.3.1.2.2 Wildlife Resource

Existing data of wildlife resource which are able to describe the project area and its surrounding areas were collected from institutions in the forms of digital file and hard copies. Such kind of data were reviewed and compared to the IUCN Red list.

2.3.1.2.3 Fisheries Resource

Existing data of fisheries resource which are able to describe the project area and its surrounding areas were collected from institutions in the forms of digital file and hard copies. Such kind of data were reviewed and compared to the IUCN Red list.

2.3.1.3 Socio-Economic Resource

Data series at village level, Sangkat level, municipality level and provincial level in 2015 was collected from Preah Sihanouk provincial department of planning and was then studied.

2.3.2 Primary Data Collection

2.3.2.1 Physical Resource

2.3.2.1.1 Air Quality, Noise and Vibration

The study on air quality is carried out to assess the current air quality conditions (Pre-construction phase) at 2 sampling locations for a 24-hour period (Figure 1). Studied parameters are as in table 2-1.

Table 2-1: Parameters for air quality

No.	Parameters	Duration	Standard*
1	Carbon Monoxide (CO)	8 hours	<20
2	Nitrogen Dioxide (NO ₂)	24 hours	<0.10
3	Sulfur Dioxide (SO ₂)	24 hours	<0.30
4	Lead (Pb)	24 hours	<0.005
5	Total Suspended Particles (TSP)	24 hours	<0.33
6	PM ₁₀	24 hours	<0.015
7	PM _{2.5}	24 hours	<0.025

Remark: * MoE's standard

There are 2 sampling locations for noise and for vibration, which are close to the air sampling locations, were selected. Noise and vibration were also conducted for a 24-hour period. Standards for noise and vibration levels are consecutively shown as in table 2-2 and table 2-3.

Table 2-2: Noise level

Parameter	Duration	Analyzed Method	Standard*		
			Morning	Evening	Night
Noise Level	24 hours	Sound Level Meter NL-42NX	70	65	50

Table 2-3: Vibration level

Parameter	Duration	Analyzed Method	Standard*	
			Day time	Night Time
Vibration Level	24 hours	Vibration Level Meter VM-53A	65	60

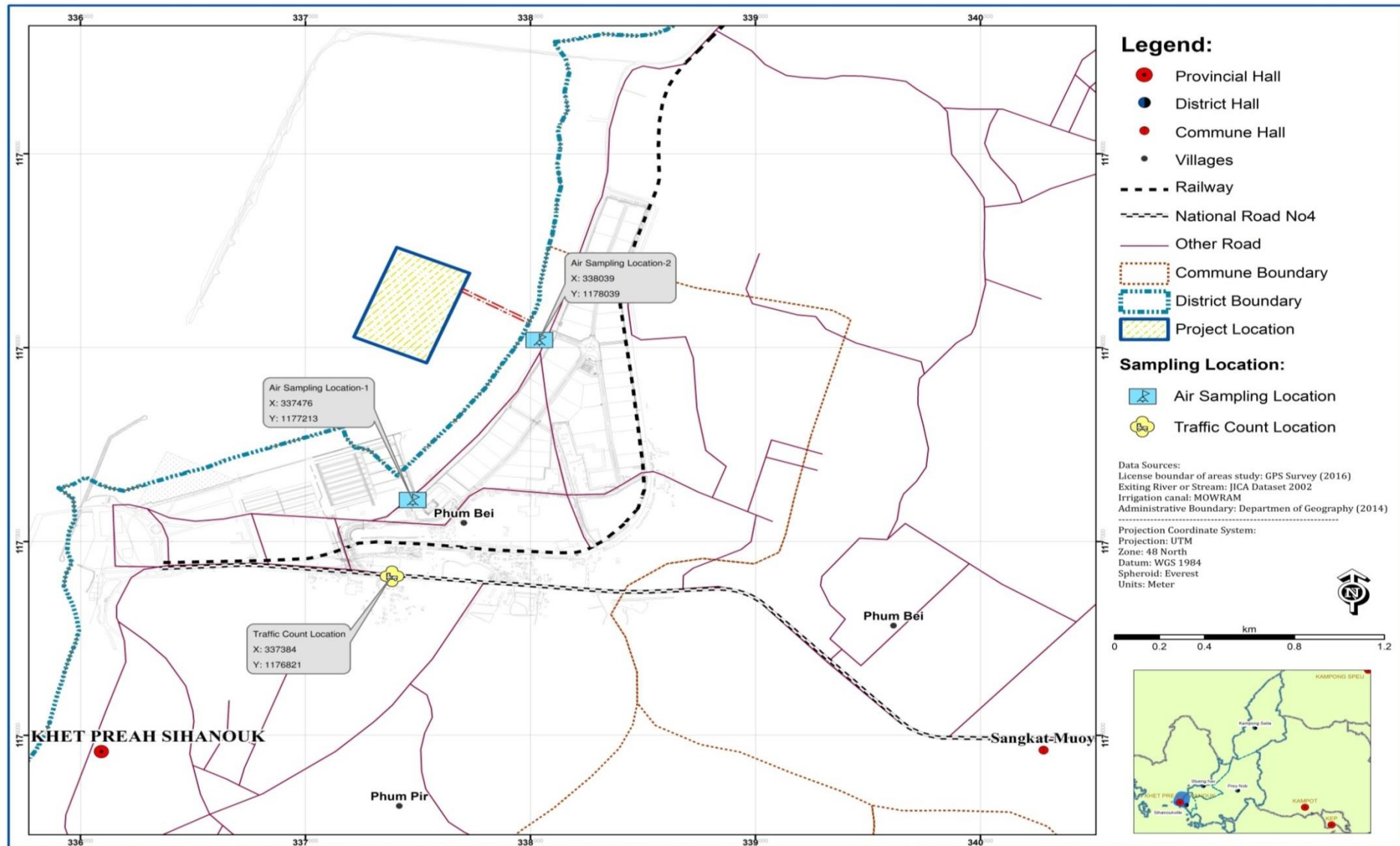


Figure 2-2: Locations of air sample and measurement of noise and vibration levels

Source: PPIC Study Team 2016

2.3.2.1.2 Hydrology

a) Suspended Solids Inflow

There are several drainages flowing into the water area inside the breakwaters as shown in Figure 2-2. As an analysis of hydrology, measurements of suspended solids (SS) were conducted in the Study on the Master Planning and Feasibility Study of the Sihanoukville Port in the Kingdom of Cambodia (JICA, 1997). The situation of drainages has been changed due to port and SEZ developments in these decades. Therefore, the survey of present condition of SS inflow at the existing drainages was conducted for ESIA of the project.

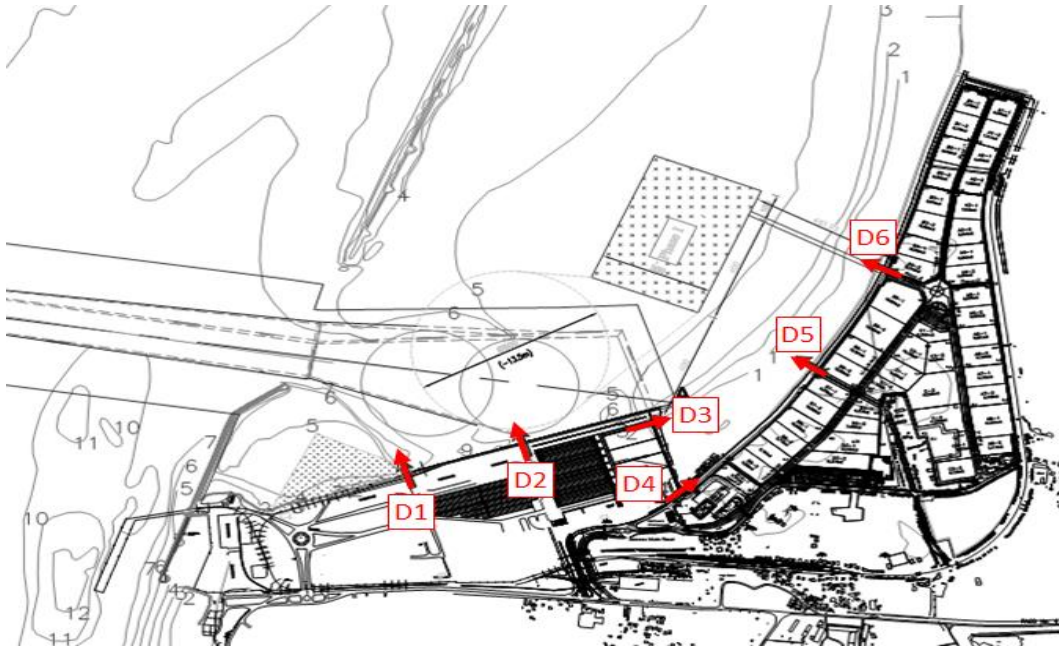


Figure 2-3: Location map of drainage

Source: JICA Study Team 2017

b) Sedimentation Modeling

The numerical simulation of dispersion (Sedimentation Modeling) of disposed soil was conducted to delineate the extent of affected area of dredged material dumping in the Study on the Master Planning and Feasibility Study of the Sihanoukville Port in the Kingdom of Cambodia (JICA, 1997).

In the case of the proposed new container terminal project, turbidity monitoring data of the multipurpose terminal project is available. The monitoring data implies the radius of sediment dispersion caused by the dumping works. The construction works of both projects related to sediment dispersion are very similar, therefore the numerical simulation of sediment dispersion is not necessary. However, the simulation was conducted to confirm the extent of affected area of sediment dispersion with the similar methodology used in the study of JICA, 1997.

The objective of Sedimentation Modeling is to confirm the extent of suspended soil after disposal of dredged materials during the proposed new container terminal construction works, simplified numerical simulation was carried out.

MIKE 21, which was one of the world-famous two-dimensional numerical models, was applied for this numerical study. This model can simulate advection and diffusion of suspended soil due to disposal of dredging materials into the sea under fluctuated tidal current field.

The sedimentation modeling consists of two models, Hydro Dynamics model (HD model) and Mud Transport model (MT model). HD model simulates water level variations and flows by the equations of conservation of volume and momentum shown as follows.

$$\frac{\partial \zeta}{\partial t} + \frac{\partial p}{\partial x} + \frac{\partial q}{\partial y} = \frac{\partial d}{\partial t} \quad (\text{Continuity})$$

$$\frac{\partial p}{\partial t} + \frac{\partial}{\partial x} \left(\frac{p^2}{h} \right) + \frac{\partial}{\partial y} \left(\frac{pq}{h} \right) + gh \frac{\partial \zeta}{\partial x}$$

(X-momentum)

$$+ \frac{gp\sqrt{p^2+q^2}}{C^2 \cdot h^2} - \frac{1}{\rho_w} \left[\frac{\partial}{\partial x} (h \tau_{xx}) + \frac{\partial}{\partial y} (h \tau_{xy}) \right] - \Omega q$$

$$- fVV_x + \frac{h}{\rho_w} \frac{\partial}{\partial x} (p_a) - 0 \quad (\text{Y-momentum})$$

$$\frac{\partial q}{\partial t} + \frac{\partial}{\partial y} \left(\frac{q^2}{h} \right) + \frac{\partial}{\partial x} \left(\frac{pq}{h} \right) + gh \frac{\partial \zeta}{\partial y}$$

The following symbols are used in the equations:

$h(x,y,t)$	water depth ($= \zeta - d$, m)
$d(x,y,t)$	time varying water depth (m)
$\zeta(x,y,t)$	surface elevation (m)
$p, q(x,y,t)$	flux densities in x- and y-directions ($\text{m}^3/\text{s}/\text{m}$) = (uh, vh) ; (u, v) = depth averaged velocities in x- and y-directions
$C(x,y)$	Chezy resistance ($\text{m}^{1/2}/\text{s}$)
g	acceleration due to gravity (m/s^2)
$f(V)$	wind friction factor
$V, V_x, V_y(x,y,t)$	wind speed and components in x- and y-direction (m/s)
$\Omega(x,y)$	Coriolis parameter, latitude dependent (s^{-1})
$p_a(x,y,t)$	atmospheric pressure ($\text{kg}/\text{m}/\text{s}^2$)
ρ_w	density of water (kg/m^3)
x, y	space coordinates (m)
t	time (s)
$\tau_{xx}, \tau_{xy}, \tau_{yy}$	components of effective shear stress

MT model describes transport and deposition of mud (cohesive sediment) in response to the output of HD model simulation. MT model solves the advection- dispersion equation shown as follows.

$$\frac{\partial \bar{c}}{\partial t} + u \frac{\partial \bar{c}}{\partial x} + v \frac{\partial \bar{c}}{\partial y} = \frac{1}{h} \frac{\partial}{\partial x} \left(h D_x \frac{\partial \bar{c}}{\partial x} \right) + \frac{1}{h} \frac{\partial}{\partial y} \left(h D_y \frac{\partial \bar{c}}{\partial y} \right) + Q_L C_L \frac{1}{h} - S$$

Symbol List

$\bar{c}$	depth averaged mass concentration (kg/m ³)
u, v	depth averaged flow velocities (m/s)
D_x, D_y	dispersion coefficients (m ² /s)
h	water depth (m)
S	accretion/erosion term (kg/m ³ /s)
Q_L	source discharge per unit horizontal area (m ³ /s/m ²)
C_L	concentration of source discharge (kg/m ³)

Input Conditions: The nested model was employed to conduct appropriate simulation at the limited target area. The calculation area and input condition for the computation are shown in Figure 2-3 and Table 2-4, respectively.

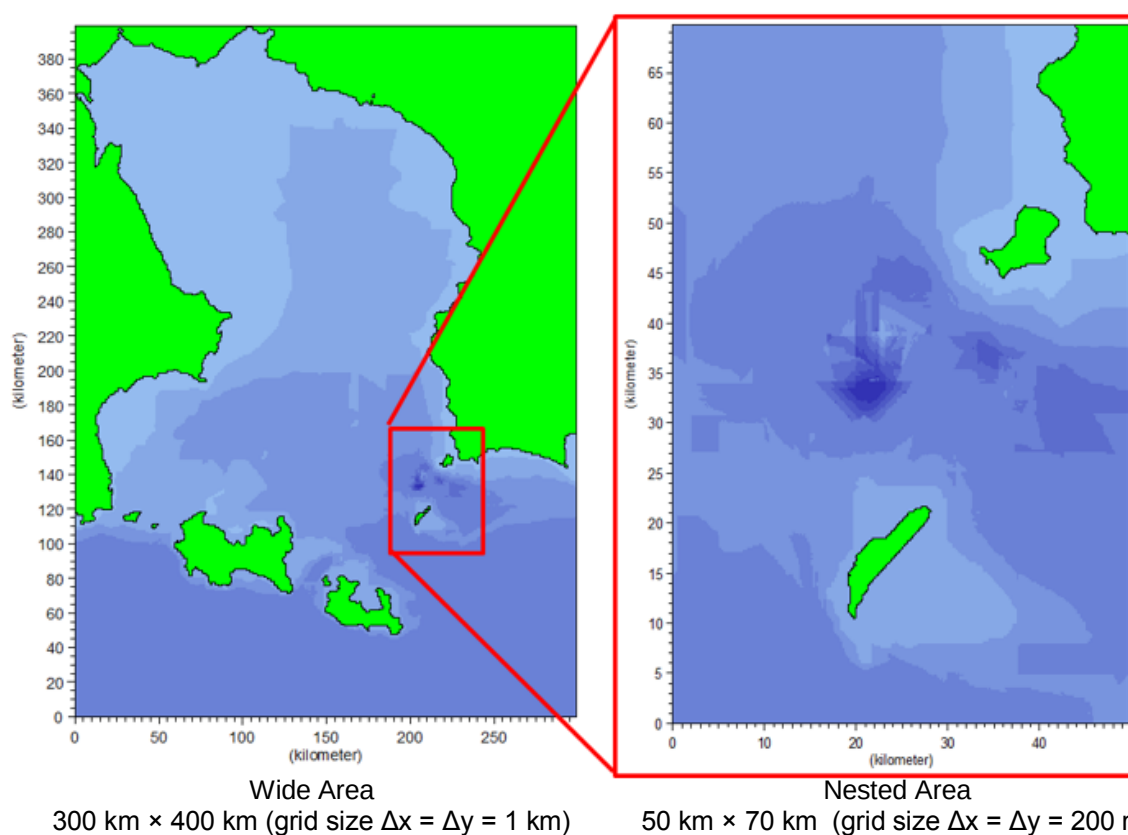


Figure 2-4: Computation Area for SS Simulation

Source: JICA Study Team 2017

Table 2-4: Input Condition of SS Simulation

Item	Condition
Dumping Interval	Every 6 hours
Dumping number per day	4 times /day
Dumping volume (per every interval)	1,000 m ³ /dumping
Grain size (d ₅₀)	0.035 mm
Generated per unit (w _o)	5.7×10^{-7} (t/m ³)
Tide condition	±0.8m (for spring tide) ±0.2m (for neap tide) (2 cycle tide change per day)
Horizontal diffusion coefficient	10 m ² /s
Particle setting velocity (V)	0.00095 m/s (calculated by Stokes Formula)

Source: JICA Study Team 2017

2.3.2.1.3 Water Quality

- Analysis of water quality (sea water and groundwater) was conducted to assess baseline water quality. Parameters are as indicated in table 2-5 and 2-6.
- Sampling Location and Techniques
 - ✓ Sea water sampling: Six sampling locations are selected, with 3 layers (upper layers, layer at a depth of -2m and bottom layer) in one location were determined. The first sampling location is set in the project area (X: 337561; Y: 1178280 UTM WGS 1984). The second sampling location is determined in turning basin (X: 336745; Y: 1177730 UTM WGS 1984). Sampling location 3 is set near the fish raising zones (X: 336803; Y: 1178138 UTM WGS 1984). Sample location 4 is set at dredging channel (X: 335304; Y: 1177921 UTM WGS 1984). Sample location 5 (X: 330134; Y: 1176583 UTM WGS 1984) and location 6 (X: 329555; Y: 1176031 UTM WGS 1984) were taken at the location of mud disposal area.
 - ✓ Sampling of ground water: 3 sampling locations were selected, 2 of which (GW1 X: 338039; Y: 1177270 UTM WGS 1984 and GW2 X: 338416; Y: 1177123 UTM WGS 1984) are located in special economic zones. The other location (GW3 X: 338677; Y: 1178799 UTM WGS 1984) is taken from the well in the Sunwah fish frozen plant. All water samples were stored in cool containers and sent to the MoE's lab at the same day.

Table 2-5: Parameters for analysis of sea water quality

No.	Parameter	Unit	Standard		Analyzed Method
			Annex 4	Annex 5	
1	pH	-	7.0 – 8.3	-	Digital pH Meter
2	Temperature	-	-	-	Digital Temperature
3	Turbidity	-	-	-	Method MAJI Meter
4	Salinity	-	-	-	Method Refractometer
5	Dissolved Oxygen (DO)	mg/l	7.5 – 2.0	-	Method MAJI Meter
6	Total Suspended Solid (TSS)	-	-	-	Method 2540 D
7	Biochemical Oxygen Demand (BOD ₅)	-	-	-	Method 5210 B
8	Chemical Oxygen Demand (COD _{OH})	mg/l	2.0 – 8.0	-	Method JIS K0102
9	Oil & Grease	mg/l	0	-	Method 5520 D
10	Total Nitrogen (TN)	mg/l	0.2 – 1.0	-	Method JIS K 0102 45
11	Total Phosphore (TP)	mg/l	0.02 – 0.09	-	Method JIS K 0102 46
12	Total Iron (Fe)	-	-	-	Method Photometer S7000
13	Mercury (Hg)	µg/l	-	<0.5	Method Metalyzer HM1000
14	Arsenic (As)	µg/l	-	<10	Method Digital Arsenator
15	Total Coliform	MPN/100ml	MPN/100ml	-	Method NF T90-413

Note: Annex 4 and 5 refer to the annexes in Subdecree on Water Pollution Control

Table 2-6: Parameters for analysis of groundwater quality

No.	Parameter	Unit	Standard	Analyzed Method
1	pH	-	6.5 – 8.5	Digital pH Meter
2	Temperature	°C	-	Digital Temperature
3	Hardness (CaCO ₃)	mg/L	< 300	Method 2340 C
4	Total Suspended Solid (TDS)	mg/L	< 800	Method MAJI Meter
5	Chemical Oxygen Demand (COD)	mg/L	-	Method JIS K0102
6	Total Iron (Fe)	mg/L	< 0.3	Method Photometer S7000
7	Ammonium (NH ₄)	mg/L	< 1.5	Method ICs 90
8	Phosphate (PO ₄)	mg/L	-	Method ICs 90
9	Arsenic (As)	mg/L	< 0.05	Method Digital Arsenator
10	Total Coliform	MPN/100ml	0	Method NF T90-413

Note: Standard refers to national drinking standard of Ministry of Industry and Handicraft

2.3.2.1.4 Mud Quality

Two sampling locations were selected in dredging channel. First location is at the point X: 337111; Y: 1177711 UTM WGS 1984, while the other is taken at the point X: 335578; Y: 1177860, UTM WGS 1984). Mud sampler was taken from the MoE's lab.



Figure 2-5: Mud samples

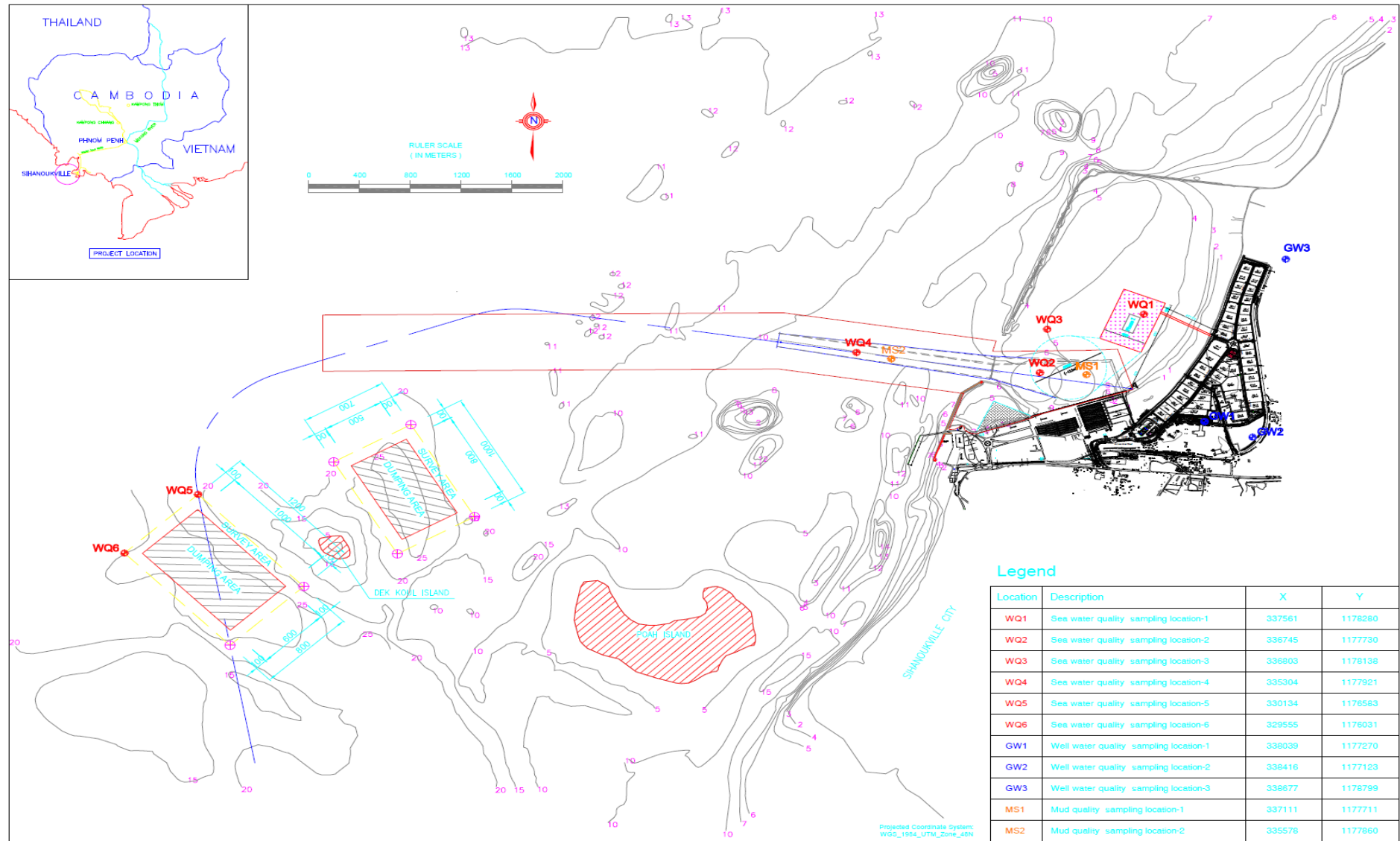


Figure 2-6: Sampling locations of sea water, groundwater and mud

Source: PPIC Study Team 2016

2.3.2.2 Biological Resources

2.3.2.2.1 Forestry Resource

The study is mainly focused on tree species and lower layer plants. These types of trees are counted in 100% of each line as shown in Figure 2-6. Tree/plant species found are written in local names and scientific ones. These species are checked with IUCN's Red List to identify the level of vulnerability. It is notable that only tree species and lower layer plants listed in the Red List were photographed and noted GPS points so that it is easy to find in the field.

According to the Forest Cover Map of the Forestry Administration in 2010, the project area does not have forest cover. It is found as a residential area and industrial zone. However, three lines were chosen to survey the plant species, which each line is with a width of 50 meters on both sides, as follows:

- T1 Along the National road No. 4;
- T2 Along Samdech Hun Sen road; and
- T3 Along the road to Phum Thmei.

Table 2-7: Location of survey line

No.	Survey line	Starting Coordination point	Ending Coordination point
1	T1	338216 1176765	336279 1176867
2	T2	337244 1176874	338446 1179471
3	T3	337364 1177112	338179 1177247

Source: PPIC Study Team 2016

2.3.2.2.2 Wildlife Resource

The approaches used for the Rapid Wildlife Assessment consisted of indirect field observations along survey lines. Opportunistic interviews were also conducted with local communities by referring to guidebooks that referenced birds and mammals of Cambodia. The following equipment and materials were used in the field surveys are as follows:

- Guide books for wildlife survey and species identification (Tan Setha and Colin Poole, 2003; Tan Setha and Federech Gos, 2003; Mensoryun et al., 2008).
- A Photographic Guide to Snakes and Other Reptiles of Thailand and South-East Asia (Merel J. Cox, et al. 1998).
- Survey Worksheets were used to record information collected in field surveys.
- Equipments used in the field surveys were GPS, digital camera, and measuring tape.

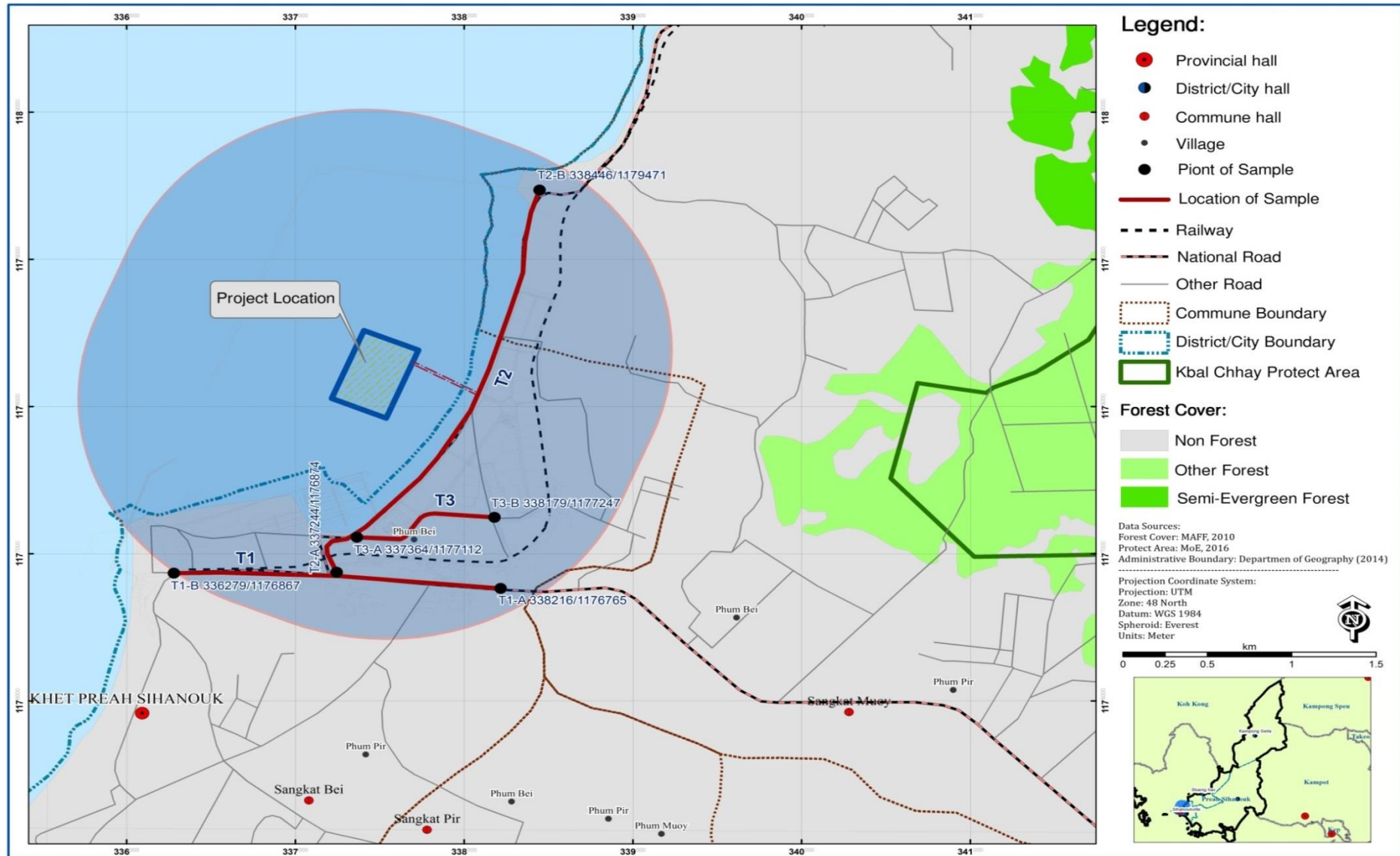


Figure 2-7: Survey lines for tree species and lower layer plants

Source: PPIC Study Team 2016

2.3.2.2.3 Fisheries Resource

To study on fisheries resource, the study team conducted: 1) group discussion with the fisheries community and 2) interviews with fishermen.

The criteria for selecting for group discussion members are former fishermen, current fishermen, and local elders. Group discussion was conducted into two groups with 8 to 10 participants. During the group discussion, freshwater fish pictures in the Kingdom of Cambodia were also used to let the participants to differentiate fish species. The vulnerable fish species are identified with vulnerable fish species in Cambodia and also the IUCN's Red List.

The interview with fishermen was conducted using the questionnaire. The main points within the questionnaire included fishing locations during the last five years, means of fishing, type of fishing gears, type of aquatic fauna caught and their majorities, market value, and impacts that would be occurred by project implementation. The samples were calculated using Yamane Taro, 1967. The selected village locations were indicated as in table 2-8.

$$n = \frac{N}{1 + N * e^2}$$

Where

n = Number of samples

N = Total Households

e = Bias 10%

Samples at village level can be calculated via the formula:

$$n_i = \frac{n \times N_i}{N}$$

Where

n_i = Samples to be selected from each village

n = Total samples

N_i = Total households in each mondul

N = Total households in the survey area

Table 2-8: Samples for the survey on fishermen

Sangkat	Village	Number of fisherman households	Samples
Sangkat 3	Mondul 3	267	28
Sangkat 1	Mondul 3	600	62
Total		867	90

Source: Provincial department of planning as of December 2016

2.3.2.3 Socioeconomic Resources

The purpose of the socio-economic study is to present the socio-economic settings of local communities such as employment, poverty rate, education, public health, infrastructure, land use, etc. as well as development activities near the project area. In this section, the study team carried out two main tasks: 1) collection of data from provincial department of planning and 2) conducted the survey with project related local villagers.

2.3.2.3.1 Demography

Statistics related to demography is collected from Preah Sihanouk Provincial Department of Planning as of 2015 and is summarized for the following matters:

- Total number of households and population in the project related villages and communes
- Ethnic minorities group in the project related villages and communes
- Migration
- Poverty rate
- Security and social order.

2.3.2.3.2 Socio-economic Setting

Socioeconomic conditions were studied on the households living near by the project area by using the questionnaire.

- Survey Technique: Prepare questionnaire for the survey and select samples using Yamane Taro, 1967 as follows:

$$n = \frac{N}{1 + N * e^2}$$

Where

n = Number of samples

N = Total households

e = Bias 5%

Samples at village level can be calculated via the formula

$$n_i = \frac{n \times N_i}{N}$$

Where

n_i = Samples to be selected from each village

n = Total samples

N_i = Total households in each mondul

N = Total households in the survey area

Table 2-9: Number of samples for the socio-economic study

Sangkat	Village	Group	Total Households	Samples
Sangkat 3	Mondul 3	Group 1	25	4
		Group 2	11	2
		Group 3	19	3
		Group 4	54	10
		Group 5	31	6
		Group 6	67	12
		Group 7	98	17
		Group 8	117	21
		Group 9	79	14
		Group 10	93	17
		Group 11	73	13
		Group 12	95	17
		Group 13	123	22
		Group 31	452	81
Sangkat 1	Mondul 3	Group 11	28	5
		Group 20	40	7
		Group 21	27	5
		Group 22	49	9
		Group 23	33	6
		Group 24	45	8
		Group25	51	9
		Group 26	40	7
		Group 27	42	7
		Group 28	40	7
		Group 29	16	3
		Group 30	13	2
		Group 31	43	8
		Group 34	42	7
Total			1.846	329

Source: Provincial department of planning as of December 2016

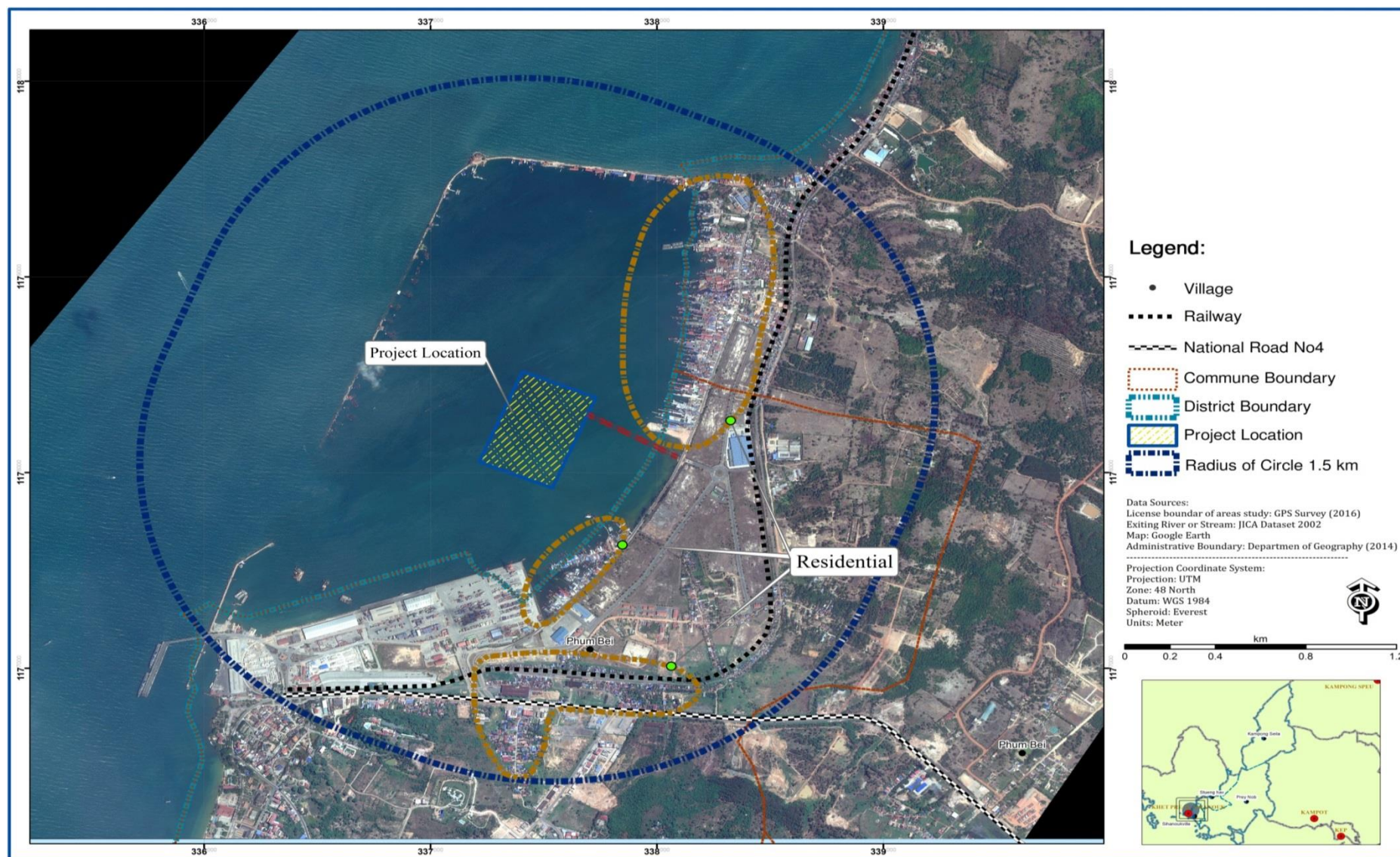


Figure 2-8: Locations for socioeconomic survey

Source: PPIC Study Team 2016

2.3.2.3.3 Land Use

Sangkat related land use and map prepared by the JICA in 2003, Scale 1/100,000, Landsat 2000 were used to define size and types of land use.

2.3.2.3.4 Traffic Survey

a) Site Selection

As advised from NIPPON KOEI study team and also approved from MoE, one site was selected for conducting the survey at National Road No.4 which is in front of the Sihanoukville Port entrance (x= 337385 y= 1176817, UTM WGS 84).

b) Vehicle Classification

Type of vehicles was classified into 10, all of which are motorbike, motorbike with trailer, passenger car, pickup, truck <4 tonnes, truck > 4 tonnes, container truck, bus < 25 seats, bus > 25 seats and handing tractor.

c) Training of surveyors

Prior to starting the survey, the survey team was trained by the team leader in the morning and tested in the afternoon using the traffic survey form. The recorded form was reviewed after field testing.

d) Traffic Count Procedures

Timing of traffic count was conducted from 8th to 14th July 2016 or for 7 days on a full-day basis, starting from 07:00 to 06:00 in the next day.

e) Counting Technique

Number of vehicles was counted every hour for 24 hours (both directions). Five surveyors were appointed for traffic survey (2 surveyors worked at day time and other 2 worked at night time) to record different direction of traffic. However, 1 surveyor was reserved to work as an assistant to help the team during meal times. Some instruments were used in supporting traffic count such as umbrella, chairs, light-reflection coat, watch, cell phone, rain coats, lamp, flash lights, battery/lamp, recorder (forms, pencils, pens, books), GPS and digital camera.

f) Data Analysis

Data recorded in the survey form was analyzed for frequency using MS-Excel 2016.

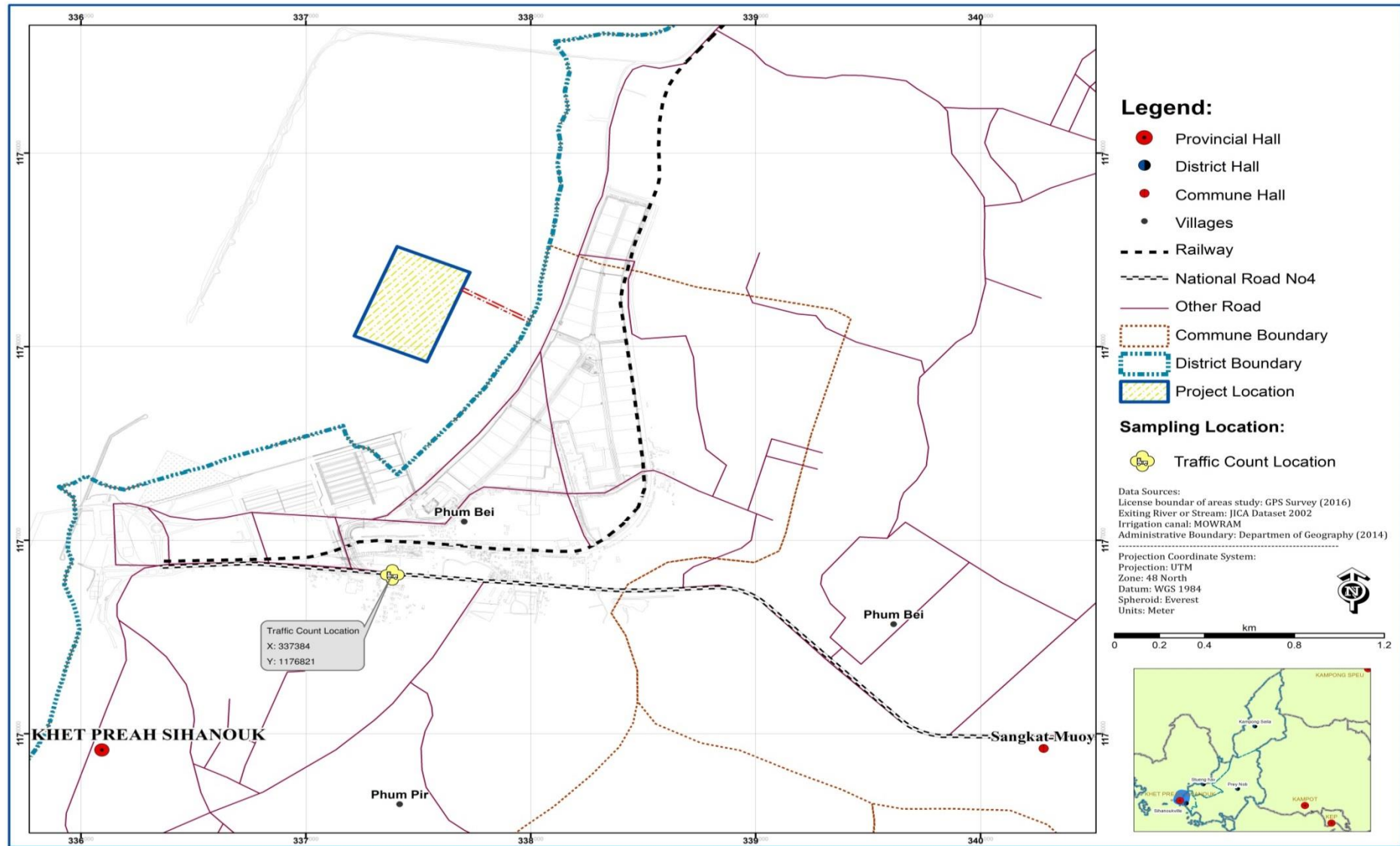


Figure 2-9: Location for traffic survey

Source: PPIC Study Team 2016

2.3.2.3.5 Public Health and Health Care

Conditions of public health and health care were collected from Sangkat health centers. Kind of diseases and local people can be described via these data.

2.3.2.3.6 Archaeological and Cultural Site

The aim is to find out Archaeological and Cultural Site which can be found in and nearby the area to be inundated by the project.

2.3.2.3.7 Tourism Zone

Tourism data from Provincial Department of Tourism was collected. Besides, the PPIC study team also observed many tourism sites. If the proposed project activities will be impacted on those sites, the proper mitigation measures will be prepared to prevent and/or to minimize the impacts.

2.3.3 Public Consultation Meeting

2.3.3.1 Consultations with Provincial Authority and Provincial Department

Consultations with provincial authority and provincial departments were separately conducted, all of which are as follows:

- 1) Preah Sihanouk Provincial Authority;
- 2) National Committee for Coastal Management and Development;
- 3) Provincial Police Commissariat;
- 4) Chamber of Commerce;
- 5) Provincial Department of Environment;
- 6) Provincial Department of Public Works and Transport;
- 7) Provincial Department of Land Management, Urban Planning, and Construction;
- 8) Provincial Department of Commerce;
- 9) Provincial Department of Water Resources and Meteorology;
- 10) Provincial Department of Mines And Energy;
- 11) Provincial Department of Labour and Vocational Training;
- 12) Provincial Department of Tourism;
- 13) Provincial Department of Planning;
- 14) Khan Fishery administration and
- 15) Cambodian National Research Organization (CNRO).

2.3.3.2 Consultations with Local Authority

Consultations with Local Authorities were separately conducted, all of which are:

- 1) Preah Sihanouk Municipality Authority;
- 2) Sangkat 1 Authority; and
- 3) Sangkat 3 Authority.

2.3.3.3 Public Consultations with Local People

Public consultations with local people were also separately conducted with project related Sangkat included local people in Sangkat 1 and Sangkat 3.

2.3.3.4 Dissemination Workshop of the ESIA Study Finding

After the preparation of the draft ESIA report was completed, the dissemination workshop on the study findings was conducted by inviting all stakeholders (as in Chapter 6). Besides the study team, the project owner and the officials from the Environmental Impact Assessment Department were invited to the workshop for observing comments, concerns, and requests from all stakeholders related to the project.

Firstly, the study team prepared an official letter to the H.E Provincial Governor to present the study findings and to request permission to organize the workshop to disseminate the study findings to relevant stakeholders. The seminar was presided over by the H.E provincial governor or his representative. The study team also provided an official letter, project executive summary, list of stakeholders to be invited, and workshop schedule.

Secondly, the H.E governor invited the study team to clarify the findings, to organize the workshop including venue and schedule for the workshop. After receiving the governor approval, the study team cooperates with provincial authority to invite participants to attend the workshop as scheduled.

Finally, the preparation of the workshop materials to distribute to the participants was organized.

2.3.4 Environmental and Social Impact Assessment and Mitigation Measure

Environmental and Social Impact Assessment is carried out based on the study on the project areas and its surrounding areas by

- Using Arc GIS to display the project area and its surrounding areas;
- Using checklist by project phase as prepared during the project site investigations;
- Using SPSS program for analysis socio-economic conditions in the study area; and
- Preparing mitigation measures to minimize adversely negative impacts by project phases.

Meanwhile, Positive impacts as a result of the project implementation are also described at the end of the chapter 7.

2.3.5 Cumulative Impact

Cumulative impacts are studied to define all impacts on physical resource, biological resource, and socio-economic resource to be developed by the project and other projects which are nearby and close to the project area.

2.3.6 Environmental Management Plan

The environmental management plan (EMP) for The Project is developed. The EMP will serve as the framework for the environmental management, commencing from the detailed design phase through to operation. The full implementation of the EMP by the works contractor will ensure that adequate protection measures are in place to avoid or mitigate The Project impacts.

The general EMP is included as part of the Special Provisions of the Specification and Performance Requirement (One of the Sections in the documents for procurement contracts for civil works). The works contractor will incorporate the EMP into his/her planning and site control and will be required to prepare an EMP for the works and report periodically.

2.3.7 Economic Analysis and Environmental Value

The Economic Analysis and environmental values is to find out if the development project is economically viable. The main analysis is the Net Present Value [NPV] and the Cost Benefit Analysis [CBA]. Next is the calculation of the Economic Internal Rate of Return (EIRR). As a result recommendation on the project is provided.

Environmental values in and around the project area is hard to make an estimation. However, in order to support the estimation of environmental value PPIC study team used Inter-ministerial Prakas No. 410 on Basic Price Determination of Natural Resources for Restoration was signed on August 18, 2017. This Prakas aims to set Basic Price Determination of Natural Resources for Restoration. It needs to be implemented for law enforcement and to prevent and crack down natural resources illegal activities. In the Prakas,

There is one item called For Illegal Activities on Fisheries Resource, specifically point No. 47 Seagrass. This item means that the project owner must pay 2.5-12.5 USD/m² for natural resources restoration to the government.

2.3.8 Study Plan and Study Team

2.3.8.1 Timeframe of the Study

Based on the MoE's mission letter, the PPIC study team has a 6-month period, starting from December 2017 to June 2018 to conduct the ESIA study and prepare the ESIA report for submission to MoE.

2.3.8.2 Composition of Study Team

The ESIA study is conducted by highly experienced team with the MoE. Table 2-10 shows the composition of study team.

Table 2-10: Study team members

No.	Name	Qualification	Position/Role
1	Mr. May Simorn	- Master of Environment Science	Team Leader
2	Mr. Pin Sokkhy	- Master of Environment Science	Deputy Team Leader
3	Mr. Chou Kimsorn	- Master of Natural Resources Management	Team Member
4	Mr. Yim Borey	- Master of Business Administration	Team Member
5	Miss Chay Panhaleak	- Master of Rural Development Management	Team Member
6	Mr. Keo Kakda	- Bachelor of Civil Engineering	Team Member
7	Miss Rong Samphors	- Bachelor of Land Management and Land Administration	Team Member
8	Socio-economic survey team		Team Member

CHAPTER 3

NATIONAL LEGAL FRAMEWORK AND INTERNATIONAL LAW

3.1 NATIONAL LEGAL FRAMEWORK

3.1.1 Constitution of the Kingdom of Cambodia

The Constitution of the Kingdom of Cambodia was approved by the National Assembly on 21st September 1993. There are some articles relevant to the project, all of which are as follows:

Article 44: All persons, individually or collectively, shall have the right to ownership. Only Khmer legal entities and citizens of Khmer nationality shall have the right to own land. Legal private ownership shall be protected by law. The right to confiscate properties from any person shall be exercised only in the public interest as provided for under the law and shall require fair and just compensation in advance.

Article 58: State property notably comprises land, mineral resources, mountains, sea, underwater, continental shelf, coastline, airspace, islands, rivers, canals, streams, lakes, forests, natural resources, economic and cultural centers, bases for national defense and other facilities determined as State property. The control, use and management of State properties shall be determined by law.

Article 59: The State shall protect the environment and balance of abundant natural resources and establish a precise plan of management of land, water, air, wind, geology, ecological system, mines, energy, petrol and gas, rocks and sand, gems, forests and forestry products, wildlife, fish and aquatic resources.

Article 61: The State shall promote economic development in all sectors and remote areas, especially in agriculture, handicrafts, industry, with attention to policies of water, electricity, roads and means of transport, modern technology and a system of credit.

3.1.2 Laws

3.1.2.1 Law on Environmental Protection and Natural Resource Management

Law on Environmental Protection and Natural Resource Management was approved by the National Assembly on the 18th November 1996 and was promulgated by Preah Reach Kram N. 12 96.36 NS.RKM dated 24th December 1996. This law has objectives:

- To protect and upgrade the environment quality and public health by means of prevention reduction and control of pollution.
- To assess the environmental impacts of all proposed projects prior to the issuance of decision by the Royal Government
- To ensure the rational and sustainable preservation, development, management and the use of the natural resources of the Kingdom of Cambodia.
- To encourage and provide possibility to public to participate in the protection of environment and the management of the natural resources.
- To suppress any acts which may affect to environment.

Regarding the management of Natural Resources this law requires all developers to prepare the report on Initial Environmental and Social Impact Assessment (IESIA) or the report on Environmental and Social Impact Assessment (ESIA) for proposed project or existing project as stated in the article below:

Article 6: An environmental impacts assessment shall be carried out on every project and activity of either private or public and shall be examined and evaluated by the MoE before it is submitted to the Royal Government for decision. This assessment shall also be applicable for those existing activities and those which are being under process and which their environmental impacts have yet not been assessed. Procedure for the environmental impact assessment shall be determined by Sub-decree following a proposal of the MoE. Nature and size of the proposed projects as well as the existing activities and activities under process of both private and public which are subject to assessment of their environmental impacts, shall be determined by Sub-decree following a proposal of the MoE.

Article 7: Every Investment Project Application and proposed project which are submitted by the State, shall enclose with them a preliminary Environmental Impact Assessment or Environmental Impact Assessment as stated the article 6 of this law. The MoE shall consider and make recommendations on the preliminary Environmental Impact Assessment or Environmental Impact Assessment to relevant competent bodies within a period as determined in the Law on Investment of the Kingdom of Cambodia.

Article 8: Natural resources of the Kingdom of Cambodia which primarily consist of land, water, airspace, air, geology, ecological systems, minerals, energy, petroleum and gas, rocks and sand, gems and stones, forests and forest sub-products, wildlife, fish and aquatic resources, shall be preserved, developed and managed to use in a rational and sustainable manner. Natural resource protected zones consists primarily of National Parks, wildlife sanctuaries, landscape protected areas, multiple use areas, shall be determined by Royal Decree.

3.1.2.2 Law on Land Management, Urban Planning and Construction

Law on land management, urban planning and construction was approved by the National Assembly on 23 May 1994 and was promulgated by Preah Reach Kram N/04 NS 94. This law aims to promote the organization and embellishment of the urban and rural areas throughout the Kingdom of Cambodia with the purpose of assuring development of this country in the spirit of:

- respecting both common and individual interests, private rights, observing laws and regulations, and overseeing on the construction matters.
- assuring through the development process an equilibrium between the cities/towns and rural areas based on their geographical conditions and special characteristics.
- assuring the value of natural and cultural wealth, ensuring the development of economy and tourism sector and maintaining the quality of the environment.

3.1.2.3 Law on Expropriation

Law on Expropriation was approved by the National Assembly of the Kingdom of Cambodia on 29th December 2001 in the 3rd National Assembly meeting of session 4 and was approved by the Senate on the form and ideology of this law on 14 January 2010 and was legally promulgated by Preah Reach Kram NS/RKM/0210/003 dated 26 February 2010. Some relevant articles include:

Article 1: This law aims to define an expropriation in the Kingdom of Cambodia by defining the principles, mechanisms, and procedures of expropriation, and defining fair and just compensation for any construction, rehabilitation, and public physical infrastructure expansion project for the public and national interests and development of Cambodia.

Article 3: This law shall be applied to expropriations involving public physical infrastructure projects in the Kingdom of Cambodia. This law does not govern any issues on expropriation in any agreement or memorandum on supporting investment between the Royal Government of Cambodia and partner countries. In case there is no such agreement or in case the agreement or the memorandum does not deal with expropriation, any expropriation shall be governed by this law.

Article 5: Public physical infrastructure primarily refers to:

- construction or expansion of railroads, roads, bridges, airports, ports and accompanying structures and equipment;
- construction or expansion of power stations, structures, equipment and lines for transmission and distribution of electrical energy;
- construction or expansion of buildings and equipment for postal, telecommunication and information technology systems;
- construction or expansion of roads, city space, vehicle parking lots, markets, parks, and public squares;
- construction or expansion of irrigation systems, clean water supply systems, sewage systems, and public interest spaces;
- construction or expansion of buildings for education, training, science, culture, health care, social security, and stadiums for performances to public audiences;
- construction or expansion of refineries, purification stations, buildings and equipment for protection of nature and the environment;
- construction or expansion of buildings and equipment for research and exploiting mines and other natural resources;
- construction or expansion of gas systems, fuel pipes, oil refineries, oil rigs, and other systems;
- construction or expansion of buildings/residences which are seriously destroyed by natural disasters such as earthquakes, floods, fires, and landslides etc., and for preparation for resettlement;
- construction or expansion of buildings for protecting and supporting residents;
- construction or expansion of border crossing posts;
- construction or expansion of or preparation for necessary construction for national defense or security;
- establishment of new sites for protection of natural resources, forests, cultural and archeological sites or protection of the environment; and
- the implementation as required by the nation in accordance with the determination made by the government.

Article 12: An Expropriation Committee shall be established and shall be led by a representative of Ministry of Economy and Finance, and representatives of concerned ministries/institutions shall be involved. The establishment and functioning of the Committee shall be determined by sub-decree.

Article 13: An Expropriation Sub-Committee that shall assist the Expropriation Committee shall be established and led by a board of municipal-provincial governors, and representatives of concerned provincial departments and authorities shall be involved. The establishment and functioning of the sub-committee shall be determined by the sub-decree provided for in Article 12 of this law.

Article 14: A Complaint Resolution Committee shall be established and led by representatives of Ministry of Land Management, Urban Planning and Construction, and representatives of other concerned ministries/institutions shall be involved. The organization and functioning of the Complaint Resolution Committee shall be determined by a separate sub-decree.

Article 19: The expropriation of the ownership of immovable property and real right to immovable property can be exercised only if the Expropriation Committee has paid fair and just compensation to the property's owner and/or rightful owner in advance, in accordance with the compensation procedures and principles set out in Section 3 of Chapter 4 of this law. The expropriation remains able to be exercised, even though the resolution of a dispute has not been completed. The owner and/or the rightful owner who has already received compensation from the Expropriation Committee still has the right to continue their complaint according to the procedure of complaining and dispute resolution set out in Article 34 in Chapter 6 of this law.

Article 22: Financial compensation given to the property owner and/or rightful owner shall be based on a market price or replacement price on the date of declaration of the expropriation. The market price or the replacement price shall be determined by an independent committee or agent selected by the Expropriation Committee.

3.1.2.4 Land Law

This law was approved by the National Assembly of Cambodia on the 20th July 2001 in the 6th meeting of session 2 and was fully agreed on the form and ideology of this law by the Senate on the 13th August 2001 and was promulgated by Preah Reach Kram NS/RKM/0801/14 dated 30 August 2001. There are some articles relevant to the project, all of which are as follows:

Article 1: This law has the objective to determine the regime of ownership for immovable properties in the Kingdom of Cambodia for the purpose of guaranteeing the rights of ownership and other rights related to immovable property, according to the provisions of the 1993 Constitution of the Kingdom of Cambodia.

Article 3: All persons shall respect the property of the State and legally acquired private property. The management of the cadastral administration of immovable property belonging to the State and the competence to issue titles related to immovable property throughout the Kingdom of Cambodia are under the authority of the Ministry of Land Management, Urban Planning and Construction. The regulations and procedures for the administration of State immovable properties will be determined by sub-decree.

Article 5: No person may be deprived of his ownership, unless it is in the public interest. An ownership deprivation shall be carried out in accordance with the forms and procedures provided by law and regulations and after the payment of fair and just compensation in advance.

Article 7: Any regime of ownership of immovable property prior to 1979 shall not be recognized.

Article 18: The following are null and void and cannot be made legal in any form whatsoever:

- any entering into possession of public properties of the State and public legal entities and any transformation of possession of private properties of the State into ownership rights that was not made pursuant to the legal formalities and procedures that had been stipulated prior to that time, irrespective of the date of the creation of possession or transformation;
- any transformation of a land concession, into a right of ownership, regardless of whether the transformation existed before this law came into effect, except concessions that are in response to social purposes;
- any land concession which fails to comply with the provisions of Chapter 5;
- any entering into possession of properties in the private property of the State, through any means, that occurs after this law comes into effect.

Article 19: Persons whose title or factual circumstances fall within the scope of article 18 of this law shall not have the right to claim compensation or reimbursement for expenses paid for the maintenance or management of immovable property that was illegally acquired. Any illegal and intentional or fraudulent acquisition of public properties of the State or of public legal entities shall be penalized pursuant to article 259 of this law. The penalties shall be doubled where any acquisition of land from the public properties causes damage or delay to works undertaken in the general interest, in particular any acquisition of roadway reserves. In all cases, if an offender does not cease his illegal occupation within the time limit set by the competent authority, the authority may begin the process to evict the offender from the land.

Article 30: Any person who, for no less than five years prior to the promulgation of this law, enjoyed peaceful, uncontested possession of immovable property that can lawfully be privately possessed, has the right to request a definitive title of ownership. In case the granting of a definitive title to ownership is subject to an opposition, the claimant has to prove that he himself fulfills the conditions of peaceful, uncontested possession for no less than five years over the contested immovable property or to prove that he purchased the immovable property from the original possessor or his legal beneficiary or from the person to whom the ownership was transferred, or from their successors.

3.1.2.5 Law on Water Resources Management

This law was approved by The National Assembly of the Kingdom of Cambodia on 22nd May 2007 of the 6th National Assembly Meeting, Session 3 and was fully approved on form and ideology of this law by the Senate on 11th June 2007 and was promulgated on the 29th June 2007. Some relevant articles include:

Article 4: Water and water resources shall be managed and developed based on an integrated water resources management (IWRM). The IWRM shall take into account:

- all aspects of water resources;
- linkages between water resources and other components of the natural environment; and
- requirement for an effective and sustainable water use for human being, environment and other sectors.

The implementation of the IWRM shall be carried out jointly and within a cooperation framework of all relevant agencies.

Article 5: The MOWRAM is mandated to manage, lead and supervise the implementation of the present law. The MOWRAM shall conduct consultation with other concerned ministries. In case of need, the Royal Government of Cambodia shall set up a joint commission for addressing and coordinating works and activities among the Ministries concerned.

Article 7: The Royal Government of Cambodia shall encourage the collaboration with and participation of the relevant agencies, private sectors, beneficiary groups, NGOs and International Organizations in all activities related to the management, investment, exploitation, conservation and development of the water resources.

Article 12: The diversion, abstraction and use of water resources for purposes other than those mentioned in Article 11, and the construction of the waterworks relating thereto, are subject to a license or permit.

The formality for license application shall be provided for by the Sub-decree.

The extraction of sand, soil, stones, gravel, petroleum and gas from the beds and banks of watercourses, lakes, canals and reservoirs is also subject to licensing. The technical hydrological formality shall be detailed in the Government sub-decree.

The filling of river, tributary, stream, natural lakes, canal, and reservoirs shall subject to license or written authorization. Its formality shall be provided for in the Sub-decree.

The diversion of water from the Kingdom of Cambodia territory shall be permitted and agreed by the Royal Government of Cambodia with due ratification by the legislative bodies.

3.1.2.6 Law on Forestry

Law on forestry was approved by the National Assembly of the Kingdom of Cambodia on 30th July 2002 in the 3rd National Assembly meeting of session 4 and was legally promulgated by Preah Reach Kram NS/RKM/0802/016 dated 31 August 2002. Some relevant articles include:

Article 1: This law defines the framework for management, harvesting, use, development and conservation of the forests in the Kingdom of Cambodia. The objective of this law is to ensure the sustainable management of these forests for their social, economic and environmental benefits, including conservation of biological diversity and cultural heritage.

Article 2: This law has extent of application to all forests, whether natural or planted. The State ensures customary user rights of forest products & by-products for local communities and as further provided in the provision of this Law or other relevant laws.

Article 3: The management of forests is under the general jurisdiction of the Ministry of Agriculture, Forestry, and Fisheries. The management of flooded forest is under a separate law. The State delegates management of protected areas to the Ministry of Environment as provisions stated in the Environmental Protection and Natural Resources Management Law of 24th December 1996 and the Royal Decree on the establishment and designation of Natural Protected areas on 1st November, 1993 and other legislations.

Ministry of Agriculture, Forestry and Fisheries has the authorization to cooperate with the Ministry of Environment, according to the provisions stated in chapter 14 of this law, on enforcement activities for all forest offenses that occur within protected areas. However, such activities shall not affect the management jurisdiction of Ministry of Environment as provided by the Environmental Protection and Natural Resources Management Law.

Article 22: Ministry of Agriculture, Forestry and Fisheries shall propose to the Royal Government of Cambodia to designate as Protection Forest any part of the Permanent

Forest Reserves, which qualifies as a special ecosystem area, an area of scientific, cultural, or tourism value or an area for biodiversity, water and soil conservation. All establishment or declassification of Protection Forests shall be reported to National Assembly and Senate.

Article 25: All activities related to the permanent forest estates and forest products & by-products (Timber Products and Non-Timber Forest Products) throughout the Kingdom of Cambodia shall require the following permits:

1. Permit to set annual harvesting quotas for forest products & by-products ;
2. Permit to harvest of forest products & by-products;
3. Permit for transport quotas of forest products & by-products;
4. Permit to transport of forest products & by-products;
5. Permit for use of forests;
6. Prakas to establish a forestry industry, sawmill, or forest products & by-products processing facility;
7. Permit to enter forest for the coupe preparation;
8. Permit to establish a stock place to sell, distribute forest products & by-products;
9. Permit to establish all types of kilns that use forest products & by-products as raw material;
10. Export quota for forest products & by-products;
11. Export and Import Permits for forest products & by-products;
12. Other types of permits that may be required according to provisions of this law.

The permits stated above shall be issued to the following:

1. A concessionaire who has received approval of the Annual Operational plan for harvesting forest products & by-products as required by the Forest Concession Agreement;
2. Any individual that has received approval for harvesting forest products & byproducts in a production forest not under concession;
3. A community with the rights to harvest forest products & by-products in a community forest that exceed customary user rights defined by rules on community forestry.
4. A person or customer who transports forest products and/or by-products from the forest area where they were harvested to the defined destination;
5. Any other individual, legal entity, community or customers who may be granted rights under provisions of this law.

Permits under this article shall contain the following items:

1. The name of the permit holder;
2. The duration of the permit;
3. The specific location and boundaries of forest products & by-products harvest area;
4. The quantity of forest products & by-products allowed to harvest in a unit determined by the Forestry Administration;
5. Origin and destination of forest products & by-products being transported;
6. Other items based on the type of permit required by the Forestry Administration.

Permits may be extended, based on an evaluation report by the competent Forestry Administration. The standard form for each permit shall be officially published by Ministry of Agriculture, Forestry and Fisheries.

3.1.2.7 Law on Fisheries

This law was approved by the National Assembly of Cambodia on 30th March 2006 in the 4th National Assembly Meeting of Session 3 and The Senate do not have enough time to control and comment and was promulgated by Preah Reach Kret N. NS/RKM/0506/011 dated 21st May 2006. Some concerned articles include:

Article 1: This law aims to ensure fisheries and fishery resource management, enhance aquaculture development, the management of production and processing, and to promote the livelihood of people in local communities for the social-economic and environmental benefits, including the sustainability of the conservation of biodiversity and natural culture heritages in the Kingdom of Cambodia.

Article 2: This law extends the implementation to all fisheries whether it be natural, artificial and aquaculture. The state ensures the rights on traditional use of fishery resources for local communities under the regulations of this law or other related laws.

Article 3: The fishery management shall be under the jurisdiction of the Ministry of Agriculture, Forestry and Fisheries. The management of inundated forest and mangrove forest which cohere to lifecycle of fishery resources shall be under the extent of this law. The state provides the management rights of natural protected areas to the Ministry of Environment under regulations of the law on the establishment and delimitation of natural protected areas, and the law on environmental protection and natural resources management, and other legislative norms.

Article 22: Disposing, discharging, dumping or littering toxic substances (solid or liquid) in fishery domains, which were determined by law and other juridical legislations of the Kingdom of Cambodia, and Conventions or International Treaties on Environmental Poisoning, and any agreements or any activities that cause toxic or harm to aquatic animals shall be prohibited.

Article 25: Building or dumping dams/dikes across lakes, streams, affluent, rivers and digging canals, pond, holes, reservoir, natural reservoir in large scale and other new constructions or pumping that could cause disastrous damage to fishery resources in fishery domain shall be studied or evaluated by the Ministry of Agriculture Forestry and Fisheries and concerned institutions

3.1.2.8 Labor Law

This law was approved by the National Assembly on the 10th January 1997 in the 7th National Assembly Meeting of Session 1 and was promulgated by Preah Reach Kram N. JS/RKM/0397/01 dated 13 March 1997. It is an important tool to assist to the negotiation of the whole or individually and to resolve work conflict in whole or individually and general working condition of all workers in the Kingdom of Cambodia. Concerned articles include:

Article 1: This law governs relations between employers and workers resulting from employment contracts to be performed within the territory of the Kingdom of Cambodia, regardless of where the contract was made and what the nationality and residences of the contracted parties are. This law applies to every enterprise or establishment of industry, mining, commerce, crafts, agriculture, services, land or water transportation, whether public, semi-public or private, non-religious or religious; whether they are of professional education or charitable characteristic as well as the liberal profession of associations or groups of any nature whatsoever. This law shall also apply to every personnel member who is not

governed by the Common Statutes for Civil Servants or by the Diplomatic Statutes as well as officials in the public service who are temporarily appointed

Article 15: Forced or compulsory labor is absolutely forbidden in conformity with the International Convention No. 29 on the forced or compulsory labor, adopted on June 28, 1930 by the International Labor Organization and ratified by the Kingdom of Cambodia on February 24, 1969. This article applies to everyone, including domestics or household servants and all workers in agricultural enterprises or businesses.

Article 137: In all establishments of any nature, whether they provide vocational training, or they are of a charitable nature or liberal profession, the number of hours worked by workers of either sex cannot exceed eight hours per day, or 48 hours per week.

Article 138: The work schedule is set by each enterprise for different jobs based on the nature of their activities and organization of work. When the work schedule consists of split shifts, the enterprise's management can normally set up only two shifts, one in the morning and the other in the afternoon.

Article 161: Each year, the Ministry in Charge of Labor issues a Prakas (ministerial order) determining the paid holidays for workers of all enterprises. These paid holidays do not break off the length of service required to obtain paid annual leave, nor do they reduce this type of leave.

3.1.2.9 Law on Mineral Resource Management and Exploitation

This law was approved by the National Assembly of Cambodia on 13th July 2001 in the 4th National Assembly Meeting of Session 3 and was promulgated by Preah Reach Kram N. NS/RKM/0701/09. Some concerned articles include:

Article 2: Ownership of all mineral resources in, on or underneath the land, mountains, plateaus, territorial water and sea islands, and in or on seabed within the territorial integrity of the Kingdom of Cambodia, shall be included in the property of the State.

Article 3: Mineral resources include any substance, whether in solid, liquid or gaseous form, naturally originated by a geological process or as a result of mining in or on the land, or in or on the sea or seabed, including gemstones, coals, metal and non-metal mines, mineral water, rock, gravels, sand, clay, petroleum and gas. The mining operation includes the prospecting, exploring and exploiting of mineral resources.

Prospecting is the preliminary exploration of the land surface by using simple instruments, involving only minor ground disturbance, in order to determine the presence of mineral of possible commercial value which may be subjected to an application for the mineral resources exploration and exploitation license.

Exploration is an investigation for the purpose of discovering and testing mineral indexes by prospecting, geological, geophysical and geochemical surveying, excavations, drilling, removal and analysis of soils, silts, water, rock and mineral samples, to determine the potential, extent, quality, quantity and economic and exploitation feasibility.

Exploitation of mineral resources is the mining operation whereby minerals are extracted from any mineral deposit processed, transported, sold or exported for commercial ends. Sale, exportation and importation of valuable metals and gemstones in raw state and after transformation shall be governed by the provisions of laws in force of the Kingdom of Cambodia.

Article 11: Six categories of license shall be made available to applicants in order to facilitate the management of the exploration and exploitation of mineral resources within the Kingdom of Cambodia.

1. An Artisan Mining License may be issued only to persons of Khmer nationality for the purpose of conducting the exploration and exploitation of mineral resources by using locally available common instruments and their own labor or with the help of family with no more than 7 (seven) persons. Mining crafts may explore and exploit mineral resources found only in loose state in silts, gravel, sand and rock, and within a demarcated area no larger than 1 (one) hectare, and to a maximum depth of 5 (five) meters.
2. A Pits and Quarries Mining License may be issued to qualified physical persons or legal entities for the purpose of conducting the exploration and exploitation of any construction and industrial minerals used for constructions, chemical and secondary industry, and mined from pits and quarries. The construction and industrial minerals include sand, gravel, crushed stone, laterite, clay, cement clay, coral, fossil, phosphorite, limestone, dolomite, marble, kaolin, pagodite, salt, potash, gypsum, peat, coal, titanium sand, silica sand or any other mineral compounds used for such purposes.
3. A Gem-Stone Mining License may be issued to qualified and competent physical persons or legal entities for the purpose of conducting the exploration and mining of precious and semi-precious stones, and ornament stones. Precious stones include diamonds, rubies, sapphires, smaragdites, and all other similar gem-stone quality minerals. Semi-precious stones include zircon, amethysts, topazs, and all other similar gem-stone quality minerals. Ornament stones are low crystal clear or non-transparent stone used for ornaments such as chalcedonies, ashlarling, normal opals, agates, jades, malachites, stone wood, black basalt, and all other similar quality stones.
4. A Mineral Transforming License may be issued to qualified physical persons or legal entities for the purpose of transforming precious or semi-precious stones or ornament stones.
5. An Exploration License may be issued to qualified and competent physical persons or legal entities for the purpose of conducting exploration of minerals and studying its potential.
6. An Industrial Mining License shall be issued only to the holder of an exploration license for the purpose of conducting exploration and mining of economically viable mineral deposit established within the boundaries of the exploration license. The holder of the exploration license shall submit technical, financial, environmental, social and economic analysis to determine the socio-economic feasibility of proceeding with a mining operation to ask for approval from the Minister in charge of minerals. A sub-decree will prescribe form and content of such a final feasibility study report and required accompanying documents, and the terms and conditions upon which an industrial mining license shall be issued.

Article 21: Every license holder or subcontractor shall be responsible for the proper conduct of exploration and mining operations in compliance with the following determinations:

1. Properly conducting operations in technically and financially effective and efficient manner, as detailed in an exploration work program or a mine feasibility study.

2. Protection of environment as detailed in Law on Environment Protection and Natural Resource Management, an environmental impact assessment and study, an environmental management plan, a mine site restoration and rehabilitation and financial guarantees.
3. Ensuring the protection of worker health and safety to be detailed in a mine plan program, and a mine health and safety program containing accident prevention and reporting procedures.
4. Protecting safety of the public in and around mine sites to be detailed in a mine plan.
5. Educating, training and providing jobs to Khmer citizens to be detailed in an education, training and employment program.
6. Utilizing as much as possible goods and services within the Kingdom of Cambodia at appropriate place and time. The Minister may further determine the necessity for the above work based on the category of license and the magnitude of the operation.

Article 25: The holder of a license shall indemnify the land owner both in and out of the license area against damages caused by his/her mining operations regardless of accidental or anticipated damages. Where the damage is caused by the mining operation of more than two holders of the license, those two holders shall jointly make indemnification against such damage.

The indemnification shall be made as follows:

- Where the mining operation area determined in the license impact the owned land, the land owner shall permit the holder of the license to conduct the mining operation on such land with prior mutual agreement whereby the owner shall receive fair and just compensation.
- Such compensation shall be made in time or finally made in accordance with the agreement between the owner and the holder of the license.
- Where the owner and the holder of the license disagree with the compensation, the Minister shall facilitate and solve it and request, if failed, the Royal Government to create a joint commission to settle this case.
- Where both parties disagree with the settlement of the joint commission, the decision shall be under the jurisdiction of the court.

Article 26: Where the ownership of the whole or a part of a mining operation area determined in the license has not been granted to any person, a competent authority cannot issue title to the whole or a part of such area to any party unless the Royal Government permits as requested by the Minister. Where people are living in the license operation area prior to the date of issuing such license, the holder of the license shall make compensation as provided in Article 25.

3.1.2.10 Law on Taxation

This law was approved by the National Assembly of Cambodia on 08th January 1997 in the National Assembly Meeting. Some major articles include:

Article 2: Object of the Tax

The tax of profits is the debt of a resident person on income from Cambodian sources and income from foreign sources and of a non-resident person on income from Cambodian sources.

Article 4: Tax Regimes

The tax regimes are as follows:

1. The assessment of the tax on profit shall be made according to the real regime, simplified regime, or estimated regime system of taxation.
2. The rules and procedures for the assignment of taxpayers to one of the three regimes as above will be determined by sub-decree and shall be based on the form of the business, the type of business activity, and the level of turnover.

Article 5: Tax Year

The tax year shall be determined as follows:

1. The tax on profit for the real regime system of taxation is calculated from the balance sheet results realized in the previous tax year.
2. If there is no closing balance sheet during any one year the tax to be paid for the following year is assessed on the profit made in the previous period from the end of the last taxable period. For new enterprises the calculation is made from the start of business operations up to the 31st of December of the year for which the tax is calculated.
3. If many successive balance sheets are drawn up during the same year the results of these balance sheets are added up to have the base for the tax to be paid.
4. The tax on profit for the simplified and estimate regime systems of taxation shall be calculated on a cash method of accounting on the past calendar year.
5. Directives on the reporting and the filing of a final declaration for enterprises that cease activities, are reorganized, or are sold or transferred during the calendar year shall be determined by prakas of the Ministry of Economy and Finance.

Article 7: Taxable Profit

The taxable profit is the net profit obtained from all the results of all types of operations realized by the enterprise including capital gains from the sale of various parts of the asset during the operation or at the close of the business, as well as income from financial or investment operations and interest, rental, and royalty income.

Article 8: Determination of Taxable Profit

The taxable profit is made up of the excess gross product realized on the expenditure that is made with the view of acquiring and preserving profit.

Article 10: Determination of Income of A Pass-Through

The income of a pass-through shall be determined as follows:

1. With regard to a pass-through, each member in determining one's income for a taxable year shall take into account separately one's distributive share of the items of LAW ON TAXATION income, gain, loss, deduction, credit, and charitable contributions for such year. For this purpose each item shall retain its character and shall be treated as distributed during the taxable year whether or not actually distributed. The loss to be carried forward will be determined after the items have been distributed.
2. The rules for determining the amount distributed, the treatment of contributions, and the adjustment to each member's base distributive share in the pass-through in any taxable year shall be determined by sub-decree.

Article 29: General Obligations of Real Or Simplified Regime System Taxpayers

Real or simplified regimes system taxpayers have the obligations:

1. All taxpayers liable to the tax on profits who must pay taxes according to the real regime or simplified regime system of taxation shall send every year to the tax administration a declaration of the profit they have realized in the previous tax year. This declaration must absolutely be registered in the period of 3 months after the end of the tax year.
2. Real regime system taxpayers must submit to the tax administration a tax declaration to which is attached:
 - a. Balance sheet
 - b. Results Account
 - c. Tables of complementary information.
3. Simplified regime system taxpayers must submit to the tax administration a tax declaration with attached documents in the form provided by the tax administration.
4. An enterprise with a loss must submit a tax declaration in the same manner and period of time.

Article 30: Obligation of Estimated Regime System Taxpayers

Estimated regime system taxpayers have the obligations:

1. The taxpayer subject to estimated regime system of taxation must submit the tax declaration to the tax administration every year by October 31, in the form provided by the tax administration.
2. The amount of estimated profit is determined by the tax administration after verification and consultation with the businessman or his representative. This estimated profit is calculated according to the profit rate with consideration to the type and activities of the business which shall be determined by Prakas of the Ministry of Economy and Finance.
3. This tax level on estimated profit shall be kept constant for a period of 3 months, 6 months or 1 year.
4. The taxpayer subject to the tax on profit under estimated regime system of taxation shall pay this tax every month at the time fixed by the tax administration.

Article 32: Obligations of persons required to make prepayments of the tax on profit Persons required to make prepayments for the tax on profit shall submit a tax declaration and pay the prepayment of the tax on profit to the tax administration in the form as specified by the tax administration by the 15th day of the month following the month in which the liability arose.

Article 41: Object of Tax

The tax on salary is a monthly tax imposed on salary that has been received within the framework of fulfilling employment activities. A physical person resident in the Kingdom of Cambodia is liable to the tax on salary for Cambodian source salary and foreign source salary. A non-resident physical person is liable to the tax on salary for Cambodian source salary.

Article 44: Tax Exempt Income of Employees

Shall be tax exempted:

1. Real refunds on professional expenses made by the employee under the assignment and for the benefit of the employer and which satisfy the 3 following conditions:
 - a. made for the direct and exclusive interest of the enterprise;
 - b. not exaggerated nor extravagant;
 - c. supported by detailed invoices already paid and made in the name of the

recipient of the real expense refund.

2. Indemnity for the layoff within the limit as provided in Labor Law.
3. Additional remuneration with social characteristics where there is provision in Labor Law.
4. Supply gratis or below acquisition cost of special uniforms or professional equipment.
5. Flat allowance for mission and travel expenses. This allowance should not overlap the real expense refund provided in this article.

Article 45: Monthly Tax Base

Except for fringe benefits taxable under article 48 of this law the monthly tax base for a resident is the taxable salary from which is deducted:

1. withholding obligations as the result of the compliance with the Labor Law in order to create pensions and for the maintenance of social welfare;
2. payments which are allowed to be tax exempt in Article 44 of this law.

Article 46: Monthly Taxable Salary

The monthly taxable salary shall be determined as follows:

1. Monthly taxable salary for a resident employee includes:
 - a. salary received from Cambodian sources;
 - b. salary received from foreign sources;
 - c. advance money, loan or installment made by the employer to the employee which shall be added to the taxable salary of the month in which they are paid out and shall be deducted from salary in the month of any repayment made by the employee.
2. Based on the evidence of family situation, any resident employee with:
 - a. minor dependent children at the time of tax payment is allowed a reduction in the tax base of seventy-five thousand Riels per each child per month,
 - b. spouse having only an occupation as housewife is allowed a reduction in the tax base of seventy-five thousand Riels for one person only per month.
3. For a non-resident taxpayer taxable salary includes salary from Cambodian sources taxable according to the provisions of this chapter.

Article 47: Determination of the Monthly Tax of an Employee

For a resident employee the tax to be paid must be determined on the monthly taxable salary and must be withheld by the employer according to the progressive rates by tranche as follows:

<u>Taxable Parts of the Monthly Salary</u>	<u>Tax Rate</u>
From 0 to 500,000 Riels	0%
From 500,001 to 1,250,000 Riels	5%
From 1,250,001 to 8,500,000 Riels	10%
From 8,500,001 to 12,500,000 Riels	15%
Over 12,500,000	20%

Article 48: The Determination of the Tax on Fringe Benefits For fringe benefits, every month, the employer shall withhold and pay tax by the time specified at the rate of 20 percent of the total value of fringe benefits given to all employees. The value of fringe benefits is the fair market value inclusive of all taxes.

Article 50: Foreign Tax Credit

A resident taxpayer who has received foreign source salary and who has paid taxes according to foreign tax law shall receive a tax credit which for deduction from the tax on salary to be paid in the Kingdom of Cambodia under the conditions that there is presentation of documents confirming this payment abroad.

- a. In order to calculate the tax to be paid in the Kingdom of Cambodia before deduction of this tax credit, the total amount of salaries received from Cambodian sources and foreign sources shall be taken into account.
- b. The tax credit is determined separately for the tax paid by a Cambodian resident in each foreign country. But, the tax credit to be allowed for the tax on salary paid abroad is the smaller of:
 - + the tax amount actually paid in a foreign country, or
 - + the amount obtained by multiplying the tax on total salaries from all sources for the same period calculated according to the table of progressive tax rates by tranche in article 47 of this law with the ratio of salary received in that foreign country to the total salaries from all sources.

The refund of the foreign tax credit is possible only if the resident taxpayer has complied with the formalities and supplied various documents as specified by the tax administration especially the certification from the employer and from the tax administration of the place of employment abroad.

Article 55: Charge to Tax

From 1 January 1998 onward, shall be established a Tax on Value Added on taxable supplies for the benefit of the State budget.

Article 59: Taxable Person

The taxable person refers to any person subject to the real regime system of taxation who makes a taxable supply as stated in article 60 of this law. A person subject to the simplified regime system of taxation may apply to be classified as a taxable person. The conditions and procedures for this application shall be determined by prakas of the Ministry of Economy and Finance. For the purpose of this chapter, an employee shall not be treated as a taxable person with respect to activities engaged in as an employee.

Article 61: Taxable Value

The taxable value shall be determined as follows:

1. The taxable value for any supply shall be the price of the goods or services the seller charged the purchaser. The taxable value includes any charges for transportation and other items payable to the seller with respect to the supply, including any specific tax on certain merchandise and services but excluding the tax on value added. Procedures for the adjustment of the taxable value at the time of supply and after the time of supply shall be determined by sub-decree.
2. When the payment for a taxable supply involves any consideration other than money for the direct or indirect benefit of the seller, this consideration shall be included in the taxable value at its fair market value.
3. The taxable value for any imported good shall be the customs value including insurance and freight plus any customs duties and any specific tax on certain merchandise and services. If there is no such adjusted customs value, the fair market value shall be used.
4. If the taxable value of the goods or services supplied does not represent the true value, the tax administration may determine a value for such goods or services and

such value shall be presumed to be the correct value until proven otherwise to the satisfaction of the tax administration.

5. The taxable value of used goods that the taxable person regularly purchases from consumers for resale or sells on behalf of other persons shall be the differential between the selling price and the purchase price, or the commission from the sale of those goods.

Article 64: Tax Rate

The tax rate shall be as follows:

1. The tax on value added shall be imposed at the tax rate of 10 percent on the taxable value of each taxable supply in the Kingdom of Cambodia.
2. The tax on value added shall be imposed at the tax rate of 0 percent on the taxable value of each taxable supply of goods exported from the Kingdom of Cambodia and of the taxable supply of a service rendered outside of the Kingdom of Cambodia as stated in article 63 of this law.
3. The tax administration may use a number of documents to certify that export has in fact occurred including export certification from the Customs Department, import documents from the country of import, executed letters of credit, and payments received by a domestic bank.

Article 93: Responsibility for Tax Administration

The institutions responsible for the administration of tax provisions are as below:

- the Tax Department of the Ministry of Economy and Finance;
- other institutions of the Royal Government which tax provisions have empowered.

The tax administration has the obligation to collect taxes and apply penalties as determined by tax provisions and to appeal to the court in the case of violations of law.

3.1.2.11 Law on Road

The Law on Road adopted by the National Assembly on 3 April 2014 at the second ordinary session of the five legislatures and approved by the Senate Page 4 of 38 to its entire form and legality on 11 April 2014 at its extraordinary session of the third legislature. Some concerned articles include:

Article 1: This law has objective to management, development of roads infrastructure sector and to ensure the road traffic safety in the Kingdom of Cambodia.

Article 3: The scope of this law shall be applied to all the activities relevant with roads infrastructure sector in the Kingdom of Cambodia.

Article 5: The competent authorities for the roads infrastructure management shall be designated as follows:

1. The Ministry of Public Works and Transport shall the competent authority to manage the expressway, national road, provincial road, and other roads as assigned by the Royal Government.
2. The Ministry of Rural Development shall the competent authority to manage the rural roads, and other roads as assigned by the Royal Government.
3. Sub-national Administration shall the competent authority to manage roads within Capital, cities, provincial urban, roads constructed, rehabilitated, and maintained by under the Sub-national Administration's budget and budget collected from various sources as well as other roads through the assignment of duties from the Ministry of

Public Works and Transport and the Ministry of Rural Development to the Sub-national Administrations and other roads as decided and approved by the Royal Government.

The sharing of other competent authorities' road management shall be determined by the Royal Government.

Article 6: Sub-national Administration shall have the right to oversee and manage roads within their jurisdictions as defined in point 3 under the Article 5 of this law. In each planning, road development and project study requiring the technical high standard, the Sub-national Administrations may request the approval of the Ministry of Public Works and Transport or Ministry of Rural Development depending upon the areas of responsibility of individual ministries and subject to the technical regulations, urbanization and heritage regulations and the provision of this law.

Article 24: Road users and all natural person relevant roads must be respective compliance with the provisions as stated in this law and law on road traffic. In case of the provisions of law on road traffic not consistent with the provision of this law, the law on road shall prevail.

Article 25: Trucks transportation users must respect the loading weight limit as hereunder specified in the Article 26 of this law and must cooperate in the weighting at the weigh station set up along each road and conform to the technical standard for the road dimension limit.

The dimensions of technical standards shall be determined by a Prakas of the Minister of the Ministry of Public Works and Transport, and a Prakas of the Minister of the Ministry of Rural Development.

The controlling of overloading the limited maximum weight of the vehicles, it is the competent authority of the national committee for the controlling of overloading the limited maximum weight of the vehicles.

The organization and functioning of the national committee for the controlling of overloading the limited maximum weight of the vehicles shall be determined by Sub-decree.

Article 26: The overloading the limited maximum on the road networks as following:

1. On the expressway, national road, provincial road, street in capital, street in city, street in urban of provinces, and rural road must be compliance as following:
 - a. Maximum weight on the sustaining axle of automobile, trailers or semitrailers is limited as follow:
 - 6 (six) tons for single axle with two wheels under the steering wheel.
 - 11 (eleven) tons for twin axles with four wheels under the steering wheel.
 - 10 (ten) tons for single axle with four wheels.
 - 19 (eighteen) tons for twin axles with eight wheels.
 - 24 (twenty four) tons for triple axles adjacent to each other's with twelve wheels.
 - b. Permitted maximum total weight of automobile is defined as follow:
 - 16 (six teen) tons for automobiles with twin axles which one axle is located in the front of the automobile with two wheels, and the other one located in the back with four wheels.
 - 25 (twenty five) tons for automobile with triple axles as one axle is located in the front of the automobile where there are two wheels and the twin ones located in the back of the automobile where there are eight wheels.

- 30 (thirty) tons for automobile with four axles as twin ones are in the front of the automobile where there are four wheels and the other two axles are in the back of the automobile where there are eight wheels.
- c. Limitation of permitted maximum total weight of automobile with trailers shall be defined as follow:
 - 35 (thirty five) tons for automobile with trailers having four axles as a single axle is located in the front of automobile where there are two wheels and the other single axle in the back of the vehicle where there are four wheels and the single axles of the trailers with eight wheels.
 - 40 (forty) tons for automobile with trailers having five axles onward.
- d. Limitation of permitted maximum weight of automobile with semi-trailers shall be defined as follow:
 - 35 (thirty five) tons for automobile with semi-trailers having four axles as a single axles is located in the front of automobile where there are two wheels and other single axle in the back of the vehicle where there are four wheels and the twin axles of the semitrailers with eight wheels.
 - 40 (forty) tons for automobile with semi-trailers having five axles onward.

The total weighs of the automobile and the trailers or semi-trailers which is not included in points above shall be asked for special permission letter from the competent authorities of road management.

2. All vehicle axle loads as specified above in point 1 shall bear a pressure on the road no more than 5(five)Kg/cm².

3.1.2.12 Law on Land Traffic

The Road Traffic Law, ratified by the National Assembly on 5 December 2014 during its 3rd Legislatures Session of the 5th Legislative Mandate, and fully reviewed and approved by the Senate on 30 December 2014 during its 6th Legislative Session of its 3rd Legislative Mandate. Some concerned articles include:

Article 1: This law is intended to ensure road traffic safety and order, and protection of human and animal health and lives, properties and environment.

Article 2: This law has the following objectives:

- To raise awareness of road traffic safety,
- To govern road traffic safety,
- To maintain road traffic order,
- To curb offenses/violations by road users.

Article 3: This law applies to all activities related to road traffic in the Kingdom of Cambodia.

Article 7: Driving all kinds of vehicles in the Kingdom of Cambodia shall always keep to the right side of the road. A goods loaded vehicle weighing more than sixteen (16) tons or a vehicle loading thirty five (35) passengers and more shall have one (1) driver and one assistant driver, both holding appropriate driving licenses relevant to the vehicle and road types, distance, and travelling time.

Article 8: Drivers of all kinds of vehicles shall implement the following measures:

1. All drivers of vehicles with an engine cylinder size of 49 cc and above shall possess appropriate driving licenses relevant to the vehicle types.

2. Whilst driving their vehicles, drivers shall always be precautious and in a comfortable position that allows easy and fast manipulation of the vehicles, and particularly the possibility to move without any disturbances.
3. Drivers shall not be allowed to cause any unnecessary disturbance to other road users and roadside residents.
4. Consumption of liquor with the alcoholic rate of 0.25 mg per liter of air or 0.50 mg per liter of blood and above shall be banned when driving.
5. Vehicles with caterpillar tracks are banned from being driven directly on the roads. Such vehicles have to be transported on other vehicles with rubber tires.
6. Using a cellphone without hand-free accessories whilst driving shall not be allowed.
7. No passengers, goods, or other items are allowed to be loaded in way that block the driver's eyesight.
8. A motorcycle may be allowed to load two adults and a child. The motorcycle driver, the passenger, and the child at three years of age and above, all shall properly wear helmets. All drivers of tri-motorcycles and motorcycles with trailers shall properly wear helmets.
9. Inside towns or densely populated areas, the driver and passengers, who sit at the front seats of a vehicle, must wear their safety seatbelts.
10. Outside towns or densely populated areas, the driver and all passengers of the vehicle must wear their safety seatbelts as stipulated in the Article 90 of this Law.
11. Babies under ten months of age must be placed inside the baby seats, which are firmly tied to the vehicle's backseats.
12. Children between the ages of ten months and four years must sit in the baby seats, which shall be firmly tied to the vehicle's backseats.
13. Children under 10 years of age shall not be allowed to sit in the front seats of the vehicles.

Article 10: For a specific lane of designated for a specific type vehicles, drivers of other kinds of vehicles shall not be allowed to drive on it except when they need to enter or leave their allowed lanes. On a road with two opposite traffic directions and divider, drivers shall keep their driving on the half-roadway to the right side. On a one-way road with two or more traffic lanes, drivers should keep their driving on the lane to the farthest right. In case of a very crowded traffic, drivers may drive on any of the lanes.

In case of a very crowded traffic as stated in Para 3 and Para 4 of this Article, driving a vehicle in a specific lane faster than that in the other one(s) shall be not considered as an act of overtaken. Drivers of vehicles with total weight more than 3.5 tons shall always keep driving on the right lane. However, when they need to turn left or to overtake, drivers may use any of the other lanes. Exceptionally, in densely-populated areas or towns, use of roadway shall be determined by Prakas by the Minister of Public Works and Transport.

Article 12: Drivers shall skirt to the right at all intersections/roundabouts or road dividers that prevent straight forward movement of their vehicles, except if there are provisions stated otherwise.

Article 17: In all cases, drivers shall be always in control of their own speeds and drive in an appropriate speed according to the actual situation so that they are able to stop their vehicles on time, if required, without any harms caused. Drivers shall slow down their speed in the following cases:

1. When passing other vehicles on narrow roads.

2. When passing other vehicles carrying passengers and children that are being stopped to load or drop them.
3. When approaching a bridge or railway.
4. When the weather is not good and the drivers cannot clearly see from a distance.
5. When changing traffic direction.
6. When reaching a turning, curved or slippery road, crossroad, or roundabout.
7. When approaching a high ground or when going down the slope.
8. When passing or overtaking stopped convoys, or when passing or overtaking other processions.
9. When reaching obstacles or dense houses built close to the roadway.
10. In all cases where slow-speed or danger signs are indicated.
11. when there are police, military or military police convoys, fire engines, ambulances, or other vehicles emitting their siren sound and/or light, all drivers shall slow down and drive to the right, and if necessary, stop at a point as close as to the roadside, to allow those convoys to go forward safely.
12. When reaching schools or hospital that are located less than 50m from the road.

Article 25: Before leaving their parking areas, drivers shall signal a clear and sufficient warning to others road users, making sure that departure of their vehicles with or without trailers will not cause any harms to others. Before changing traffic direction such as turning left or right, changing lanes, making U-turn or reverse, moving to the right to stop or park, drivers shall slow down their vehicles and signal a clear and sufficient warning to others road users. When turning left or right, making U-turn or reverse, drivers shall observe the following rules:

1. Turning Left

- Before turning to the left, drivers shall examine the back of their vehicles through the rear-view mirror, and particularly through the left side mirror to assess the traffic position and movement behind;
- Drivers shall turn on the left indicators at a sufficient distance from where the turning will take place, reduce their speeds, and, if there are no obstacles, keep as close as to the long-line divider at the middle of the road;
- Before turning to the left, drivers shall look at the left and right and at the left once again, especially to assess vehicles coming from the opposition direction. If the road is free, drivers shall start turning with due care, especially minding the pedestrians who are crossing the road. If the road is not free, drivers shall wait and give way to the vehicles from the opposition direction and from the right to go first;
- Turning to the left shall be conducted by skirting on the right side, i.e. turning left behind the vehicles from the opposite direction, except when there are instructions from the traffic police.

2. Turn right:

- Before turning right, drivers shall examine the back of their vehicles through the rear-view mirror, and particularly through the right side mirror to assess the traffic position and movement behind;
- If there is no obstacle, drivers shall turn on the right indicators at a sufficient distance from where the turning will take place, slow down their vehicles, and keep to the right;

- Before turning right, drivers shall look at the left and right, and at the back via the right side view mirror, especially making sure that there is no obstacle on the right behind them. If the road is free, drivers shall keep to the most right as possible and pay proper attention to the pedestrians who are crossing the road.
3. U-turn and reverse:
- Drivers intending to make U-turn or reverse shall make sure that such act will not cause too much interference or harms to other road users;
 - When reversing, drivers shall take due care and constantly look at the traffic movement behind them, and particularly before reversing, drivers shall watch out for small children or small animals behind them;
 - U-turn is prohibited in the following cases:
 - at places near road junctions or road-railway intersections,
 - on curved roads where drivers may not see other vehicles at minimum distance of 150 meters,
 - when reaching or coming the peak,
 - at places where U-turn is banned,
 - on the one-way roads.

The above rules shall be waived if there are signals from the road traffic police or traffic marks on the roads commanding otherwise.

3.1.2.13 Law on Investment

This law was approved by the National Assembly of Cambodia on 04th August 1994 in the 1st National Assembly Meeting and was promulgated by Preah Reach Kram 05th August 1994. Some major articles include:

Article 3: The Council for the Development of Cambodia is the sole and one-stop service organization responsible for rehabilitation, development and over-seeing investment activities. The Council for the Development of Cambodia is the Royal Government's "Etat-Major" responsible for the evaluation and the decision making on all rehabilitation and development, and investment project activities.

Article 13: Incentives shall include the exemption, in whole or in part, of duties and taxes.

Article 17: Investors in the Kingdom of Cambodia shall be free to hire Cambodian nationals and foreign nationals of their choosing in compliance with the labour and immigration law.

3.1.2.14 Law on Amendment to the law on Investment of the Kingdom of Cambodia

This law was approved by the National Assembly of Cambodia on 03rd February 2003 in the National Assembly Meeting and was promulgated by Preah Reach Kram 24th March 2003. Some major articles include:

Article 1 New: The Law governs all Qualified Investment Projects and defines procedures by which any person establishes a qualified Investment Project. Only Qualified Investment Projects are entitled to the benefits subject to the scope of this Law.

Article 6 New: All persons wishing to establish a QIP shall submit an Investment Proposal to the Council for the Development of Cambodia in the form and according to the procedures provided in this Law and the Sub-Decree.

Article 7 New: Within three (03) working days of the Council's receipt of the Investment Proposal the Council shall issue to the Applicant a Conditional Registration Certificate or a Letter of Non-Compliance.

The Council shall issue the Conditional Registration Certificate if the Investment Proposal Contains all the information required under the Sub-Decree, and if the Proposed activity not in the Negative List set out in the Sub-Decree, However, if the Investment Proposal does not satisfy the above condition, the Council shall issue a Letter of Non Compliance to the Applicant.

The Conditional Registration Certificate shall specify the approvals authorizations clearances licenses, Permits or registrations require for the QIP to operate as well ad the government entities responsible to issue such approvals, clearances, licenses, permits or registrations. The Conditional Registration Certificate shall also confirm the incentives that the QIP is entitled to under new Article 14 of this law and recognize the statutes of the legal entity which will undertake the QIP.

If the Council for the Development of Cambodia fails to issue a Conditional Registration Certificate or Letter of Non-Compliance within three working days, the Conditional Registration Certificate shall be considered to be automatically approved in the form set out in the Sub-Decree.

The Council for the Development of Cambodia shall obtain all of the licenses form relevant ministries-entities listed in the Conditional Registration Certificate on behalf of the Applicant.

All government entities responsible for issuing an authorization, clearance, License, permit or registration listed on the Conditional Registration Certificate shall issue such document no later than the 28th working day form the date of the Conditional Registration Certificate Any government official who, without proper reason, fails to respond to an Applicant's request by this deadline shall be punished by law.

The Council for the Development of Cambodia shall issue a Final Registration Certificate within 28 working days of its issuance of the Conditional Registration Certificate Issuance of the Final Registration Certificate does not release the QIP from obtaining any other approvals specified by competent ministries-entities. Even upon the lapse of the 28 working days deadline as stipulate in the paragraph 6 above, all competent entities shall issue approvals as prescribed by laws and regulations. the date of issuing the Final Registration Certificate shall be the date of QIP Commencement.

All Letters of Non-Compliance shall clearly state the clear reasons why the Investment Proposal was not acceptable as well as the additional information required to enable the Council to issue a Conditional Registration Certificate.

Article 12New: The Royal Government shall make available incentives under this Chapter to Qualified Investment Projects.

Article 18 New: Investors shall be allowed to hire foreign employees provided that:

- The qualification and expertise are not available in the Kingdom of Cambodia among the Cambodian populace In the event of such hiring, appropriate documentation including photocopies of the employee's passport, certificate and or degree and a curriculum vitae shall be submitted to the Council for the Development of Cambodia,
- A Letter asserting needs for hiring the foreign employees shall be required investors shall obtain an approval and a permit from the Ministry of Social Affairs, Labor, Vocational Training and Youth Rehabilitation,

- Before working for investors the foreign employee shall hold a work permit in the Kingdom of Cambodia, issued by the Ministry of Social Affairs, Labor, Vocational Training and Youth Rehabilitation, Investors shall perform the following obligations:
- Provide adequate and consistent training to Cambodia staff,
- Promotion of Cambodia staff to senior Positions will be made over time.

Article 21 New: If an investor intends to end its activities in the Kingdom of the Cambodia, it shall inform the Council for the Development of Cambodia through either a registered letter or a hand delivered letter stating the reason of such a decision and signed by the investor or this attorney in fact.

Article 22 New: If an investor intends to stop the activity of its QIP without judicial procedures the investor shall provide proof to the Council that the QIP has properly settled its debts, including any complainants and claims from the Ministry of Economy and Finance, before the investor is allowed to officially stop the activities of the QIP or dissolve according to the applicable commercial law.

Article 23 New: Once the QIP is allowed to stop its activity either within the judicial procedures or not, the investor can transfer the remaining proceeds of their assets overseas or use them in the Kingdom of Cambodia. However in the event that the QIP had used machineries and equipment that were imported duty free for less than five years, the QIP shall have the obligations to pay the duties applicable to those machineries and equipment according to the determination of the Sub-Decree.

3.1.2.15 Law on Social Security Schemes for Persons Defined by the Provisions of the Labour Law

The law was adopted by the National Assembly of the Kingdom of Cambodia on August 15, 2002, in the 8th session of the National Assembly of Legislature 2 and the Senate also fully approved with forms and ideals of this law on 05 September 2002 and was promulgated by the Preah Reach Kram NS/RKM/0902/018, dated 25 September 2002. Some important relevant articles include:

Article 1: The rules are intended to establish a social security system for those under the provisions of the labor law in the Kingdom of Cambodia as follows: **1)** Retirement Salary which is responsible for providing benefits for pensioner, weak person and death. **2)** Risk at work which is responsible for providing benefits for work-related accidents and vocational diseases. For the other part will be determined by series of sub-decree based on the actual situation of the national economy.

Article 3: Social Security scheme which is created by this law shall be insured by the National Social Security Fund hereinafter referred as "NSSF". National Social Security Fund is a public institution that was created by sub-decree compliance on General Statute of Public Enterprises, which announce to use Preah Reach Kram No. NS / RKT / 0696/03 dated 15 June 1996 and Royal Decree No. NS / RKT / 1297/91 dated 31 December 1997 on Statute of the legal status of public institutions.

Article 6: All employers and workers under the provisions of this law shall be obligated to pay dues to the NSSF. Procedures of payments for contribution and benefits are set out in the sub-decree on the establishment of NSSF as stated in Article **3** above.

Article 12: shall be considered a work-related accident risk that falls on the body of workers by work or during work by any reason and despite a mistake from workers or not , accidents

which falls on the body workers or not, accidents, which falls on the body workers during work for employer or director of enterprises, or falls on vocational student with or without wages, any position, wherever. Also to be considered as work dangerous that falls on the body of workers, while the person went straight from their homes to work or return without stopping or without going to other places for personal interests or besides required work.

Article 14: 1. A victim caused by employment injury or commuting accident or occupational disease shall promptly inform to employer's representative about the accident inflicted on his/her except in the event of force majeure or in complete accessibility or has other thoughtful reasons. The beneficiaries, if there is a fatal accident, shall carry out such obligation Employer shall notify to NSSF within the period of less than forty-eight hours about employment injury or commuting accident or occupational diseases inflicted on workers working in there enterprise. This notification shall be made through the modality, which determined by Joint Prakas of the Ministry in charge of Social Security Schemes and Ministry of Health as proposed by the Governing Body of NSSF. 3- The method of investigation and duty of the victim of employment injury or commuting accident or occupational diseases shall be determined by joint Prakas of the Ministry in charge of Social Security Schemes and Ministry of Health.

Article 19: In case of risk causing the victims lose their life, National Social Security Fund shall provide an expense allowance for cremation of the body and an annuity to the assigned inherent of the victims.

Article 24: 1) Fund for health and social activities of NSSF is supplied with money which is a remuneration of the money due to tardiness of the employer to pay dues and provides tables salary sheet not in time, as well as reserves, which was cut in advance and other income of NSSF. 2). NSSF can use the resources of the Fund of Health and Social Affairs for: a - take action in goal for General work, preventing work-related accidents and illness in professional especially for research and statistics of occupational risk and to advert to encourage preventative measures and facilitate professional development. B) providing financial assistance or join public institutions or private organizations in health and social activities for the benefit of members of NSSF of each section.

Article 33: The National Social Security Fund is free from all income tax and VAT. But the operation of the Fund that tend to trade and which is intended purely for the profit shall be legally under the VAT.

3.1.2.16 Law on Trade Union

The law was adopted by the National Assembly of the Kingdom of Cambodia on April 04, 2016, in the 6th session of the National Assembly of Legislature 5 and the Senate also fully approved with forms and ideals of this law on 12 April 2016. Some important relevant articles include:

Article 1: Purposes

The purposes of this law are to:

- provide for the rights and freedoms of all enterprises or establishments, all persons under the provisions of the Labour Law and personnel working in the air and maritime transportation; and
- determine the organisation and functioning of the professional organisations of workers and employers in the Kingdom of Cambodia.

Article 2: Objectives

The objectives of this law are to:

- protect the legal rights and interests of all persons under the provisions of the Labour Law and personnel working in the air and maritime transportation;
- ensure the rights to collective bargaining between workers and employers;
- promote harmonious industrial relations; and
- contribute to the development of decent work, and enhancement of productivity and investment.

Article 3: Scope

- This law covers enterprises or establishments and all persons working for the enterprises or establishments under the provisions of the Labour Law.
- This law also covers personnel working in the air and maritime transportation.

Article 5: Right to Establish and to Join a Worker Union or an Employer Association

Workers and employers have, without any distinction whatsoever, the right to establish a worker union or an employer association of their own choice for the exclusive purpose of research, study, training, promoting the interests, and protecting the rights as well as moral and material interests, collectively and individually, of persons covered by the statute of the worker union or employer association.

Workers shall have the right to:

- take part in the formation of a worker union;
- become a member of a worker union and be under its rules;
- take part in any lawful activities of the worker union of which he or she is a member;
- seek and hold office in any worker union of which he or she is a member and under its rules;
- take part in the election of the representatives at the workplace where there is a provision stipulating such election;
- be elected or appointed and serve as a workplace representative when there is a provision stipulating such election or appointment; and
- exercise other rights provided under this law.

Employers shall have the right to:

- take part in the formation of an employer association;
- become a member of such association in accordance with its rules;
- take part in any lawful activities of the employer association of which it is a member;
- hold an office in that association in accordance with its rules; and
- exercise other rights provided under this law.

Any formation of worker union or employer association which includes both employers and workers therein shall be prohibited.

Article 6: Non-Discrimination in Membership

All workers or employers, regardless of race, colour, sex, belief, religion, political opinion, nationality, social origin, or health status, shall have the right to be a member of a worker union or an employer association of their choice. No person, including any worker union, may interfere with this right.

Article 7: Freedom Not to Join

The freedom of the person as set forth in Article 5 (Right to Establish and to Join a Worker Union or an Employer Association) of this law also implies the freedom not to join a

worker union or an employer association and the freedom to withdraw its membership at any time from a worker union or an employer association that they joined.

A worker may withdraw his/her membership from a worker union by submitting a letter, with his/her signature or fingerprint affixed thereon, to his/her worker union and employer. Following such notification, the worker concerned shall be deemed to have automatically and immediately relinquished his/her membership and the employer shall stop deducting union dues from his/her wage. No person may interfere with a worker's rights to join or to leave a worker union.

Article 9: Rights of Worker Unions and Employer Associations

The council of national worker union, worker unions and employer associations shall have the right to:

- draw up their own statutes, administrative regulations, functional organisation, and work programs as long as they are not contrary to the public order, regulations and laws in force; and
- freely elect their representatives.

Article 10: Structure of Worker Union or Employer Association and Affiliation with Worker Union or Employer Association

Worker union has the following 3 (three) levels:

1. A local worker union shall be established by at least 10 (ten) workers within that enterprise or establishment;
2. A federation of worker unions shall be established by at least 7 (seven) registered local worker unions;
3. A confederation of worker unions or a coalition of federations of worker unions shall be established by at least 5 (five) registered federations of worker unions.

Employer association has the following 2 (two) levels:

1. An employer association shall be established by at least 9 (nine) enterprises or establishments;
2. A federation of employers shall be established by at least 6 (six) registered employer associations.

Worker unions or employer associations can freely consult one another on any research, study, training, professional promotion and protection of their moral and material interests.

Worker unions can affiliate with other worker unions at national and international levels. Employer associations are also entitled to the same rights.

A worker union in an enterprise or establishment has the right to be member of a higher-level worker union only once at the same time.

Article 62: No Discrimination on Ground of Union Activities

Employers shall not discriminate against workers on the basis of their involvement in holding the worker union leadership or participation in worker union activities when making decisions pertaining to recruitment, management, duty delegation, promotion of rank and position, remuneration, granting of benefits, disciplinary measures, and dismissal, including the termination and discontinuation of the employment contract that is subsequently found to be against the procedures.

Article 63: Employer's Actions considered to be Unfair [Labour] Practices

The following unfair [labour] practices by an employer shall be deemed illegal:

- a. to interfere in any way with the workers in exercising their right to selforganisation of a worker union;
- b. to impose a working condition or an employment renewal condition that requires a worker not to join a worker union or to withdraw from the worker union to which he/she belongs;
- c. to contract out services or functions being performed by worker union members when such operation may interfere in the exercise of the rights of worker to self-organisation of a worker union;
- d. to initiate control, such as assisting or interfering with the formation, administration of any worker union, or affiliation of worker unions, including the provision of financial or support to such worker union or its founders or supporters in any manner other than that provided for in this law;
- e. to discriminate in relation to wages, working hours, other terms and working conditions in order to encourage or discourage [workers] to become a member of any worker union;
- f. to dismiss, terminate, or otherwise prejudice or discriminate against workers for having given or being about to give testimony or otherwise provide evidence or information relevant to the application of this law or the applicable labour standards in force;
- g. to breach the duty to bargain collectively as prescribed in this law, or to violate or to cause violation of a statute, employment contract, memorandum of understanding, collective bargaining agreement, or provisions of the law, or to obstruct the bargaining process and implementation of the collective bargaining agreement;
- h. to lock out in non-compliance with legal procedures;
- i. to block a gate of an enterprise or establishment or its entrance or exit gate by various means, or to interrupt through threats, provoking violence against workers who take part or intend to take part in a strike; and
- j. to fail to fulfil all obligations relating to the labour sector in the event of closure of an enterprise or establishment.

Article 64: Discrimination in Membership

It shall be considered as an unfair [labour] practice for a personnel, worker, worker union, or representative of worker union to deny membership as set forth in Article 6 (Non-Discrimination in Membership) of this law.

Article 65: Worker Union's Actions considered to be Unfair [Labour] Practices

The following unfair labour practices by worker union or representative of worker union shall be deemed illegal:

- a. to restrain or coerce workers in the exercise of their rights to selforganisation of the worker union. However, the worker union shall have the right to prescribe its own rules with respect to the recruitment or retention of membership;
- b. to cause or attempt to cause an employer to discriminate against workers including dismissal of workers in non-compliance with the law and the usual conditions such as on the grounds that the workers in question have denied being a member of or have requested to leave the union;
- c. to breach the duty of integrity and good faith in the negotiation of the collective bargaining agreement, provided it is the most representative worker union;
- d. to cause or attempt to cause an employer to pay, or to give, or to agree to pay, or to give any amount of money or other things for services which are not performed or

- not to be performed, including a demand for a service fee to conduct negotiation of a worker union;
- e. to violate or cause violation of the statute, employment contract, memorandum of understanding, agreement, collective bargaining agreement, or laws, or to obstruct the bargaining process and implementation of the collective bargaining agreement;
- f. to agitate for the only purpose of serving political tendency or their personal ambitions, or to commit acts of violence at the workplace and other places;
- g. to congest or block the entrance and exit of the premises of the enterprise or establishment, or to incite or to threaten or to violently prevent or to coerce non-striking workers by all means from working, and to close off public roads;
- h. to lead a strike or demonstration that contravenes the legal procedures; and
- i. to destroy individual, collective, or public properties.

Article 66: Access to an Enterprise or Establishment

Access to an enterprise or establishment by a representative of a local worker union to exercise his/her rights or to interact with its members shall only be given by the permission of the employer who shall not withhold such permission, unless the permission affects the normal operation of the enterprise or establishment.

Article 67: Protection from Dismissal

All workers who are candidates standing for election for the leadership of a worker union enjoy the same protection from victimisation and dismissal as shop stewards. Such protection begins 45 (forty-five) days prior to the election and ends 45 (fortyfive) days after the election if he/she is not elected. In order to enjoy such special protection, the worker union shall notify the employer of the candidacy and make a copy to the Ministry in charge of labour by any formal means. The employer shall only be required to comply with these provisions once for each election for the leadership of worker union.

From the time that the application for registration is submitted, all worker unions which are founders or workers who voluntarily become members of this worker union, during the application period, shall enjoy the same protection as shop stewards. This protection shall last for a period of up to 30 (thirty) days following the date on which the Ministry in charge of labour has certified the worker union registration.

Beyond the date specified in the above paragraph, this protection shall be extended to the leader, vice leader, and secretary of the worker union. The worker union shall notify the employer of the names of the individuals to be protected by any formal means. A copy of this notification shall be sent to the Ministry in charge of labour.

Article 68: Right of Access to the Enterprise or Establishment for Dismissed Worker Union Leaders

Leaders and persons responsible for the administration of the worker union, who have been legally laid off temporarily shall retain the right of access to the enterprise or establishment. Otherwise, leaders and persons responsible for the administration of the worker union, who have been definitively dismissed shall be entitled to access the enterprise or establishment within 60 (sixty) days from the date of such definitive dismissal for the purpose of fulfilling the responsibilities in accordance with their mandate without affecting the normal operation of the enterprise or establishment.

Leaders and persons responsible for the administration of the worker union, who committed serious misconduct and were lawfully dismissed, must resign from that worker union, and he/she has no duties to access the enterprise or establishment.

Article 75: Dispute Settlement of Worker Union and Employer Association

Dispute arising between one worker union and another worker union shall be settled through compromise and mutual understanding with utmost efforts of all parties concerned in the dispute and by the council of national worker unions.

Dispute arising between one employer association and another employer association, as well as dispute arising between a worker union or the council of national worker unions and an employer association or a federation of employers, shall be settled through discussions with utmost efforts at ensuring minimum services, essential services, and public order. If the discussions as set forth in paragraphs 1 and 2 of this Article do not lead to mutual agreement, disputes shall be settled in accordance with the laws and regulations in force.

Article 79: Act of Illegal Obstruction of the Right to Establish a Worker Union or an Employer Association

A written warning shall be issued to any person who illegally obstructs:

- the right to establish a worker union or an employer association;
- the right to join a worker union or an employer association;
- the right not to join a worker union or an employer association; or
- freedoms to be leaders or persons responsible for the administration of the worker union or the employer association.

A written warning shall be issued to any person for the obstruction as a result of any discrimination of:

- ethnicity, nationality, or race;
- political tendency;
- gender, belief, religion;
- health status; or
- disability.

In the event of a failure to comply with the warning as set forth in paragraph 1, a transactional fine not exceeding 1,000,000 (one million) Riels shall be imposed.

In the event of a failure to comply with the warning as set forth in paragraph 2, a transactional fine not exceeding 5,000,000 (five million) Riels shall be imposed.

Article 87: Illegal Obstruction of Strike

A written warning shall be issued to any employer who by any means prevents the workers from participating in a legal strike or threatens against workers who participate in a legal strike.

In the event of a failure to comply with the above warning, a transactional fine not exceeding 5,000,000 (five million) Riels shall be imposed.

3.1.2.17 Royal Decree on Establishment of National Committee on Coastal Area Management and Development

The Royal Decree was signed by the King on February 16, 2012. Some important relevant articles include:

Article 1: Establish the National Committee on Coastal Area Management and Development, which is abbreviated as NCCMD, shall be the direct subordinates of Royal Government in charge of managing and developing coastal areas of Kingdom of Cambodia in the sustainable and responsible manner.

Article 2: NCCMD shall be composed of the following:

- Prime Minister of Kingdom of Cambodia Honorable President
- Minister of Ministry of Land Management, Urban Planning and Construction
President
- Minister of Ministry of Environment Vice President
- Minister of Ministry of Tourism Permanent Vice President
- Secretary of State of the Council of Ministers 01, Member
- Secretary of State of Ministry of Interior 01, Member
- Secretary of State of Ministry of National Defense 01, Member
- Secretary of State of Ministry of Economy and Finance 01, Member
- Secretary of State of Ministry of Agriculture, Forestry and Fisheries 01, Member
- Secretary of State of Ministry of Industry, Mines and Energy 01, Member
- Secretary of State of Ministry of Water Resources and Meteorology 01, Member
- Secretary of State of Ministry of Public Works and Transport 01, Member
- Secretary of State of Ministry of Planning 01, Member
- Secretary of State of Ministry of Health 01, Member
- General Secretary of Council For The Development Member Of Cambodia (CDC)
- Commander in Chief of National Police commissioner Member
- Commander in Chief of Royal Cambodian Armed Forces Member
- President of Board of Governors in 4 coastal areas Member
- Representative of National Committee of Marine Security 01, Member
- Representative of National Authority for Land Dispute Resolution 01, Member
- Representative of General Department of Techniques 01, Member of Ministry of Environment
- Representative of General Department of Land Management and Urban Planning of Ministry Land Management, Urban Planning and Construction 01, Member
- Secretary-General of NCCMD Member
- The precise composition of NCCMD shall be determined by the Decision of the Royal Government.

Article 3: NCCMD shall obtain the responsibilities in implementing their tasks on the coastal areas, reserved land of coastal areas, subordinate areas, islands, firth, river, canal, water line connected to the sea and surface water next to coastal areas of Kingdom of Cambodia in the aspect of urbanization, environment and tourism.

Article 4: Shall be established the General Secretariat, located in the Ministry of Tourism, subordinated for NCCMD to perform daily tasks.

Article 5: NCCMD has functions and duties as the following:

- Organize the policy, action plan, master plan, activities plan, program, and other projects which are related to the management and development of coastal areas
- Organize legal frameworks and necessary policies to assure the management, conservation, and development in the coastal areas with the manner of transparency, equity, and environmental sustainability

- Examine, prevent, and take necessary actions to prevent any inactivity which may harm to environment and natural resources along the coastal areas
- Examine and evaluate any development projects and project's implementation in coastal areas aligning with the guideline of the Royal Government for coastal areas' development
- Take part in examining and providing the comments to appropriate institution on the investment's proposals regarding the coastal areas, reserved land of coastal areas, subordinate areas, islands, firth, river, canal, water line connected to the sea and water surface next to the coast
- Examine, monitor, and facilitate any on-going and future-plan activities of ministries, institutions, sub-national administration, national and international organizations, non-governmental organizations, any civil societies and private sectors located along the coastal areas in order to speed up the works effectively and sustainably
- Mainstream the knowledge to sub-national administration, private sector, and any relevant parties to comprehend the development of coastal areas
- Cooperate with the most beautiful bay in the world club and relevant international institutions in order to promote the development of coastal areas
- Educate, train the human resources to response to the necessities in managing and developing the coastal areas
- Cooperate with the ministries, national institutions, private sectors, and any relevant parties to facilitate the above works effectively
- Prepare the annual budget for NCCMD
- Write the semi-annual and annual reports for the Royal Government
- Perform other duties assigned by the Royal Government of Cambodia

Article 6: NCCMD shall have at least 2 meetings a year upon the invitation of the President. In the necessary case, NCCMD's President may invite the representatives of Ministries, Institutions, specialized officers, technicians or private sectors to participate in the meeting for consulting, discussing, and researching on any related issues with respect to their working frameworks. In case the president is absent, a Vice President, who is authorized by the president, may lead the meeting instead.

Article 7: NCCMD possesses the right to request the intervention forces in order to implement its responsibilities if necessary.

Article 8: NCCMD may obtain the technical consultants, national or international specialists according to the necessary.

Article 9: General Secretariat of NCCMD shall be supervised by a Secretary General accompanied by a necessary number of Deputy Secretary Generals who are appointed by Royal Decree. The organization and functioning of General Secretariat of NCCMD shall be determined by Sub-Decree.

Article 10: NCCMD possesses the rights to use the seal of Ministry of Land Management, Urban Planning and Construction in its working process.

3.1.3 Subdecree

3.1.3.1 Subdecree on Environmental Impact Assessment Process

Sub-Decree No. 72 ANKr/BK on Environmental Impact Assessment Process was approved on 11 August 1999 by the Royal Government of Cambodia. Some relevant articles include:

Article 1: The main objectives of this sub-decree are: 1) To determine an Environmental Impact Assessment (EIA) upon every private and public project or activity, and it must be reviewed by the Ministry of Environment (MoE), prior to the submission for a decision from the Royal Government. 2) To determine the type and size of the proposed project(s) and activities, including existing and ongoing activities in both private and public prior to undertaking the process of EIA. 3) Encourage public participation in the implementation of EIA process and take into account of their conceptual input and suggestion for re-consideration prior to the implementation of any project.

Article 2: This sub-decree hereby applies to every proposed and ongoing project(s) and activities, either by private, joint-venture or state government, ministry institutions of which are described in the annex of this sub-decree, except a special case, where a project will be approved by the Royal Government.

Article 3: The MoE has responsibilities as following:

1. Review and evaluate the report of the Environmental Impact Assessment in collaboration with other concerned ministries;
2. Follow up, monitor and take appropriate measures to ensure a Project Owner will follow the Environmental Management Plan (EMP) while project construction is taking place and accede to their EIA report's approval.

Article 4: Institutions and ministries who are responsible for proposed project shall have the right to examine and approve any project(s) that stated in the annex of this sub-decree, after the MoE has reviewed and commented on their EIA report.

Article 6: A Project Owner must conduct Initial Environmental Impact Assessment (IEIA) in order to comply with the EIA requirement as stated in the annex of this sub-decree.

Article 7: A Project Owner must apply to the MoE for reviewing their IEIA report and report of pre-feasibility study.

Article 8: A Project Owner must apply to the MoE for reviewing their full report of EIA report and Feasibility Study, in case a project tends to cause a serious impact to the natural resources, ecosystem, health and public welfare.

Article 16: When a project is requested to submit a full report of EIA, as described in Article 8, the Project Owner/Responsible Person shall submit it to the MoE along with their application for project's investment with the Project Approval Ministry/Institution.

Article 17: The MoE will review the report, as described in Article 16 and will provide findings and recommendations back to the Project Owner and to Project Approval Ministry/Institution within 30 work-days, commencing from the date of the receipt of their EIA report and pre-feasibility study report.

Article 20: The Project Owner must acknowledge the findings and recommendations of their IEIA or/and EIA report(s) in which have been approved by the MoE, before they can proceed their project's implementation.

3.1.3.2 Subdecree on Water Pollution Control

Sub-Decree No. 27 ANK.BK on Water Pollution Control was approved on 6 April 1999 by the Royal Government of Cambodia. Some concerned articles to project are as follows:

Article 1: The purpose of this sub-decree is to regulate the water pollution control in order to prevent and reduce the water pollution of the public water areas so that the protection of human health and the conservation of bio-diversity should be ensured.

Article 2: This sub-decree applies to all sources of pollution and all activities that cause pollution of the public water areas.

Article 8: The disposal of solid waste or any garbage or hazardous substances into public water areas or into public drainage system shall be strictly prohibited.

Article 10: The discharge or transport of wastewater from any sources of pollution to other places for any purpose is subject to prior permit from the Ministry of Environment. The application for this permit shall be copied to the concerned ministries or agencies.

Article 25: The water quality standard of public water areas for the purpose of the conservation of the bio-diversity is stipulated in the Annex 4 of this subdecree. There are 5 Annexes attached to this Sub-Decree which indicate the Environmental Standards concerning Water Pollution Control.

3.1.3.3 Subdecree on Solid Waste Management

Sub-Decree No. 36 ANK.BK on Solid Waste Management was approved on 27 April 1999 by the Royal Government of Cambodia. Some articles concerning the project include:

Article 1: The purpose of this sub-decree is to regulate the solid waste management with proper technical manner and safe way in order to ensure the protection of human health and the conservation of bio-diversity.

Article 2: This sub-decree applies to all activities related to disposal, storage, collection, transport, recycling, dumping of garbage and hazardous waste.

Article 5: The collection, transport, storage, recycling, minimizing and dumping of waste in the provinces and cities is the responsibility of the authorities of provinces and city. The implementation as mentioned in the first paragraph of the article 5 shall comply with the guideline on the sound management of waste specified by the Prakas (declaration) of the Ministry of Environment.

Article 6: The Ministry of Environment shall monitor the implementation in disposal, collection, transport, storage, recycling, minimizing and dumping of the household waste in the provinces and cities.

This Sub-Decree contains Annex that indicates the Environmental Standard on 33 types of Hazardous wastes.

3.1.3.4 Subdecree on the Control of Air Pollution and Noise Disturbance

Sub-Decree No.42 ANK.BK on the Control of Air Pollution and Noise Disturbance was approved on July 10, 2000 by the Royal Government of Cambodia. Important articles concerning the project include:

Article 1: The purpose of this sub-decree is to protect the quality of the environment quality and public health from air pollutants and noise disturbance through monitoring, curbing and mitigating activities.

Article 4: Air quality standard shall be specified in the Annex-1 of this sub-decree. The standard of maximum quality of hazardous substance permitted in the air shall be specified in the Annex-2 of this sub-decree.

Article 7: The standard for noise emission from various sources like vehicles, manufacturing places and the standard for maximum noise emission for public and residential areas shall be specified in the Annex 5, Annex 6 and Annex 7 of this sub-decree.

Article 26: The Ministry of Environment shall regularly control and monitor the situation of the air quality within the in order to take measures to prevent and reduce air pollution.

Article 28: If it is found that any area is affected by air pollution which may threaten human life or environmental quality, the Ministry of Environment shall immediately notify the public about such danger and investigate to find out the sources of pollution and shall take measure to prevent air pollution and to restore the air quality.

Article 30: Where there is a complaint or report that any source of pollution discharges, air pollutant, noise, vibration which cause any harm to human health or public property, the Ministry of Environment, in collaboration with concerned ministries, is entitled to conduct inspection at such source of pollution and take samples for testing.

There are 8 Annex attach to this Sub-Decree which indicate the Environmantal Standard concerning the control on air pollution and noise disturbance.

3.1.3.5 Subdecree on Mangement of Ozone Depleting Substances

Sub-Decree No. 47 ANK.BK on Management of Ozone Depletion Substances was approved on the 31th December 2007. The objectives of this sub-dcree are:

- Management of substances damaging the ozone layer and management of business activities and the use of this substance in accordance with the Montreal Protocol of the Vienna treaty.
- scope apply to all imports, exports, transit, production, storage, sale, transportation and use of substances damaging the ozone layer, although it is in single or component form, or in maintaining form and used or refining or modifying the quality in the Kingdom of Cambodia.

This sub-Decree is attached in Annex 2 to control of substances that destroy the ozone layer, including: Annex 1 is Table of substances destroying the ozone layer and Annex 2 is a list of products using substances that destroy the ozone layer that shall be registered with the Ministry of Environment.

3.1.3.6 Subdecree on the Establishment of Sihanoukville Autonomous Port

Sub-Decree N. 50 ANK.BK on the establishment of Sihanoukville Autonomous Port was approved on the 17th July 1998. Main articles of this Sub-Decree include:

Article 1: was established a public enterprises, which features a state-owned company named "Sihanoukville Port", hereinafter referred (PAS, Sihanoukville Autonomous Port), which are under the supervision of the Ministry of Public Works and Transport and is under the finacial protectorate of the Ministry of Economy and Finance.

- PAS is headquartered in Sihanoukville.
- PAS is legal individual with technical, administrative and financial autonomy.
- PAS is affected by the provisions of this decree and to comply with the provisions of Preah Reach Kram No. 0696/03 dated 17 June 1996 on the General Statute of Public Enterprises and the provisions of the Trade Act.

Article 2: PAS is in charged of business services based on:

- Pilotage ships, logistics ships
- Handling, transfer, storage and delivery of goods
- Maintenance storage, warehouse, pitch Development and infrastructure rehabilitation of PAS which is existed and to be expanded.

Article 3: Duties of PAS are:

- Responsible and manage on the protection safety security and public order in the region.
- Take the same principles and management as traders.
- Manage and effectively lead and manage the activities and flourish.
- As a public institution PAS received power and obligations from the state to fulfill its mission in accordance with the objective.

Article 4: exemption of regulations in contrary to this PAS shall pay taxes in accordance with the laws and regulations.

Article 5: The first capital of PAS is determined by the first balance sheet, which has received the approval from the Ministry of Economy and Finance and the Ministry Public Work and Transport. When this decree comes into force PAS shall be considered as an alternative legal ownership over all asset recorded in inventory.

Article 6: the staffs of PAS are under a separate statute, decided by the board of committee based on Preah Reach Kram on the general statute of the public enterprise. From the time this particular statute put into force, all of the staff of PAS are not under the framework of the state.

Article 7: PAS shall be directed by the Board with a wide range of rights to function within the framework of the provisions of this decree and its internal rules.

The Board of Directors is composed as follows:

- 1 Representative from The Ministry of Public Works and Transport as a Director;
- 1 Representative from The Council of Ministers as a Member;
- 1 Representative from The Ministry of Economy and Finance as a Member;
- 1 Representative from Preah Sihanouk Ville Authority as a Member;
- 1 Representative from The Ministry of Commerce as a Member;
- 1 Representative of Employees of PAS as a Member; and
- 1 Person from General Director of PAS as a Member.

Article 10: Board organizes a meeting at any time depending on the benefits of enterprise at the invitation of the President or at the request of members who have at least four members. However, the board must meet at least once in every 3 months. In case of his busy, an oldest member shall be elected to lead the meeting. Board of Directors shall discuss on the issues within their framework. The agenda of the meeting and related documents shall be

sent to all board members and state officials monitor at least 10 days prior to the meeting. Board meetings can take place only if the member is present at least half. If no quorum meetings shall delay to the next 15 days to discuss the same issue on the same agenda. The next meeting is not necessarily required quorum.

The decision of the Board can only be approved if a majority of members of the meeting. If numbers of voices are equal from both group, the voice of the President shall be considered as an most advantage.

Article 11: The decision of the Board of Directors shall be recorded in logs that shall be sent to the supervisory authority, to the individual council members and officials to oversee state and other institutions as stated in Article 24 of this Sub-Decree in latest 15 days from the date of the meeting. Original logs must be signed by the meeting chairman and a board member who presented in a previous meeting.

Article 12: The Director General is the regular manager of PAS and is appointed for a mandate of 3 years by Sub-Decree at the request of the Patron Ministry.

Article 24: in latest 15 days after approval of the Board of Director, PAS shall send to the Minister in charge of Cabinet of Minister and Guardian Minister, Minister of Economy and Finance, the following documents:

- The minutes of Board of Directors meeting;
- Enterprise project as stated in Article 18 report on the activity balance sheet and management accounts of PAS; and
- Report of the Commissioner of Accounts.

Article 25: Being put in chains of PAS, a State Control Officer who shall be appointed by sub-decree at the request of the Minister of Economy and Finance. State control officer has the right to attend all meetings of the Board of Directors and can comment on all points of the agenda but has no voice for approval. The State Control Officer has monitoring mission in accordance with provisions of Article 20 to 25 of Preah Reach Kram No. CS/RKM / 0696/03 dated 01 June 1996 on the General Statute of Public Enterprises.

3.1.3.7 Subdecree on Construction Permit

Sub-Decree No. 86 ANK.BK on Construction Permit was approved on 19 December 1997. Important articles concerning the project include:

Article 1: All private or public person, physical or legal shall have the rights to construct a building on their own titled land and such rights shall be protected by this Anukret. Any Construction Permit issued prior the construction start- up shall be considered as legal document of the Construction.

Article 4. Authority of Provincial and Municipal Administration

- 4.1. Provincial and Municipal administration shall have the authority to issue all the construction permits under their jurisdiction.
- 4.2. The construction permits shall be signed by the delegate of the Royal Government to the Municipality or governors of the provinces and municipal or duly appointed vice governors. Reason of denial of construction permit shall be notified in writing.

Article 27: Security and Public Health: Construction permits shall be refused if these constructions by their situation, their nature or their dimensions are of such nature as to adversely affect the health or the public security or are exposed to pollution or to risks.

27.1. AREAS AT RISKS (dangerous area) Construction permits shall be refused on all areas at risk, landslide zones, inundated zones, banks of rivers, “preks”, “stungs” and “pongs” when the lack of terrain solidity presents a danger for persons and possessions. Construction permits shall be refused on inundated zones when the constructions can cause a reduction of water stockage or flow on these terrain and neighboring terrains and effect to the water quality (edges of river, “preks”, “stungs”, “pongs”).

27.2. NOISE POLLUTION (NOISE VIBRATION) The Khmer version is the official version of this document. Construction permits shall be refused or shall be granted only under special orders if these constructions are susceptible to be exposed to serious noise pollution or to produce serious noise pollution.

Article 28: Protection of Resort

Construction permits shall be refused or shall be granted only under special orders if these constructions can by their nature, their dimensions or their situation, compromise the conservation or the exploitation of an urban or natural site, or archaeological and historical vestiges.

Article 31: Drinkable Water Supply and Disposal of Sewage Water

31.4 The construction permit application shall include the blue print of septic tank for hygiene installation and the connection to the sewer systems. A construction permits shall be denied if it does not present sufficient assurance of hygiene and health of the projected construction and surrounding existing constructions.

3.1.3.8 Subdecree on Urbanization of City, Municipality and Urban Areas

Sub-Decree No. 42 ANK.BK on Urbanization of City, Municipality and Urban Areas was approved on April 03, 2015 with the objectives to ensure:

- The effectiveness, sustainability and equity of urbanization;
- The protection of human rights, and public and private interests in development, conservation and construction;
- The promotion of cultural value, green development and contribution in reduction of global climate change and extend the prevention and reduce the catastrophe; and
- safety, welfare and easiness for all people including handicappeds, elderly and children.

Article 21: Surface of buildable area ratio compared with plot area of construction for maximum percentage of land to build on is defined as follows:

1. Residential Zone

- | | |
|--------------------------------------|---------------------------------------|
| - Detached low-rise residential zone | not more than 50% of the plot surface |
| - Linked low-rise residential zone | not more than 75% of the plot surface |
| - Medium-rise residential zone | not more than 60% of the plot surface |
| - High rise residential zone | not more than 60% of the plot surface |
| - Mix residential zone | not more than 65% of the plot surface |

2. Commercial Zone

- | | |
|-----------------------|---------------------------------------|
| - Commercial zone | not more than 75% of the plot surface |
| - Mix Commercial zone | not more than 70% of the plot surface |

3. Industrial zone

- Industrial zone not more than 60% of the plot surface
- Light Industrial zone not more than 60% of the plot surface
- Mix Industrial zone not more than 60% of the plot surface
- 4. Mixed used zone not more than 70% of the plot surface
- 5. Transportation zone not more than 60% of the plot surface
- 6. Tourist zone not more than 50% of the plot surface
- 7. Administration & public facility zone not more than 60% of the plot surface
- 8. Green and open space zone not more than 10% of the plot surface
- 9. Cultural, heritage and religious zone not more than 50% of the plot surface
- 10. Some other zone not more than 50% of the plot surface

The ration of buildable area compare to the land area above are not used for residential areas which were planned to used official approved land before this sub-Decree approved. In this soul, the obliged official shall implement the use of this land.

When a new building is constructed in one plot of land with one or many old nuiliding and there is no plan for removing this or these buildings, the ratio of land area for construction land area shall be calculated by adding the land area of old building to the land area of the new building.

The remaining area from the land area for construction shall be used for watery gardening at least 30% of the remaining area from this new construction area. Adding to the watery gardening area, all plot of land with a request of construction shall be determined to plant trees consistent with technical standards in order to increase green space in cities and contribute to reducing global clamate change.

The plot land with 150 square meters shall be transplanted with trees at least one tree in order to make calculation, if the result of this calculation is odd, the numbers of trees to be transplanted must be even numbers in the last result.

This technical guideline on the square meters of land for construction compared to the plot of land shall be issued by the Minister of Land Management, Urbanization and Construction.

Plan of ratio of construction area compared to the land area of Capital, towns, districts, shall initiate to manage the same way as mater plan of land used and land used plan and decided by the National committee of land management and urbanization.

Article 25: The ration of buildable area compared to the land area in percentage in type of land, level of construction in Town shall be determined to 30 (Thirty) percent.

When a new building is constructed in one plot of land with one or many old nuiliding and there is no plan for removing this or these buildings, the ratio of land area for construction land area shall be calculated by adding the land area of old building to the land area of the new building.

The remaining area from the land area for construction shall be used for watery gardening at least 50% of the remaining area from this new construction area. The plot land with 100 square meters shall be transplanted with trees at least one tree unless there will be a new regulation thathn this. For calculation, if the result of this calculation is odd, the numbers of trees to be transplanted must be even numbers in the last result.

Article 26: The index of maximum land use for control area in cities shall be defined with 1,5 (one and a half). If a new building is constructed in one plot of land with one old or many old

buildings and there is no plan to remove the old buildings, the index of land use shall be calculated by adding the land area of the old buildings to the land area of the new building.

Article 30: The height of a building in city shall be determined on the basis of the land size, the width of the road and physical infrastructure where the building located and where the economic, social, environmental, geographical, cultural, wellbeing, health and beauty conditions are met in consistence with each of the following methods:

1. Method 1: Meter limitation

- Short building shall be determined by maximum height of ground floor, first storey and second storey.
- Medium height building shall be determined by the height from the 3rd floor to the 11th floor.
- High building shall be determined by the height from 12th floor up.

2. Method 2: Floor area ration limitation

- The limitation of the height of the index of land use as defined in article 22,26 and 27 of this sub-decree.

3. Slant plan

- Short-high building shall be applied in case that the width of road is shorter than 9 (nine) meters and maximum height is equated with slant plan with an equivalence of the height of building and width of the road compared with an open space of (A).
- Medium-high building shall be determined of its maximum height at the slant plan and consistent with the building height and the width of road compared with an open space of (B)
- High building shall be determined of its maximum height at the slant plan and consistent with the building height and the width of the road compared with and open space of (C).

4. Method 4: The definition of a building height applies the two or three abovementioned methods.

Maximum and minimum height of each floor is set in the land use master plan and land use plan in accordance with the type of use of buildings and geographical locations. However, the minimum height of the building for each floor is set to 2.8 meters for residential buildings.

Buildings height plans of the capital city and towns, district initiates the management as the procedures of land use master plan and land use plan and decided to put to use by the decision of the president of the National committee for land management and urbanization.

The number (A) (B) and (C) will be launched by the decision of the president of the National committee for land Management and the urbanization.

Determination of the height of a building shall be determined by a declaration of the Minister of Ministry of Land Management, Urban Planning and Construction.

Article 32: The standards of technical land size shall be defined in order to ensure the effectiveness of city preparation, management and development, and city infrastructure development and city land development with beauty and public order. The minimum standards of technical land size for residential zone shall be determined into different types as below:

1. Low-rise residential zone

- Detached low-rise residential zone (villa or mini-villa) not less than 10 x 20m

- Linked low-rise residential zone (flats or attached houses) not less than 16 x 22m
- 2. Medium-rise residential zone
 - Type 1 (from 3rd to 8th storey) not less than 15 x 15m
 - Type 2 (from 9th to 11th storey) not less than 20 x 30m
- 3. High-rise residential zone
 - Type 1 (from 12th to 18th storey) not less than 1500 m²
 - Type 2 (from 19th storey up) not less than 3000 m²

The definition of technical land size will not be subject to existing land areas or land with smaller size than the abovementioned.

The minimum standards of technical land size for other residential areas, commercial zone, industrial zone and agriculture zone shall be determined with the circulation of the Minister of land management, urbanization and construction.

Article 34: Off-street parking space for building in land size shall be adequate in response to the type of each building and it must be outside of public street and public locations.

The minimum numbers of parking space shall apply with the following:

1. Residential building include:
 - Detached houses (villa and mini-villa)
Floor area 100 m² There must be one small parking lot
 - Attached houses (flats and attached buildings)
Floor area 120 m² There must be one small parking lot
 - Luxury apartment or condominium
Floor area 100 m² There must be one small parking lot
 - Medium joint apartment
Floor area 120 m² There must be one small parking lot
 - Normal joint apartment with the
Floor area 150 m² There must be one small parking lot
2. Commercial buildings include:
 - Restaurant, Drinking Palour and Entertainment club
Floor area 20 m² There must be one small parking lot
Dancing Floor area 1 m² There must be one small parking lot
 - Supermarket
Floor area 50 m² There must be one small parking lot
 - Market or sale shop
Floor area 50 m² There must be one small parking lot
 - Other commercial building
Floor area 50m² There must be one small parking lot
3. Industrial buildings include:
 - Factory building
Floor area 250 m² There must be one small parking lot
Floor area 1250 m² There must be one big parking lot
 - Private storage
Floor area 400 m² There must be one small parking lot
Floor area 2000 m² There must be one big parking lot
4. Academic, education and sport building includes:
 - Higher education institutions
Floor area 100 m² There must be one small parking lot
 - Secondary education institutions

- Floor area 200 m² There must be one small parking lot
 - Primary education institutions
 - Floor area 300 m² There must be one small parking lot
 - Sport Centers
 - Floor area 100 m² There must be one small parking lot
- 5. Health building includes:
 - Hospitals
 - Floor area 100 m² There must be one small parking lot
 - Exercises and health club
 - Floor area 120 m² There must be one small parking lot
- 6. Theaters, meeting and eventhalls, and cinemas include:
 - Theaters, cinemas, meeting and eventhalls
 - Floor area 30 m² There must be one small parking lot
 - Floor area 300 m² There must be one big parking lot
- 7. Hotels and guesthouses include:
 - Hotel
 - Numbers of room 5 There must be one small parking lot
 - Numbers of room 30 There must be one big parking lot
 - Guesthouses
 - Numbers of room 5 There must be one small parking lot
 - Numbers of room 30 There must be one big parking lot
- 8. Public and private office buildings include:
 - Private administration and office buildings
 - Floor area 100 m² There must be one small parking lot
- 9. Gas stations include:
 - Gas stations
 - Floor area 10 m² There must be one small parking lot
 - Floor area 100 m² There must be one big parking lot
- 10. Transport buildings include:
 - Transport building office
 - Floor area 100 m² There must be one small parking lot
 - Floor area 500 m² There must be one big parking lot
- 11. Other buildings include:
 - Other buildings
 - Floor area 10 m² There must be one small parking lot
 - Floor area 100 m² There must be one big parking lot.

The number of parking lot stated above are the minimum numbers required for development and construction in the Kingdom of Cambodia. In calculation, if the result decimal, the number of parking lots must determined by the even number, which is next larger value of the results.

In case of a multi-purpose building, the calculation of the parking lots shall be based on each function, combined together to obtain the total number of parking lots for the whole building.

Public and private parking lots must have parking space for disabled and vulnerable people.

Standards of parking lots for vehicles, parking lot sizes and technical aspects of the parking lots shall be determined by a Prakas of the Minister of Land Management, urbanization and construction.

Standards of parking lots for vehicles, parking lots sizes for public parking in Capital, towns and cities shall be determined by a joint Prakas between the Minister of the Ministry of Land Management, Urbanization and construction and the Minister of the Ministry of Transport and Public works.

License for any construction of any type on the construction above shall respect the regulations of the minimum numbers of parking lots of the Article 33.

3.1.3.9 Subdecree on Solid Waste Management in Urban Areas

Sub-decree No. 113 ANK.BK on Solid waste management in urban area was approved on the 27th August 2015. The purpose of this sub-decree is to effectively, transparency, and accountability improved the management of solid waste in urban area to ensure the beauty, the protection of public health and the environment.

Article 15: The owner of urban solid waste is carried out separate waste and packaging waste which can be reused or recycled separately from solid waste that is disposed of in accordance with the instructions of the Capital, town, district.

Article 16: The owner of urban solid waste shall responsible for packing in a bag or put in the private trash their personal urban solid waste, which has developed in a manner thoroughly not to leak or penetrate the lagoon or not to have stink emissions during the period of waiting for disclosure in accordance with the instructions of government of capital, towns, district.

Article 22: Administration of Capital City, town and district must establish public trash bins and shall arrange cleaning services, garbage collection and transportation of urban solid waste generated from trading along the streets and public places within its jurisdiction. Business owner or administrator of the service locations of company, enterprises, and entertainment center shall arrange trash bins in the area for solid waste disposal of its customers or employees.

Article 23: The owner or contractor for the demolition, renovation or construction of housing or buildings is responsible for solid waste from its working areas as follows:

- Proper storage, not cause harm to public order and the environment and
- Clear collect and transport by own self to the urban solid waste collection or by using service of cleaning, transportation and urban solid waste pitch service in the area and pay as determined by the capital, town, district administration.

Article 27: The exploitation of dredging, transportation and disposal of mud from the Basin shall be allowed from the Municipality of Phnom Penh, town, and district after receiving technical advice from the Provincial Department of Environment.

Article 28: The Ministry of Environment shall provide guideline on management techniques separately for hazardous waste generated from houses, institutions or public building, commercial centers and tourism services with discussion with the Under-National Administration.

List of hazardous wastes generated from houses, Institutions or public buildings, commercial centers and tourism services are set in the annex 2 of this sub-decree.

3.1.3.10 Subdecree on the management of drainage system and wastewater treatment system

Subdecree No. 235 on the management of drainage system and wastewater treatment system was signed by Samdech Hun Sen dated 25 December 2017. The purpose of this sub-decree is to improve the management of drainage system and wastewater treatment plant in effectiveness way, transparency and accountability in order to ensure that there are safety, public health and biodiversity conservation.

Standard Discharge of Wastewater from Business Building, Resident, City and Resort or Creation Center into Sewer System Connection to Wastewater Treatment Plant is included. The sub-decree also includes effluent standards which appear to be stricter than the sub-decree on Water Pollution Control sub-decree No 27.

3.1.3.11 Subdecree on the Establishment of Social and Environmental Funds

The Sub-Decree No. 238 was signed by Samdech Hun Sen dated 21 November 2016. Important articles concerning the project include:

Article 2: This sub-decree aims to identify, manage, use, and administer "Environmental and Social Fund" effectively, efficiently, transparently and accountably to restore the environment, protect the environment, conserve biodiversity and utilize natural resources sustainably and sustainably for the long-term benefits of all Cambodians and every generation in the Kingdom of Cambodia.

Article 5: The Environmental and Social Fund Committee has the following roles and duties:

- Identify policies and strategies to collect, manage, use Social and Environmental Funds;
- Urge project owners to pay environmental and social funds;
- Take administrative and legal measures to collect environmental and social funds from project owners in environmental management plan, environmental impact assessment report, and environmental protection contract;
- Coordinate with government, ministries, donors, private sector and charitable organizations to mobilize environmental and social funds;
- Review and decide on the fund's expenditure plan for environmental rehabilitation, environmental protection, conservation of biodiversity and sustainable use of natural resources, and sustainable livelihoods;
- Manage, use and distribute funds received from private and public development projects;
- Review the request for the use of environmental and social funds to serve the environment;
- Monitoring and evaluating the implementation of applied environmental and social funds;
- Provide technical guidance on management and use of environmental and social funds for environmental projects;
- Report quarterly financial and progress reports to the Ministry of Economy and Finance; and
- To carry out other tasks assigned by the Royal Government.

Article 8: Environmental and social funds are sourced from:

- Premium from the owners of the private and public development projects contained in the Environmental Management Plan of the Environmental Impact Assessment Report and the Environmental Contract;
- Income from environmental protection, ecosystem services and biodiversity conservation;
- Donation or funding of equipment, materials, donations from donors, development partners, national or international organizations; and
- Fees other than the environment and other sources.

Article 10: Environmental and Social Funds are used in the following activities:

- Environmental protection, conservation of forests, biodiversity and sustainable ecosystems and sustainable livelihoods;
- Environmental assessment and improvement of biodiversity and ecosystem services throughout the Kingdom of Cambodia;
- Develop infrastructure and improve the living conditions of people living in and near development areas or other areas;
- Scientific research, biodiversity and ecosystem research;
- Scientific and technical research on the environment
- Promoting the environment;
- Support for community-based nature protection programs and communities serving the environment;
- Human resource training for the environment and natural resources; and
- Publication on the protected areas.

3.1.4 Ministrial Order/Prakas

3.1.4.1 Prakas on General Guidelines on Reporting of IESIA and ESIA

This Prakas was signed by the Environment Minister on September 02, 2009. Some concerned articles with the project include:

Article 2: Project owners are private individuals, private companies or joint venture companies, state ministries/institutions must prepare an IESIA or ESIA report on the proposed project, as well as existing and ongoing activities as stated in Annex I of Decree No. 72 ANKBK dated 11 August 1999 on the Environmental Impact Assessment Process for submitting to the MOE for review and comment except for projects that are particularly urgent and necessary, decided by the government.

Article 4: The owner of the project as stated in Article 2 and 3 above can use the services of the consulting company which is directly responsible for preparing the IESIA or ESIA report with respect to the general guidelines.

Article 6: The consulting company as stated in Article 4 must have adequate professional qualifications and ability in the preparation of the IESIA or ESIA report which was registered at the Ministry of Commerce and approved by the MoE.

3.1.4.2 Prakas of Inter-Ministries on Waste and Solid waste management

Prakas N.80 BK.MP-BSt. on solid waste management in the provinces-cities of the Kingdom of Cambodia, was put into operation on 25 February 2003. The key clause related to the project include:

Clause 1: The declaration aims to promote the responsible authorities and the relevant competent authorities in implementing effective measures to manage solid waste in the provinces-municipalities in the country under its management to ensure the protection of public health, aesthetic, quality of the environment and biodiversity.

Clause 2: This post is applicable to all activities including collecting, clearing, temporary storage, transportation, processing, disposable of all types of solid waste in the provinces-municipalities of the Kingdom of Cambodia.

Clause 4: Disposal or dumping of solid waste littering along the streets, public area, towns, markets, entertainment area, tourist centers, resorts, sacred places, paddy plantation, protected area, mountainous area, beaches, river bank, water sources, navigation route, Agricultural Drainage, sewage drainage systems are strictly prohibited.

Clause 5: The local authorities are responsible and take the necessary measures to prevent and stop the dumping of solid waste scattered everywhere under its management, as stated in Clause 4 above.

Clause 6: The local authorities are responsible and should implement the collection, temporary storage, transportation and disposal of solid waste in the premises the following ways:

- a) preparing an introduction to keeping and take out of solid waste for temporary storage and collection;
- b) define an appropriate program to collect and gather all the waste regularly; and
- c) controlling the solid waste transportation to avoid littering the streets that lead to affection of the circulation and beauty of the municipalities.

Clause 7: Solid waste collected from the sources as stated in Article 6 above is to dispose in the pit or landfill as defined by the competent authority or local authorities. Disposal of solid waste in the vicinity of any land or private property for any purpose is strictly prohibited.

3.1.4.3 Prakas of Inter-Ministries on Tax Rates of Mineral Prices and Procedures of Tax Declaration

Inter-ministerial Prakas No. 284 on Tax Rates of Mineral Prices and Procedures of Tax Declaration was signed on March 13, 2015. This Prakas aims at providing a reference for either local investor or international investor to duly pay tax rates of mineral prices and to clearly know of procedures of tax declaration.

3.1.4.4 Prakas of Inter-Ministries on Basic Price Determination of Natural Resources for Restoration

Inter-ministerial Prakas No. 410 on Basic Price Determination of Natural Resources for Restoration was signed on August 18, 2017. This Prakas aims to set Basic Price Determination of Natural Resources for Restoration. It needs to be implemented for law enforcement and to prevent and crack down natural resources illegal activities.

3.1.4.5 Prakas on Sanitation at Construction Site

This Prakas was signed by the Minister of the Ministry of Labour and Vocational Training on 30 March 2011. Some concerned articles with the project include:

Article 3: Toilets and bathrooms at construction sites, Employers are obliged to:

- Ensure all workers working at the construction sites have toilets and suitable bathrooms adjacent to the sites
- Provide sufficient drinking water at the construction sites for workers' consumption such as washing their hands before eating etc.

Article 4: construction site or mobile construction site, the employers must provide:

- Drinks with adequate hygiene
- Sufficient clean water for daily needs
- A suitable accommodation that can at least protect rain or strongly direct sunlight
- Proper toilets and bathrooms.

Article 5: The construction site of a large number of enterprises: In case of the construction site is intervened by a large enterprise or a large number of employers, the employers may discuss joint measures to address the requirements of Articles 3 and 4 above, with a clear written agreement on:

- Water supply manager, toilet toilets and
- The person responsible for checking the supply above is correct.

Article 6: In case of no agreement: In the case that the employer does not have the agreement as stated above in Article 5, the employers of each section must comply with Articles 3 and 4 of this Prakas respectively.

3.1.4.6 Prakas on Providing Information at Construction Site

This Prakas was signed by the Minister of the Ministry of Labour and Vocational Training on 30 March 2011. Some concerned articles with the project include:

Article 3: Announcement about the construction site

After receiving the Construction Permit from the Ministry of Land Management, Urban Planning and Construction, the following employers shall make announcements of construction sites to the Ministry of Labor and Vocational Training for at least 15 (fifteen) days prior to the opening of the first construction site. These employers are as follows:

- 1) Employers employing more than eight workers and working at construction site, living building with an area of 120 square meters and height of up to 07 meters up from the highest point coming down.
- 2) Employees who employ 8 or more workers for all construction sites which are not living buildings.

Article 4: Contents of announcement about the construction site

In the contents, employers must:

- 1) show:
 - Address of the construction site;
 - The name and address of the enterprise owner, the construction company or the construction company and the trademark if the enterprise owner is a legal entity;
 - Name and address of the architect;
 - Types of works to be constructed: roads, railroads, bridges, dams, canals, buildings industry or commercial constructions, etc.;
 - The start date of the first and the approximate length of the construction;
 - The number of approximate workers will be used during construction; and
 - Types of works that may have subsequent contractors, even if the contractor is alone.

- 2) Report on:
 - Works and activities to be consecutively implemented; and
 - Means to be used in construction site (machineries etc.)
- 3) notice the risks to be occurred and proposed preventing measures.
- 4) prove that all employees are easily access to bathrooms, toilets and others.

3.1.4.7 Prakas on Materials Storage, Disposal and Construction Site Cleanliness

This Prakas was signed by the Minister of the Ministry of Labour and Vocational Training on 30 March 2011. Some concerned articles with the project include:

Article 3: Orderliness and cleanliness

At construction site, the employer must keep clean the construction site as follows:

- Working site should not be confined with petroleum, oils, or other substances that can lead to harm to workers by slipping;
- Working site should not be disturbed because of other construction materials, wastes, especially, do not dispose of nuts with sharp nails;
- Debris or wastes should be stored safely before being disposed of every day, if necessary, pre-soaking, avoiding dust on the ground; and
- Liquid waste, wipes, oils, or flammable liquids should be properly stored in places that do not cause fire.

Article 4: Storage of construction materials and equipment

At construction site, the employer shall arrange storage of construction materials and work equipment as follows:

- 1) Storage of construction materials and equipment:
 - Should not be storage over weight;
 - Should be Less than 3 meters from the high edges, which can lead to damage by accident, except for proper protection;
 - In the sphere of bridging tower is at least 2 meters away; and
 - Should not become piles that can harm workers
- 2) Any object that may fall, roll, or spill, it is necessary to take precautions and take measures that will not harm the workers
- 3) Bag piles are arranged in alternate layers so as to prevent slippage and fall down on workers.
- 4) Brick piles do not be higher than human height
- 5) Hazardous materials must be handled in accordance with the appropriate technique. Work materials and other construction materials must be kept orderly and precise without interference with works travel of workers or internal traffic of the site.

Article 5: At construction sites, employers must be cautiously guarded, thus preventing objects from falling down on workers or guests. At the highest place of construction site much be clean regularly so as to prevent debris, trash that can be hazardous by falling objects.

3.1.4.8 Prakas on the Protection of Risk by Climate Change at Construction Site

This Prakas was signed by the Minister of the Ministry of Labour and Vocational Training on 30 March 2011. Some concerned articles with the project include:

Article 3: Work implementation at the construction site where workers can not shade Employers shall allow workers to rest from 11:30 to 13:00 on each working day. In the event

of a sudden and unexpected emergency, the employer may suspend the holiday as stated in the above paragraph, occasionally, by the employer, recording a written record, for inspection by the Labor Inspector or Labor Inspector regarding the suspension of such leave.

Article 4: Works at the field when heavy rains or strong winds, Workers must have a break during heavy rains or strong winds, especially for the following tasks:

- excavating, filling, clearing land;
- Produce formworks;
- Lift materials, and
- Works implementation at the roof or the site existing in fall protection system.

Article 5: In case of exceptional urgency, the employer may suspend the worker's leave as stated in these 4 items in the event of an unusual emergency with reasonable cause:

- Completion of work at the end of the hour with no more than an hour and
- Completion of concrete work with no more than one hour

In the case of a vacation break as stated in paragraph 1 above, the employer shall record the written reasons for the inspection by the Labor Inspector or Labor Inspector of the suspension of such leave.

Article 6: Installment of crawler crane: When installing a large bridging tower of a construction site, the employer must communicate with the meteorological department for accurate information on wind speeds, avoiding the risk of weight lifting or the process of a large spin.

3.1.4.9 Prakas on the training of hygiene and security techniques for workers, staff and unions

This Prakas was signed by the Minister of the Ministry of Labour and Vocational Training on 19 June 2013. Some related articles with the project include:

Article 1: Objective

The purpose of this Prakas is to encourage all employees of enterprises and institutions to provide health and safety information to workers before they can work.

Article 3: Scope

Employers of enterprises as stated in Article 1 of the Labor Law have an obligation to educate workers and their representatives on sanitation, occupational safety, and health issues related to the work of each position.

Article 4: Employers' Obligations

Employers of enterprises and establishments must provide training to workers and representatives of possible risks in enterprises and establishments and effective preventive measures.

Article 5: General Training Program

All the tutorial materials are compiled and reviewed every year. These files are outlined in detail by the following:

- Physical risk
- Chemical risk
- Biological Risk
- Risks related to the use of machinery
- Risk of weight lifting by the machine

- Risks related to vehicle traffic in enterprise or establishment
- Electrical Risk
- Fire risk or explosion
- Risk of falling from highs
- Risk of weight lifting by labor
- Risk of employment alone
- Risk of job fatigue
- Risk of night work
- Hygiene, nutrition
- Risk of working behaviors
- Building security and gateway
- Emotional stress by job (job stress)
- and other necessary risks.

Article 6: Education and Training Program

The employer must ensure that hygiene, work, health and safety technology work for each worker. This education is beneficial and is very clear to the practice of each worker's office. Employers must explain to the workers to understand:

- Potential risk at their work
- Effective protection measures and clear protection tools available
- Behavioral and behavioral gestures in times of emergency.

Employers must educate workers and their representatives when:

- First working
- Change job position
- Changing mechanical engineering, adding chemical equipments
- Switch chain production
- Workers have long holidays (more than one month).

This training is done by the actual technician and done during working hours, and the trainees are paid the normal wage.

3.1.4.10 Circular On Development of Cambodia Coastal Areas

Coast of Kingdom of Cambodia was included as a member of the most beautiful bay in the world club, on May 25-26, 2011 at Tambacounda, Republic of Senegal, by the most beautiful bay in the world club since it has variety of biological diversity, luxury of natural environment, value of ecology, socio-economic, culture and tradition of the areas as well as the attractive tourism. The improvement of economy, tourism and the population growth in the coastal areas as well as in the whole Kingdom of Cambodia requires the appropriate physical development in order to meet the actual needs. In this regards, Royal Government of Cambodia possesses management and development plan of the coast accurately with effectiveness and sustainability in order to avoid and prevent the impacts of the development of tourism, social-economic, culture and tradition of the coastal areas.

Royal Government of Cambodia issued this circular in order to instruct to the ministries, relevant institutions and sub-national level to implement the principle of the management, consumption, maintenance, protection and development of coastal areas in the Kingdom of Cambodia which consist of land domain, islands, and water as below:

1. Coast

Coast shall be determined from the highest of high tide line of the sea up to the line prohibiting the tenure or other construction in stone or sand which is determined as area for public use and is classified as the state public land. The size of the coast shall be determined as below:

- Inclined beach shall be determined at least 30 (thirty) meters off the highest of high tide line to mainland.
- Steep beach shall be determined at least 20 (twenty) meters off the top of steep beach to mainland.

In case that the actual situation of the inclined beach may not be determined as above-mentioned size; the size of the coast must be invented or expanded in order to create the coast for visit and entertainment if possible.

The appropriate number of umbrellas, chairs, and small tables, which are movable and for relaxation, are allowed to put on the beach, and the huts shall be organized for watchmen by providing materials and necessary instruments as requires in order to monitor and safeguard for the public and tourists.

2. Coastal Reserved Land and Consumption

The coastal reserved land is generally use for green garden and network scenery or for plant growth to identify the border of the coasts and coastal reserved land adjacent to the public roads located in the direction to mainland.

2.1.Coastal Reserved Land

The coastal reserved land is the land that is from the upper coastal line to the mainland. The coastal reserved land is public state land, except it is legally occupied. Length or size of the coastal reserved land shall be determined as below:

- Width of coastal reserved land shall be determined at least 50 (fifty) meters off the upper costal line to the mainland.
- In case, along the coasts, there is the existence of public road already, the coastal reserved land can be determined with this public road.

2.2.Consumption of the Coastal Reserved Land

The consumption of coastal reserved land obtains special condition varied from one another based on the situation of each location:

- 1) Coastal reserved land which has numerous people living on and charaterized as urban area or has the activities of tourism; the consumption shall be determined as below:
 - may allow the construction of the small stores to serve the tourist service in between the trees, which each small store is from one another at least 15 (fifteen) meters in order to ease the public and tourists' travelling and maintian the sigh towards the sea. These small stores' constrution shall be organized properly in accordance with technical standards and maintainance the clear entrance and exit in order to get rid of the impact on the garden and green scenery.
 - may allow to have any constructions of the symbolic such as statues or public art.
 - may allow to have the parking lots for all kind of tourist vechicles to park in the surrounding area of the coastal reserved land which shall not have any impacts on gardens and green scenery.

- may allow to build public toilets, which are good, with appropriate number in order to serve the public and tourists by located them at the appropriate place and does not affect to the area's view.
- cannot allow to have commercial ports construction except the existing ports and the locations that has greatly potential and necessary to build such ports there.
- cannot allow to have firm buildings on the coastal reserved land except that constructions are built in the purpose of serving for public and tourism such as:
 - The entrances or bridges for connecting to the ports which have tourist boats or small-machine boats for tourists or public use. These ports shall have appropriate location and shall not disturb activities of passing the coast.
 - Museum of biological diversity, maritime plants, aquariums where located in front of the building can be allowed the tourists or public to pass
 - Other locations that the government permits.

2) The coastal reserved lands located in the areas which do not have many people living on and is not the urban area, the consumption shall be determined as below:

- may allow to build the commercial or fishing ports. For the existing ports shall be organized for hygiene and environmental management, especially the solid and liquid waste. In necessary case shall study on the environmental impacts and the appropriateness of the location in order to ensure the security, confortation and minimization other risks.
- may allow to organize as water tourism sites, tourism ports, or new entertainment areas consisting of the hygiene and environmental management, especially the solid and liquid waste in accordance with the technical standards in order to protect the water resources, ecological system and biological diversity.
- may allow to organize as tourist village in the new or existing villages based on the actual situation and potentiality of each location.
- shall study on the location and evaluation on the environmental impacts properly in accordance with technical standards of any proposals request to develop the constructions such as factory construction, industry, workshop, other stations, etc. which may restrict the air pollution to emit into the atmosphere as well as noise pollution which produce the serious disturbance to the neighbouring areas.
- may allow to have the development or other constructions in accordance with the Royal Government's policies.

3. Public Roads along with the Coastal Reserved Land

Public roads along with the coastal reserved land is the roads which are constructed next to the outside line of the coastal reserved land which divide the coastal reserved land into subordinate area. This road is the barrier to prevent the violation occupied the coastal reserved land.

In case that there is no public road, the ministries, institutions and sub-national level which have relevant authority shall commence the organization of road construction plans and submit it to the Ministry of Land Management, Urban Planning, and Construction in order to examine on the appropriateness compliance with the policy and technical standards of land management and urbanization in order to maintain, protect, and boost the landscape in the coastal area. This road shall have the reserved land with the size of at least 15 (fifteen) meters from both sides of the road axis.

4. Subordinate Area along the Public Road

The subordinate area is the block located between public road along with the coasts and along another road line which located in the direction to the mainland.

The development and other constructions in this area shall be complied with the Land-use Master Plan and Land-use planning and applicable regulations. For the areas which do not have Land-use Master Plan and Land-use planning, the Ministry of Land Management, Urban Planning and Construction shall determine the detail instruction for implementation.

In order to promote the view of natural environment and construction, the development of the buildings in the subordinate area shall be complied with the policy as below:

- Shall have low index for all kind of buildings as stipulated in the provision of urbanization
- Shall organize to have garden, growing grass, and plants and have sidewalk on the reserved land in accordance with the technical standards
- Shall organize as public space, garden, entertainment garden or public park in order to promote the view of the coasts.
- Shall obtain prior permission letter from competent authorities for all installation of commercial signs.

5. Public Road, Sidewalk, and Garden or Green Network directed to the Beach

Public road, sidewalk, and garden or green network directed to the beach which connects to interface of the road next to the coastal reserved land shall:

- remain both sides of the pavement at least 6 (six) meters for public road in subordinate areas in order to organize the garden, growing grass, plants as well as all sidewalk in compliance with the technical standards.
- organized to have garden, grass field, and land for growing plants in order to create green network connected to the coastal reserved land; for the land surface or public space which located next to the existing or new public road to promote the landscape of the environment and on purpose of opening the marine breeze side.

6. Firth, River, Canal, Water Line connected to the Sea

Firth is the water surface which connected to the sea surface. The size of the firth shall be determined on of the highest line of high tide. The size of the reserved land of the firth shall be determined for at least 30 (thirty) meters from the highest line of the high tide.

River, canal, and water way of which the ship or raft can pass and float is fresh water surface which connected to the sea water. The size of the width of river, canal, water line of which ship or raft can pass and float shall be determined on the line of the highest water level for both sides during rainy season, except the unusual flood. The size of the reserved land of the river, canal, and water line which ship or raft can pass and float shall be determined for at least 20 (twenty) meters from the line of the highest water level in the rainy season.

Public roads along the reserved land of the firth, river, canal, and water line, of which the ship or raft can pass and float, is the road that is built next to the outside line of the reserved land of the firth, river, canal, and water line, of which the ship or raft can pass, is divided into the reserved land of firth, river, canal, and water way, of which ship or raft can pass and float within the satellite area. This road is the shield preventing any violation occupied of the reserved land of the sea firth, river, canal, and water way of which the ship or raft can pass and float.

In case that there is no public roads as mentioned above, Ministries, institutions, and administration under national level shall commence and organize the project to build such roads and submit to Ministry of Land management, Urban Planning, and Construction to examine the compliance with the policies and technical standard of land management and urbanization on purpose of maintainance, protection and improvement the view of the environment along the coasts. This road shall have the reserved land for at least 10 (ten) meters both sides from the road axis.

A long the public roads shall be prepared to have gardens, grass fields and area for growing plants in order to create green sytem to promote the beauty and environment. The development as other building constructions next to the public roads, shall have low index the same as subordinate area along with the road next to the coastal reserved land.

7. Island

Island is the land which is surrounded by the sea water. The border of the island in the sea shall be determined by the maximum of high tide line. The size of island can be small or big variety differently which can be used for other purposes except there are specified determination. Island is subject for living and developing in accordance with the policies of development socio-economic, national defense and tourism.

7.1 The Use and Development of Island for Living Purpose

Except, there is prohibition by laws, some islands may be allowed to use temporarily and irregularly based on the actual contract. The development of the island is subject to be complianced with land consumption master plan, land consumption planning as well as applicable regulations or development plans which government or competent Ministries, institutions permitted.

For the islands that are allowed to use in this purpose which have no Land-use Master Plan and Land-use planning, the Ministry of Land Management, Urban Planning, and Construction shall organize detail directions for the implementation in accordance with the real situation and the following principles:

- Maintain and protect the existing natural resources and forest with a minimum of 60% (sixty per cent)
- Have low index which the ratio of the surface of the bottom building is lower than 35% (thirty five per cent, and the remaining land shall use for tree planting and gardening for a minimum of 50% (fifty per cent).
- Build Khmer-architecture construction
- Organize the maximum amount of public spaces and tourist sites to promote the visit of the public and tourists.
- Prepare small-size ports or tourist ports that allow the entry and return of the public or tourists.
- Prepare the tourist sites in case of having the beach and build public road nearby the beach based on the situation of the islands. Ministries, institutions, and the relevant authorities shall initiate the road building plan and submit to the Ministry of

Land Management, Urban Planning, and Construction to examine the appropriateness upon the policy and technical standards of land management and urban planning. The public road shall have appropriate size in accordance with technical standards and the needs for long-term use

- Prepare the management of solid and liquid waste in accordance with the technical standards to avoid the harm to the environment
- Maintain, protect, recycle, and use the maritime resources, ecological system, and all kinds of biological diversity such as coral, fish, and other maritime plants around the island for tourism purpose.

7.2 The Development and Construction on the Islands for Non-living Purposes

The Royal Government of Cambodia may directly develop the islands or cooperate with private sector or authorize the private to develop the islands in accordance with the policies of the royal government. Upon the approval from the Royal Government, the authorized person shall prepare the physical island development plan and submit to the Ministry of Land Management, Urban Planning, and Construction to examine the appropriateness in accordance with the policies and techniques on land management, urban planning, and construction. Such development shall follow the following principles:

- Have low or medium index
- Maintain and protect the existing natural resources and forest with a minimum of 60% (sixty per cent)
- Build Khmer-architecture construction
- Prepare physical development plan that indicate the use of public land, garden, park, green system, infrastructures such as public roads, roads for pedestrian, sewage system, water-purification system in accordance with technical standards and the geography.
- Prepare small-size ports or tourist ports that allow the entry and return of the public or tourists based on the real situation and appropriate locations
- Prepare the management of solid and liquid waste in accordance with the technical standards to avoid the dumping and the drain of toxic water into the sea before the purification.
- Maintain, protect, recycle, and use the maritime resources, ecological system, and all kinds of biological diversity such as coral, fish, and other maritime plants around the island for tourism purpose

7.3 For the purpose of sea scenery promotion, the originality of any islands which are not favorable to use or serve as other development purposes shall be preserved.

8. Water Territory/ Sea Domain

The water surface refers to the upper and inside water surface. Inside the water, there are maritime resources, ecological system, and all kinds of biological diversity.

The water surface which has maritime resources, ecological system, and biological diversity such as coral, variety of fishes, and maritime plants, shall be managed, protected, preserved, and developed appropriately, effectively, and sustainably.

For the safety of the tourists and biological diversity, all types of boats or tourist ships such as boat machine, Canoe Machine, or Water Motor are allowed only in the permitted premise.

The development of tourist port or floating tourist sites and inside the water shall be under the approval from National Committee on Coastal Area Management and

Development in examining the appropriateness of location in accordance with the policies and technical standards on land management and urban planning.

The fishing in areas of maritime resources, ecological system, and biological diversity shall be prohibited except the fishing using family-fishing tools for tourism purpose.

The sand pumping and other constructions in the internal water such as Sea-research Terminal or Mining-seeking Terminal shall have the approval from the Royal Government of Cambodia.

All construction locations on the water shall leave the navigation ways for the entry and return into the ports.

3.1.5 National Policy and National Strategic Plan

3.1.5.1 National Strategic Plan on Green Growth

National Strategic Plan on Green Growth 2013-2030 was approved from the Council of Minister in the plenary session on 01 March 2013, the vision is envisaged to develop sustainable economy together with environmental, Social and Cultural sustainability for poverty alleviation.

The National Strategic Plan aims at green growth, ensuring politic stability and macroeconomic stability to reach a status of a developed country. It also aims to promote a national economy with growth stability, reduction and prevention of environmental pollution, safe ecosystem, poverty reduction, and promotion of public health service, educational quality, natural resources management, and sustainable land use and water resources management to increase energy efficiency, ensuring food and glorify the national culture.

Blue economy development with sustainability is one of the 9 strategic directions.

Development at the sea is an important part to foster a national economy through commercial activities, water course transportation, sea port construction, ecotourism at the island, coastal tourism attraction, exploration and extraction of fuel fossils and gas mines, fishing and other development posing no pollution to the environment of the sea.

The blue economy development with sustainability shall have the following strategies:

a) Blue Economy Management and Development

- Coordinating with relevant national and international institutions to strengthen blue economy development in balance with environment and society at the marine areas.
- Managing natural resources of the sea, coastline areas and marine ecosystem for safety, and sustainability by continuing to strengthen management and conservation of wetland and watersheds, coastline, and the protected areas at the sea.
- Conserving and using marine natural resources with sustainability to help reduce poverty of the people, stabilize economy growth, food security and sustainable livelihoods. Therefore, the Royal Government of Cambodia has to protect and restore marine environment and marine ecosystem for national socio-economic benefits.
- Studying and assessing any impacts on marine natural resources, caused by development projects.
- Managing marine pollution, including management of waste disposal, plastic disposal, organic pollutants, heavy metals and liquid waste discharge to protect marine health, and marine biodiversity.

b) Monitoring on marine pollutants

- Promoting observation and inspection on quality of sea water with acid substance to protect a marine ecosystem easily exposed to vulnerability, and the community fisheries, living on these resources.
- Supporting and encouraging scientists to conduct researches on marine pollutants and preserve quality of sea water
- Identifying factors causing impacts and reducing the impacts on economy, society, environment, and culture, especially on the people living on the islands, due to over-fishing and fishery exploitation, and pollution to biodiversity, coral species and mangroves.

c) Ensuring marine food security

- Increasing yield of fish stock to a maximum and marine aquaculture to support sufficient food supply in order to address green growth goals in the short term.
- Identifying strategies in capacity building for conservation and sustainable environment management for the benefits of the people as fishmongers.

d) Reducing greenhouse gas emission and climate change adaptation

- Studying, researching and conducting analysis of climate change leading to sea level rise and coastal soil erosion, serve threats to marine areas and islands, especially people living in the islands, who will encounter challenges. Therefore, it is important to learn about disasters arising from climate change and marine pollutants.
- Enhancing the use of renewable energy, such as energy produced by wind force and sea wave, and reducing carbon low emission in the blue economy development.
- Preparing beforehand for prevention and protection against disasters at the sea, equip tooos and provide timely information on natural disasters and other disasters to the islands inhabitants, traders, and other businesspersons at the sea through techniques for climate change adaptation.

3.1.5.2 Rectangular Strategy III

The “**Rectangular Strategy**” maintains its overall early structure in Phase III. However, the Royal Government has revised the order of priorities, changed the formulation of some sides of the rectangles of the strategy and included new priorities. It has also refined and sharpened measures in response to Cambodia’s specific needs and emerging contexts as described earlier and stated in the “**Political Platform of the Royal Government of the Fifth Legislature**”. The revised order of existing priorities and added new priorities are also aimed to promote development through strengthening of links and interactions between the four elements of the central theme which underlies the objectives of the strategy—viz. **Growth, Employment, Equity and Efficiency**—a system of equations that summarizes the Royal Government’s determination for enhancing the welfare of people.

The Four Strategic Rectangles are 1) Promotion of Agriculture Sector, 2) The Development of Physical Infrastructure, 3) Private Sector Development and Employment, and 4) Capacity Building and Human Resource Development.

Infrastructure development and modernization is a key factor for supporting economic growth, enhancing economic efficiency as well as strengthening competitiveness and promoting Cambodia’s economic diversification, especially for reducing poverty incidence. To respond to the demands of the next higher stage in the long term development of the

country, the Royal Government will draft a master plan for achieving comprehensive connectivity by addressing both hard and soft aspects of the transport, electricity and information technology and telecommunication sectors, in addition to further development of irrigation system and clean water supply sectors. Alongside, the Royal Government will be more attentive to the development of urban infrastructure. All these initiatives will be undertaken consistent with the framework of land management and urban planning.

The strategic objective of the Royal Government of the Fourth Legislature was to continue the rehabilitation and development of transport infrastructure, including further construction and maintenance of roads, expansion of port capacity, restoration and development of railroads, expansion of airport services and strengthening of flight safety and traffic safety. The Royal Government accomplished good progress in the rehabilitation and development of transport infrastructure for enhancing domestic integration and regional connectivity. As of 2012, approximately 4,350 km out of the total length of 5,616 km of the national road network and 1,100 Km out of the total length of 6,640 Km of provincial roads were rehabilitated and improved with bituminous asphalt pavement. In parallel, the Royal Government placed high priority on the maintenance and construction of rural roads as well as border belt roads in order to serve the needs of the population, promote economic development and help safeguard territorial integrity. Furthermore, the Royal Government has improved infrastructure and enhanced the services of airports and ports.

However, Cambodia continues to face a number of challenges in transport infrastructure development such as high transportation costs compared with neighboring countries and other challenges related to linkage of various transportation modes in the country, road repair and maintenance, overloaded freight trucks, traffic safety and traffic jams and coordination between sector institutions.

To respond to the needs of the next higher stage of development, the objective of Royal Government of the Fifth Legislature is to promote further development of all modes of transport infrastructure as well as urban infrastructure supported with a vibrant, safe and efficient logistics system aimed at contributing to the enhancement of national competitiveness and people's welfare.

In pursuance of this objective, the Royal Government will place priority on:

1. Stepping up the construction of national, provincial and rural roads, particularly by targeting the paving of 300 – 400 Km of additional roads per year with asphalt or concrete pavement.
2. Directing more attention to the repair and maintenance of the transport system, particularly roads through the strengthening of mechanisms and enhancement of road repair and maintenance system, including effective and strict enforcement of punitive measures against overloading.
3. Further focusing on traffic safety through the improvement and stricter enforcement of the “**Law on Land Traffic**”, including the strict enforcement of measures against traffic violation, strengthening vehicle safety inspection and the system for issuance of vehicle roadworthiness certificates, the mechanism for issuing driving licenses, installation of traffic signs, facilitation of traffic flow, professional ethics and competence of law enforcement officers, as well as promotion of public awareness and dissemination of information on traffic safety in accordance with the slogan: “**Today, Tomorrow: No Traffic Accident!**”.
4. Designing and implementing the Master Plan for Transport Infrastructure Development to connect all parts of the country and with the neighboring countries through developing multi-modal and cross border transport systems along with an

efficient and competitive logistics system aimed at promoting investment, trade, tourism and rural development, with focus on the completion of railroad restoration and development, further development of airport and seaport infrastructure, assessment of the potential for investment in inland waterway transport as well as finding alternatives to monopolistic transport services and intensified implementation of various cross-border agreements and protocols signed by Cambodia.

5. Preparing necessary policies and legal framework for the management and development of infrastructure, such as the Law on Roads and related regulations addressing road standards and quality, Law on Ports and the Law on Road Transport to facilitate the implementation of Master Plan for Transport Infrastructure Development.
6. Preparing a Master Plan for Urban Infrastructure Development, in particular public transport in urban areas and connectivity of production centers on the outskirts of municipalities, main economic poles, industrial zones and special economic zones to reduce traffic congestion, improve national economic efficiency and competitiveness, as well as enhance welfare of people and ensure environmental sustainability through consistency with the framework of land management and urban planning including National Policy on Housing, laws related to land management, urbanization and construction, National Strategy on Development of Municipal and Urban Areas, installation of solid and liquid waste management system as well as fire prevention and firefighting system.
7. Further encouraging participation of the private sector in the development of transportation infrastructure by strengthening and improving the “**public-private partnership**” mechanism through the introduction of policy on the promotion of public-private partnership in Cambodia in order to attract and facilitate the implementation of infrastructure projects financed by the private sector.

3.1.6 Process of IESIA and ESIA in Cambodia

The EIA Process was promulgated requiring an IESIA/ESIA for projects listed in the subdecree annex “List of the projects that require an Initial Environmental and Social Impact Assessment” to be submitted by public or private project owners to the MoE for review. This means that under the sub-decree, the MoE is responsible for review of IESIA/ESIA and to collaborate with the line ministries. The MoE has the authority to approve or reject a project. The Council for the Development of Cambodia has overall jurisdiction over projects and also has the power to comment and require amendments or additions to IESIA/ESIA. The MoE has further responsibility in the monitoring of project implementation. The MoE implements these responsibilities through its EIA Department. Besides the MoE, other ministries with responsibility for projects have the right to examine and approve projects, following MoE review. Provincial and urban authorities with responsibility for projects are required to ensure that Project Owners prepare IESIA/ESIA and submit it to the Provincial Environment Office.

The procedures are conducted in 4 stages for the MoE and 3 stages for Provincial/municipal Department of Environment. MoE’s 4 stages is as follows:

- 1) Technical officials of the EIA Department inspect the project location, department level meeting and provide comments for IESIA/ESIA within 15 days;
- 2) Inter-Ministrial leveling meeting and provide comments for IESIA/ESIA report within 5 days;

- 3) MoE's leaders meeting and provide comments for IESIA/ESIA report within 5 days; and
- 4) The EIA Department compiles comments for incorporating into IESIA/ESIA report within 5 days.

3.2 INTERNATIONAL CONVENTION AND PROTOCOL

3.2.1 International Convention on Climate Change and Kyoto Protocol

The Convention Climate Change was adopted on 9th May 1992. As of 19th April 2005, 149 states and regional economic integration organizations have deposited instruments of ratifications, accessions, approvals or acceptances. The Kyoto Protocol is now an international and legally binding agreement to reduce greenhouse gases emissions world wide following ratification by Russia on November 18, 2004.

The ultimate objective of the Convention is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (man-made) interference with the climate system. Such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

3.2.2 Convention on Biodiversity

The Convention on Biological Diversity, signed in 1992, is the first global agreement on the conservation and sustainable use of biological diversity. The Convention has three main goals:

- Convention of Diversity;
- Sustainable use of the components of biodiversity; and
- Sharing the benefits arising from the commercial and other utilization of genetic resources in a fair and equitable way.

The agreement covers all ecosystems, species, and genetics resources. The Convention is legally binding; countries that join it are obliged to implement its provisions. The Convention deals with many issues, including impacts assessment. The following outlines the issues most relevant to Sihanoukville Port Urgent Development for Oil Supply Base & Multipurpose Terminal project. Cambodia as signatory to the Convention, shall as far as possible and appropriate:

- Regulate or manage biological resources were important for the conservation of biological diversity whether within or outside protection areas with a view to ensure their conservation and sustainable use;
- Promote the protection of ecosystem, natural habitats and the maintenance of viable population of species in natural surroundings;
- Endeavour to provide the conditions needed for compatibility between present uses and the conservation of biological diversity and sustainable use of its components;
- Where a significant adverse effect on biological diversity has been determined pursuant to Articles 7, regulate and manage the relevant processes and categories of activities;
- Encourage cooperation between its governmental authorities and its private sector in developing methods for sustainable use of biological resources; and

- Promote participation of stakeholder, particularly when it comes to assessing the environmental impacts of development projects that threaten biological diversity.

3.2.3 International Environmental Agreements

Cambodia is party to the following international environmental agreements relevant to the Project: (i) UNESCO World Heritage Convention, 1991; (ii) Convention on Biodiversity, 1995; (iii) UN Framework Convention on Climate Change, 1995; (iv) Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1997; (v) Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat, 1999; (vi) Basel Convention on the Control of Transboundary Movements of the Hazardous Wastes and Their Disposal, 2001; (vii) Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol on Substances that Deplete the Ozone Layer, 2001, and all Amendments, 2007; (viii) Climate Change Kyoto Protocol, 2002; and (ix) International Tropical Timber Agreement, 2006.

3.2.4 Montreal Protocol on Ozone Destruction Substances

The Convention Protocol, 1989, on Substances that Depletes the Ozone Layer is designed to reduce ozone-depleting substances (ODSs). Signatory parties agree to:

- Control annual consumption and production of specified ODSs;
- Reduce Depletes e consumption and production of specified ODSs by 50 % from July 1998. Countries with consumption of ODSs under 0.3 kg/capita/yr are permitted an extra 10 years to phase out their use (consumption of ODSs in Thailand in 1991 was 0.19 kg/capita/yr).

Common ozone-depleting substances (ODSs) are: chlorofluorocarbons (CFCs), halon, carbon, tetrachloride, methyl chloroform, and methyl bromide. They are used in in the following application:

- Refrigeration compressors;
- Vehicle and small- to medium air conditoners;
- Forms;
- Spay cans of cosmetics, paints, drug etc;
- Electronic microprocessors, computer hard disks (ODSs are use as anti-moiture and cleansing agencies); and
- Pesticides, pharmaceutical products, industrial paints (ODSs are used as anti-moiture and cleansing agencies); and
- Fire extinguishers (halon is used).

3.3 PRINCIPLE GUIDELINES AND POLICY

3.3.1 Principle guidelines of JICA for Social and Environmental Studies in 2010

The objectives of the guidelines are to encourage Project proponents etc. to have appropriate consideration for environmental and social impacts, as well as to ensure that JICA's support for and examination of environmental and social considerations are conducted accordingly. The guidelines outline JICA's responsibilities and procedures, along with its requirements for project proponents etc., are to facilitate the achievement of these objectives. In doing so, JICA endeavors to ensure transparency, predictability, and accountability in its support for and examination of environmental and social considerations.

According to the guidelines, JICA classifies development projects into four categories with regards to the extent of environmental and social impacts, and taking into account the outlines, scale, site and other conditions. The four categories are as follows:

- (1) Category A: Proposed projects are likely to have significant adverse impacts on the environment and society.
- (2) Category B: Proposed projects are classified as Category B if their potential adverse impacts on the environment and society are less adverse than those of Category A projects.
- (3) Category C: Proposed projects are classified as Category C if they are likely to have minimal or little adverse impact on the environment and society.
- (4) Category FI: Proposed projects are classified as Category FI if they satisfy all of the following requirements:
 - JICA's funding of projects is provided to a financial intermediary or executing agency;
 - The selection and appraisal of the projects is substantially undertaken by such an institution only after JICA's approval of the funding, so that the projects cannot be specified prior to JICA's approval of funding (or project appraisal); and
 - Those components are expected to have a potential impact on the environment.

In JICA's preparatory survey, JICA conducts environmental and social surveys at the EIA level for Category A projects and at the IEE level for Category B projects and Master Plan Studies. JICA prepares drafts of mitigation measures - including avoidance, minimization, and compensation - as well as drafts of monitoring plans and of institutional arrangements for environmental and social considerations.

Over a certain period of time, JICA confirms with project proponents etc. the results of monitoring the items that have significant environmental impacts. This is done in order to confirm that project proponents etc. are undertaking environmental and social considerations for projects that fall under Categories A, B, and FI.

Sihanoukville Port New Container Development Project is classified as Category A, according to the guidelines of JICA, which will cause a significant adverse impact. Therefore, the preparation of ESIA reports is necessary.

3.3.2 Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations

Japan Bank for International Cooperation Guidelines for Confirmation Of Environmental and Social Considerations (JBIC) enforced on April 1, 2012, with the objective of encouraging project proponents to implement appropriate environmental and social considerations in accordance with the Guidelines by making their procedures (both before and after funding decisions are made), criteria for decision-making, and requirements which projects subject to funding are to meet clear. In so doing, JBIC endeavors to ensure transparency, predictability, and accountability in its confirmation of environmental and social considerations.

Sihanoukville Port New Container Development Project is classified as Category A according to the JBIC. This is due to the fact that it is one of the 23 sensitive sectors, Ports and harbors, and it is also a large-scale project.

CHAPTER 4

PROJECT DESCRIPTION

4.1 INTRODUCTION

To promote economic growth is a high priority of the Royal Government of Cambodia (RGC) which has been implementing and will continue to do. Through this effort, the RGC has been supported by development partners. One of the major partners that is indispensable is the Government of Japan (GOJ), via JICA.

Since the container throughput is expected to reach the handling capacity limit which is an important part in promoting economic growth; PAS in cooperation with JICA have conducted a feasibility study on Sihanoukville Port New Container Terminal Development Project. As a result, the project is economically feasible. One of the major components in the study is ESIA in order to legally complete Cambodia's framework as well as concessional loans from the GOJ.

In this section, there is a detailed description of the project including geographical location, type of the project, size and magnitude of the project, dumping site, sources of materials for project construction, quantities of materials for project construction, waste management, sources of water and power supply, machineries and equipments, total investment for project, and construction schedule.

4.2 GEOGRAPHICAL LOCATION

Sihanoukville Port New Container Terminal Development Project is located in Sangkat 3, Preah Sihanoukville municipality of Preah Sihanouk Province. It is about 231 km from Phnom Penh City. The project location can be reached by National Road No. 4 from Phnom Penh City to Preah Sihanoukville province about 230 km. It then turns right, which is in front of the port, and travels along by Samdech Hun Sen road about 1.3 km (Figure 4.1).

4.3 TYPE OF THE PROJECT

The Project type falls within Port Construction of the Sub-decree on EIA Processes of the MoE as attached in its annex, section D10. Therefore, the ESIA study is required to comply with Cambodia's legal framework.

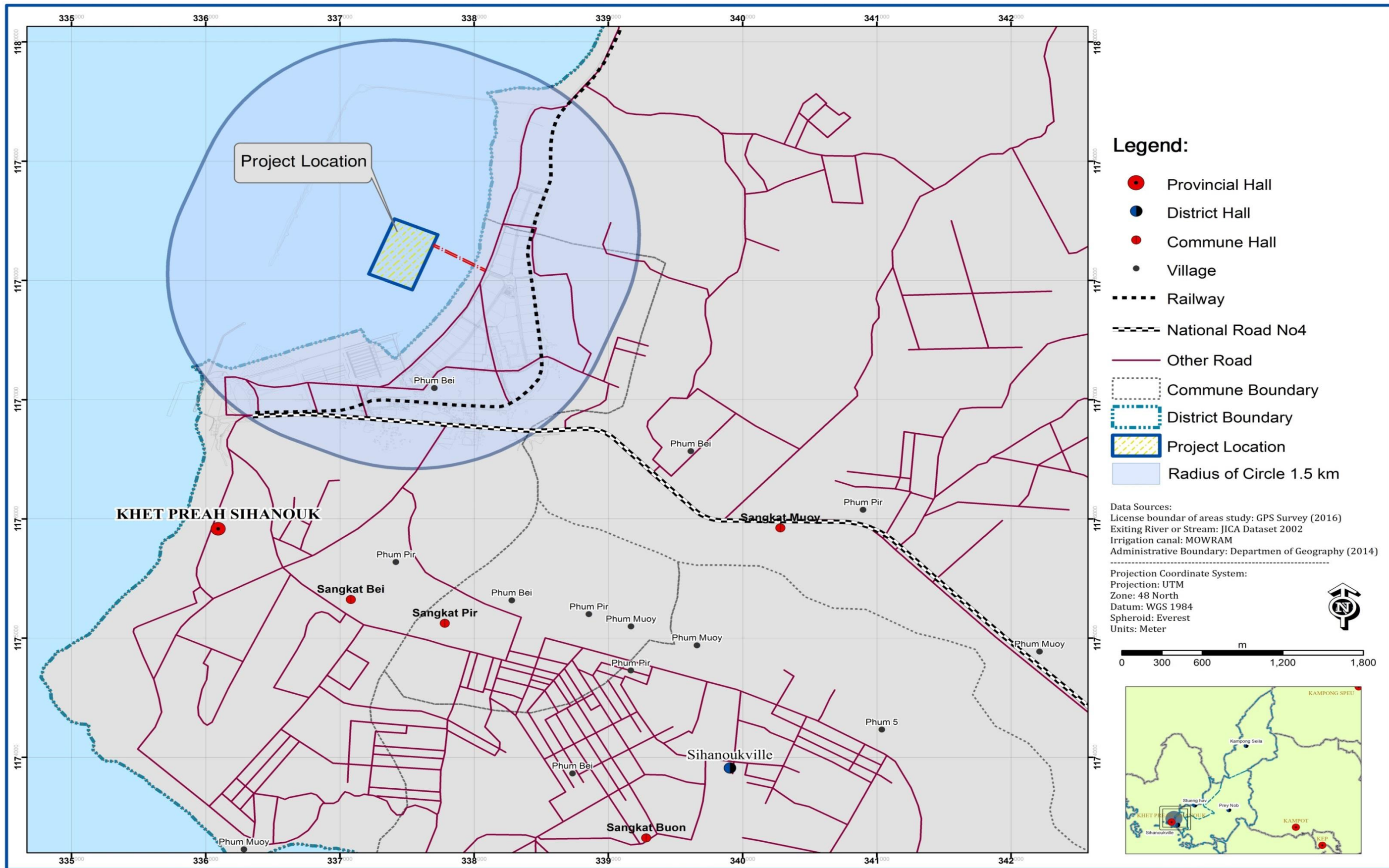


Figure 4-1: Project geographical location

Source: Feasibility study report 2014

4.4 SIZE AND MAGNITUDE OF THE PROJECT

4.4.1 Port Facility Design

4.4.1.1 Basic Concept of Design

Existing container terminal with depth of -10.5 m can accommodate only 25,000 DWT class container vessels (around 2,000 TEUs), so-called Under-Panamax size. On the other hand, the large-size trend of container vessels has been worldwide observed. In East Asia Region Route, 60,000 DWT class container vessels (around 4,000 TEUs) have drastically increased, and it is supposed that 60,000 DWT class container vessels will ply Sihanoukville Port along with steady increase in container cargoes. In order to meet the large-size vessel trend, PAS eagerly requested the berth facility to accommodate Over-Panamax size container vessels. It is fact that accommodating Over-Panamax size container vessels are considerable advantage of port sales for shipping lines.

2) Target Vessel

One Over-Panamax size container vessel for 1 berth

Maximum. 60,000 DWT: Draft =13.8 m, LOA =285 m, Beam=40.0 m

Two Under-Panamax size container vessel for 1 berth

8,000 DWT~15,000 DWT: Draft= 7.3 m~ 9.0 m, LOA= 127 m~158 m,
Beam=20.4 m~ 24.5 m

2) Container Terminal Capacity: Phase I (350 m berth length), Phases II and III (300 m berth length) Phase I: 450,000 TEUs /year

Phase II: 400,000 TEUs /year

Phase III. 400,000 TEUs/year

3) Container Handling Method

Quayside Container Crane (QC) + RTG + Tractor trailer

4) Tide

LWL=+0.0 m CDL

HWL=+1.43 m CDL

(for Multipurpose Terminal Project)

4.4.1.2 Container Berth

The four alternatives were studied for the preliminary design of container berth considering structural and construction cost, maintenance aspects, environmental impact, construction aspects and etc. The alternatives are: 1) Steel Pipe Sheet Piles Structure, 2) Concrete Deck on Steel Pipe Pile, 3) Concrete Block Method, and 4) Concrete Deck on Steel Pipe Pile and Strut Beam.

In consideration of the quay structural comparison, Concrete Deck on the Steel Pipe Pile & Strut Beam is supposed to appropriate, its typical section as shown in Figure 4-2.

However, its disadvantage should be well-considered. It is noted that other quay structure types exceed the Concrete Deck on the Steel Pipe Pile & Strut Beam in some aspects. The Consultant suggests to be adopted the Concrete Deck on the Steel Pipe Pile & Strut Beam structural method based on the comprehensive evaluation results. Especially the maintenance issues for the steel piles and the concrete deck explained that maintenance cost of the Concrete Deck on the Steel Pipe Pile & Strut Beam for 350m in length is estimated about 1.2 million USD for 50 years.

In the comparison of the quay structural method, Construction cost for 350m of Concrete block structural method could be higher about 3.7 million USD than the Steel Pipe

Pile & Strut Beam structural method. Therefore, the Concrete Deck on the Steel Pipe Pile & Strut Beam is still economical in consideration with the maintenance cost for 50 years.

4.4.1.3 Reclamation and Soil Improvement

The comparatively good dredged materials such as rock layer and sandy layer will be used to fill in the reclamation area. The special soil improvement is not considered. For the seawall construction for the protection of the reclaimed area, the very soft layer is planned to replace the good sand to keep the stability of the seawalls. The plan for sand replacement for the soft layer having 6.5 m thickness at the seawall area and seawall structural section is shown in Figure 4-2.

4.4.1.4 Access Channel and Turning Basin

The general layout plan of dredging is shown in Figure 4-3. The length of access channel is approximately 4.5 km from the port entrance as Sta.0+000 to seaward up to -13.5 m contour line. The turning basin covers the area between the new container berth (Phase I) and MPT with water area of approximately 49 ha (486,000 m²). The total volume of dredging is 3.98 million m³.

4.4.1.5 Yard Layout of New Container Terminal

The Yard Layout of No. 1 Container Terminal in Phase I, is shown in Figure 4-3.

4.4.1.6 Administration Building, Maintenance Building, Gate, Inspection Facility, and Required Facilities

The required facilities and equipment for the new container terminal are:

- Administration Building: 2,500 m² , RC structure 4 stories
- Workers building: 600 m² (RC structure)
- Terminal Gate: 820 m² RC Structure (3 lanes for In, 4 lanes for out)
- Maintenance work shop: 1200 m² (RC structure, maintenance office in second stories)
- Fuel Station: 400 m² (Fuel reservoir tank & distributer)
- Generator house and sub-station : 300 m² (Three generators, panels & transformer)
- Parking Place of In-yard Car (Tractor head & Yard Chassis)
- Animal, Plant and Health Inspection Station
- Dangerous Goods Temporary Storage Plant (installed in the container storage area)
- Waiting Space for Road-chassis
- Over-height Attachment Space (Maintenance Space)
- Parking Area of Terminal-use Vehicles
- Night Lighting Tower
- Container Freight Station (CFS) (installed outside of Container Terminal)

Each scale of facilities and equipment should be determined at the detailed design stage.

Source: Feasibility study report 2016

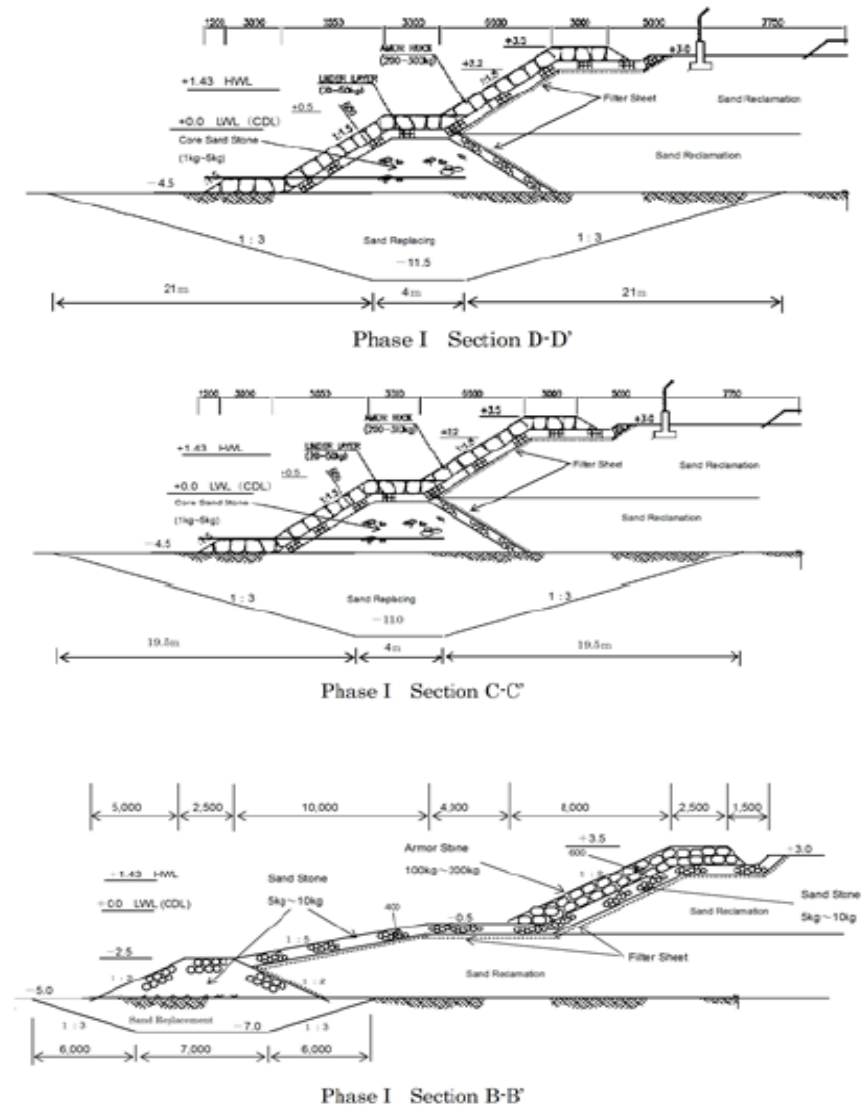
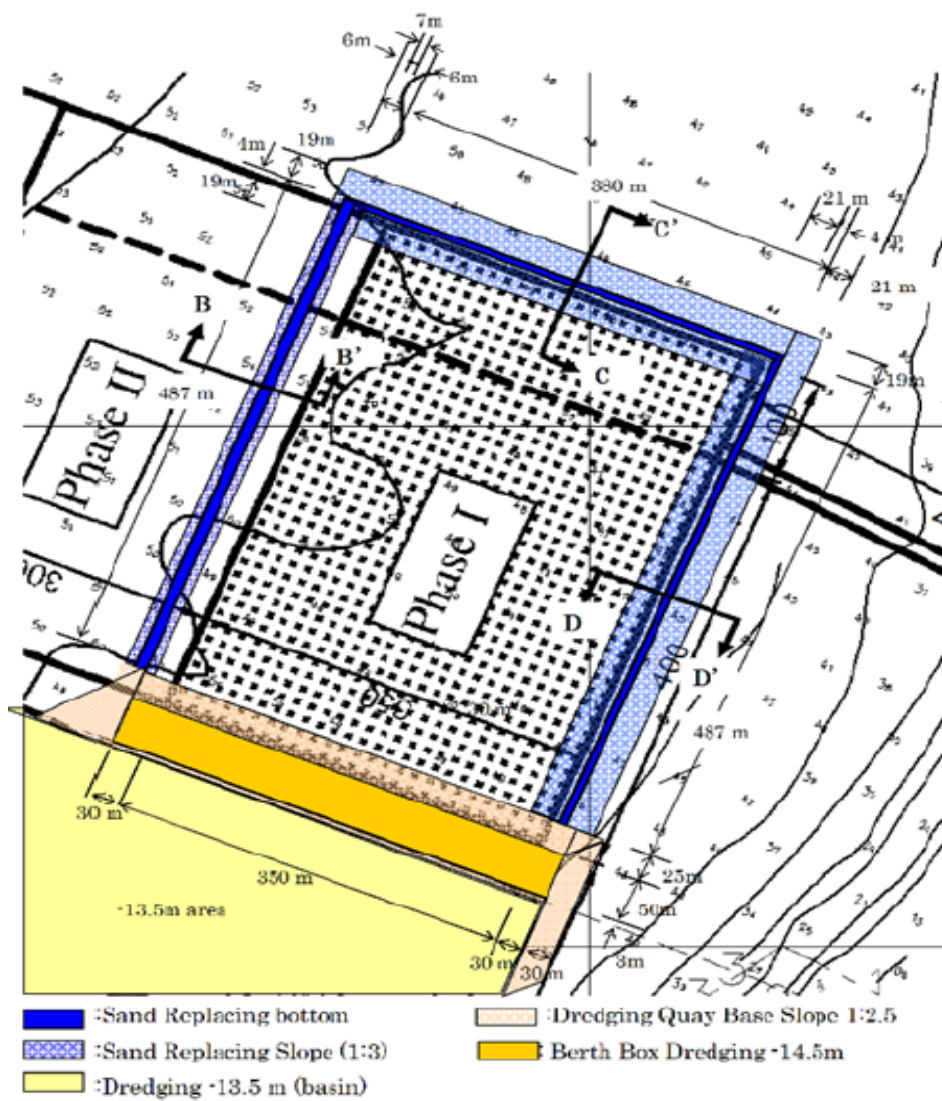


Figure 4-3: Sand Replacement Plan and Seawall Structure

Source: Feasibility study report 2016

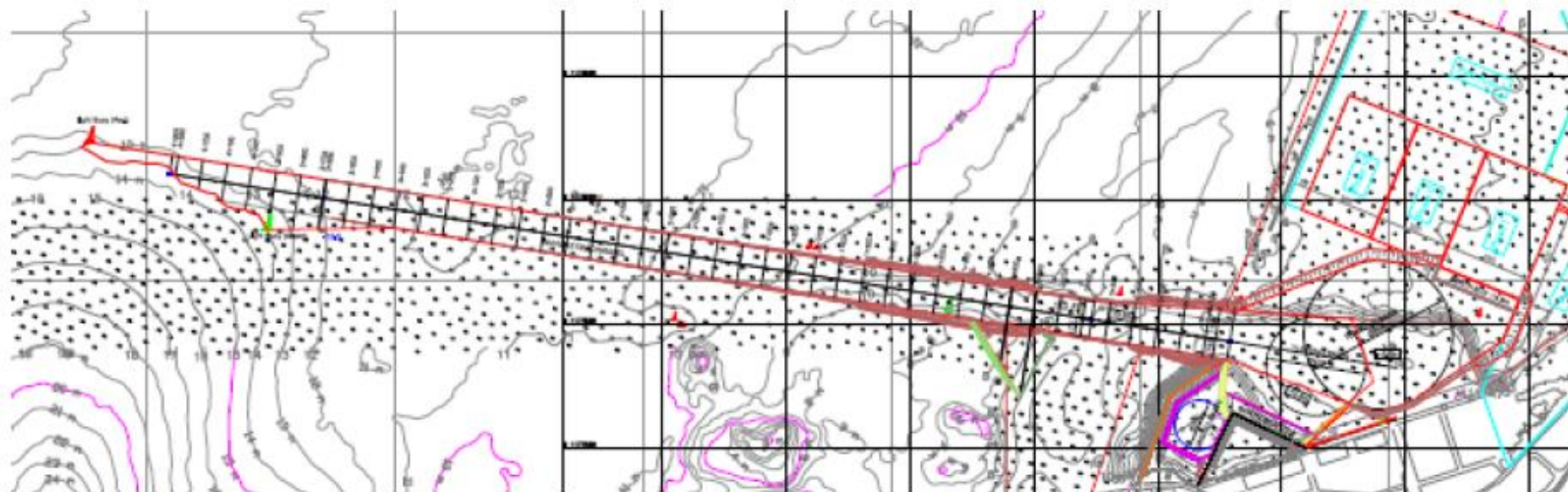


Figure 4-4: General layout plan of dredging

Source: Feasibility study report 2016

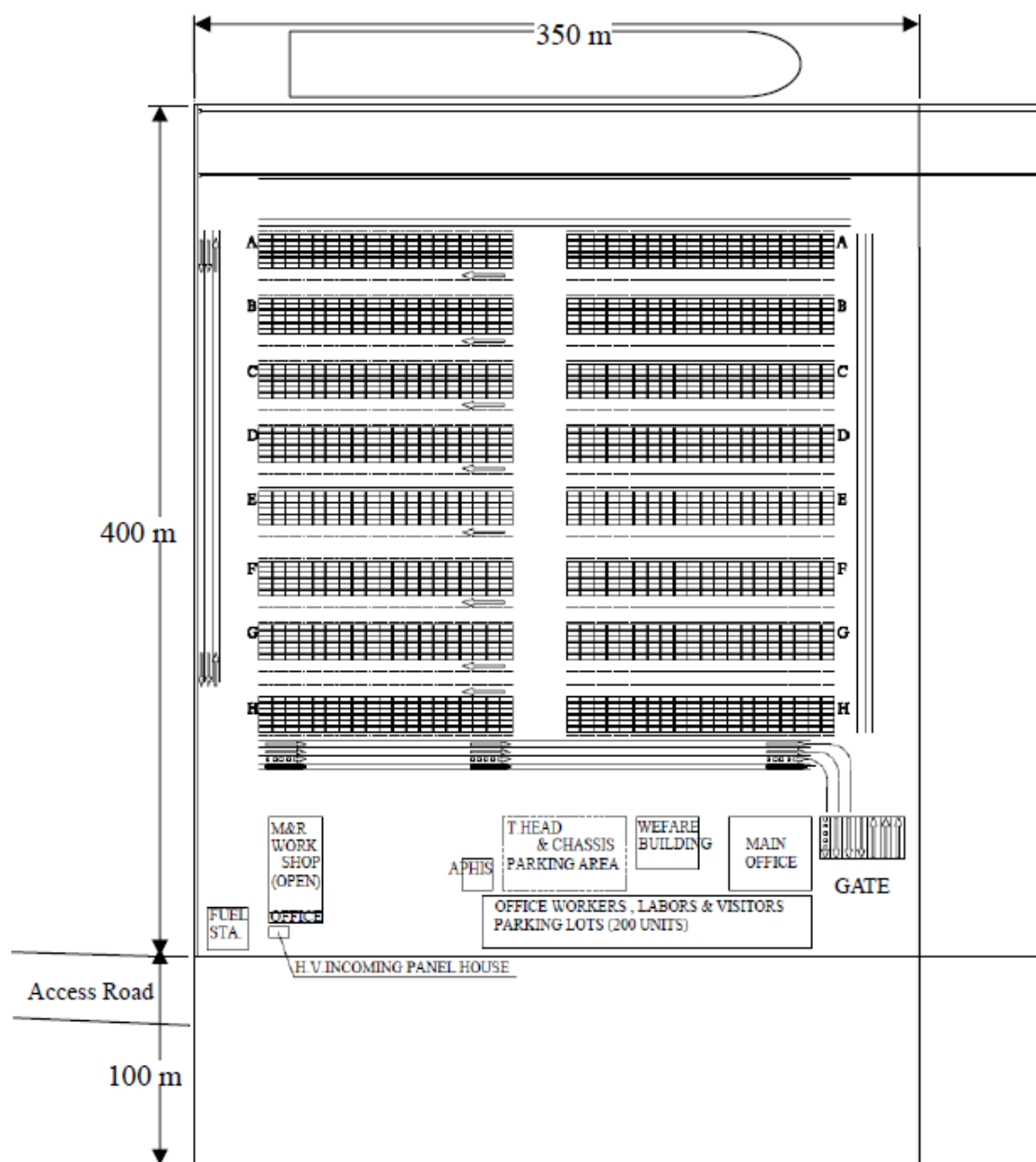


Figure 4-5: Yard Layout of Container Terminal No. 1 (Phase I)

Source: Feasibility study report 2016

4.4.1.7 Yard Layout of New Container Terminal

Non-destructive inspection facilities such as the X-ray inspection facility should be installed outside of the Gate of the New Container Terminal together with the gate reception house which consists of Police, Custom and CAM-CONTROL, in order to shorten waiting time of the trailers at gates of the New Container Terminal. These inspection equipment and facilities are provided by Customs, PAS will be provided the inspection yard at designated location as shown in Figure 4-6. The scale of facilities and equipment should be determined at the detailed design stage.

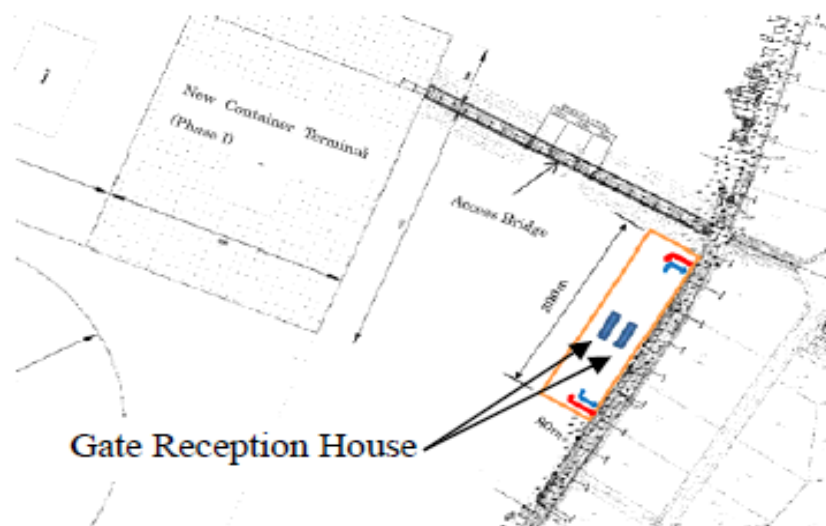


Figure 4-6: Location and Area of Customs Inspection Yard

Source: Feasibility study report 2016

4.4.1.8 Cargo Handling Equipment

4.4.1.8.1 Quayside Container Crane (QC)

The quayside container cranes with outreach response to the Post-Panamax-type container ships of 40 m beam (16 rows on deck) stacking 6,000 TEUs containers must be selected. The main specifications are shown in Table 4-1.

Table 4-1: Main Particulars of Quayside Container Crane (QC)

Main Particulars	Unit	Value	Remarks
Rated Load	ton	40.6	For container
		40.6	For hatch cover
		50	For cargo
Span	m	30	
Outreach		44.2	
Supply Power		A.C. 6.6 Kv, 50 Hz, 3 Phase	

Source: Feasibility study report 2016

4.4.1.8.2 Rubber Tyred Transfer Crane (RTG)

The main specification of the rubber tyred gantry crane is that it has the capability to stack containers 1 over 5 high, and the other specifications are shown in Table 4-2.

Table 11: Main Particulars of Rubber Tyred Gantry Crane

Main Particulars	Unit	Value/Remarks
Rated Load	LT	40
Type of Spreader	m	Single lift (20/40 FT Telescopic Spreader)
Span	m	30
Container Arrangement	row	6 (0 + 6) Arrangement
Power Source		Diesel-Engine Generator Sets

Source: Feasibility study report 2016

4.4.2 Preliminary Design of Access Road and Bridge

4.4.2.1 Alignment of Access Road and Bridge for Phase I

The road alignment has been planned to take advantage of the minimum amount of land between the road site and SEZ. Additionally, the current roadside housing and stores are not affected by this road plan. The road alignment plan is shown in Figure 4-7.



Figure 4-7: Alignment Plan of Access Road to New Port

Source: Feasibility study report 2016

4.4.2.2 Intersection of National Road No.4

The National Highway Route 4 intersection is selected as the starting point for the access road since it has minimal impact caused by traffic increase from the new port.

At the intersection of National Road No. 4, traffic arises due to traffic from Phnom Penh taking right turn when the traffic towards the port is concentrated. Therefore, the plan to add two more lanes for right turn towards the New Port and SEZ has been done in order to alleviate National Road No. 4 traffic. The plan is to widen the 250 m length lane and the 150m divergent lane. Intersection plan of National Road No. 4 is shown in Figure 4-8.

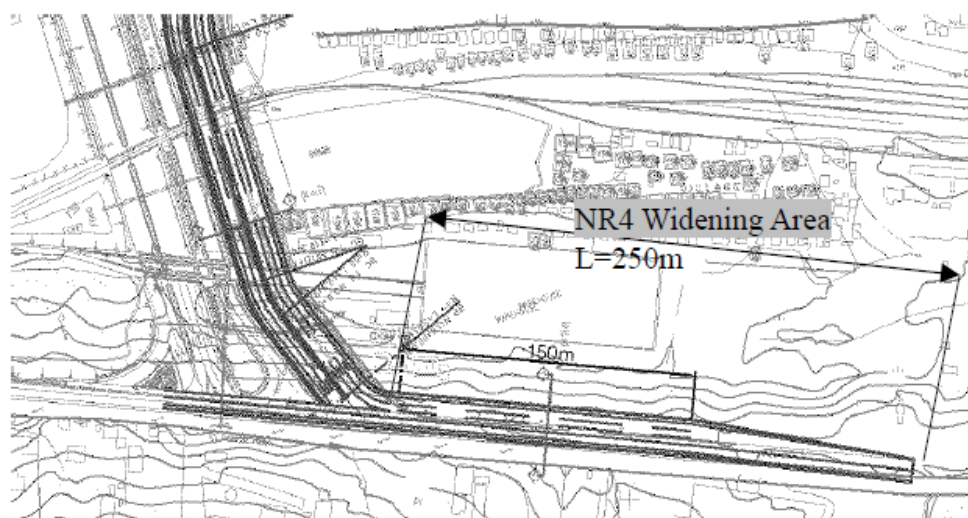


Figure 4-8: Intersection Plan of National Road No. 4

Source: Feasibility study report 2016

When widening the area between National Road No. 4 and the existing port entrance, to cater for the additional lane, the existing green belt will be modified. The plan is shown in Figure 4-9.

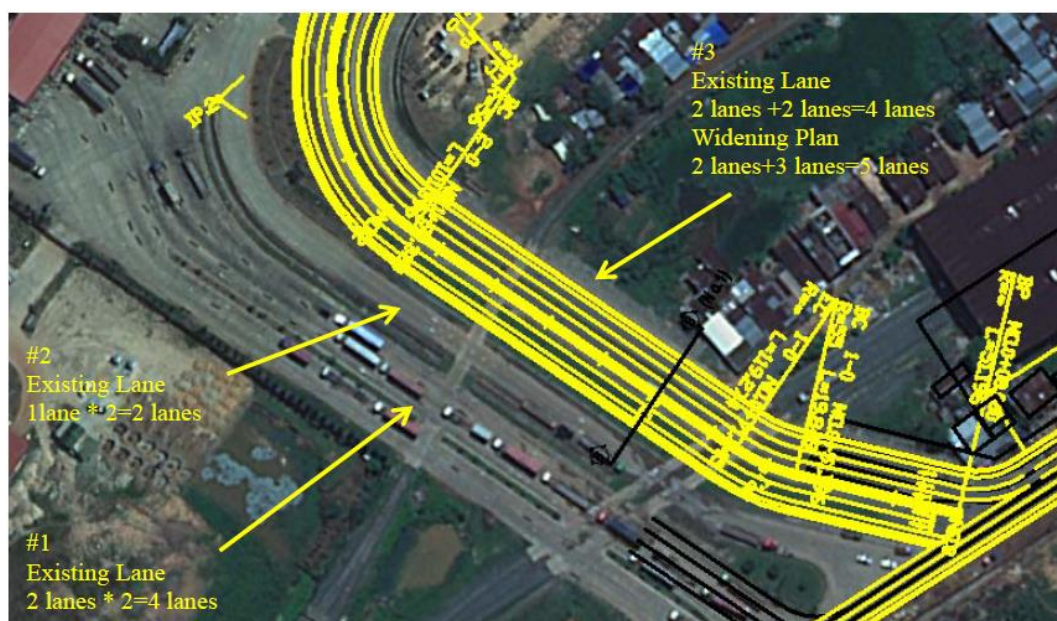


Figure 4-9: Intersection of National Road No. 4

The current lane configuration is composed of #1 and #2 and #3 as indicated below. The area between #2 and #3 shall be treated as green belt. The green belt is aimed at reducing the cost impact as much as possible to the project because widening maintenance has been carried out in 2015. For this purpose, the existing 4 lanes road shall be upgraded to 5 lanes road by changing the green belt to roadway. We foresee that it shall facilitate the traffic flow by this option. Existing cross section and plan cross section are shown in Figure 4-9 and Figure 4-10.



Figure 4-9: Plan Cross Section

Source: Feasibility study report 2016

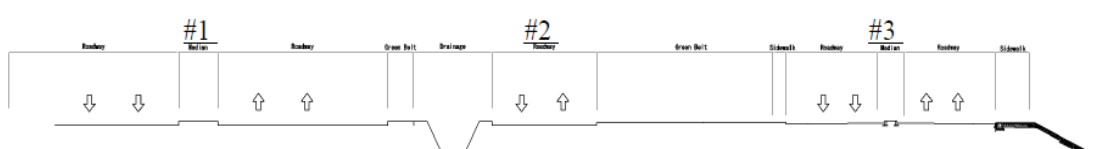


Figure 4-10: Existing Cross Section

Source: Feasibility study report 2016

4.4.2.3 Bridge Design for Phase I

An access bridge for the terminal is planned from the access road to the new container terminal, where small fishing vessels are capable to pass beneath the bridge. The bridge is planned at 18 m in width (two lanes for each way with one walkway), the bridge is 100 m in length and made by R.C. structural piers and P.C. structural beams.

1) Bridge Length: 100.0 m

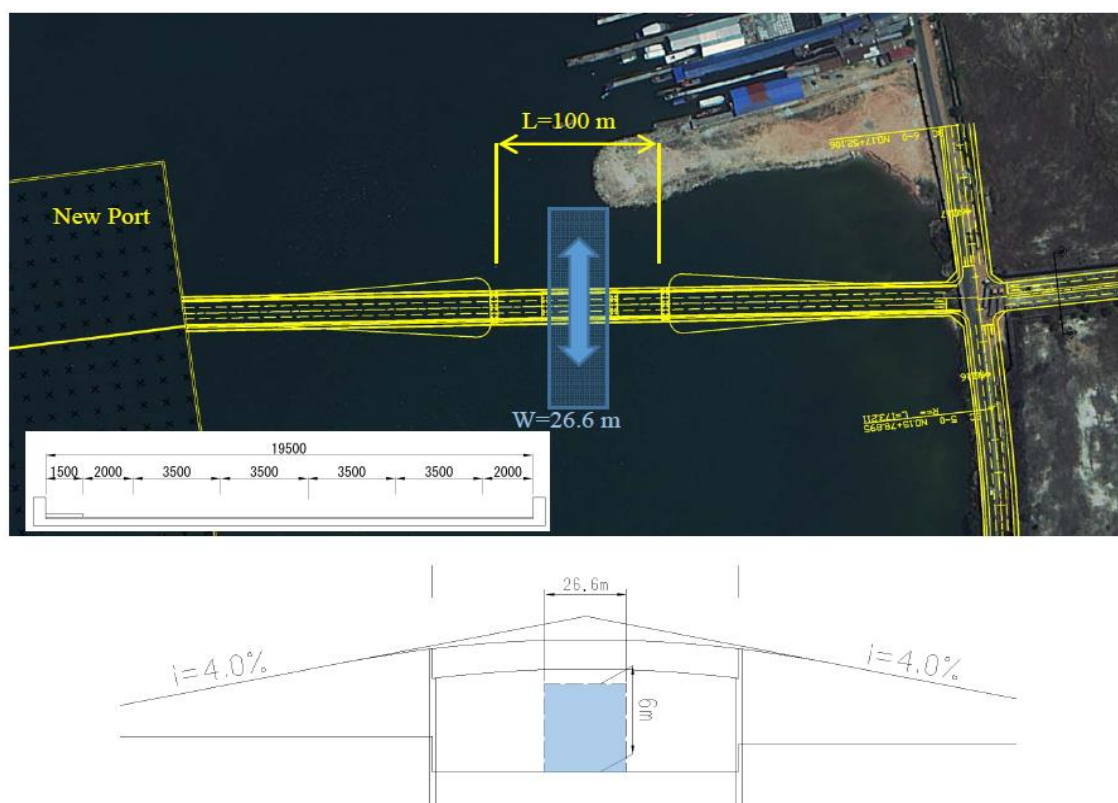


Figure 4-11: Bridge Length and Clearance Width

Source: Feasibility study report 2016

2) Design Criteria: Specifications for Highway Bridges (Japan Road Association)

3) Approach Slope Grade: 4.0%

Due to the reason that the majority of traffic is large trailer, low-gradient has been adopted in the planning.

4) Clearance height of under Bridge: $H=6.0$ m

Clearance of 6.0 m has been adopted for small fishing boats to pass after considering the consultation with PAS.

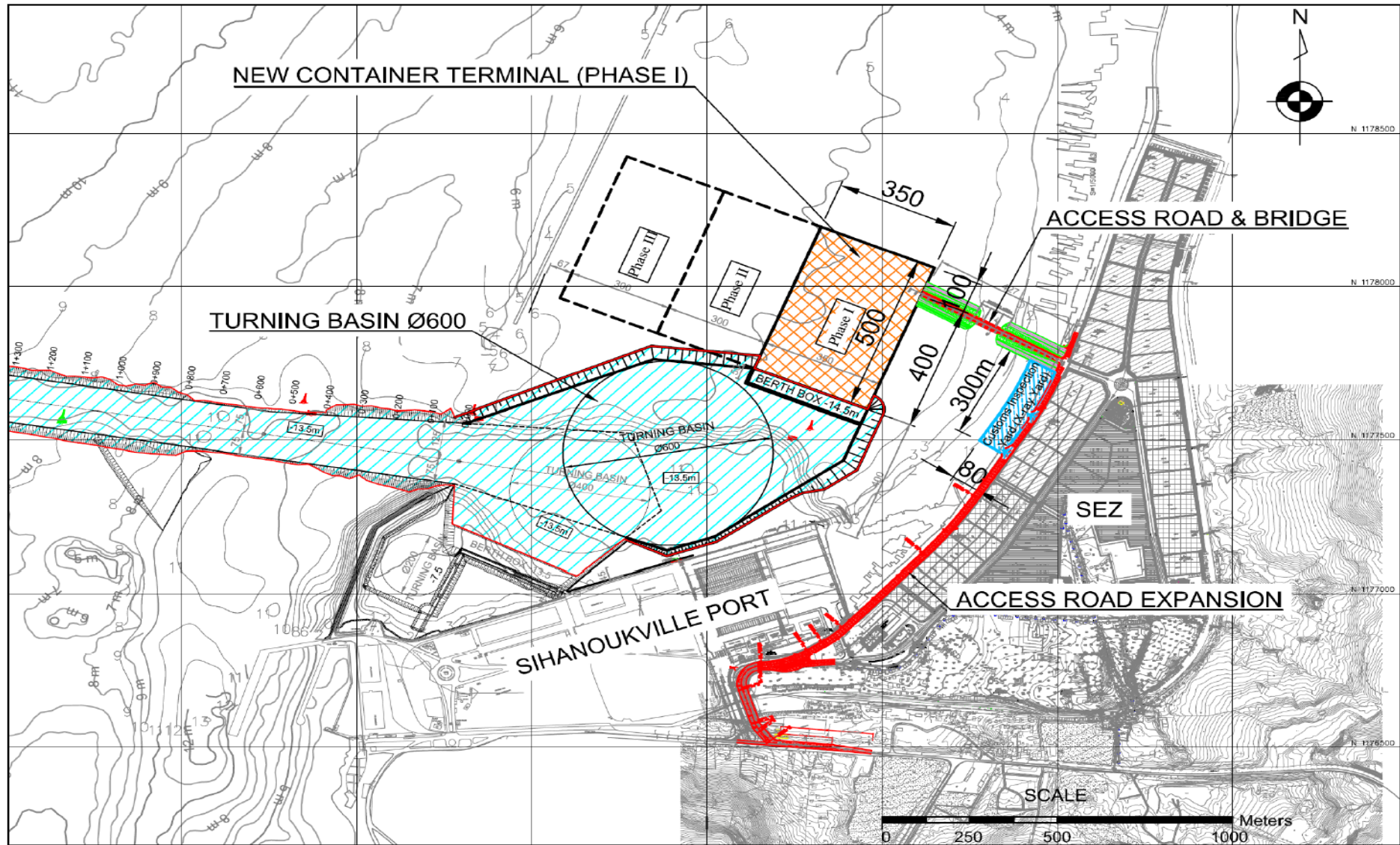


Figure 4-12: General layout plan of new container terminal

Source: Feasibility study report 2016

4.5 DUMPING SITE

4.5.1 Dumping Site of Multipurpose Terminal Project

The two sites in seaside at 5 km west of the port as shown in Figure 4-13, were designated as dumping sites for dredged material in MPT Project. The dumping sites have abundant remaining capacity even after completion of MPT Project, and are also the first choice for the dumping site of new container terminal project.

The deep spots were designated as dumping sites. The deeper site of D1 is the main dumping site with depth of CDL -52 m, and the space from the seabed to CDL -20 m is designed as the capacity. The total capacity is 10.3 million m³, and the designed dumping volume of MPT and new container terminal projects are 1.3 million m³ and 3.2 million m³ respectively. Therefore, the remaining capacity will be 5.8 million m³ at the completion of proposed project.

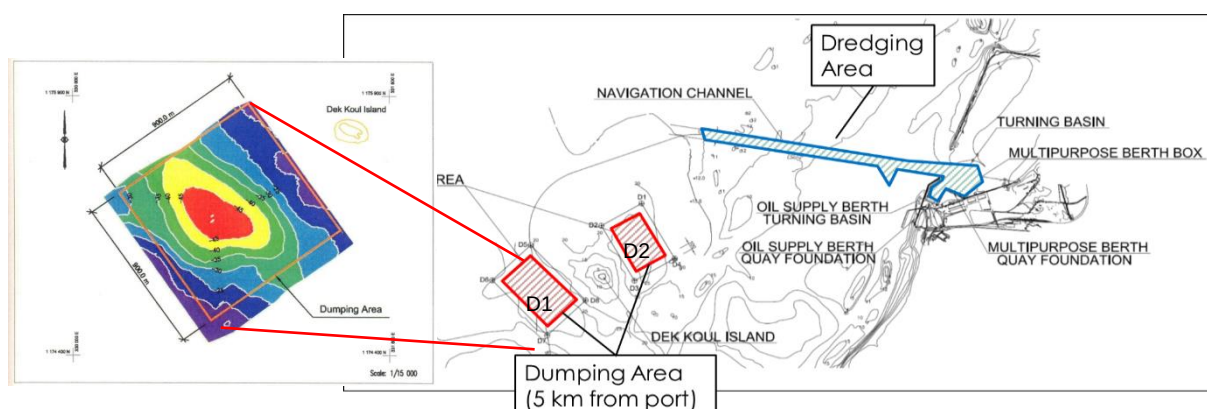


Figure 4-13: Location Map of Dumping Sites

Source: JICA Survey Team

Team

4.5.2 Alternatives

The seaside and landside sites are alternatives for dumping sites. The moisture percentage of dredged soil is very high as shown in Figure 4-14, and seems to be more than 100%. The net dumping volume is 3.2 million m³, and the estimated necessary capacity of land site dump site considering water content is 6.4 million m³. The features of landside dumping site is preliminary estimated below.

Capacity:	6.4 million m ³
Project	
Area:	1800 m x 1800 m
Height of embankment:	2 m
Dump truck:	14 m ³ type truck x 457,143
Construction schedule:	21 months
Traffic of dump trucks:	870 trucks per day



Figure 4-14: Dredged Soil in MPT

Source: JICA Survey Team

4.5.3 Evaluation of Alternatives

The details of dumping sites will be studied in the detail design stage, however, the basic properties of alternatives summarized in Table 4-3 indicates the superiority of Plan A (seaside) in both technical and environmental aspects.

Table 12: Comparison of Alternatives on Dumping Site

Contents		Alternatives	
		Plan A	Plan B
Description		In seaside	In landside
Technical Evaluation	Site Selection	The remaining capacity of dumping sites of MPT Project will be used for the proposed project.	The site selection is very difficult. The sites must be near to the project site and far from residential areas, national parks, and reserved areas.
		Excellent	Bad
	Construction Equipment	The similar types of the split barge used in MPT Project can be also used in the proposed project.	A waterproof type of dump trucks are necessary to carry dredged sediments from dredging sites to dumping sites. Those trucks need to be imported and very expensive.
		Excellent	Bad
	Cost	Transportation of dredged material: not very expensive Construction of dumping site: no cost	Transportation of dredged material: very expensive Construction of dumping site: very expensive
		Excellent	Bad
	Total	Excellent	Bad
Environmental Evaluation	Pollution	The dumping causes sediment dispersion. The monitoring data of turbidity in MPT Project was less than threshold.	The water quality of water discharge from dumping site will be acceptable with appropriate treatment.
		Good	Good
	Natural Environment	Serious impacts on natural environment are not expected because the monitoring data in MPT Project was less than threshold and the dumping sites are located in far from national parks and reserved areas.	The extent of impacts on natural environment is depends on site selection. In case of sites far from residential areas, the sites must be valuable areas on natural environment. In case of sites near residential areas, serious impacts on natural environment are not expected
		Good	Unknown
	Social Environment	No serious impact on social environment is expected, because the dumping sites are far from residential areas.	The extent of impacts on social environment is depends on site selection. In case of sites far from residential areas, serious impacts on social environment are not expected. In case of sites near residential areas, serious impacts on social environment are expected. Besides, transportation of dredged material is necessary in both cases. Traffic jam is expected, and leaking sediment from dump trucks soils the surface of roads.
		Good	Unknown or Bad
	Total	Good	Bad
Overall Evaluation		Recommended	Not Recommended

Source: JICA Survey Team

4.6 SOURCES OF MATERIALS FOR PROJECT CONSTRUCTION

4.6.1 Sand Resource

Sihanoukville Port New Container Terminal Development Project will use sand from the sources AS mentioned in Table 4-4. This sand will be supplied by a local firm having the license from MoE and win official procurement.

Table 13: Source and distance from source to the project site

No.	Description	Quarry Name	From source to project site	Document Status
1	River Sand	Srae Ambel River	70 km by sea	Approved
2	River Sand	Steung River No. 5	30 km by sea	Approved
3	Mountain Sand	Kbal Chhay	25 km by land	Approved
4	Mountain Sand	Otres	15 km by land	Approved

Source: JICA Survey Team



Figure 4-15: Locations of sand sources

Source: JICA Survey

Team

4.6.2 Steel and Cement

Steel will be imported from Japan. The other materials for the project construction including cement and others will be bought from local markets.

4.7 QUANTITIES OF MATERIALS FOR PROJECT CONSTRUCTION

Quantities of materials needed for the project are summarized as in tables 4-5 and 4-6.

Table 14: Quantities of materials for the project construction (Package 1)

Construction Work Items (Package 1)			Unit	Quantity
1	Temporary works			
	1.1	Mobilization and demobilization	lump sum	1

Construction Work Items (Package 1)			Unit	Quantity
	1.2	Temporary works	lump sum	1
2	Dredging works			
	2.1	Dredging access channel (-13.5m)		
		1) Dredging Soil	m ³	1.207.000
		2) Dredging weathered rock	m ³	93.000
		3) Dredging rock	m ³	16.000
	2.2	Dredging port basin (-13.5m)		
		1) Dredging Soil	m ³	2.551.000
		2) Dredging weathered rock	m ³	80.000
		3) Dredging rock	m ³	12.000
	2.3	Dredging berth box (-14.0m)		
		1) Dredging soil	m ³	18.000
	2.4	Transport and disposal dredged materials	m ³	3.177.000
3	Reclamation works			
	3.1	Reclamation of dredged materials	m ³	800.000
	3.2	Reclamation of sand materials (including settlement volume)	m ³	700.000
4	Revetment works			
	4.1	Base dredging	m ³	162.096
	4.2	Base sand replacement	m ³	162.096
	4.3	Core sand stone	m ³	33.600
	4.4	Sand stone (5-10kg)	m ³	16.517
	4.5	Under layer stone	m ³	8.064
	4.6	Amor stone	m ³	17.312
	4.7	Filter sheet	m ³	33.344
5	Berth construction			
	5.1	Dredging		
		1) Dredging from quay line to under the quay deck	m ³	73.500
		2) Dredging for sand replacement	m ³	71.750
	5.2	Sand replacement	m ³	71.750
	5.3	Piling works		
		1) Supply and delivery steel pipe pile (1000mm T=16, L=30 – 37.5m)	ton	1.005
		2) Supply and delivery steel pipe pile (900mm T=16, L=30 – 37.5m)	ton	4.516
		3) Driving steel pipe pile (1000mm)	m	2.588
		4) Driving steel pipe pile (900mm)	m	12.938
	5.4	Strut Steel Pipe Work		
		1) Supply and delivery strut steel pipe (5.2t/set x 50 sets)	ton	269
		2) Installation of strut pipe beam	set	50
	5.5	Corrosion protection		
		1) Cathodic corrosion protection	number	450
		2) Petrolatum lining, Petrolatum lining corrosion protection	m ²	1.875
		3) Urethane coating, Urethane coating corrosion protection	m ²	950
	5.6	Slope protection		
		1) Slope leveling work	m ²	15.750
		2) Filter sheet	m ²	18.550
		3) Filter stone	m ²	9.100
		4) Amor stone	m ³	16.000
	5.7	Deck concrete work		
		1) Pile cap concrete (Re-bar 120kg/m ³)	m ³	1.785

Construction Work Items (Package 1)			Unit	Quantity
	2) Beam concrete (Re-bar 130kg/m ³)		m ³	5.300
	3) Slab concrete (Re-bar 145kg/m ³)		m ³	5.950
	4) Fender wall and other		m ³	300
5.8	Retaining concrete block wall			
	1) Wave dissipation concrete block		number	246
	2) In-situ concrete wall		m ³	600
	3) Rubble backing stone		m ³	3.300
	4) Filter sheet		m ²	4.200
5.9	Berth Fitting			
	1) Fender		number	35
	2) Bollard		number	18
	3) Ladder		number	2
	4) Crane rail		m	650
	5) Crane rail accessories		lump sum	1
5.10	Other small works		Lump sum	1
6	Access road works			
6.1	Base and filling of access road for bridge			
	1) Base dredging		m ³	83.755
	2) Base sand replacement		m ³	83.755
	3) Core sand stone		m ³	18.488
	4) Under layer stone		m ³	5.885
	5) Amor stone		m ³	9.400
	6) Filter sheet		m ²	12.473
	7) Reclamation		m ³	175.400
6.2	Access bridge (2 spans continuous post-tensioning PCT-section)		m	100
6.3	Expansion of the existing access road			
	1) Road pavement for new area		m ²	26.576
	2) Road pavement for existing road (only surface R.C coarse)		m ²	13.620
	3) Sidewalk pavement		m ²	3.526
	4) Medial strip		m	400
	5) Box culvert (L=54m), U Ditch (1,041m), RC pipe, drainage		lump sum	1
	6) Replacement of the existing block wall		m ²	1.200
7	Utilities			
7.1	Yard and road drainage			
	1) Main drainage (φ 800 ~ φ1200 PCP with MH)		m	1.200
	2) Branch drainage (φ 300 ~ φ600 PCP with MH)		m	1.400
	3) Drainage around fence (V ditch)		m	1.350
7.2	Water supply and distribution			
	1) Distribution main pipe (φ150) HDPE		m	1.450
	2) Distribution branch pipe (φ50 - 100) HDPE		m	50
	3) Meter and valves		lump sum	1
	4) Water reservoir and pumping facilities (800 tons)		Lump sum	1
	5) Outside connection with SEZ water supply system (φ150) HDPE		m	950
7.3	Power supply system			
	1) Transformer 6000 v – 400 v		number	3
	2) Transformer 22000 v – 6000 v		number	1
	3) Switch gear + panel		lump sum	1
	4) 6000 v cable		m	2.280
	5) 400 v cable		m	900

Construction Work Items (Package 1)			Unit	Quantity
	6)	Street lighting system	number	50
	7)	Yard lighting pole and lights	set	6
	8)	22kv Cable connection	m	2.600
7.4	Sewerage treatment system and pipeline			
	1)	Sewer treatment tank (200 persons)	unit	1
	2)	Sewer treatment tank (30 persons)	unit	2
	3)	Pipeline installation	lump sum	1
7.5	Telecommunication system			lump sum 1
7.6	Container reefer rack, panel and plug			set 144
7.7	Other works			
	1)	Boundary fencing	m	1.260
	2)	Road fencing and other utilities	m	385
8	Yard Pavement			
8.1	RTG Traversing lane			
	1)	Horizontal lane (P.C Plate)	m ²	6.240
	2)	Vertical lane (P.C Plate)	m ²	3.450
8.2	RTG Repairing lane (P.C Plate)			m ² 180
8.3	Parking			
	1)	Tractor and chaises parking (heavy duty)	m ²	1.500
	2)	Officer, visitor, worker car parking (light duty)	m ²	2.800
	3)	Other motorbike (light duty)	m ²	100
8.4	Heavy duty yard pavement			
	1)	Apron pavement	m ²	8.925
	2)	Container yard and road pavement	m ²	71.000
8.5	Container sleeper			
	1)	Size 1500 x 300 x 16.2m	m ²	6.600
	2)	Size 750 x 300 x 16.2m	m ²	390
8.6	Light duty yard pavement			
	1)	Office area	m ²	1.000
	2)	Between container sleeper	m ²	22.000
8.7	Walkway			
	1)	Road curb	m	1.400
	2)	Light duty pavement (t=50)	m ²	1.800
8.8	Outside road pavement in reclamation area			
	1)	Container trailer road and parking	m ²	31.000
	2)	Walkway	m ²	850
	3)	Center island landscape area	m ²	1.500
	4)	Road curb	m	1.500
8.9	Other works			
	1)	Road marking and yard marking and other small works	lump sum	1
9	Architectural works			
9.1	M&E workshop			m ² 1.200
9.2	Administration office			m ² 2.500
9.3	Fuel station			m ² 400
9.4	Sub-station and generator house			m ² 300
9.5	Main gate and weighing bridge			m ² 820
9.6	Worker building			m ² 600
10	Navigation Aids			
10.1	Light buoy			number 3

Construction Work Items (Package 1)			Unit	Quantity
11	Customes Inspection Yard (X-ray yard)			
	11.1	Reclamation for inspection yard	m ³	108.000
	11.2	Boundary fence construction	m	710
	11.3	Slope protection		
		1) Under layer stone	m ³	2.500
		2) Amor stone	m ³	6.000
		3) Filter sheet	m ²	6.900

Source: Feasibility study report 2016

Table 15: Quantities of materials for the project construction (package 2)

Package 2			Unit	Quantity
1	Cargo Handling Equipment			
	1.1	Quayside gantry crane (Post-Panamax, 16 rows)	unit	3
	1.2	Rubber mounted yard gantry crane (6 rows, 1 over 5, Hybrid type)	unit	9
	1.3	Reach Stacker (10 tons)	unit	2
	1.4	Tractor & Chassis (40'container)	unit	16
	1.5	CCTV system	set	1
	1.6	Emergency generator 1500 KVA	unit	3
	1.7	Terminal Operation System (TOS)	set	1

Source: Feasibility study report 2016

4.8 WASTE MANAGEMENT

4.8.1 Solid waste management

4.8.1.1 Construction Phase

Most of the solid wastes are kitchen waste (from workers camps), leaves, wood residuals, debris from construction materials, office waste and waste from construction materials such as iron, polyethylene plastic pipe, plastic, wood, cement, lime, paint etc. To manage solid waste, the construction contractor will take measures to isolate solid waste by categories. The construction contractor will have waste management plan in cooperation with the authority and make a contract with the company to collect and transport those wastes to the disposal site as approved by MoE and local authority.

4.8.1.2 Operation Phase

The waste will originate from office such as: paper, old stationery, carton/foam, wooden board, plastic and garbage produced by ships in the port area. Solid wastes generated at this stage are mostly from kitchen where serves a large number of port workers and some materials.

To properly manage these wastes, PAS plans to put trash bins in the main areas of the project and advises their employees and workers to dispose of waste at those locations. Moreover, PAS will take more measures to classify solid wastes by category and pack and store in the defined locations. PAS will make a contract with a local company for collecting and transporting wastes to dumping area.

4.8.2 Liquit waste management

4.8.2.1 Construction Phase

Liquid waste is generated from construction activities and workers camp. To properly manage the liquid waste, the construction contractor will prepare the sewer system and the septic tank nearby the workers camp, project office, and construction areas.

4.8.2.2 Operation Phase

Liquid waste will be generated from the project area which originates from service offices, kitchen of workers and staffs, and other areas with the project area. To deal with these issues the project will construct 2 septic tanks and pipeline systems.

4.9 SOURCES OF WATER AND POWER SUPPLY

Water consumption for the construction project will be bought from Sihanoukville Water Supply Authority, while Power supply will be from Electricity of Sihanoukville province.

4.10 MACHINERIES AND EQUIPMENTS

List of machineries and equipment is as table 4-7 below:

Table 16: List of machineries and equipments for the project construction

No.	Machinery and equipment	Type	Unit	Quantity
1	Excavator	1 m ³	Hour	200
2	Wheel loader	1 m ³	Hour	150
3	Dump truck	10 tons	Hour	400
4	Truck crane	25-40 tons	Hour	150
5	Crawler crane	100-150 tons	Hour	150
6	Crawler crane	50 tons	Hour	150
7	Generator	100 KVA	Hour	500
8	Flat Barge	500 tons	Hour	200
9	Flat Barge	1000 tons	Hour	250
10	Anchor Boat	250 horses	Hour	200
11	Grab Dredger	20-23 m ³	Hour	200
12	Trailer Suction Dredger	5000 m ³	Hour	100
13	Hopper Barge	1000-1300 m ³	Hour	600
14	Pusher Barge	1000 horses	Hour	300
15	Bulldozer	21 tons	Hour	200
16	Concrete pumping Truck	-	Hour	100
17	Motor Grander	-	Hour	200
18	Macadam/ Vibration/ Tier Roller	10 tons	Hour	400

Source: Feasibility study report 2016

4.11 HEALTH AND SAFETY MANAGEMENT PLAN

Health and Safety Management Plan for the project will exist in the construction contract to be implemented by the contractor. The plan will include:

- 1) Structure on safety management
- 2) Safety management

- 3) Monitoring
- 4) Training on safety and
- 5) Emergency response.

4.12 TOTAL INVESTMENT FOR PROJECT

Sihanoukville Port New Container Terminal Development Project will use concession loan from Japanese government, which is approximately US\$ 205.4 million, as detailed in Table 4-8.

4.13 CONSTRUCTION SCHEDULE

The project construction schedule is 36 months as detailed in table 4-9.

Table 17: Breakdown of the project cost

Table 17: Breakdown of the project cost

Package 1			Unit	Quantity	Total (USD)
1	Constrcution Expense				
	1.1	Temporary Works	lump sum	1	4.100.000
	1.2	Dredging works incl. Environmental Protection and Monitoring	m ³	3.959.000	24.263.000
	1.3	Reclamation Works	m ³	1.500.000	8.700.000
	1.4	Revetment Works	m	1.358	5.341.422
	1.5	Berth Construction	m	350	13.540.502
	1.6	Access Road works	m ²	38.922	9.932.631
	1.7	Utilities	lump sum	1	1.942.636
	1.8	Yard Pavement	m ²	159.335	9.062.892
	1.9	Architectural works	Building	5	4.607.560
	1.10	Navigation Aids	Location	3	3.000
	1.11	Customes Inspection Yard (X-ray yard)	m ³	108.000	1.308.010
				Sub Total 1.1 – 1.11	82.801.652
2	Price Escalation of Constrcution Cost				10.118.745
3	Contingency for Construction (5%)				4.646.020
4	Engineering Services incl. pakage 2				2.304.150
5	Contingency for Engineering Services (5%)				126.277
6	Price Escalation of Engineering Services				228.277
7	Administration Cost				4.140.083
8	VAT				2.484.050
				TOTAL	142.457.039

Package 2			Unit	Quantity	Total (Y)
1	Cargo Handling Equipment				
	1.1	Quayside gantry crane (Post-Panamax, 16 rows)	Piece	3	2.466.000.000
	1.2	Rubber Tyred gantry crane (6 rows, 1 over 5, hybrid type)	Piece	9	1.431.000.000
	1.3	Reach Stacker (10 tons)	Piece	2	70.000.000
	1.4	Tractor & Chassis (40'container)	Piece	16	537.600.000
	1.5	CCTV system	Piece	1	24.000.000
	1.6	Emergency generator 1500 KVA	Piece	3	15.000.000

Package 2			Unit	Quantity	Total (Y)
	1.7	Terminal Operation System (TOS)	Set	1	265.000.000
Sub Total 1.1 – 1.7					4.808.600.000
2	Price Escalation				1.349.771.950
3	Contingency (3%)				184.751.159
4	Administration Cost				240.430.000
TOTAL			62.958.335 USD		6.583.553.109 Yen
Grand Total (Package 1 & Package 2)					205.415.374 USD

Source: Feasibility study report 2016

Table 18: Construction schedule

Sequence/Items			Project Month		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36			
			Unit	Quantity																																							
Phase 1 Package 1 Civil Works	1 Mobilization and Demobilization			← ICB: 36 Months →																																							
	Temporary Works																																										
	2 Dredging Works																																										
	Dredging Works	m ³	3,959,000																																							9000m ³ /day	
	Transport and Disposal Dredged Materials	m ³	3,177,000																																							9000m ³ /day	
	3 Reclamation Works																																										
	Reclamation of Dredged Materials	m ³	800,000																																							9000m ³ /day	
	Reclamation of Sand Materials (including settlement volume)	m ³	700,000																																							3500m ³ /day	
	4 Revetment Works																																										
	Base Dredging	m ³	162,096																																								900m ³ /day
	Sand, Sand Stone, Amor Stone& Filter Sheet Works	m ³	237,589																																								900m ³ /day
	5 Berth Construction																																										
	Dredging	m ³	145,250																																								900m ³ /day
	Sand Replacement	m ³	71,750																																								500m ³ /day
	Piling Work (900mm, 1100mm)	m	15,526																																								100m/day
	Strut Steel Pipe Work	Set	240																																								
	Corrosion Protection	L.S	1																																								
	Slope Protection	m ³	25,100																																								
	Concrete Deck Work	m ³	13,335																																								60m ³ /day
	Retaining Concrete Block Wall (Wave dissipation concrete Block)	Nos	266																																								
	Berth Fitting (Fender, Bollard, etc.)	L.S	1																																								
	6 Access Road Works																																										
	Base and Filling of Access Road for Bridge																																										
	1) Base Dredging	m ³	83,755																																								900m ³ /day
	2) Base Sand Replacement	m ³	83,755																																								900m ³ /day
	3) Stone Works	m ³	33,773																																								900m ³ /day
	Access Bridge (2 spans continuous post-tensioning PC T- section girder	m	100																																								
	Expansion of the Existing Access Road																																										
	1) Road Pavement for new area	m ²	26,576																																								100m ² /day
	2) Road Pavement for existing road (only surface R.C coase)	m ²	13,620																																								
	2) Sidewalk Pavement	m ²	3,526																																								
	3) Medial Strip	m	400																																								
	5) Box Culvert (L=54m) , U Ditch (1,041m),RC Pipe(ø1000, 54m), Drain age	L.S	1																																								
	6) Replacement of the Existing Block Wall	m	1,200																																								100m/month
	7 Utilities																																										
	Yard and Road Drainage	m	3,950																																								
	Water Supply and Distribution	m	2,450																																								
	Electrical Works	L.S	1																																								
	Sewerage Treatment System and Pipeline	L.S	1																																								
	Telecommunication system	L.S	1																																								
Container Reefer Rack, Panel & Plug	lot	144																																									
Other works (Fence Works)	m	1,645																																								5m/day	
8 Yard Pavement																																											
Container yard pavement (including RTG Lane, Sleeper, etc.)	m ²	125,985																																								100m ² /day x 3 teams	
Outside road pavement in reclamation area	m ²	33,350																																									

CHAPTER 5

DESCRIPTION OF ENVIRONMENT

The understanding of the natural environment and socio-economic environment in and around the project area is very important for the decision making process of authorities, especially the MoE to approve of the ESIA report. The decision maker may understand if the ESIA approval or MoE's license, which may lead to the project construction, could provide some positive and negative effects on physical, biological resources and socio-economic resources. This ESIA report can be compared to reach an effective decision.

5.1 NATURAL ENVIRONMENT

5.1.1 Physical Resource

5.1.1.1 Topography

Based on the study on Topographical Map, Scale 1/100.000 (data source: MRC 2000) shows that the project area is on the sea with the depth from -4 to -5m, as shown in Fig. 5-1. It also shows that the project area is on the sea and its surrounding areas have altitudes of 10 to 18 m above mean sea level (a.b.m.s). Eastern parts of the project area are highland with low mountains and cover altitudes of up to 140 m a.b.m.s (Figure 5-2).

Based on the study on Slope Map, Scale 1/100.000 (data source: JICA 2002) indicates that the surrounding project areas have angles from 0-1.3 degree (Figure 5-3).

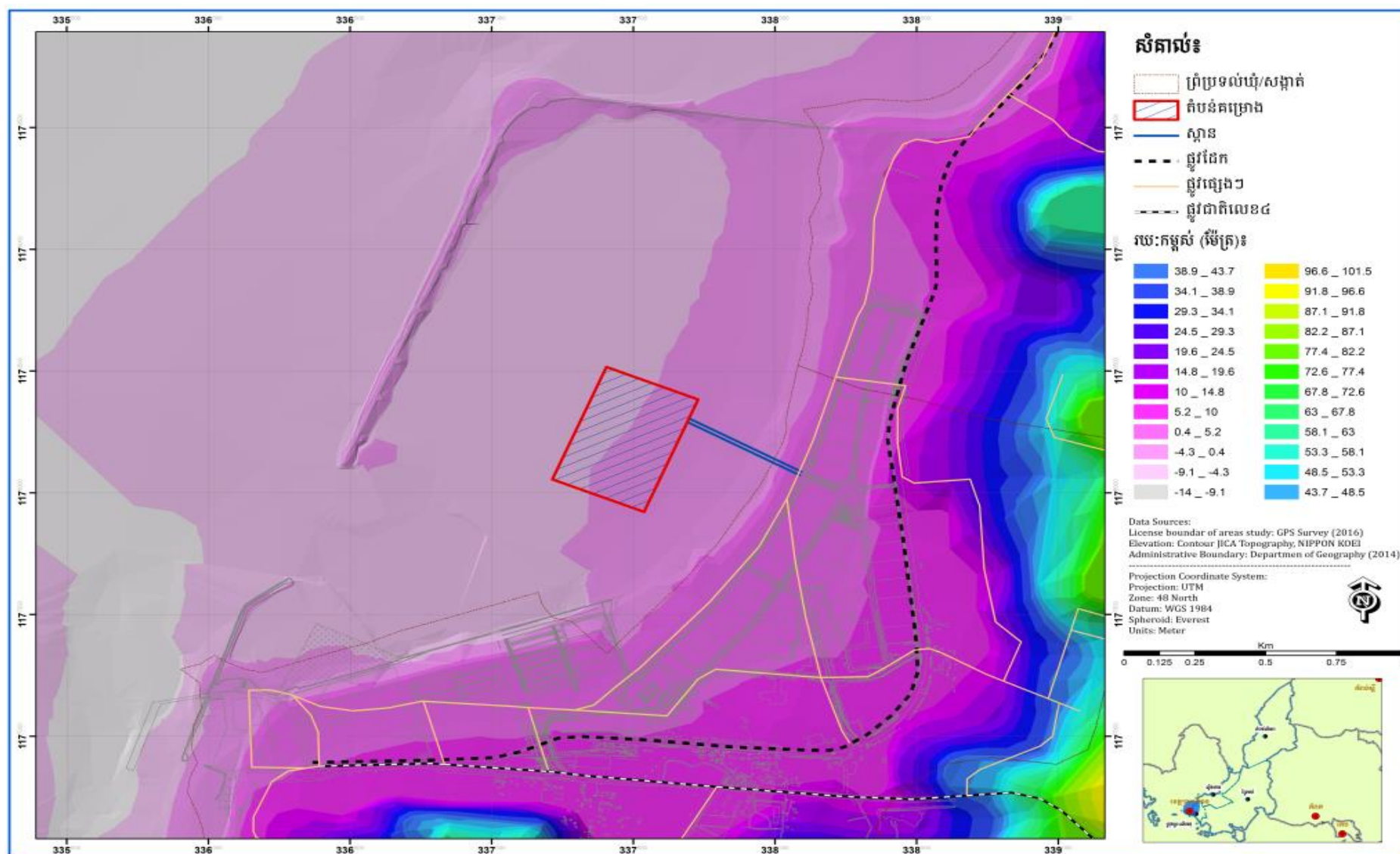


Figure 5-1: Topographical map

Source: MRC, 2000

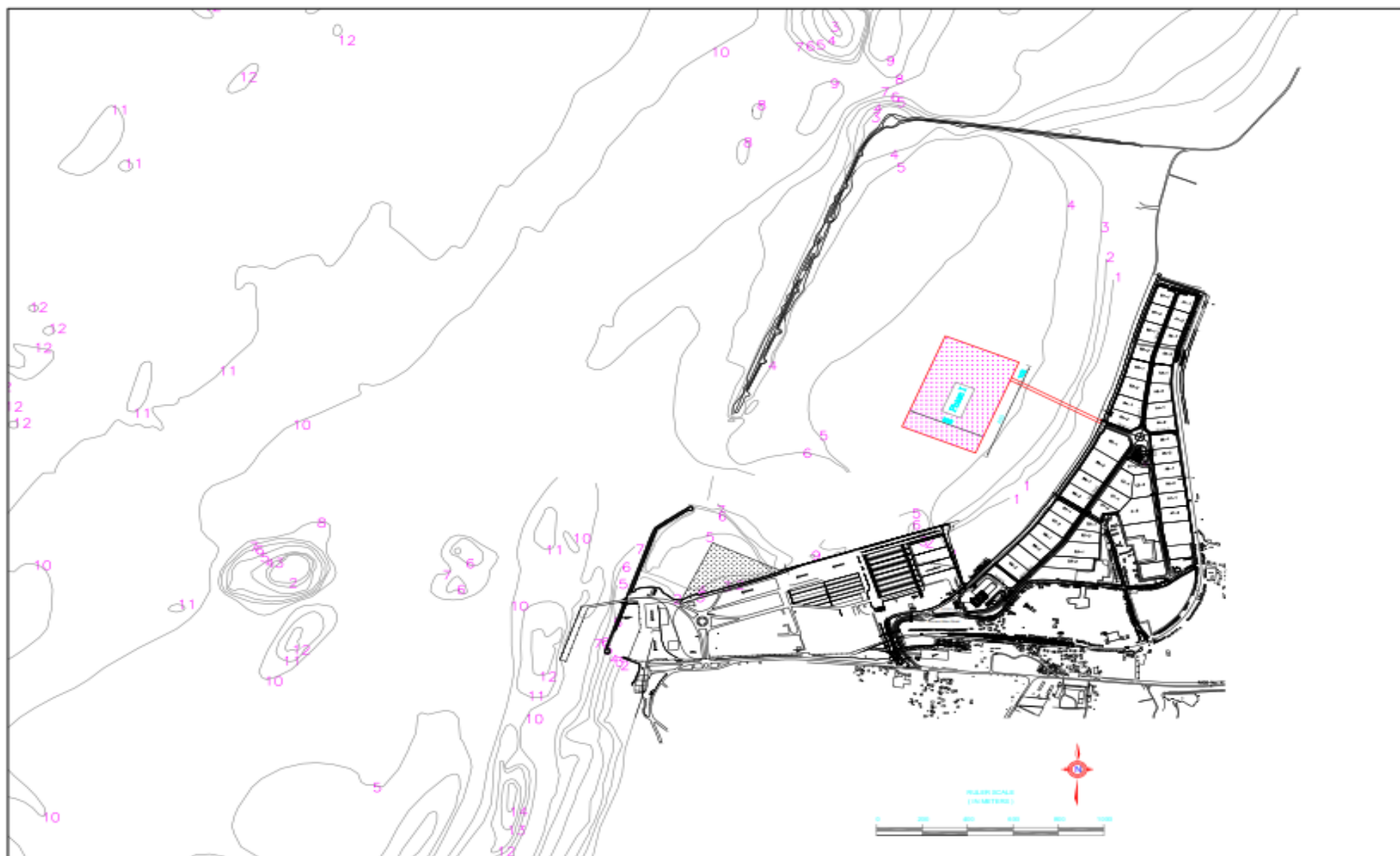
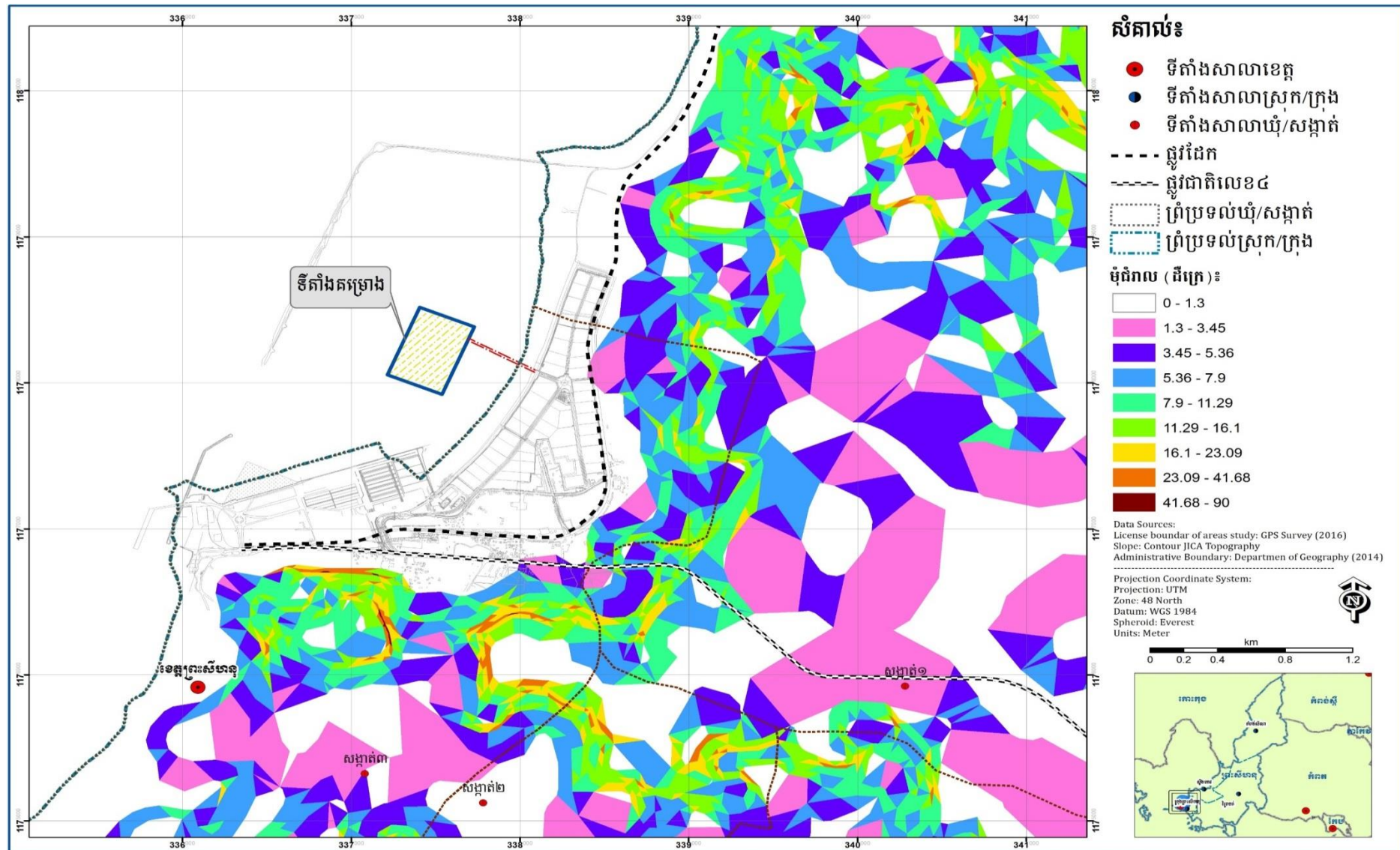


Figure 5-2: Topographical map

Source: Project data, 2000



Source: MRC, 2000

5.1.1.2 Geology

The study on geology is to know about the age and history of soil formation, and can also show its natural activities include: ascent, volcanic eruptions etc.

Based on the geological study Scale 1/100.000 (data source: JICA 2002) indicates that the project area is the sea. Eastern parts of the project area which is about 1.5 km were occurred in the Secondaire which is form Jurassic-Cretaceous sandstone which about 150-200 million years ago (Tran Khanh 2000).

5.1.1.3 Soil Type

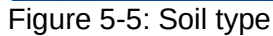
Based on Charles D.Crocker 1963, which was analyzed by GIS indicates that at the eastern part of the project area within a radius of 1.5 km there is only one type soil (acid Lithosols) as shown in Figure 5-4. This soil type includes all young soil that are descended from the acid stones include: Gré, Ryolithe and Granite. This soil has different texture from one main stone to another. But the soil profile which represent this type of land is originated from Gré.

Soil profile: gray-brown sand mixed, sometimes with Gré pebbles, pH 5-5.5 at the upper layer from 0-20 cm or 30 cm. The next layer is larger stone blocks with depth not more than 30 cm (Tran Khanh 2000).



Figure 5-4: Geological map

Source: JICA, 2002



Source: Crocker 1962

5.1.1.4 Climate

The project area shares the same climate as other areas in the country. It is influenced by tropical monsoon and is divided into two seasons, dry and rainy seasons. a 6-month dry season lasts from November to April, and is divided into two small seasons: summer and windy. Windy season starts from November to January, bringing cold air from Siberia and the summer started from February to April. The rainy season also lasts 6 months, starting from May to October. The wind flows from southwest, bringing moisture from the Indian Ocean and provides rainfall, which is critical for irrigation of agricultural crops and other plants.

According to the Meteorological data during the last 6 years (2010-2015), which were collected by the Department of Water Resources and Meteorology of Preah Sihanoukville province, included rainfall, humidity, temperatures, wind speed, and wind direction are as follows:

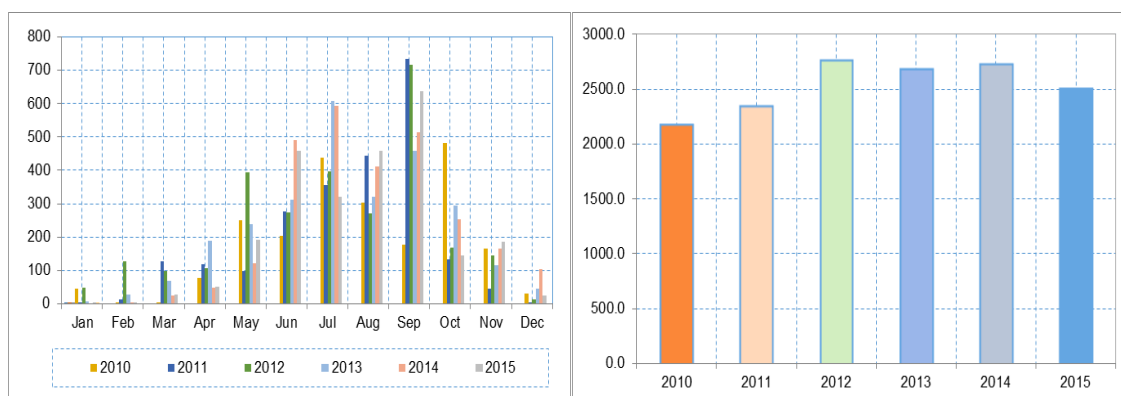
5.1.1.4.1 Rainfall

Rainfall generally varies from year to year. Total annual rainfall in Preah Sihanoukville province during the last 6 years is 2,175.6 2,346.7 2,758.4 2,682.2 2,725.6 2,504.3 mm for 2010, 2011, 2012, 2013, 2014 and 2015, respectively (Table 5.1).

Table 5-1: Monthly rainfall (mm) from 2010-2015 in Preah Sihanoukville province

Year	Month												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2010	46.2	0.6	2.6	78.4	249.8	204.4	438.8	303	176.6	480.6	164.4	30.2	2,175.6
2011	1.2	12.6	126	119.8	97	277.6	355	442.8	732.5	131.9	44.7	5.4	2,346.7
2012	47	126.6	97.4	108.1	394.9	273.3	397.4	271.8	714.9	169	145.8	12.2	2,758.4
2013	6.6	27.4	69.8	187.6	237.2	312.7	608.3	319.8	459.5	294.3	114.2	44.8	2,682.2
2014	0	0.4	23.4	49.6	121	491.6	591.9	412.3	513.1	252.9	165	104.4	2,725.6
2015	2.8	1.6	27.4	50.8	190.4	459.2	321.1	458.2	636.4	146.2	184.5	25.7	2,504.3
Aveg.	17.3	28.2	57.8	99.1	215.1	336.5	452.1	367.9	538.8	245.8	136.4	37.1	
Max	47	126.6	126	187.6	394.9	491.6	608.3	458.2	732.5	480.6	184.5	104.4	
Min	0	0.4	2.6	49.6	97	204.4	321.1	271.8	176.6	131.9	44.7	5.4	

Source: Provincial Department of Water Resources and Meteorology, 2016



Graph 5-1: Monthly and yearly rainfall (mm) from 2010-2015 in Preah Sihanoukville province

Source: Provincial Department of Water Resources and Meteorology, 2016

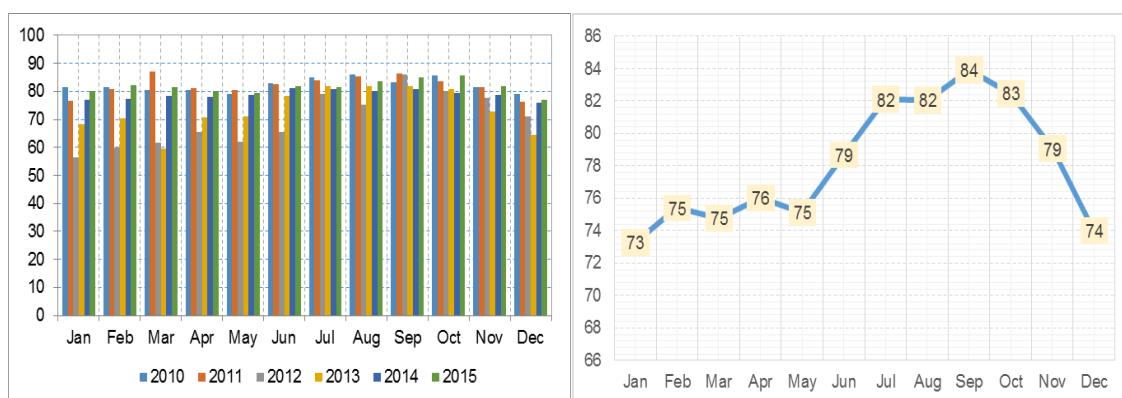
5.1.1.4.2 Humidity

Humidity rates change according to the season. The highest moisture month is in September and the driest month is January. Humidity rates in Preah Sihanoukville station within the last 6 years are as shown in Table 5-2. It is generally observed that the rate of humidity is high at night throughout the year.

Table 5-19: Monthly Humidity from 2010-2015 in Preah Sihanoukville province

Year	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	81.5	81.5	80.3	80.5	79	82.9	85.1	85.9	83.4	85.6	81.6	79.2
2011	76.5	80.8	87.1	81	80.6	82.5	84.1	85.5	86.3	83.5	81.4	76.3
2012	56.3	60.1	61.6	65.6	61.9	65.5	79	75.4	86.2	80.2	77.6	71.2
2013	68.3	70.3	59.7	70.8	71	78.3	82	82	81.8	80.7	72.9	64.3
2014	76.9	77.4	78.4	78.1	78.8	81.1	80.9	80	80.8	79.3	78.8	75.9
2015	80.1	82.3	81.6	80.2	79.5	81.8	81.5	83.6	85	85.7	82	77
Aveg.	73.3	75.4	74.8	75.9	75.1	78.7	82.1	82.1	83.9	82.5	79.1	74.1
Max.	81.5	82.3	87.1	81	80.6	82.9	85.1	85.9	86.3	85.7	82	79.2
Min.	56.3	60.1	59.7	65.6	61.9	65.5	79	75.4	80.8	79.3	72.9	64.3

Source: Provincial Department of Water Resources and Meteorology, 2016



Graph 5-2: Monthly Humidity from 2010-2015 in Preah Sihanoukville province

Source: Provincial Department of Water Resources and Meteorology, 2016

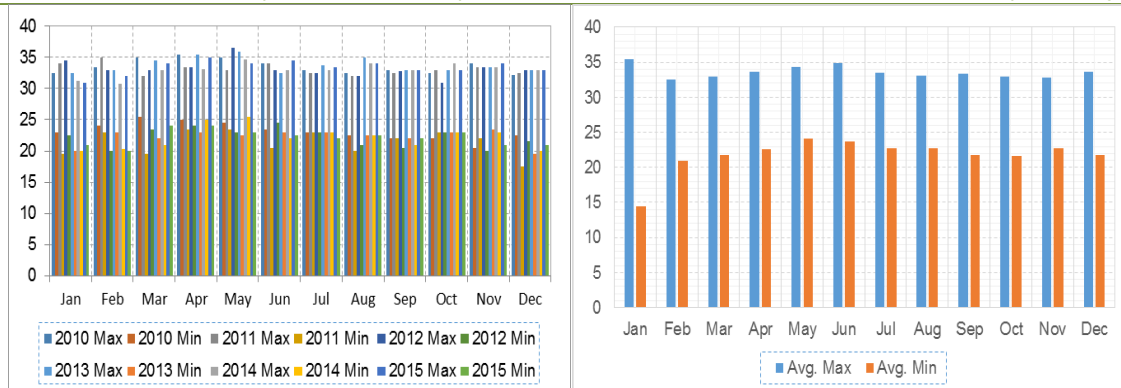
5.1.1.4.3 Temperature

Maximum temperature in Preah Sihanoukville ranges from 33.1 to 44 °C. The hottest month is June. The minimum temperature ranges from 14.4 to 24.1 °C. The coldest months are January and February (Table 5-3).

Table 5.3: Max. and Min. temperature in Preah Sihanoukville province

Year	(°C)	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	Max.	32.5	33.5	35	35.5	35	34	33	32.5	33	32.5	34	32.2
	Min.	23	24	25.5	25	24.5	23.5	23	22.5	22	22	20.5	22.5
2011	Max.	34	35	32	33.4	33	34	32.5	32	32.5	33	33.5	32.5
	Min.	19.5	23	19.5	23.5	23.5	20.5	23	20	22	23	22	17.5
2012	Max.	34.5	33	33	33.5	36.5	33	32.5	32	32.8	31	33.5	33
	Min.	22.5	20	23.5	24	23	24.5	23	21	20.5	23	20	21.5
2013	Max.	32.5	33	34.5	35.5	36	32.5	33.8	35	33	33	33.5	33
	Min.	20	23	22	23	22.5	23	23	22.5	22	23	23.5	19.5
2014	Max.	31.3	30.7	33	33.1	34.7	33	33	34	33	34	33.5	33
	Min.	20	20.3	21	25	25.5	22	23	22.5	21	23	23	20
2015	Max.	31	32	34	35	34	34.5	33.5	34	33	33	34	33
	Min.	21	20	24	24	23	22.5	22	22.5	22	23	21	21
Aveg. Max.		35.5	32.6	32.9	33.6	34.3	34.9	33.5	33.1	33.3	32.9	32.8	33.7
Aveg. Min.		14.4	21.0	21.7	22.6	24.1	23.7	22.7	22.8	21.8	21.6	22.8	21.7

Source: Provincial Department of Water Resources and Meteorology, 2016



Graph 5-3: Monthly max. and min. temperature and its monthly average max. and min. temp.

Source: Provincial Department of Water Resources and Meteorology, 2016

5.1.1.4.4 Wind Speed and Wind Direction

Wind speeds vary from month to month and from year to year. Generally in Preah Sihanoukville province lowest wind speeds are from October to December. While highest wind speed are from August to September (Table 5.4).

Table 5.4: Wind speed (m/s) and wind direction in Preah Sihanoukville province

Year	WD/WS	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	WD	NW	S	SE	NW	NW	SW	NW	NW	NW	NW	NE	NE
	WS	9.0	7.0	6.0	5.0	21.0	8.0	7.0	16.0	17.0	7.0	8.0	7.0
2011	WD	NE	E	N	SW/SE	N	NW	NW	NW/W	NW	NW/W	NE	NE
	WS	5.0	7.0	6.0	4.0	5.0	7.0	8.0	9.0	8.0	7.0	5.0	6.0
2012	WD	NE	NE	W/SE	SW/SE	NW	NW	NW	NW/W	NW	NW/W	NE/N	NE
	WS	6.0	9.0	5.0	4.0	8.0	10.0	6.0	10.0	9.0	12.0	8.0	6.0
2013	WD	NE	N/NE	SW	NW	SW	SW	NW	W/SW	NW	N/NW	N/NW	N/NW
	WS	3.0	5.0	6.0	9.0	5.0	5.0	12.0	10.0	12.0	8.0	7.0	9.0
2014	WD	N	S	SE	NE	NW	NW	W	W	W	W	E	N
	WS	4.0	5.0	4.0	4.0	4.0	8.0	9.0	8.0	8.0	7.0	6.0	7.0
2015	WD	NE	S	N/NE	E	S/SW	E	SW	NW	SW	S/SW	SW	N
	WS	6.0	6.0	6.0	6.0	7.0	8.0	7.0	7.0	12.0	6.0	8.0	6.0
Monthly Avg.		5.5	6.5	5.5	5.3	8.3	7.7	8.2	10.0	11.0	7.8	7.0	6.8
Max.		9.0	9.0	6.0	9.0	21.0	10.0	12.0	16.0	17.0	12.0	8.0	9.0
Min		3.0	5.0	4.0	4.0	4.0	5.0	6.0	7.0	8.0	6.0	5.0	6.0

Source: Provincial Department of Water Resources and Meteorology, 2016

5.1.1.5 Air Quality, Noise and Vibration Levels

5.1.1.5.1 Air Quality

2 locations were selected for air quality analysis and then analyzed in the MoE's laboratory. As a result, it shows that the parameters CO NO₂ SO₂ and TSP are not exceeded the MoE's standard. As for PM_{2.5} and PM₁₀, they are higher than standard of WHO due to traffic activities (Table 5-5). The result is concluded the atmospheric environment in the project area is fairly good.

Table 5.5: Result of air quality analysis

Locations	Air concentration in atmosphere (mg/m ³)						
	CO	NO ₂	SO ₂	TSP	Pb	PM2.5*	PM10*
Sampling site 1	6.24	0.028	0.025	0.361	Not detected	0.159	0.186
Sampling site 2	4.65	0.024	0.019	0.266	Not detected	0.108	0.145
Standard level	20 (8h)	0.1 (24h)	0.3 (24h)	0.33 (24h)	0.005 (24h)	0.025 (24h)	0.05 (24h)

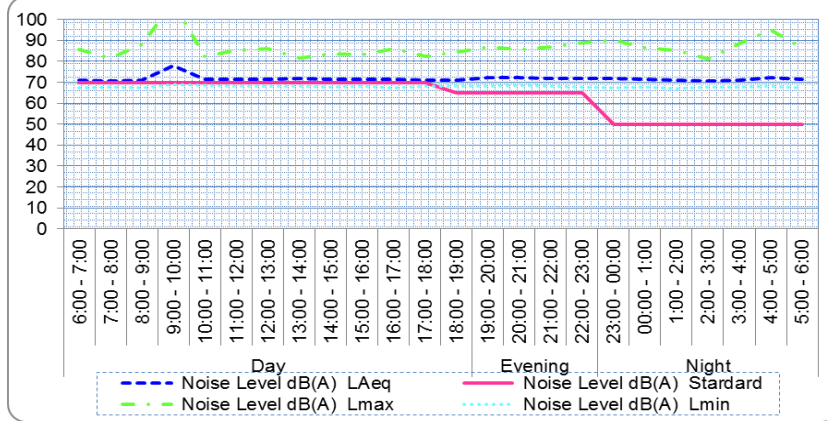
Note: (*) Standard of WHO (No Cambodian standard for PM2.5 and PM10).

5.1.1.5.2 Noise Level

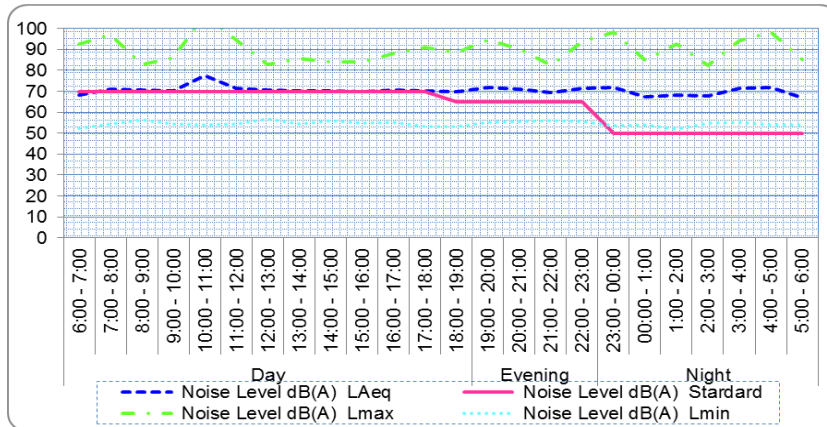
Result from noise level measurement shows that maximum noise level is higher than the MoE's standard at 2 sampling sites especially from 9.00-10.00 for site 1, from 10.00-11.00 for site 2 and from 04.00-05.00 for both sites. Likewise, the average noise level is higher than the MoE's standard at site 2, especially from 9.00-10.00 at site 1, from 10.00-11.00 at site 2 and from 04.00-05.00 for both sites (Graphic 5.4 and 5.5). This is because of the heavy traffic.

5.1.1.5.3 Vibration Level

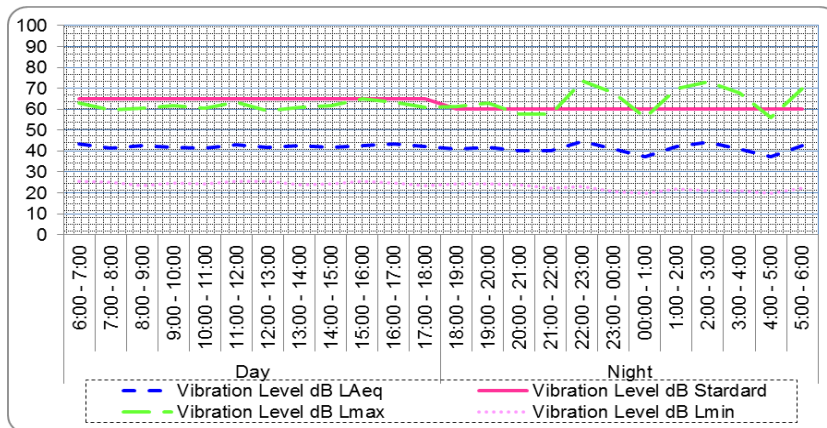
Result from vibration level measurement shows that maximum vibration level is lower than the Japan's standard during the 24-hour measurement for site 1 and is higher than the standard during night time for site 2. Overall, the average vibration level of both locations is lower than the standard either daytime or nighttime (Graph 6 and 7).



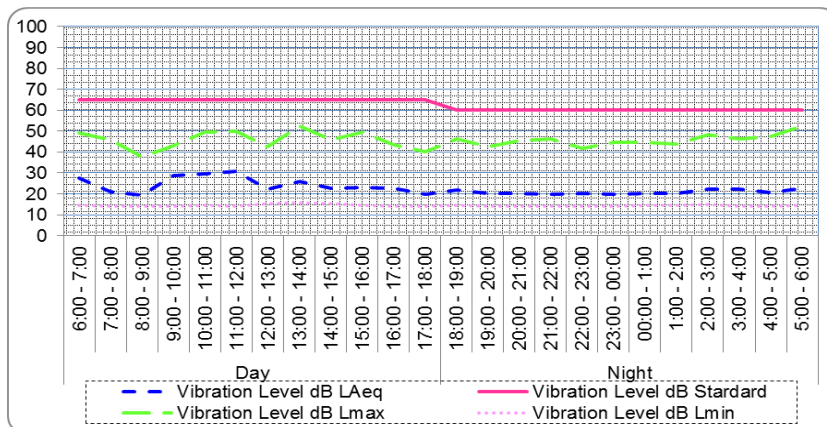
Graph 5-4: Noise level at Site 1



Graph 5-5: Noise level at Site 2



Graph 5-6: Vibration level at Site 1



Graph 5-7: Vibration level at Site 2

5.1.1.6 Hydrology

5.1.1.6.1 Waterway System

Based on JICA data source 2002 and direct observation, it shows that there is no waterway around the project area.

5.1.1.6.2 Sea Current

Sea current in the dry season is calm. In the rainy season, sea current moves into waves due to strong winds. The result of sea current measurement showed that the sea current from South to North is predominant in the two measuring points. Maximum speed of the sea current in the northern access channel is about 40 cm/sec occurring for both directions: the south and the north. The speed of the sea current in the southern access channel is stronger than in the northern part. Maximum speed of the southern current is sometimes up to 60 cm/sec.

5.1.1.6.3 Wave

From general survey in the dry season, sea surface is calm with very few waves, whereas there may be a height of about 0.4 – 0.7 mm. But in the rainy season, waves seem to occur often that a height ranging from 0.5 – 0.9m, and sometimes there may be up to 1.5–2m. Wave direction depends on wind direction.

5.1.1.6.4 Flood Tide/ Ebb Tide

Generally, flood tide and ebb one can occur twice a day. Usually ebb tide occurred in the morning while flood tide began in the afternoon until night. In Sihanoukville Province average height of flood tide is from 0.5 – 1 m, but during the windy season the flood tide height can be slightly higher, up to 1–1.5 m, which can be seen from November to January of each year. Generally, the average ebb tide height ranged from 0.5 – 0.8 m compared to the sea level.

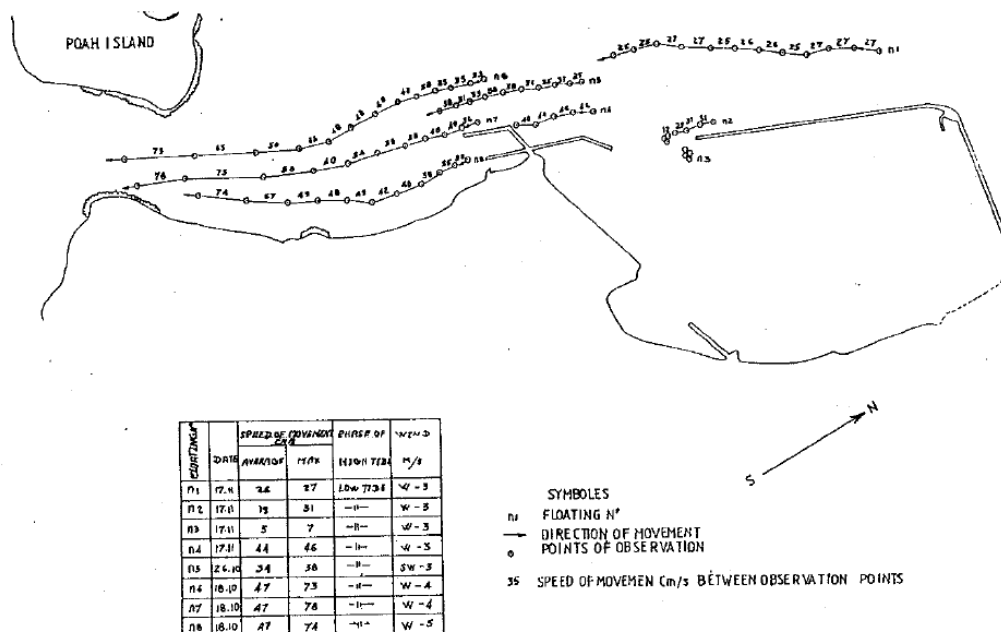


Figure 5-6: Results of Ebb tide survey

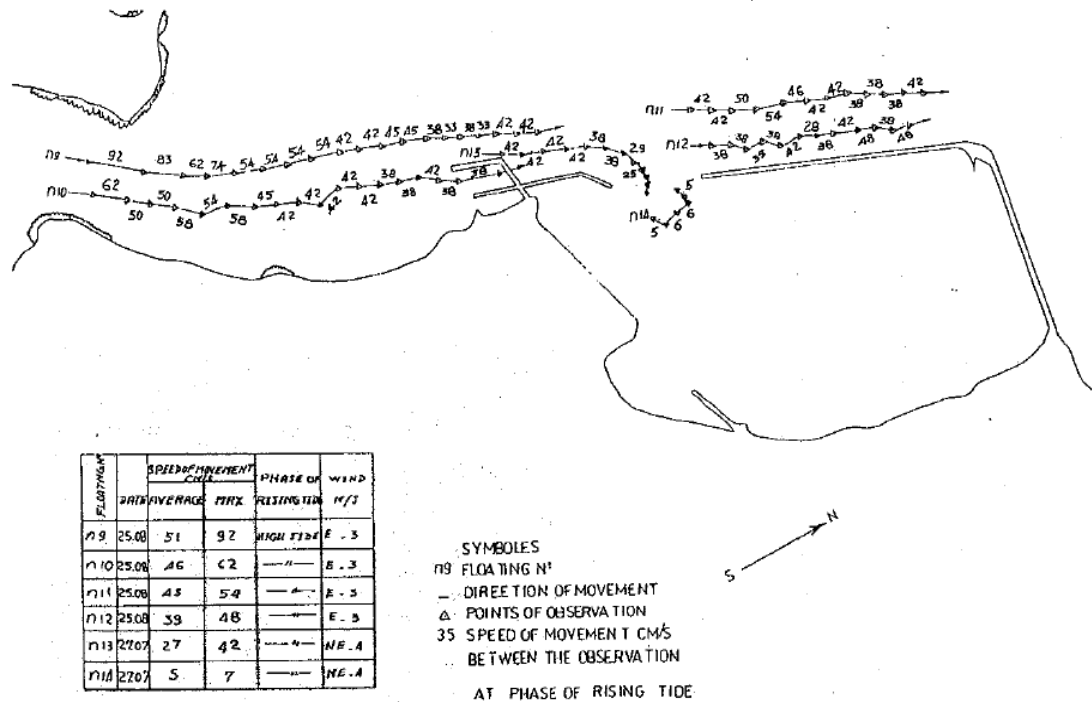


Figure 5-7: Results of flood tide survey

5.1.1.6.5 Suspended Solid Inflow

The SS sampling was conducted in December 2016 at six sites, and the results of laboratory test are shown in Table 5-6. All of data shows very low concentration in the range of 10 to 30 [mg/l], which is lower than MoE's standard. The survey was conducted in December, which was the end of rainy season or beginning of the dry season, and there was no rainfall on the day of sampling. Therefore, the concentration was very low.

On the other hand, the results of another TSS survey conducted in August 2016 shown the concentration of 100 to 200 [mg/l] at the sites near the breakwaters or the dumping sites (Table 5-7). The differences of concentration between the two surveys do not mean lower concentration of SS in the drainages, but means lower concentration during the dry seasons.

The concentration of SS also changes depending on the location. The concentration near the coastline is high due to SS inflow from drainages. In fact, the data near the coastline, such as WQ1 on August 2016, has shown higher concentration than the data at seaside (WQ5 and WQ6).

Table 5-6: Results of Suspended Solids Survey on December 2016

Sampling Site	D1	D2	D3	D4	D5	D6
TSS (mg/l)	12	29	22	16	21	29
Standard	Standard I < 60, Standard II < 120					

TSS: Total Suspended Solids

Table 5-7: Results of Suspended Solids Survey on August 2016

Sampling Site	WQ-01-1	WQ-02-1	WQ-03-1	WQ-04-1	WQ-05-1	WQ-06-1
TSS (mg/l)	180	104	136	114	103	106
Standard	No value					

In conclusion of suspended solids survey, the concentration of SS in the Sihanoukville Port changes in response to seasonal condition due to natural SS inflow from the drainages. The concentration becomes high during the rainy season especially near the coastline.

5.1.1.8 Water Quality

5.1.1.8.1 Sea Water Quality

6 sampling locations were identified for sea water quality analysis. The sampling was conducted on August 17, 2016 and analyzed at the MoE's laboratory. The result is shown in Table 5-8. The result shows that most of the parameters don't exceed the MoE's standard for biodiversity conservation. But the parameters:

- Oil and grease exceeds the MoE's standard level at the sampling site 6, due to the human activities (illegal people living in the port area) such as discharging oil-contained liquid waste into the sea.
- Total Coliform also exceeds the MoE's standard level due to taking samples in the rainy season, resulting soil erosion washed away by rain into the sea and considering as the main source of higher Coliform.

Overall, the result of water quality analysis can be concluded that sea water quality is fairly good.

5.1.1.8.2 Ground Water Quality

During the study period, 3 boreholes were selected for groundwater analysis. The result shows that all parameters don't exceed the MIH's standard for drinking water quality (Table 5-8). The result can be concluded that the groundwater quality is very good for drinking and cooking purposes.

Table 5-8: Result of sea water analysis

No.	Parameters	Unit	Standard	Result of analysis					
				Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
1. Surface layer									
1	pH	-	6.5 – 8.5	8.40	8.60	8.20	8.20	8.20	8.20
2	Temperature (°C)	°C	-	29.10	30.00	29.40	30.70	30.50	29.60
3	Turbidity	NTU	-	0.00	0.00	0.70	0.00	4.00	2.00
4	Salinity	%	-	0.10	0.10	0.20	0.20	0.20	0.20
5	Dissolved Oxygen (DO)	mg/L	2.0 – 7.5	5.80	6.60	5.40	5.80	6.00	5.60
6	Total Suspended Solid (TSS)	mg/L	-	180.000	104.00	136.00	114.00	103.00	106.00
7	Biochemical Oxygen Demand (BOD ₅)	mg/L	-	1.17	0.93	0.86	0.83	0.98	1.56
8	Chemical Oxygen Demand (COD _{OH})	mg/L	2.0 -8.0	2.29	2.07	2.15	2.06	1.84	3.29
9	Oil and Grease	mg/L	0	2.54	1.47	3.67	3.05	2.88	2.93
10	Total-N	mg/L	0.2 – 1.0	0.86	0.41	0.30	0.59	0.64	1.06
11	Total-P	mg/L	0.02 – 0.09	0.05	0.03	0.07	0.04	0.05	0.09
12	As	mg/L	< 0.01	Not detected	0.003	Not detected	Not detected	Not detected	Not detected
13	Fe-Total	mg/L	-	0.13	0.01	0.001	0.01	0.08	0.06
14	Hg-Total	mg/L	<0.0005	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected
15	Coliform	MPN/100ml	<1000	3.6 x 10 ²	2.9 x 10 ²	6.4 x 10 ²	1.1 x 10 ³	6.4 x 10 ²	1.5 x 10 ³
2. Depth -2m									
1	pH	-	6.5 – 8.5	8.30	8.30	8.20	8.20	8.20	8.20
2	Temperature (°C)	°C	-	29.40	30.10	29.30	30.20	30.00	29.70
3	Turbidity	NTU	-	0.00	0.20	0.80	4.00	8.00	6.00
4	Salinity	%	-	0.20	0.20	0.20	0.20	0.20	0.20
5	Dissolved Oxygen (DO)	mg/L	2.0 - 7.5	5.20	6.40	5.40	5.60	5.60	5.20
6	Total Suspended Solid (TSS)	mg/L	-	195.00	116.00	152.00	134.00	182.00	115.00
7	Biochemical Oxygen Demand (BOD ₅)	mg/L	-	1.06	1.07	1.46	1.26	1.39	1.75
8	Chemical Oxygen Demand (COD _{OH})	mg/L	2.0 - 8.0	2.71	2.32	2.54	2.83	2.97	3.66
9	Oil and Grease	mg/L	0	1.93	0.91	1.96	2.44	2.17	1.10
10	Total-N	mg/L	0.2 - 1.0	0.55	0.83	0.43	0.66	0.84	0.55
11	Total-P	mg/L	0.02 - 0.09	0.02	0.03	0.02	0.05	0.14	0.08
12	As	mg/L	< 0.01	0.003	Not found	0.001	0.001	0.003	Not detected
13	Fe-Total	mg/L	-	0.03	0.07	0.15	0.17	0.12	0.02
14	Hg-Total	mg/L	<0.0005	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected
15	Coliform	MPN/100ml	<1000	4.3 x 10 ²	1.2 x 10 ³	6.4 x 10 ²	1.5 x 10 ³	6.4 x 10 ²	1.5 x 10 ³

No.	Parameters	Unit	Standard	Result of analysis					
				Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
3. Bottom layer									
1	pH	-	6.5 - 8.5	8.20	8.20	8.20	8.20	8.20	8.20
2	Temperature (⁰ C)	⁰ C	-	29.40	29.70	29.50	29.70	29.80	29.6
3	Turbidity	NTU	-	1.38	4.00	2.70	10.00	22.00	24.0
4	Salinity	%	-	0.20	0.20	0.20	0.20	0.20	0.20
5	Dissolved Oxygen (DO)	mg/L	2.0 - 7.5	4.80	5.80	5.00	5.40	5.00	3.20
6	Total Suspended Solid (TSS)	mg/L	-	230.00	129.00	181.00	175.00	289.00	172.00
7	Biochemical Oxygen Demand (BOD ₅)	mg/L	-	1.98	1.29	1.64	1.29	1.56	1.92
8	Chemical Oxygen Demand (COD _{OH})	mg/L	2.0 - 8.0	3.18	2.86	2.97	3.28	4.80	4.09
9	Oil and Grease	mg/L	0	0.84	0.52	0.23	0.44	1.01	0.89
10	Total-N	mg/L	0.2 - 1.0	0.65	0.35	0.39	0.72	0.96	0.69
11	Total-P	mg/L	0.02 - 0.09	0.05	0.14	0.06	0.14	0.22	0.11
12	As	mg/L	< 0.01	0.003	0.003	0.003	0.005	0.008	0.003
13	Fe-Total	mg/L	-	0.03	0.03	0.08	0.14	0.21	0.18
14	Hg-Total	mg/L	<0.0005	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected
15	Coliform	MPN/100ml	<1000	4.3 x 10 ²	9.2 x 10 ²	6.1 x 10 ²	1.5 x 10 ³	3.8 x 10 ²	7.5 x 10 ²

Table 5-9: Result of groundwater analysis

No.	Parameters	Unit	Drinking water standard*	Result		
				Site 1	Site 2	Site 3
1	pH	-	6.5 – 8.5	6.6	6.7	6.7
2	Temperature ($^{\circ}\text{C}$)	$^{\circ}\text{C}$	-	30.2	30.6	30.7
3	Total Suspended Solid (TDS)	mg/L	< 800	234	135	126
4	Hard water (CaCO_3)	mg/L	< 300	40	60	50
5	NH_4	mg/L	< 1.5	0.16	0.11	0.18
6	PO_4	mg/L	-	3.01	3.45	3.45
7	Chemical Oxygen Demand (COD)	mg/L	-	2.37	2.06	3.17
8	Fe	mg/L	< 0.3	0.1	0.16	0.2
9	As	mg/L	< 0.05	Not detected	0.002	0.004
10	Total Coliform	MPN/100ml	0	0	30	61

Note: Drinking water quality standard of the Ministry of Industry and handicraft

5.1.1.9 Seabed Mud Quality

2 locations were selected for seabed mud quality analysis. The result shows as in table 5-10. It is noted that the value of all parameters were not in the standard set by the Ministry of Environment. All parameter will, therefore, be used as a reference data in case there will be suspected pollution occur from the seabed mud during construction phase.

Table 5-10: Result of seabed mud quality analysis

No.	Parameters	Unit	Standard*	Result	
				Site 1	Site 2
1	pH	-	-	7.31	8.71
2	As	mg/kg-dry	-	2.80	1.66
3	Cd	mg/kg-dry	-	0.11	0.08
4	Cr6	mg/kg-dry	-	3.26	2.24
5	Cu	mg/kg-dry	-	0.98	2.06
6	CN	mg/kg-dry	-	2.24	1.86
7	Total Fe	mg/kg-dry	-	146.06	159.30
8	Pb	mg/kg-dry	-	1.85	2.17
9	Hg	mg/kg-dry	-	0.02	0.04
10	Hg	mg/kg-dry	-	16.50	20.80
11	TN	ppm	-	2450	2100
12	TP	ppm	-	283.96	179.77

Note: No seabed mud quality standard in Cambodia

5.1.1.10 Numerical Simulation of Dispersion of Disposed Soil

5.1.1.10.1 Background

The numerical simulation of dispersion of disposed soil or Sedimentation Modeling was conducted to delineate the extent of affected area of dredged material dumping in the Study on the Master Planning and Feasibility Study of the Sihanoukville Port in the Kingdom of Cambodia (JICA, 1997).

In the case of the proposed new container terminal project, turbidity monitoring data of the multipurpose terminal project is available. The monitoring data implies the radius of sediment dispersion caused by the dumping works. The construction works of both projects related to sediment dispersion are very similar, therefore the numerical simulation of sediment dispersion is not necessary. However, the simulation was conducted to confirm the extent of affected area of sediment dispersion with the similar methodology used in the study of JICA, 1997.

5.1.1.10.2 Objective

To confirm the extent of suspended soil after disposal of dredged materials during the proposed new container terminal construction works, simplified numerical simulation was carried out.

5.1.1.10.3 Numerical Model and Input Conditions

MIKE21, which was one of the world-famous two-dimensional numerical models, was applied for this numerical study. This model can simulate advection and diffusion of suspended soil due to disposal of dredging materials into the sea under fluctuated tidal current field. The nested model was employed to conduct appropriate simulation at the limited target area. The calculation area and input condition for the computation are shown in Figure 5-8 and Table 5-11, respectively.

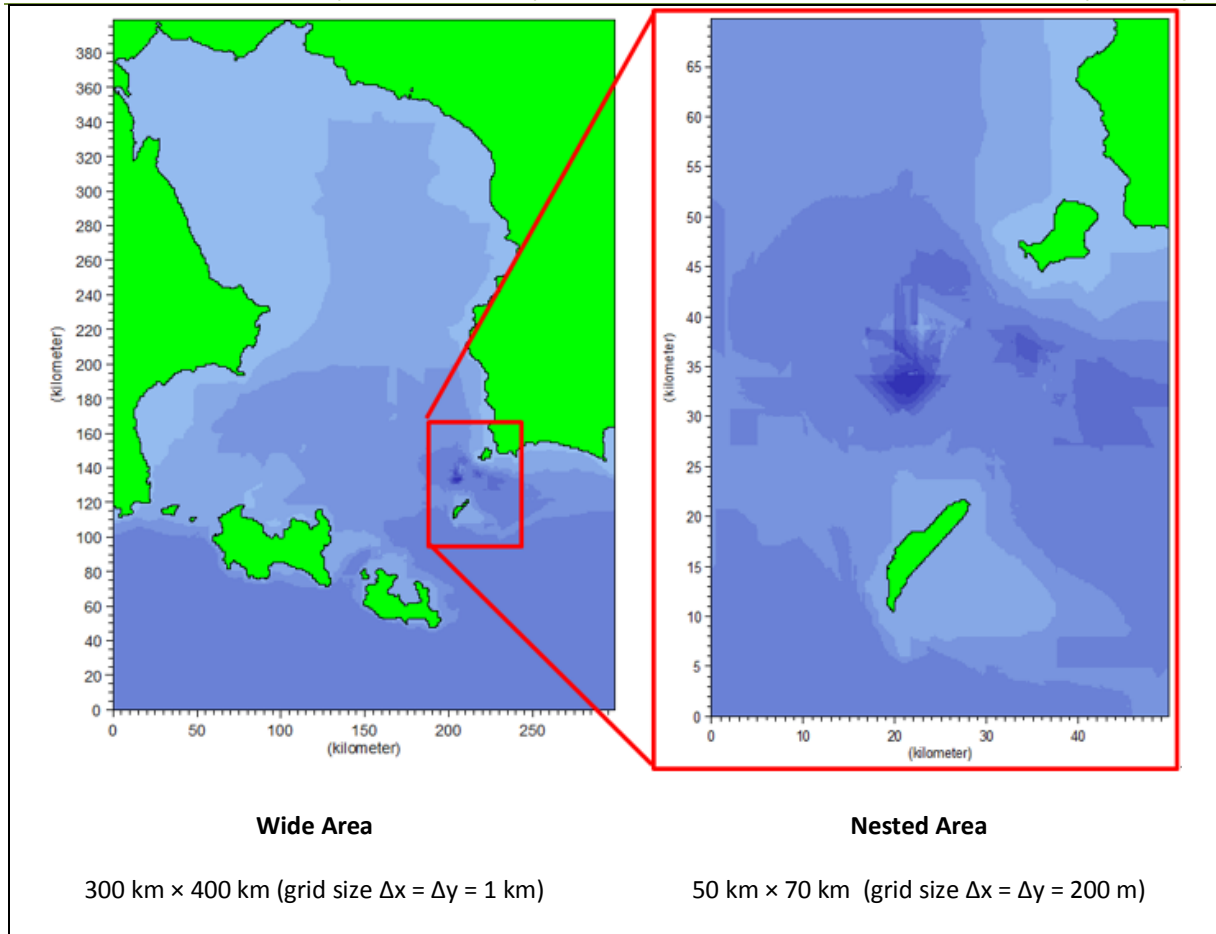


Figure 5-8: Computation Area for SS Simulation

Source: JICA Survey Team

Table 5-11: Input Condition of SS Simulation

Item	Condition
Dumping Interval	Every 6 hours
Dumping number per day	4 times /day
Dumping volume (per every interval)	1,000 m ³ /dumping
Grain size (d_{50})	0.035 mm
Generated per unit (w_0)	5.7×10^{-7} (t/m ³)
Tide condition	± 0.8 m (for spring tide) ± 0.2 m (for neap tide) (2 cycle tide change per day)
Horizontal diffusion coefficient	10 m ² /s
Particle setting velocity (V)	0.00095 m/s (calculated by Stokes Formula)

Source: JICA Survey Team

5.1.1.10.4 Validity of Numerical Model

Due to the insufficient actual field data for diffusion and convection phenomena on site, it is difficult to verify the numerical model as quantitative level. Thus, the current pattern and the advection and diffusion pattern were checked under the different conditions of tidal current.

Figure 5-9 and figure 5-10 show one of examples to compare the current patterns

under the different tide conditions, and the advection and diffusion pattern of turbidity with and without tidal current. The tidal current changes in accordance with tide conditions and the position of suspended solids shifted to the downstream side of tidal current as expected.

As the result of several checking and calibration, it was justified that the employed numerical model could predict the actual phenomena with sufficient accuracy.

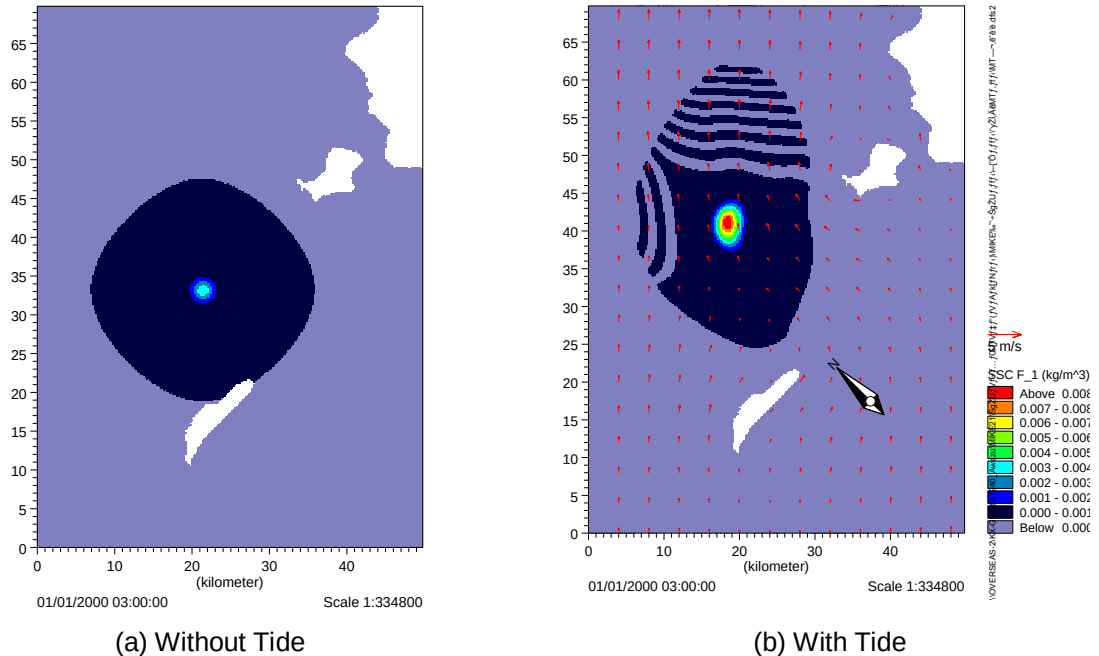


Figure 5-9: Comparison of Current Patterns under Different Tide Conditions

Source: JICA Survey Team

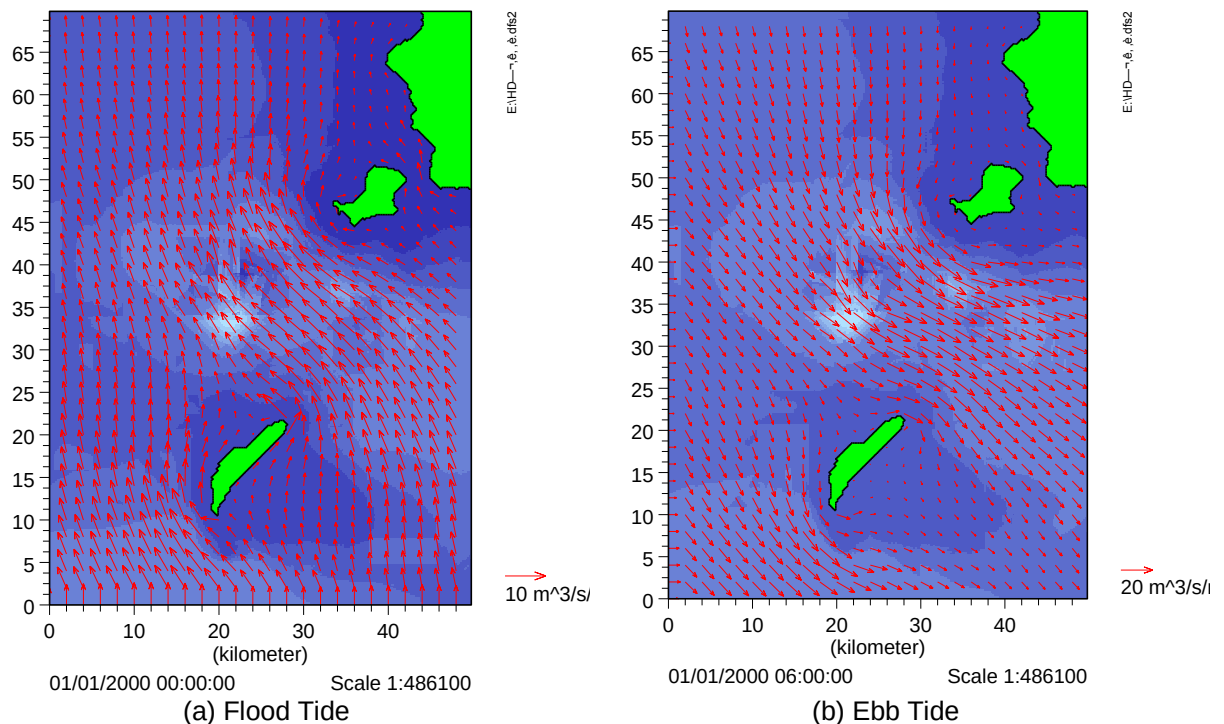


Figure 5-10: Comparison of Advection and Diffusion Patterns under Different Tide Conditions

Source: JICA Survey Team

5.1.1.10.5 Location of Dumping Site and Evaluation Points

The location of dumping site and the evaluation points are as shown in Figure 5-11.

5.1.1.10.6 Relationship between Turbidity Dispersion and Tidal Current

The computation results of turbidity dispersion for suspended soil and tidal current at 20minutes, 2 hours and 4 hours after the dumping activity are shown in Figure 5-12 to Figure 5-14, respectively. The concentration of turbidity is dispersed and moving to downstream side due to change in tidal current. The area of turbidity is just nearby dumping area and no adverse effect to the outside of dumping area was observed.

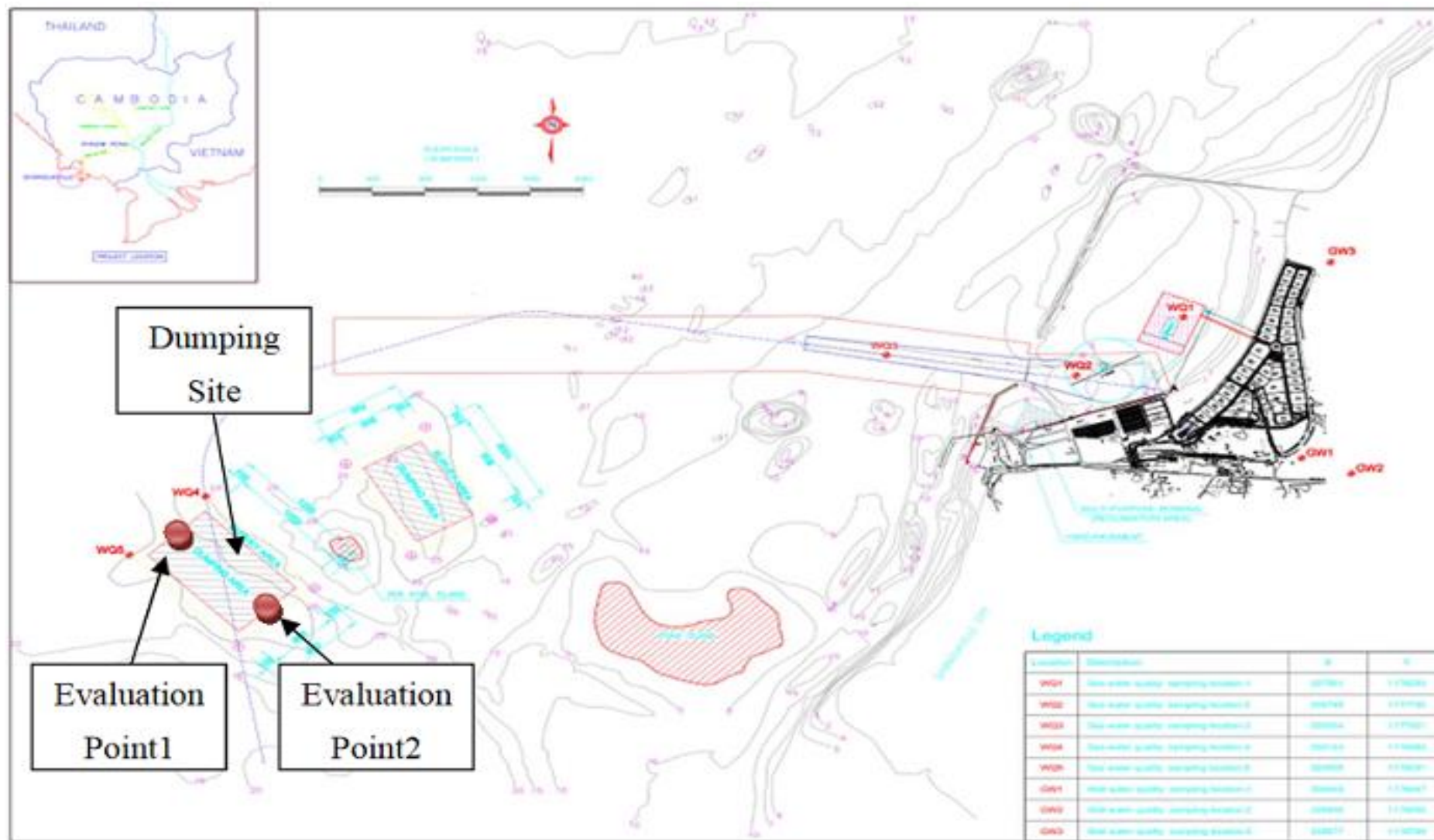


Figure 11-11: Location of Dumping Site and Evaluation Points
Team

Source: JICA Survey

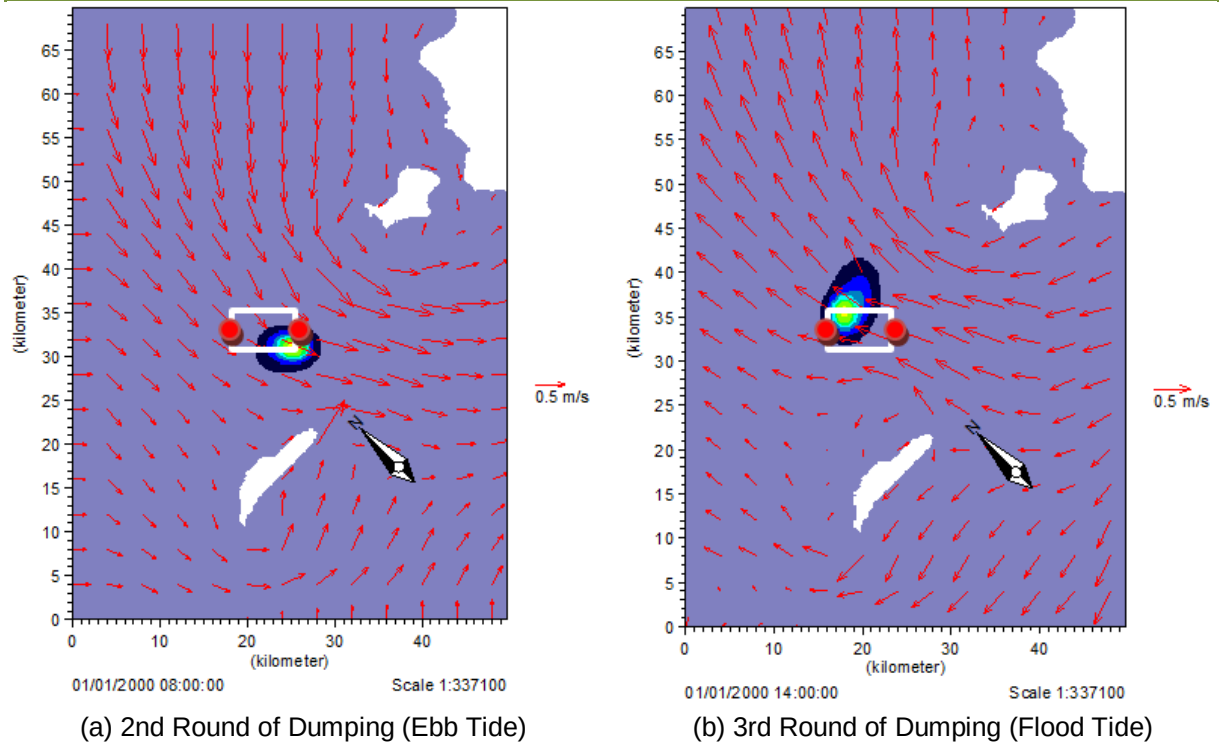


Figure 5-12: Relation between Turbidity Dispersion and Tidal Current at 20 Minutes after Dumping
Source: JICA Survey Team

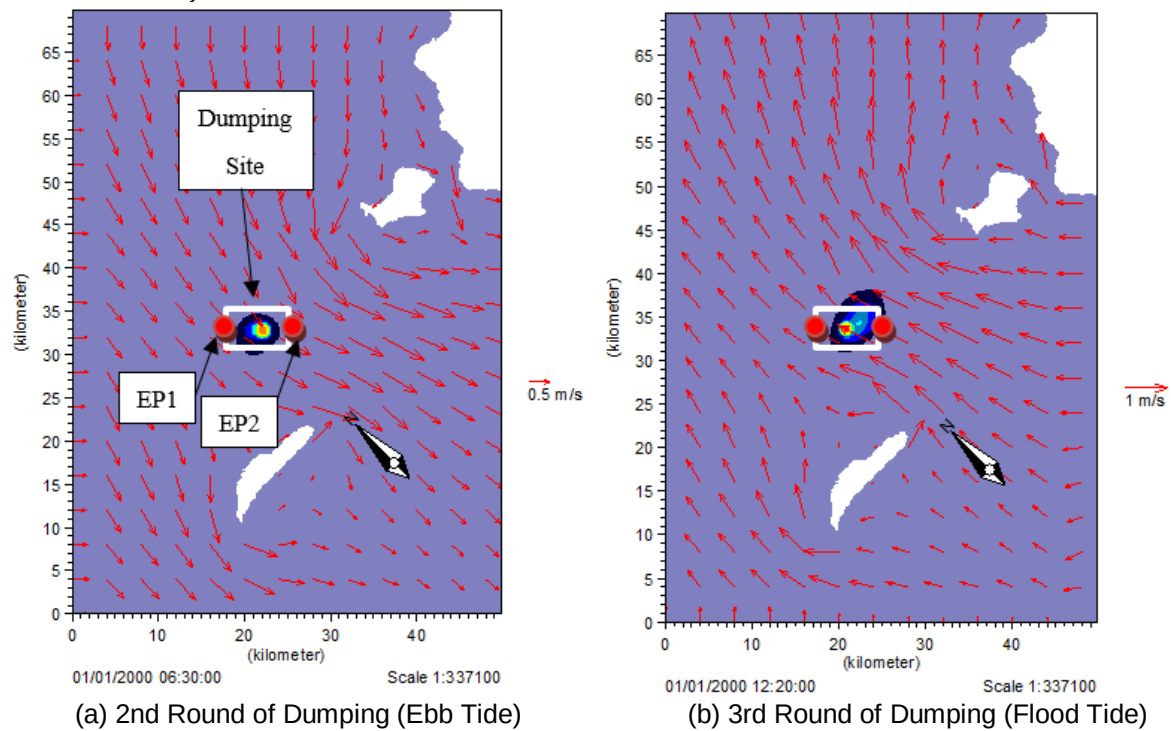
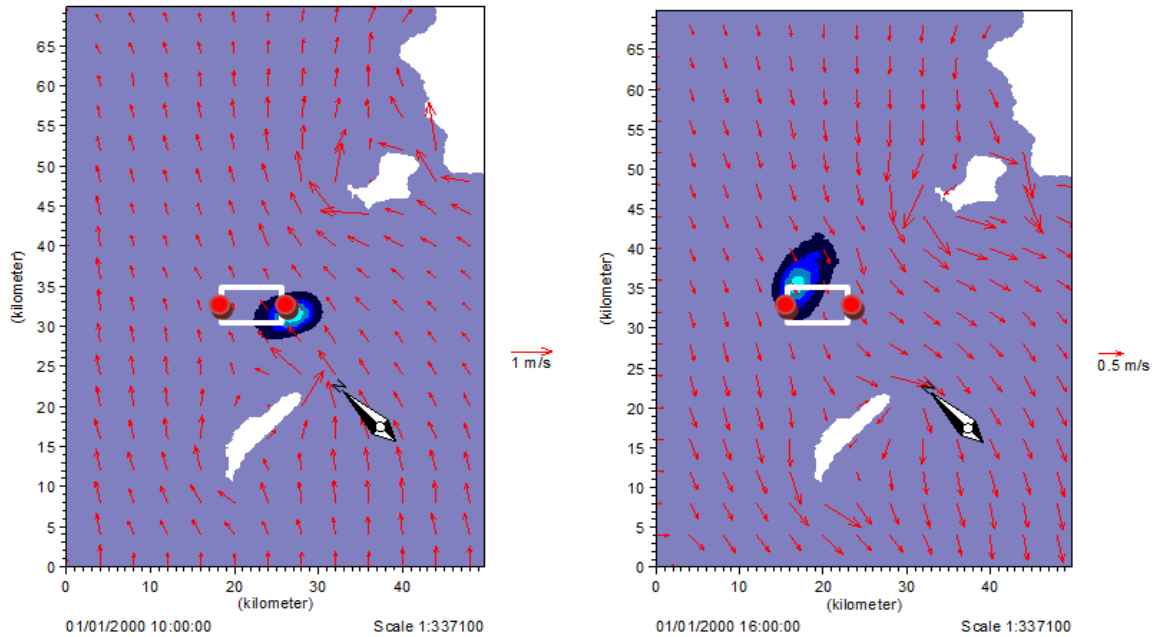


Figure 5-13: Relation between Turbidity Dispersion and Tidal Current at 2 hours after Dumping
Source: JICA Survey Team



(a) 2nd Round of Dumping (Ebb Tide) (b) 3rd Round of Dumping (Flood Tide)
 Figure 5-14: Relation between Turbidity Dispersion and Tidal Current at 4 hours after Dumping
 Source: JICA Survey Team

5.1.1.10.7 Density of Suspended Soil at Evaluation Points

Figure 5-15 shows time variation of the density of suspended soil for 36 hours. As the reference, the change in tide elevation and current speed are also shown in Figure 5-16 and Figure 5-17.

- Just after the dumping, high turbidity is observed at center point with 10 NTU. However, high turbidity suddenly decreases and becomes less than 1 NTU within several ten minutes due to advection and dispersion effect of tidal current.
- The peak values of turbidity at each evaluation points are different due to spatial variation of tidal current. The peak values for both points are less than 5 NTU. The results fulfill the environmental control criteria during the dumping activity.
- The high turbidity is disappeared within 2 hours after the dumping. This means that 6 hours interval is sufficient to ease the turbidity effect.

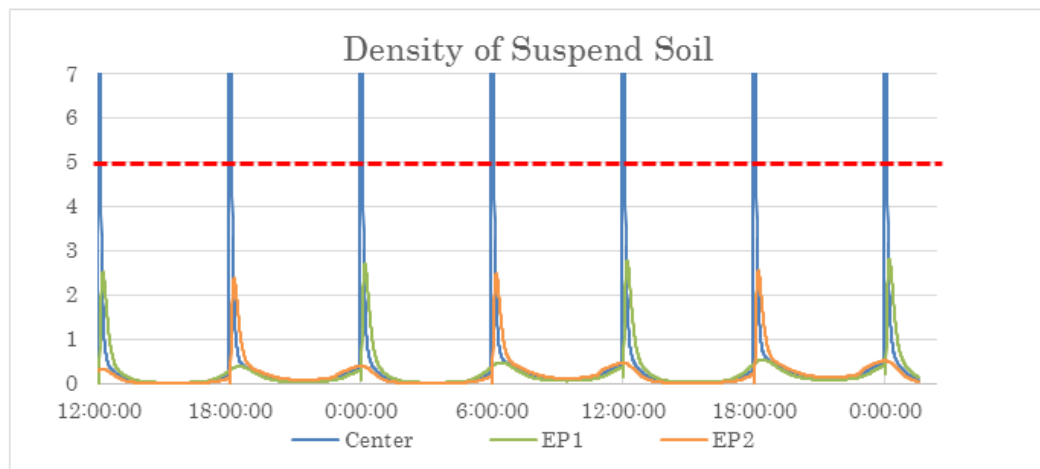


Figure 5-15: Density of Suspended Soil at Evaluation Points (Unit: NTU)
 Source: JICA Survey Team

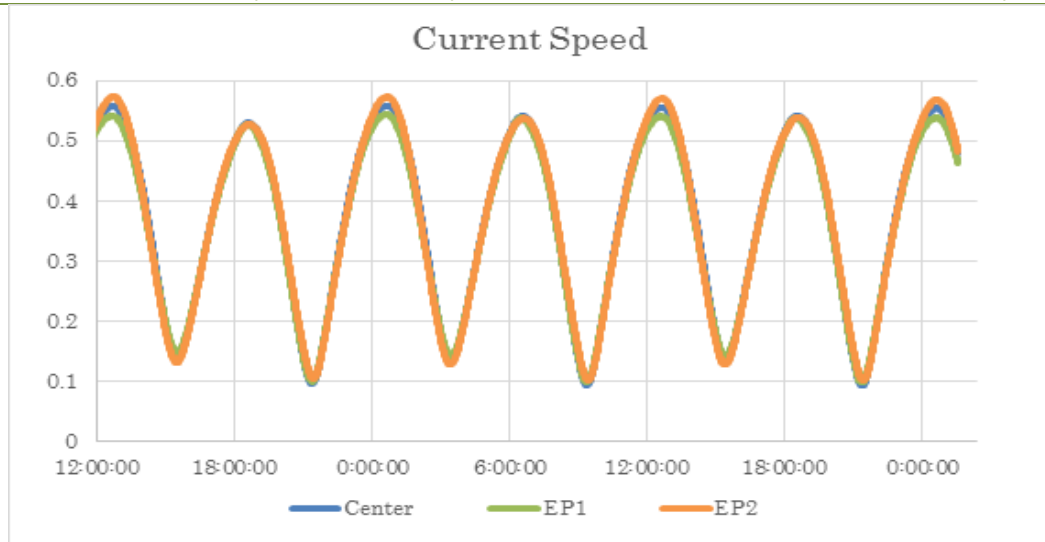


Figure 5-16: Tide Level (Unit: m)

Source: JICA Survey Team

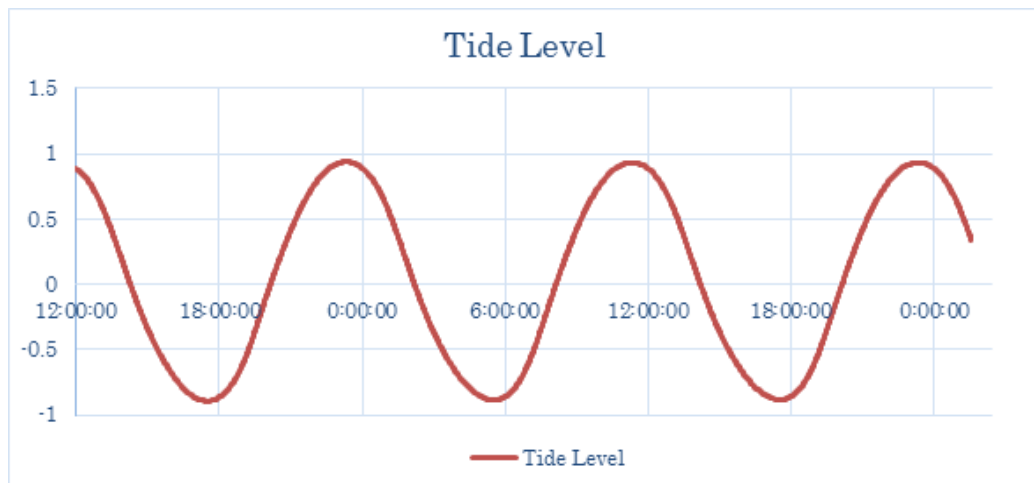


Figure 5-17: Current Speed

Source: JICA Survey Team

5.1.1.10.8 Conclusion

The dispersion of suspended soil after disposal of dredged materials during the proposed new container terminal construction works will occur only in limited area according to the results of numerical analysis. The JICA Survey Team concluded that the possibility of serious environmental impacts on the surrounding area of dumping site due to the disposal works was low.

5.1.2 Biological Resource

5.1.2.1 Forest Resource

There were 169 species of flora recorded in the field survey. Of those species, 13 were in Cambodia's wood quality classification system. Most of them were classified as least concern in IUCN Red List. According to Annex 2 of the Prakas on Timber Product and by-product to be prohibited from harvest of the Ministry of Agriculture, Forestry and Fisheries, dated February 14, 2005, there were three species: Tatrao, Thnong and Angkanh found in the survey area (Table 5-12).

Table 5-12: Type of plants found in the survey area

No.	Khmer Name	Scientific name	Family	IUCN	WQC
1	Ta Trao	Fagraea fragrans	Loganiaceae	LC	Luxury
2	Thnong	Pterocarpus indicus	Leguminosae-papilionoideae	VU	Luxury
3	Angkanh	Cassia siamensis	Leguminosae-caesalpinioideae	N/A	Luxury
4	Torsek	Peltophorum vogelianum	Fabaceae	N/A	First Grade
5	KoKi	Hopea odorata	Dipterocarpus tuberculatus	VU	First Grade
6	Mai Sak	Tectona grandis	Verbenaceae	N/A	First Grade
7	Chheu Teal	Dipterocarpus costatus	Dipterocarpaceae	EN	Second Grade
8	Pring Bay	Syzygium cumini	Myrtaceae	N/A	Third Grade
9	Thlork	Parinari annamensis	Chrysobalanaceae	N/A	Third Grade
10	Pring Srer Toab	Syzygium polyanthum	Myrtaceae	N/A	Third Grade
11	Pring Thom	Syzygium tincorium	Myrtaceae	N/A	Third Grade
12	Kray	Polyalthia cerasoides	Annonaceae	N/A	Third Grade
13	Kror Bao	Hydnocarpus annamensis	Flacourtiaceae	VU	Third Grade
14	Kror Vanh Chrouk	Cyperus rotundus	Cypraceae	LC	Ungraded
15	Kork	Juncus effusus	Juncaceae	LC	Ungraded
16	Muk Chhneang	Christia vespertilionis	Leguminosae-papilionoideae	LC	Ungraded
17	Kroab Baek	Swietenia macrophylla	Meliaceae	VU	Ungraded
18	Preah Khlorb	Mimosa pudica	Leguminosae-mimosoideae	LC	Ungraded
19	Popeal Khae	Alstonia scholaris	Apocynaceae	LC	Ungraded
20	Tunsae	Caryota urens	Palmae	LC	Ungraded
21	Thnaot	Borassus flabellifer	Palmae	EN	Ungraded
22	Russy Srok	Dendrocalamus membranaceus	Gramineae	LC	Ungraded
23	Mien	Dimocarpus longan	Sapindaceae	NT	Ungraded
24	Kanh Chhaet	Neptunia oleracea	Leguminosae-mimosoideae	LC	Ungraded
25	Roluos Bay	Erythrina variegata	Leguminosae-papilionoideae	LC	Ungraded

Note: WQC = Wood quality classification of Cambodia

LC = Least concern, NT = Near threatened, VU = vulnerable, EN = Endangered,

N/A = Not Available (No information available or yet to be assessed)

5.1.2.2 Aquatic Plant Resource

Aquatic plant resource is rarely seen in this development zone because it has been actively developed since the 1960s. On the other hand, it is not a protected area or conservation area. However, there are block of rock next to the sea with white sand and some seaweed and this is an active port area. But there are some coral grows in the sea, about 8 km from the beach which is far from the project location.

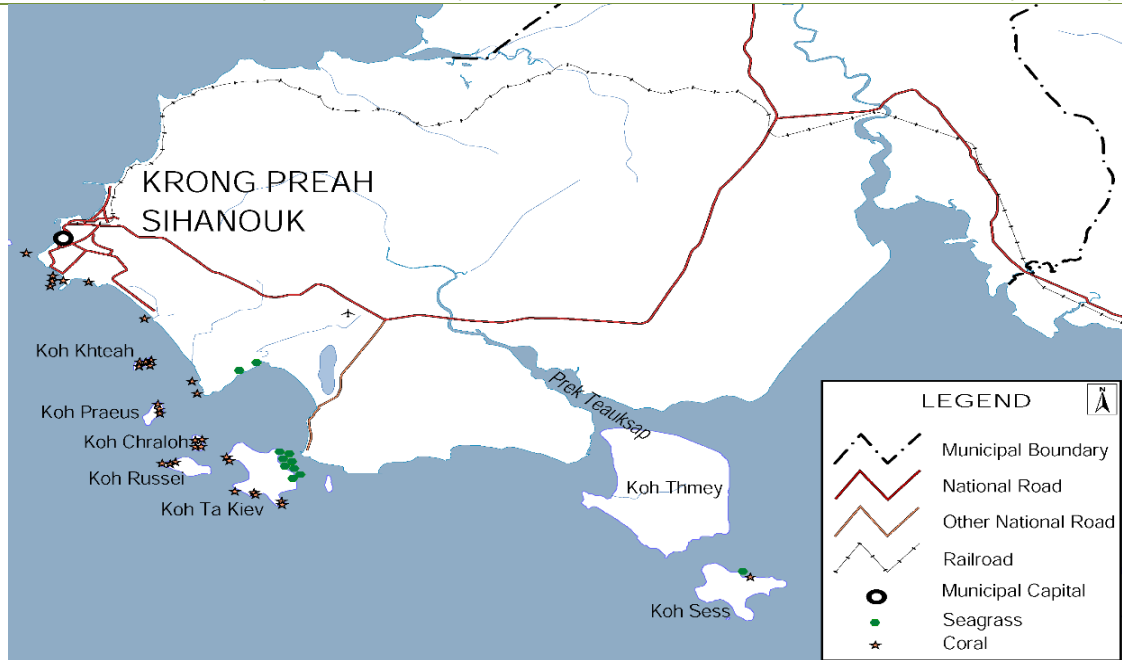


Figure 5-18: Coral and Seaweed locations in Sihanouk Province

Source: Report on environment of Sihanoukville in April 2001 (Ministry of Environment and DANIDA)

5.1.2.3 Wildlife Resource

Wildlife resources were conducted through interviews with residents. As a result, there were 72 birds, 24 mammals, 26 reptiles, and 10 Amphibians. Most of them are least concern (Table 5-13).

Table 5-13: Summarize of animals found in the survey area

No.	Treaten situation	Bird	Mammal	Reptile	Amphibian/bartrachian
1	Least concern (LC)	62	12	9	10
2	Near threatened (NT)	3	-	-	-
3	Vulnerable (VU)	2	-	8	-
4	Endangered (EN)	2	2	-	-
5	Critically endangered(CR)	-	1	1	-
6	Not available (N/A)	3	9	12	-
Total		72	24	26	10

5.1.2.4 Fisheries Resource

5.1.2.4.1 Current Situation of Fishing Activity

a) Experiences in Fishing Activity

Since they have been living on the sea, they have often conducted fishing activities for their daily livelihoods, and some of them have such activities as their main income source as well. Fishing activities for those people have been implemented for a long time. Amongst the 90 interviewees, their experiences over 6 years are 81%, while the rest have experiences between 3 and 5 years.

b) Fishing Gears

There are 5 fishing gears are used by fishermen, all of which are net, Shrimp Net, Seine, Crab hoop, and Octopus hoop. Generally, net and shrimp net are the most popular

fishing gears contributing of 60% and 23%, respectively. The popular size of fishing gears is shown in table 5-14.

Table 20: Size of popular fishing gears

Size (m ²)	Net		Shrimp Net	
	Number of family	percent	Number of family	percent
<1000	18	20	22	24
1000-3000	29	32	30	33
3000-5000	52	28	17	19
> 5000	18	20	22	24

Source: Survey data in July 2016

c) Geographical Locations for Fishing

There are many fishing areas in Sihanoukville, most of them located near the islands. According to interviews with fishermen, there are 33 fishing areas where can be reached by local fishermen (Figure 5-19). Table 5-15 shows 6 popular fishing areas such as: Koh Russey, Koh Tang, Koh Rong, Koh Thas, Koh Poulouwaia and Koh Pring.

Table 21: Location of fishing area

No.	Fishing area	Frequency		
		Always	Often	Rare
1	Koh Russey	27	6	
2	Koh Tang	25	7	1
3	Koh Rong	23	7	
4	Koh Thas	21	8	1
5	Koh Polowai	18	1	5
6	Koh Pring	18	7	2
7	Koh Dek Kol	9	2	3
8	Koh Sdach	7	3	4
9	Koh Ses	6	2	
10	Koh Pos	5	2	
11	Lor Toek Trey	3		1
12	Koh Preap	2		
13	Koh Kong	2		2
14	Ream	2		1
15	Phleung Kror Horm	1	1	1
16	Koh Daung	1	2	2
17	Poy Loa	1		
18	Koh Takeav	1	1	
19	Koh Yor	1		
20	Koh Tres	1		
21	Koh Chaor Lous	1		
22	Koh Krorbei		1	
23	Koh Tauch	1		
24	Koh Krosar			1
25	Koh Smach	1		
26	Koh Phann	1		
27	Koh Andoeuk	2		
28	Koh Kala	1		
29	Thmor Sor		1	
30	Koh Ta	3		
31	Koh Yeay	2		
32	Koh Tunsay	1		

No.	Fishing area	Frequency		
		Always	Often	Rare
33	Bae	1		

Source: Survey data in July 2016

d) Species of Fish and Aquatic Fauna

There are 61 fish species and 6 aquatic fauna species and their present conditions that fishermen have caught which is shown in table 5.16.

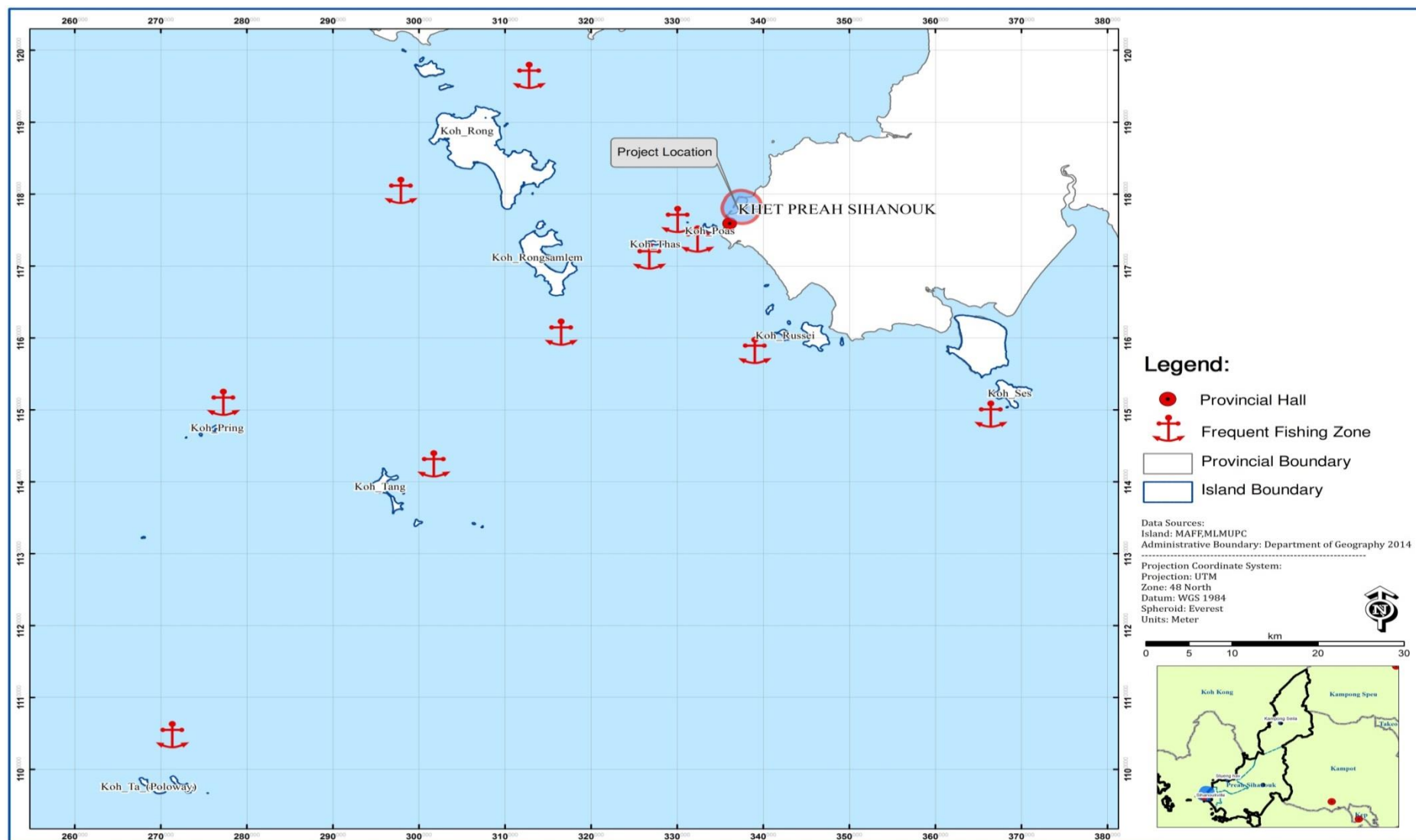


Figure 5-19: Popular Fishing Area

Source: Survey data in July 2016

Table 22: Types of fish species and aquatic fauna

No.	Khmer/Local Name	English Name	Scientific Name	Present situation		
				Many	Average	Rare
1. Sea fish						
1	Trey Baek Chhnang	Tripletail	Lobotes surinmensis	✓		
2	Trey Beka Damrey	Indo-Pacific sailfish	Istiophorus platypterus	✓		
3	Trey Ambor	-	-	✓		
4	Trey Tok Kae Kroem	Bluelined grouper	Cephalopholis formosa		✓	
5	Trey Tok Kae	Red spotted rockcod	Cephalopholis leopardus		✓	
6	Trey Tok Kae Och Krorhorm	Coral hind	Cephalopholis miniata		✓	
7	Trey Sambaor Hear	Toothpony	Gazza minuta		✓	
8	Trey Kror Horm Srorka kras	Redspot monocle bream	Nemipterus furcosus		✓	
9	Trey Kror Horm Srorka Tun	Teardrop threadfin bream	Nemipterus isacathus		✓	
10	Trey Ko	Longspined tripodfish	Pseudotriacanthus strigilfer		✓	
11	Trey Kror Horm Phnek Lean	Moontail bullseye	Priacanthus hamrur		✓	
12	Trey Kror Horm	Red bigeye	Priacanthus macracanthus		✓	
13	Trey Dor Angkor	-	Gerres abbreviatus		✓	
14	Trey Sraom Dav	Dorab wolf-herring	Chirocentrus dorab		✓	
15	Trey Andat Chhkae	Doublelined tonguesole	Paralagusia bilineata		✓	
16	Trey Kantuy Roeng	Toredo scad	Megalaspis cordyla		✓	
17	Trey Kdor Chcen	Greater lizardfish	Saurida tumbil		✓	
18	Trey Kantaing Phleung	Orangespotted spinefood	Siganus guttatus		✓	
19	Trey Kantaing Prophes	Streamlined spinefood	Siganus argenteus		✓	
20	Trey Kamong	Short mackerel	Rastrelliger brachysoma		✓	
21	Trey Ptaung	-	Tylosurus acus melanotus		✓	
22	Trey Changkaum Bei	Trgertooth crocker	Otolithes ruber		✓	
23	Trey Kantuy Krorbei	-	Xenocephalus sp.		✓	
24	Trey Ka Chy	Painted sweetlips	Diagramma pictum		✓	
25	Trey Kalaing	Talang gueenfish	Scomberoides commersonianus		✓	
26	Trey Pror Luos	Silver sillago	Sillago sihama		✓	
27	Trey Angrae	-	Sphyraena sp		✓	
28	Trey Beka	Broad-barred spanish mackerel	Scomberomorus semifaciatus		✓	
29	Trey Ang Keuy	-	Lutjanus johnii		✓	
30	Trey Tror Sak	Fourlined terapon	Pelates quadrinlineatus		✓	
31	Trey Chhlam	Brownbanded bambooshark	Chiloscyllium punctatum		✓	

No.	Khmer/Local Name	English Name	Scientific Name	Present situation		
				Many	Average	Rare
32	Trey Ptuok	Cobia	Rachycentron canadus		✓	
33	Trey Sloek Russey	Scaly hairfin anchovy	Setipinna taty		✓	
34	Trey Chen Chas	African pompano	Alectis ciliaris		✓	
35	Trey Koun	Kelee shad	Hilsa kelee		✓	
36	Trey Ki	-	-		✓	
37	Trey Kahiv	-	-		✓	
38	Trey Balaing	Island mackerel	Rastrelliger faughni		✓	
39	Trey U Duy	-	-		✓	
40	Trey Chap Sor	Silver pomfret	Pampus argenteus		✓	
41	Trey Kbal Taor/Taing Taor	-	-		✓	
42	Trey Kam Kuoch	-	-		✓	
43	BorBel	-	-		✓	
44	Sam Pan	-	-		✓	
45	Trey Sek	Freckle goatfish	Upeneus tragula		✓	
46	Trey Chheam	Striped bonito	Sarda orientalis		✓	
47	Trey Kes	-	-		✓	
48	Trey Kamory	Chacunda gizzard shad	Anodontostoma chacunda		✓	
49	Trey Ach Sa-oy	Rusty jobfish	Aphareus rutilans		✓	
50	Trey Kantaing Thmor	Doublebarred spinefood	Siganus virgatus			✓
51	Trey Andaeng Puy	-	Clarias nieuhofi			✓
52	Trey Kaun Kum	Yellowtail scad	Atule mate			✓
53	Trey Baors Tra	Russell's snapper	Lutjanus russelli			✓
54	Trey Ka-ok	Spotted catfish	Arinus sp			✓
55	Trey Chaor	Herring scand	Alepes vari			✓
56	Trey Kam Kouch	Golden trevally	Gnathanodon speciosus			✓
57	Trey Kalok Bouv	African pompano	Alectis ciliaris			✓
58	Trey Chap Khmao	Black pomfret	Parastromateus niger			✓
59	Trey Chor Pon	Japanese threadfin	Nemipterus japonicus			✓
60	Trey Kdor Sva	-	-			✓
61	Trey Dav	Dorab wolf-herring	Chirocentrus dorab			✓
2. Aquatic fauna						
1	Kdam ses	Blue crab	Portunus pelagicus	✓		
2	Bangkea sor	White Shrimp	-		✓	

No.	Khmer/Local Name	English Name	Scientific Name	Present situation		
				Many	Average	Rare
3	Bangkea krur horm	Red Shrimp	-		✓	
4	Moek Bampong	Squid	Uroteuthis duvaucelii		✓	
5	Bangkorng	Lobster	-		✓	
6	Bangkea Ov Khak	-	Penaeus sp			✓

Source: Survey data in July 2016

e) Yields of Fish and Aquatic Fauna

The survey results showed that the total annual yields of fish and aquatic fauna is 28,095 tons. During the dry season, the yields are 10% more than that in the rainy season. The yield by fishing gear is presented in Table 5-17.

Table 23: Fish yield caught by fishermen

Fising gears	No. of Faminly	Duration of Fishing			Size (m ² or hoop)	Capacity (gr/h/100m ² or hoop)	Yield (t)
		h/d	d/m	m/y			
The Rainy Season							
Net	520	11	20	6	4,100	148	4,165
Shrimp Net	199	11	20	6	4,900	241	3,102
Seine, Trawler	87	10	20	6	250	13,905	3,629
Crab hoop	52	11	24	6	1,400	1,393	1,606
Octopus hoop	9	8	28	6	60	20,833	151
Total							12,654
The Dry Season							
Net	520	11	20	6	4,100	267	7,514
Shrimp Net	199	10	20	6	4,900	237	2,773
Seine, Trawler	87	10	20	6	250	13,013	3,396
Crab hoop	52	11	24	6	1,400	1,393	1,606
Octopus hoop	9	8	28	6	60	20,833	151
Total							15,441
Total Yield							28,095

Note: h = Hour, m² = square meter, gr = gram, and t = Ton

Source: Survey data in July 2016

f) Conclusion

The study of fishery resources for the project can be concluded that the development project will not provide any significant impacts on fishing activities. However, daily fish raising activities may have impact during the project construction. This should be considered by PAS. In case of any impact by the project, proper compensation should be made. In general, the fishermen expressed their support for the development project.

5.1.2.4.2 Current Situation of Aquaculture

a) History of Aquaculture

The chief of village/mondul reported that 20 families used to carry out fish raising near the project area. Currently, only 8 families are running fish raising. It is notable that fish raising has been implemented 13 years ago, since 2003. The other 12 families stopped their fish raising due to losses caused by water pollution from the plants which is close to the sea, causing fish to die. Among the interviewed 8 families, 5 families have more than 10 years of experience and 3 other families are within 5 years of experience.

b) Type of Fish

4 fish species are being raised, all of which are Trey Ptouk (*Rachycentron canadus*), Trey Spung (*Lutjanus argentimaculatus*), Trey Toek Ke (*Cephalopholis* sp.) and Trey Chap Sor (*Pampus sparrows argeteus*). The fish raising method is incorporating two or three types of fish together into one fish cage. Most of fish species were bought from local fishermen.

c) Income from Fish Raising Activities

Based on the interviews, two families lost from fish raising activities in 2015 because of fish death, resulting from diseases and those fish could not be cured on time. However, they will continue raising fish in the next year. The other families have been profiting from such activities, ranging from US\$ 2,196 to US\$ 24,000 per year.

Table 24: Income from Fish Raising Activities

No.	Owner name	Farm Size (m ²)	Expense(USD)	Income(USD)	Profit(USD)
1	Nguon Sarat	75	2,900	2,500	-400
2	Chror Sun	300	19,262	15,000	-4,262
3	Yi Borous	270	33,600	40,600	7,000
4	Hak Ponleu	225	15,000	18,000	3,000
5	Nhoem Sakhon	380	34,600	58,600	24,000
6	Hon Sophary	320	20,125	24,225	4,100
7	Kim Heang	360	29,000	34,000	5,000
8	Seng Doung	360	39,575	41,771	2,196

Source: Survey data in July 2016

5.2 SOCIO-ECONOMIC ENVIRONMENT

The purpose of the socio-economic study is to present the current situations of the living conditions of the people who have been living in the studied area and of the affected households. This section includes economic situation (employment and income), land use, water consumption and sanitation, energy consumption, etc. before implementing of the project. Infrastructure, education, health and public well-being, Archaeological and Cultural Site and tourism area are included in this section.

Results can be considered as a benchmark before the project implementation, and may be measured after project execution. The study is very important that can be used as a tool to support decision making process.

5.2.1 Demography and Settlement Pattern

5.2.1.1 Demography

Preah Sihanoukville province has a total area of 2,536,68 km², 4 districts /municipalities, 27 communes/Sangkat and 111 villages/Centers, with total families of 45,066 households and total population of 211,526. In Sihanoukville municipality, there are 17,250 families and total population of 78,380 (Preah Sihanoukville Provincial Department of Planning, 2015). The demographic characteristics are shown in Table 5-19. Population by village/mondul related to the project is shown in Table 5-20, while detailed population in village/mondul related to the project area is shown in Table 5-21.

Table 25: Demography in Sihanoukville Municipality

Description	Year		
	2013	2014	2015
Number of family	17,003	18,034	17,250
Number of total population (person)	77,657	82,048	78,380
Annual growth rate (%)	3.2	5.7	-4.5
Total female	39,554	41,942	39,656
Comparing female to 100 males	103.8	104.6	102.4
Percent of female as head of family (%)	10.8	13.9	13.2
Average size of family (persons/family)	4.6	4.5	4.5
Number of population aged 0-17 years old	28,307	30,561	24,617
Number of population aged 18-60 years old	44,901	46,659	48,665
Number of population aged over 61 years old	4,449	4,829	5,098

Source: Sihanoukville Provincial Department of Planning, 2016

Table 26: Population by village/mondul related to the project

Sangkat	Village/Mondul	Total family	Total population	
			female	male
Sangkat 3	Mondul 3	2,102	4,564	4,571
Sangkat 1	Mondul 3	2,537	5,735	5,522
Total		4,639	10,299	10,093

Source: Sihanoukville Provincial Department of Planning, 2016

Table 27: Detailed population in village/mondul related to the project area

Sangkat	Mondul	Group	Total family	Number of population	
				Total	female
Sangkat 3	Mondul 3	Group 1	25	125	66
		Group 2	11	49	25
		Group 3	19	81	39
		Group 4	54	217	111
		Group 5	31	143	63
		Group 6	67	268	137
		Group 7	98	453	235
		Group 8	117	498	252
		Group 9	79	365	179
		Group 10	93	415	220
		Group 11	73	308	160
		Group 12	95	404	207
		Group 13	123	500	253
		Group 31	452	1,719	829
Sangkat 1	Mondul 3	Group 11	28	116	67
		Group 20	40	217	103
		Group 21	27	107	50
		Group 22	49	201	107
		Group 23	33	148	84
		Group 24	45	191	102
		Group 25	51	229	123
		Group 26	40	188	92

Sangkat	Mondul	Group	Total family	Number of population	
				Total	female
		Group 27	42	190	84
		Group 28	40	177	80
		Group 29	16	65	29
		Group 30	13	50	21
		Group 31	43	189	95
		Group 34	42	173	87
Total			1,846	7.786	3.900

Source: Sihanoukville Provincial Department of Planning, 2016

5.2.1.1 Settlement Pattern

Based on the observations in the studied area, local people's settlement pattern is concentrated along National Road No.4 (A), in the port area (B), and near the proposed project (C) (Figure 5-20). People living in the port area are considered as illegal dwellers and will resettle in the future.

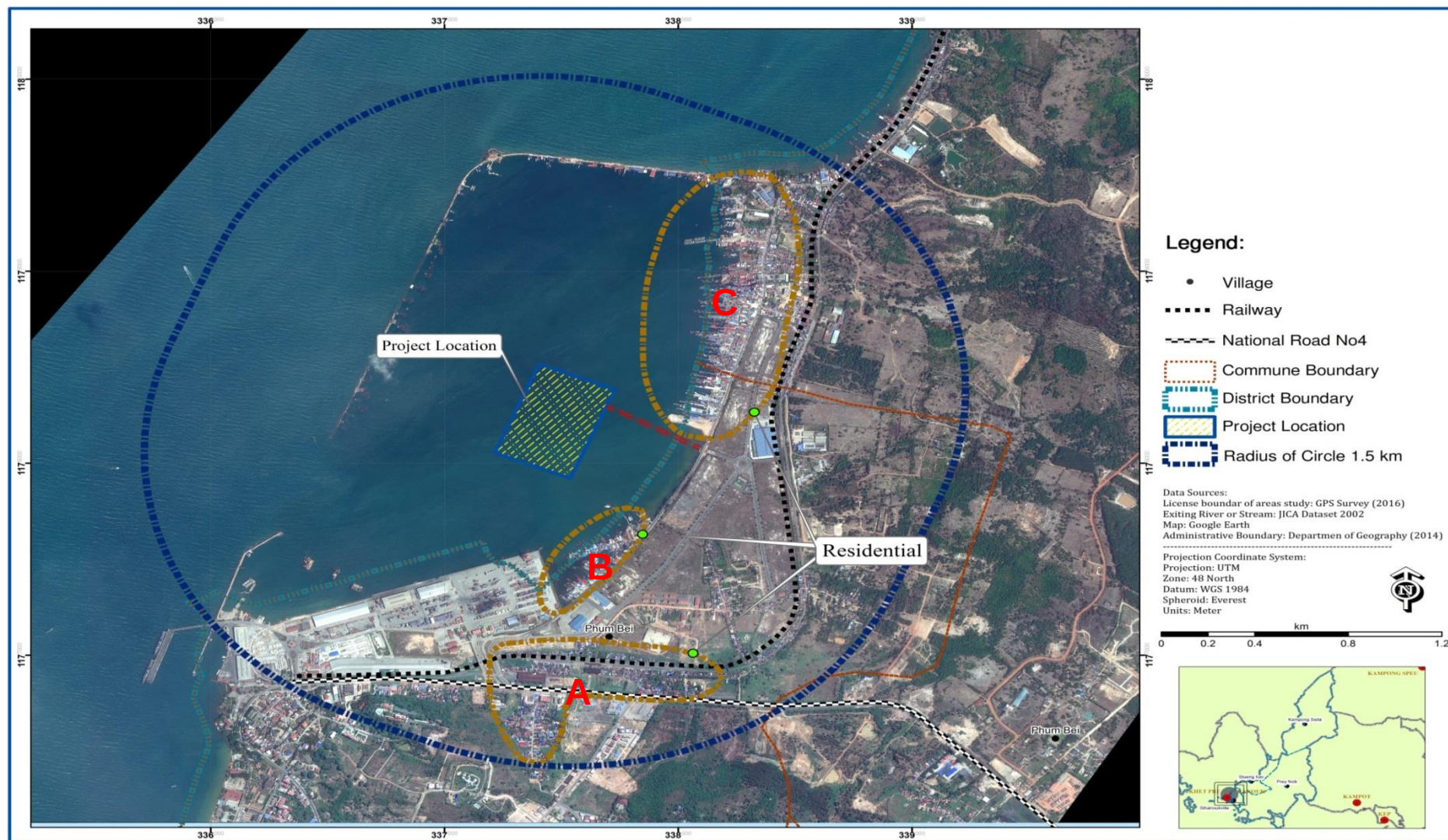


Figure 5-20: People's settlement pattern for the project

5.2.2 Tradition and Religion

People living in Sangkat 3 and Sangkat 1 are mostly Khmer. Therefore, Buddhism is the main. Meanwhile, most of the interviewees were Cambodian (92.4%) and the rest were Vietnamese. Buddhism is the main religion as well.

5.2.3 General Information from Respondent

Of the 329 interviewed households, there are 240 persons or 72.9% are women and about 92% are household heads and spouses of household heads. The others are the son/daughter of the household heads. These people aged between 17 and 77 years old. Mostly their educational levels are from primary school to high school and 19% have never attended school. Family members vary between 3 and 15 people/households, with an average of 5 persons per household.

The wealth that own by most families are motorcycles, bicycles, fans, telephone, and televisions. Some families have also car, pumping machine, sewing machine, and washing machine. Regarding animal raising, people raise mostly chicken/ducks ranging from 20 to 100 heads, while pig raising ranging from 7 to 10 heads. Only one household raises 60 oxen/cows.

5.2.4 Socio-economic Setting

The economic situation mentioned here refers to the employment and income of the people in the studied area. Employment is an income source for supporting family economy. Generally, the more of income sources, the stronger family economy is.

5.2.4.1 Employment

The majority of people employment in Sihanoukville municipality is in the service sector followed by the agriculture sector (main occupations and secondary occupations), as detailed in Table 5-22 and Table 5-23.

Table 5-22: People's main occupation in Sihanoukville municipality

Description		2013	2014	2015	
		Percent (%)	Percent (%)	Percent (%)	Population
Whose main occupation are in services		89.4	89.1	90.1	41,675
As	Sell and Trade	29.6	28.8	27.3	12,628
	Repair	1.5	1.9	2.1	927
	Transportation	7.9	7.0	7.4	3,422
	Employed in agriculture/construction	10.9	12.2	11.9	5,504
	Employed in private sector (factory, staff, NGO)	27.0	26.6	30.7	14,200
	Government employed	12.4	12.5	10.7	4,949

Source: Sihanoukville Provincial Department of Planning, 2016

Table 28: Secondary occupation in Sihanoukville municipality

Description	2013	2014	2015	
	Percent (%)	Percent (%)	Percent (%)	Population
Whose secondary occupation are in agriculture	20.2	18.9	32.0	1,593
Female whose secondary occupation are in agriculture	7.9	8.3	13.5	673
Whose secondary occupation are in services	2.4	5.2	5.6	279
Female whose secondary occupation are in services	0.9	2.9	1.7	87
Whose secondary occupation are in craftwork	77.4	75.9	62.4	3,108
Female whose secondary occupation are in craftwork	31.9	30.9	25.1	1,250

Source: Sihanoukville Provincial Department of Planning, 2016

Similarly, among the 329 interviewed households, most of them were service providers. In addition, the study also focuses on the people's secondary occupations. As a result, among the interviewed households, there are 73 households with secondary jobs. The main and secondary occupations are shown in Table 5-24.

Table 29: Occupation of household head in the survey area

No.	Description	Respondent	Percent (%)	No.	Description	Respondent	percent(%)
Main occupation				Secondary occupation			
1	Small-scale business owner	94	30.3	1	Small-scale business owner	20	27.4
2	Fishermen	41	13.2	2	Motor taxi driver	11	15.1
3	Staff of private company	32	10.3	3	Government employee	9	12.3
4	Fishing worker	26	8.4	4	Factory worker	4	5.5
5	Motor taxi driver	26	8.4	5	Construction worker	4	5.5
6	Government employee	24	7.8	6	Staff of private company	3	4.1
7	Construction worker	19	6.1	7	Bussiness man	2	2.7
8	Factory worker	8	2.6	8	Carpenter/repairer	2	2.7
9	NGO staff	4	1.3	9	Fishing worker	1	1.4
10	Carpenter/repairer	4	1.3	10	Other	17	23.3
11	Bussinessman	2	0.6	Total		73	100
12	Other	49	9.7				
Total		329	100				

Source: Socio-economic survey in July 2016

5.2.5.2 Income and Expenditure

Based on the interviewed results indicates that people can earn income by different types of employments. The highest source of income is fisherman (\$150 - \$3,000/month). Of the 329 households, the median income per household is 1,600,000 Riels or UD\$ 400 per month. The total expenditure per household is 1,000,000 Riels or UD\$ 250 per month. Incomes by occupation are as shown in Table 5-25.

Table 30: Income of household head by occupation

Main Occupation	Respondent	Total Monthly Income	
		Riel	USD
Small-scale business owner	94	600.000-6000.000	150-1500
Fisherman	41	600.000-12.000.000	150-3.000
Staff of private company	32	600.000-6000.000	150-1.500
Fishing worker	26	520.000-4.000.000	130-1.000
Motor/Taxi driver	26	600.000-3.000.000	150-750
Government employee	24	500.000-6.800.000	125-1.700
Construction worker	19	500.000-2.000.000	125-500
Factory worker	8	400.000-1.200.000	100-300
NOGs/IOs staff	4	800.000-2.800.000	200-700
Carpenter/repairer	4	400.000-2.400.000	100-600
Bussinessman	2	3.000.000-6.000.000	750-1.500
Other	49	500.000-6.000.000	125-1.500
Average monthly income/family		1,600,000	400

Source: Socio-economic survey in July 2016

5.2.5 Poverty Rate

As of 2015, the poverty rate in Cambodia is 18.76%. In Preah Sihanoukville province, the poverty rate is 14.02%. The poverty rate of Sihanoukville municipality is 8.49%. In sangkat 1 and Sangkat 3, the poverty rate is 4.07% and 4.44%, respectively (Sihanoukville Provincial Department of Planning, 2016).

5.2.6 Land Use

According to land area recorded by Sihanoukville provincial department of planning as of 2016 indicates that Sangkat 1 has an area of 4,552 ha while Sangkat 3 has an area of 1,323 ha. Land use type in these Sangkats have not yet been classified. However, farming land was not found during the survey period.

According to land use map, there are 14 land types (Figure 5-21). The type and size of the land use in the project related sangkat is shown in table 45. Based on the interviews of 329 households indicates that their residential land has an average of 70 m²/ households and farmland ranging from 0.01 to 1 ha per household with an average of 0.11 ha.

Table 31: Land use type and its areas in the project related sangkat

No.	Type of Land Use	Land use area by Sangkat (ha)	
		Sangkat 1	Sangkat 3
1	Residential land	-	209.09
2	Abondant field covered by grass	0.07	-
3	Evergreen Forest	0.83	91.11
4	Bamboo forest and secondary shrub	1,134.70	43.89
5	Beach	8.1	0.62
6	Grass field	2,042.18	506.11
7	Bush	1,028.55	151.32
8	Sweet water surface	1.45	18.99
9	Infrastructure	0.02	0.35
10	Stone surface	27.43	43.39
11	Rubber plantation	324.05	-
12	Crops in the garden	-	112.66
13	Fruit tree	-	23.18
14	Other (Sea, gulf)	32.47	156.02

Source: JICA 2002



Figure 12-21: Land use map
2002

Source: JICA

5.2.7 Water Consumption and Sanitation

5.2.7.1 Water Consumption

As of December 2015, residents of Preah Sihanoukville municipality have access to pond, borehole, mixed well, and dug well (Table 5-27). As for residents living in the project related Sangkats, most of households have access to public water supply, borehole, mixed wells, dug well and pond (table 5-28). Regarding drinking water sanitation, since 2013 the drinking water conditions in the municipality have been improved (Table 5-29).

Table 32: Water consumption sources in Preah Sihanoukville municipality

Water Source	2013	2014	2015
Number of pump well or mixed well	1,190	1,218	1,114
Number of protected dug well	554	823	730
Number of unprotected dug well	570	250	240
Number of ponds	3	5	5

Source: Sihanoukville Provincial Department of Planning, 2016

Table 33: Number of families using water from different sources in project related Sangkat

Water Source	Total by Sangkat	
	Sangkat 3	Sangkat 1
Number of families usually uses water from public water supply	3,956	1,430
Number of families usually uses water from pump well or mixed well	177	517
Number of families usually uses water from protected dug well	190	981
Number of families usually uses water from pond	-	946

Source: Sihanoukville Provincial Department of Planning, 2016

Table 34: Hygiene of drinking water in Preah Sihanoukville municipality

Description	2013	2014	2015
Number of families regularly uses ~~tape water~~ or pure water for drinking	10,531	11,385	11,974
Number of families regularly uses water filter for drinking	923	889	861
Number of families regularly boil water for drinking	4,586	4,176	3,808
Percentages of families regularly drink clean water (%)	94.3	91.2	96.5

Source: Sihanoukville Provincial Department of Planning, 2016

Based on the survey results, the source of water for cooking and cleaning/washing is not so different. The slight difference is that bottled drinking water is used as a supplementary for drinking and cooking because they think the quality is better than the other sources. The consumption water source is shown in Table 5-30.

Table 35: Water sources for household consumption

Water sources	Type of water use		
	Drinking	Cooking	Washing/Cleaning
Public water supply (%)	65.7	74.8	78.4
Pump well (%)	0.3	1.2	1.2
Shallow well (%)	11.9	18.8	20.4
Pure water (%)	22.1	5.2	-

Source: Socio-economic survey in July 2016

The cost of water consumption per household is an average of 26,000 Riels/month. Regarding drinking water, among the interviewed 329 households there are 233 or 70.8% are used to drink boiling water. The rest drink water directly without any treatment.

5.2.7.2 Sanitation

The use of sanitary latrine has been improving steadily since 2013 in Preah Sihanoukville municipality). Table 50 describes the number of families use sanitary latrine in Preah Sihanoukville municipality.

Based on the survey results shows that amongst the 329 interviewed households there are only 280 (85.1%) that have access to sanitary latrine, while the rest go to bush where is around their house compound or defecate directly to the sea.

Table 36: Latrine consumption in Preah Sihanoukville municipality

Description	2013	2014	2015
Number of families has latrine	15577	16875	16619
Percentage of families has latrine (%)	91.6	93.6	96.3

Source: Socio-economic survey in July 2016

Table 37: Latrine use in the project related Sangkat

Description	Total by Sangkat					
	Sangkat 3			Sangkat 1		
	2013	2014	2015	2013	2014	2015
Total number of families	4377	4403	4323	4411	4405	4391
Number of families has latrine	4060	4161	4323	3659	3911	4039
Percentage of families has latrine (%)	92.8	94.5	100	83.0	88.8	92.0

Source: Sihanoukville Provincial Department of Planning, 2016

5.2.8 Solid Waste Management

Under the sub-decree No 36 on waste management is under the control of the MoE. In addition, the RGC has also drafted sub-decree No. 113 on the management of solid waste in the city on August 27, 2015 with the aim at improving waste management of urban solid waste, transparency and accountability to ensure aesthetics, public health and environmental protection. An important part of this sub-decree is that garbage of solid waste from the town must be carried out, separation and packaging of solid wastes that can be recycled or recycled separately from solid wastes which are disposed of according to the instructions of the Municipal/District Administration Department.

Based on the survey results shows that amongst the 329 interviewed households there are only 26 (7.9%) that have access to solid waste collection service. For people having not received the service, they normally applied traditional ways (burning and/or burying).

5.2.9 Energy Consumption

As of December 2015, in Preah Sihanoukville people mostly use electricity (13,439 families or 98%) followed by the use of batteries as sources for lighting. Statistics regarding the energy use in the project related sangkat are shown in table 5-33.

Table 38: Energy use in Preah Sihanoukville municipality

Description	Total by Sangkat	
	Sangkat 3	Sangkat 1
Total number of houses	4,323	4,391
Number of houses with electricity	4,216	4,219
Number of houses with battery light	-	45

Source: Sihanoukville Provincial Department of Planning, 2016

Based on the interviews, it is found that regarding sources of lighting all the families use electricity (the cost is from 610-4,500 Riels/kwh). On the average basis, they spend 60,000 Riels per month per households.

Regarding energy for their daily cooking, based on the interviews found that gas and charcoal are the main energy sources for cooking and other relevant purposes. On the average basis, the expenditure for firewood is 40,000 Riels per household per month.

5.2.10 Infrastructure

Preah Sihanoukville province consists of a number of high-quality transport infrastructures such as roads, waterways and airports that are actively working to support national economic development. These included:

Road: there are two main lines, National Road No. 3 and National Road No.4. The National Road No. 4 connecting Phnom Penh to Sihanoukville is about 230 kilometers. But if we travel on National Road No. 3, it is about 260 km. The provincial roads are 443.8 km.

Railway: It connected from Phnom Penh city through Takeo, Kampot and Sihanoukville provinces which is about 264 km long and was built between 1960 and 1969.

Sea Port: the largest international deep seaport in the Kingdom of Cambodia, with the increase of capacity to transport goods and carry goods every year.

Airport: Preah Sihanoukville province has an International Airport that has been operating until today.

Beside, the province also has plenty of roads including national roads, provincial roads, and rural roads. The entire transportation network is shown in Table 5-34.

Table 39: Communication network in Sihanoukville

No.	Road Type	communication network	length (Km)	Direction	Number
1	Main Road	National road 1 digit	142	-	2
		National road 2 digits	11	-	1
		Provincial road	129,33	-	-
		Rural road	64,87	-	-
		Railway	264	Phnom Penh-Preah Sihanoukville	1
2	Waterway	Autonomous port	-	-	1
3	Airway	Airport	-	Siem Reap- Preah Sihanoukville	1

Source: Sihanoukville Provincial Department of Planning, 2016

5.2.11 Traffic Condition

PAS is the cargo distribution center consisting of combination of all kinds of multi-transport systems for the provision of import and export services to the customers and port users. The transport networks connected from Sihanoukville Province to Phnom Penh by land are: (1) National Road No.4 (2) National Road No.3 and Rail Road.

Figure 5-22 showed that number of motorbikes start busy in the morning (07:00 - 08:00, working hour and school time), at noon (11:00 -12:00 ending of working hour and school time) and in the evening (05:00 - 08:00, working hour and school time)

Figure 5-23 showed that number of motor-trailor start having their activities mostly at day time but the peak time starts from 12:00 to 16:00.

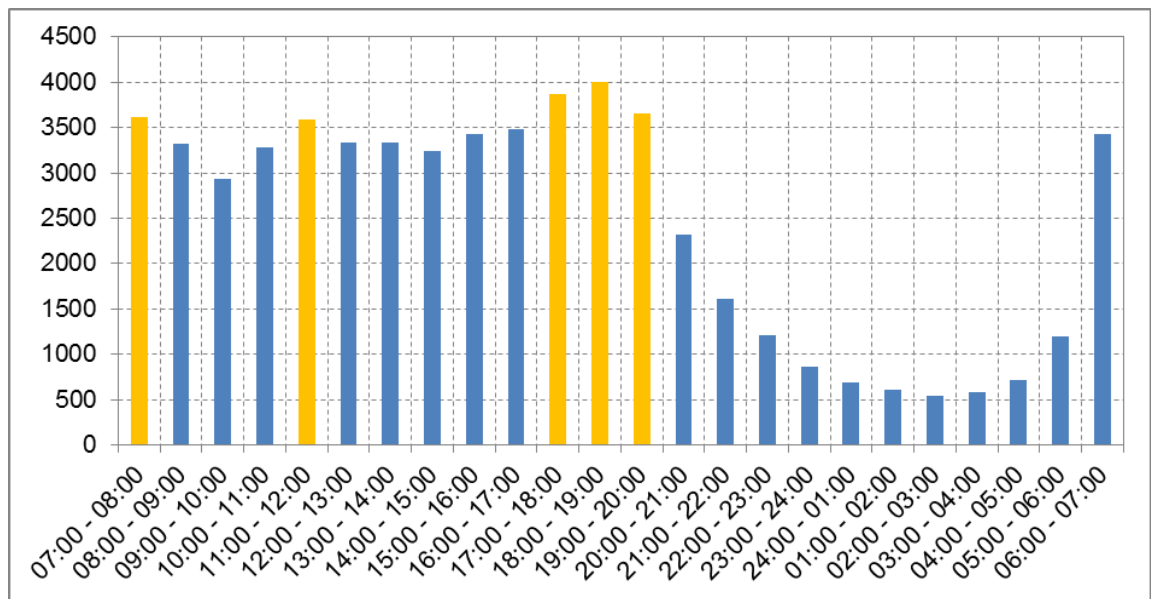


Figure 5-22: Peak time for motorbike

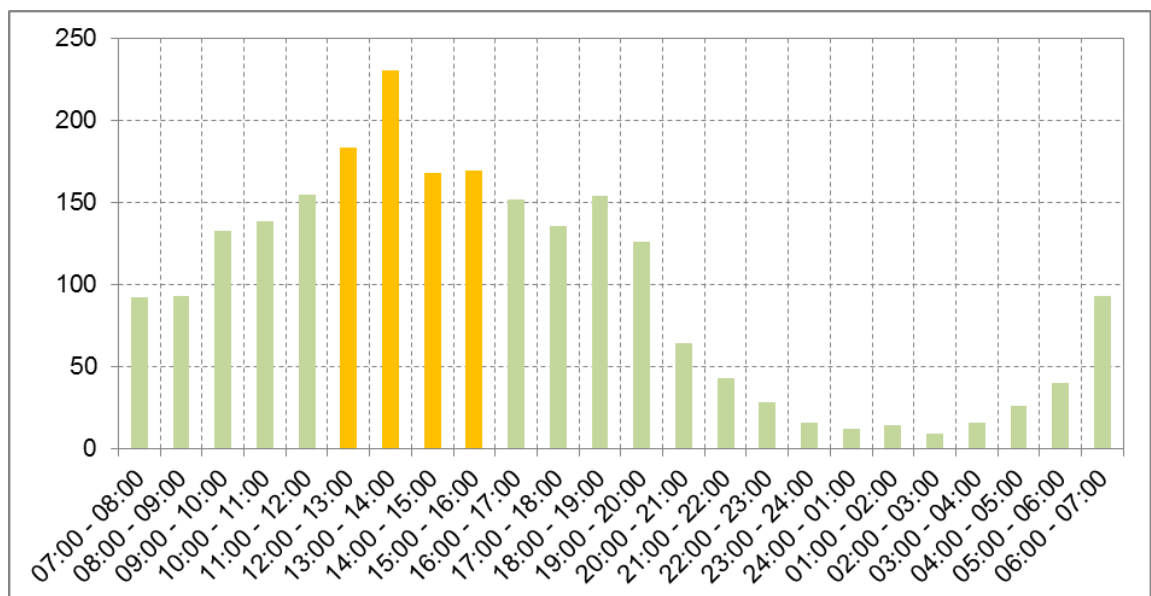


Figure 5-23: Peak time for motor-trailor

Passenger cars start having activities from early morning since 06:00 am until 20:00 evening but the peak time was observed from morning at 10:00 until evening at 19:00. Figure 5-24 showed the peak time of the passenger cars. However, the number of trips for passenger cars starts decreasing their activities from early night at 20:00 until morning at 07:00.

Figure 5-25 showed the peak time of pick-up car moving stable from morning at 07:00 until evening at 18:00 but the peak time for pick-up car start increasing sharply from evening at 14:00 until 18:00.

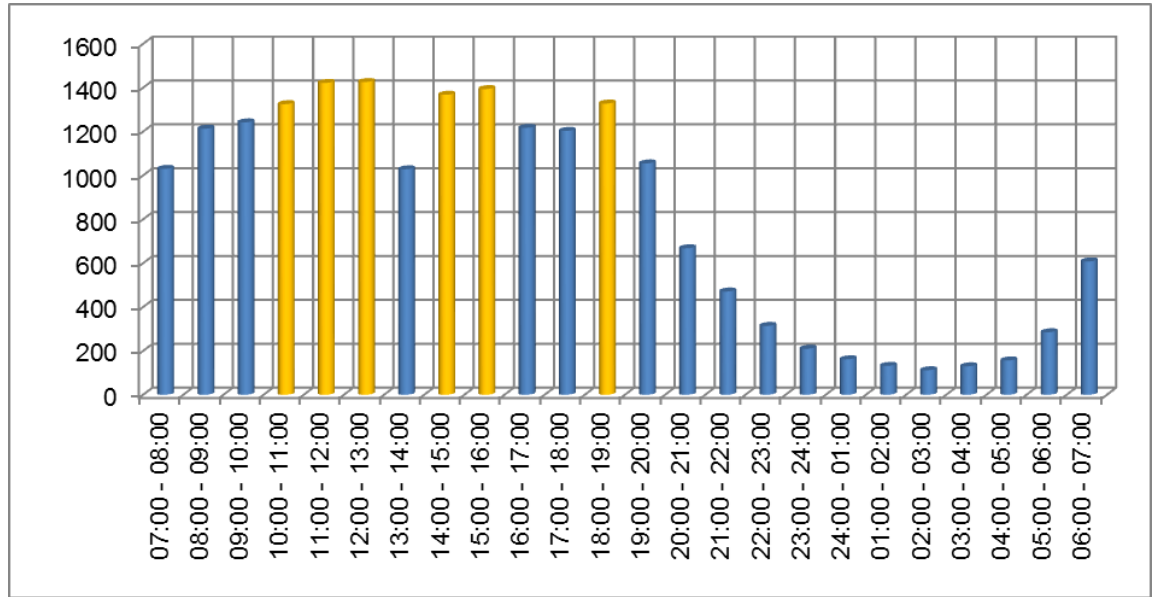


Figure 5-24: Peak time for passenger car

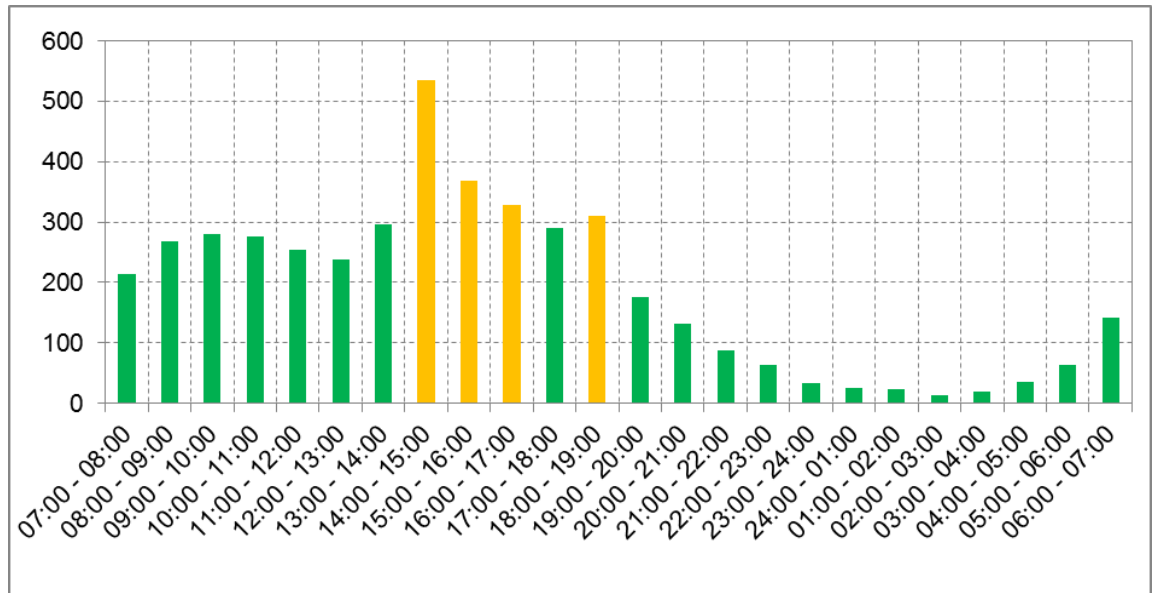


Figure 5-25: peak time of pick-up car

Figure 5-26 showed that the truck <4 tones and >4 tones, usually, start having activities in early morning at 06:00 until evening at 19:00. The peak time for both trucks is at noon from 13:00 to evening at 16:00.

Figure 5-27 showed that the bus <25 seats start having activities from early morning until evening but the peak time is from morning at 09:00 until noon time 12:00. However, the bus >25 peak time is at early morning 06:00 to 07:00 and late afternoon from 17:00 until evening at 19:00.

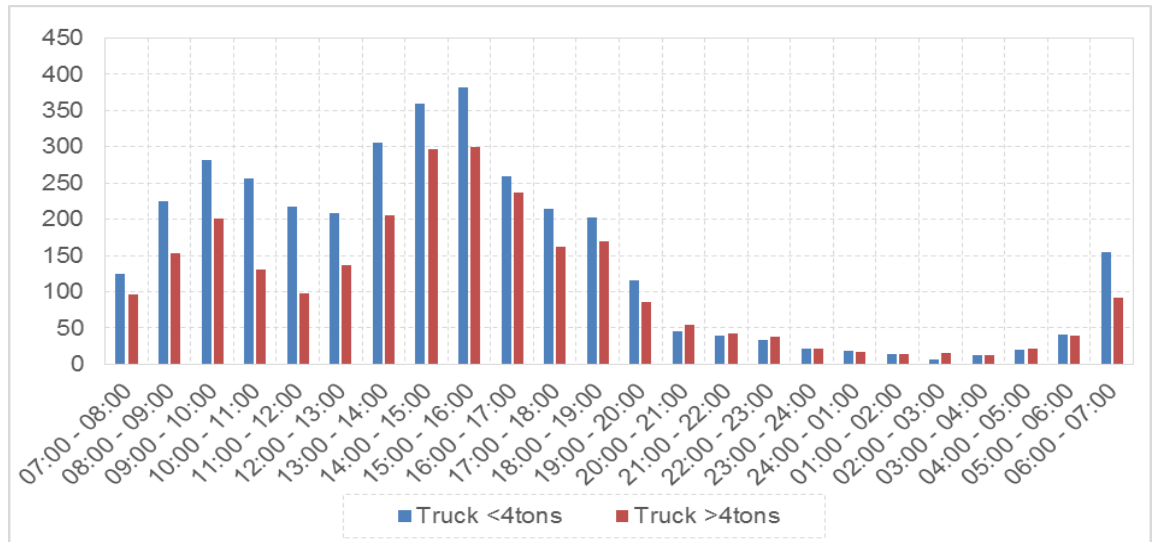


Figure 13: peak time for truck <4tones and >4tones

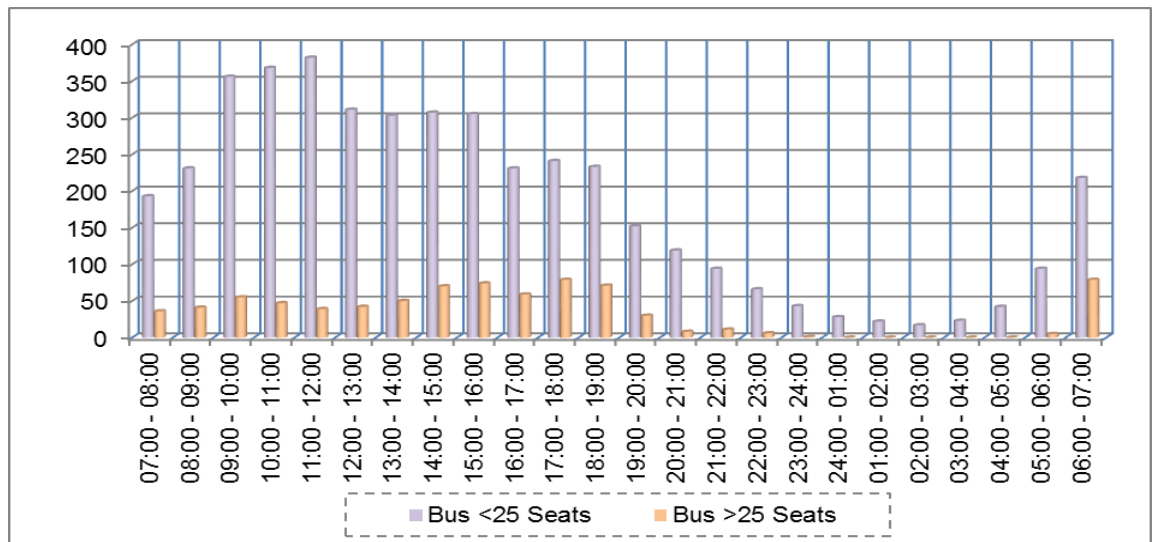


Figure 14: Peak time for bus <25 seats and >25 seats

Figure 5-28 showed that container truck starts having activities from morning at 08:00 until night at 22:00 but the peak time is in the afternoon at 14:00 until night at 20:00.

Figure 5-29 showed that vehicles are tourism car is in the first priority followed by (2) container truck, (3) pick-up car, (4) truck <4 tones, (5) bus < 25 seats, truck > 4 tones, and bus > 25 seats, respectively. On the average basis per hour there are 260 trips of vehicles went across the traffic count location.

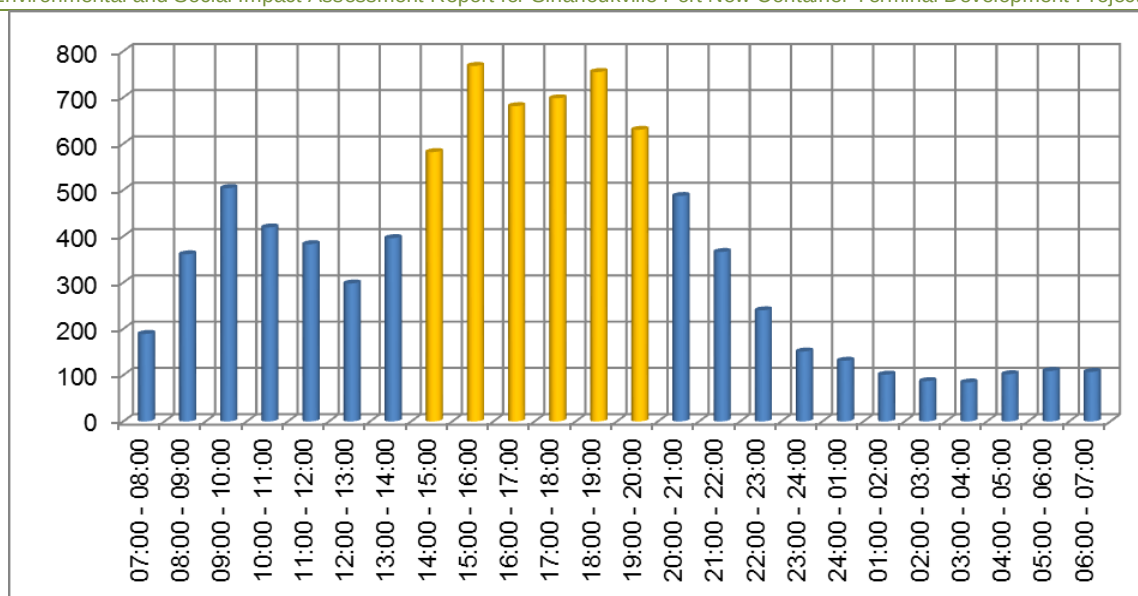


Figure 158: Peak time for container truck

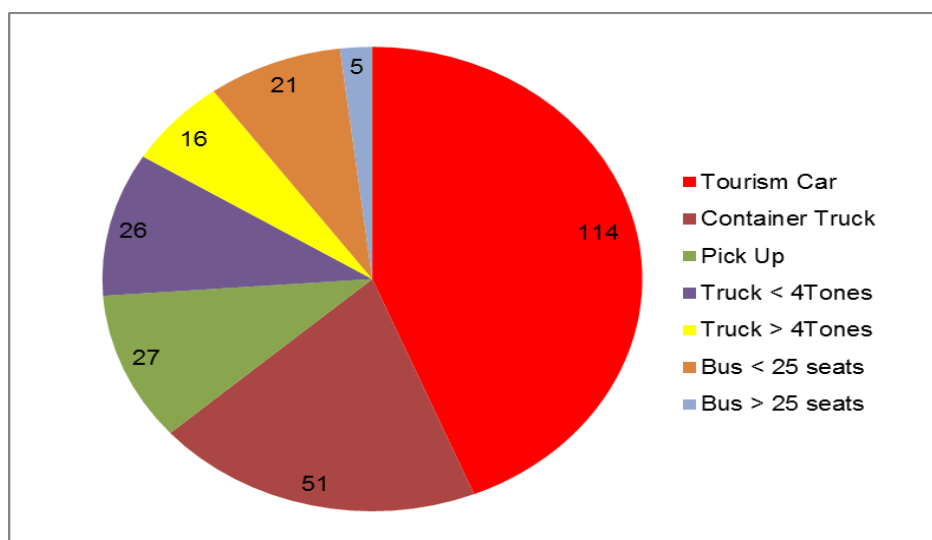


Figure 16: average vehicle per hour

The total number of vehicles counted for a 7-day period is shown in table 5-34.

Table 40: Total number of vehicles counted for a 7-day period

Total traffic count for a 7-day period										
Date	Motorbike	Motor Tractor	Passenger Car	Pick-up	Truck <4t	Truck >4t	Container	Bus <25seats	Bus >25seats	Hand Tractor
08/07/2016	7010	279	2775	614	589	377	1562	662	130	0
09/07/2016	7520	318	2282	572	509	404	1664	667	183	1
10/07/2016	7215	328	2052	484	337	201	301	552	115	1
11/07/2016	9220	361	3225	831	607	409	1404	715	85	3
12/07/2016	8725	305	2982	576	480	340	1107	605	82	1
13/07/2016	9345	352	2860	699	555	435	960	582	91	0
14/07/2016	9715	351	3002	701	520	454	1545	596	124	0
Total	58750	2294	19178	4477	3597	2620	8543	4379	810	6
Max	9715	361	3225	831	607	454	1164	715	183	3
Average	8393	328	2470	640	514	374	1220	626	116	1

The survey result can be concluded that traffic and/or transportation activities on National Road No. 4 were very busy. On the average basis per hour there are 260 trips of vehicles went across the traffic count location. This can be observed by-type vehicle activities. The container truck peak time is in the afternoon at 14:00 until night at 20:00, the bus <25 seats peak time is from morning at 09:00 until noon 12:00 and the bus >25 peak time is at early morning 06:00 to 07:00 and late afternoon from 17:00 until evening at 19:00, the peak time for both trucks less than and above 4 tones is at noon from 13:00 to evening at 16:00, the peak time for pick-up car is at 14:00 until 18:00 and the peak time for passenger car is from morning at 10:00 until evening at 19:00. This National Road plays an important role in transporting goods and passengers from and to Sihanoukville since economic activities have been improving. Such traffic condition can be an indicator for development related plan in the future.

5.2.12 Education

Educational sector has been improving in Cambodia. The number of schools has been increasing along with improvements in the educational sector, which are being conducted nationwide framework. According to the Ministry of Education, Youth and Sport 2014-15 report showed that there are 12,505 schools across the country, of which 143 are in Preah Sihanoukville province. The number of schools in Preah Sihanoukville municipality is shown as in Table 5-36.

Table 41: Number of schools in Preah Sihanoukville municipality

Description	School	Room	No. of Student	No. of Teacher
Kindergarten	18	47	1556	55
Primary school	17	229	9918	360
Secondary school	6	102	2843	198
High school	2	53	1792	122
Total	43	431	16109	735

Source: Sihanoukville Provincial Department of Planning, 2016

It is generally said that people need to go to school at least 5th grade of primary school for simple reading and writing, and to 9th grade of secondary school for accurate writing. In the survey area, the enrollment rate and the illiteracy situation is shown in Table 5-37.

Table 42: Enrollment rate and illiteracy situation in the project related sangkat

Sangkat	Enrollment				Illiteracy	
	Population (6-14 years old)		Attended school (6-14 years old)		(15-45 years old)	
	2014	2015	2014	2015	2014	2015
Sangkat 3	4,203	2,916	4,109 (97.76%)	2,892 (99.18%)	0.5%	0.4%
Sangkat 1	3,801	3,761	3,682 (96.87%)	3,690 (98.11%)	0.2%	0%

Source: Sihanoukville Provincial Department of Planning, 2016

5.2.13 Health and Public Well-Being

The health sector plays an important role in promoting the welfare of people in both urban and rural areas. Generally, people's public health services include health center in commune/sangkat, referral/operational hospital in district, and provincial hospital. Through collaborations with international organizations, the health sector has been improving the quality of health services, in particular, reduces costs for the majority of the poor. According to the 2014 Demographic and Health Survey report, indicate that from 2010 on living cost of urban residents were still higher than rural residents. However, the cost of rural residents fell from \$ 74.79 in 2010 to \$ 41.76 in 2014, while the expenditure of rural household increased from \$ 23.55 in 2010 to \$ 34.95 in 2014. The health center of the commune/sangkat covers all the villages in the commune/sangkat and plays an important role for the health service of the people living.

In Sangkat 1, there are 1 Health Center, while in Sangkats 3 there is no health center. However, all residents living in Sangkat 3 also received health services from Sangkat 1 Health Center. According to a report of the Sangkat 1 Health Center showed that acute diarrhea, acute myocardial infarction, High blood pressure, upper respiratory infections and pneumonia are the most common diseases. The number of patients receiving treatment at Sangkat 1 health center is shown in table 5-38.

Table 43: Diseases recorded in Sangkat 1 Health Center in 2016

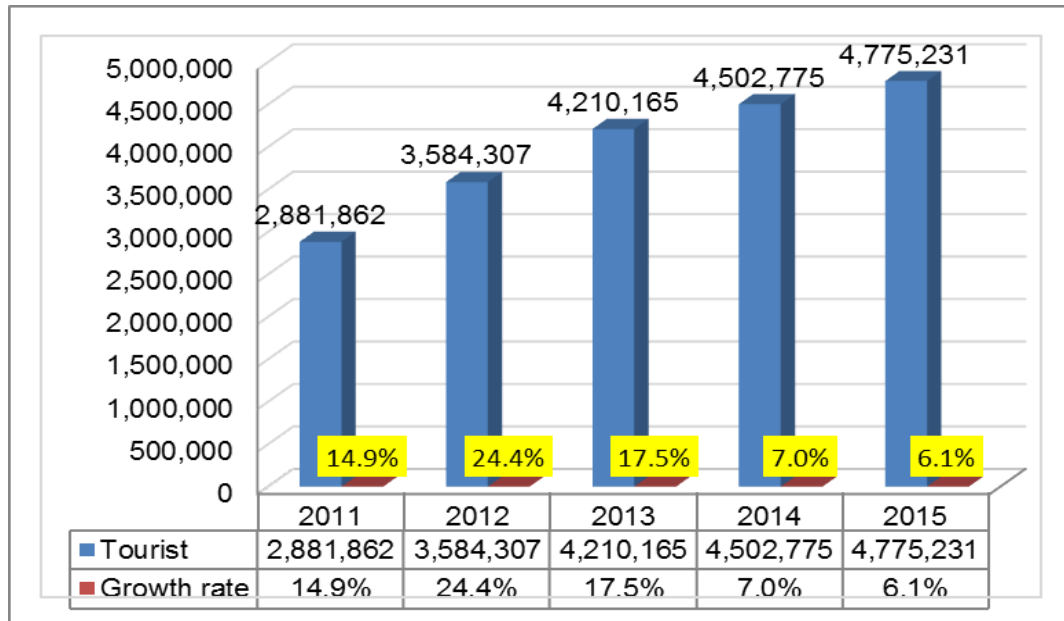
No.	Disease type	Number of case
1	Dysentery	108
2	Diarrhea without dehydration	202
3	Acute gastritis	226
4	Inflamed kidneys	34
5	Fed Kidney	5
6	Other uncontaminated diseases	800
7	mild malaria	3
8	High Blood Pressure	31
9	Other injuries (beside traffic accident and UXO)	393
10	Acute inflammation of the fallopian tubes	31
11	cervical inflammation	177
12	Acute respiratory tract	1,694
13	Other lower respiratory tract	13
14	pneumonia	20
15	Suspected pulmonary tuberculosis	25
16	Acute Bronchitis	27
17	Cough more than 2 weeks	86
18	Other respiratory diseases	92
19	Various dermatological diseases	58
20	Dental disease	65
21	Red eyes diseases	23

Source: Report of Sangkat 1 Health Center, 2016

5.2.14 Tourism Site

According to statistics from the Ministry of Tourism in 2015, the number of tourists visiting Cambodia has increased from 2011 to 2015 (Graph 5-8), with an average stay of 6.8 days per tourist (Ministry of Tourism Report 2015).

As of the first semester of 2016, Preah Sihanouk province received a total of 1,032,881 tourists, an increase of 16.65% over the first half of 2015, of which 809,784 are local tourists, increased 21.03% and 223,097 international tourists, increased 3.12%. The top ten international tourist arrivals in Sihanoukville are shown in Table 5-39.



Graph 5-8: Tourist growth in the Kingdom of Cambodia

Source: Ministry of Tourism 2016

Table 44: The number of tourists in Preah Sihanoukville province

No.	Nationality	1 st semester		
		2015 (person)	2016 (person)	Growth rate (%)
1	Chinese	22,186	25,359	14.30
2	Russian	22,286	23,160	3.92
3	Vietnamese	20,226	20,704	2.36
4	German	10,344	19,122	84.86
5	American	20,178	19,702	-2.35
6	British	18,323	17,916	-2.22
7	Australian	12,699	13,712	7.09
8	French	17,630	13,273	-24.71
9	Canadian	7,410	8,934	20.56
10	Korean	8,048	7,081	-12.01
Total		159,330	168,963	-

Source: Sihanoukville Provincial Department of Tourism, 2016

5.2.15 Natural Heritage and Archaeological Site

Based on data provided by provincial department of culture and fine arts and field observations, there is no physical cultural resource will be affected by the proposed project. According to the Sangkat councils, no chance finds of archaeological/historical relics have yet been experienced or reported.

5.2.16 Natural Protected Areas

23 Natural Protected Area of the Kingdom of Cambodia were established by the Royal Decree dated November 1, 1993 covering an area of 3.2 million hectares, equivalent to 17% of the country. 1 Stung Treng Ramsar and 13 protected forest and conservation area were then established. Through in-depth reforms in environment and natural resources in 2016, protected areas have grown to approximately 5.9 million hectares by transferring 13 protected areas and protected areas from the Ministry of Agriculture, Forestry and Fisheries under the Ministry of Environment's control and the establishment of newly eight protected areas. In 2017, the Royal Government of Cambodia has decided to establish biodiversity conservation corridors and protected areas. Currently, the Kingdom of Cambodia has a total area of 7.4 million hectares, which is equivalent to 40.5% of the country's total land area (Figure 5-30).

At approximately 26 kilometers away from the project site, there is Ream National Park which is a protected and conservative area. In addition, there are many multipurpose, Kbal Chhay area, which is about 18 kilometers from the project site. However, there are no protected areas around and near the project area.

Prepared by Phnom Penh International Consultants Co., Ltd.

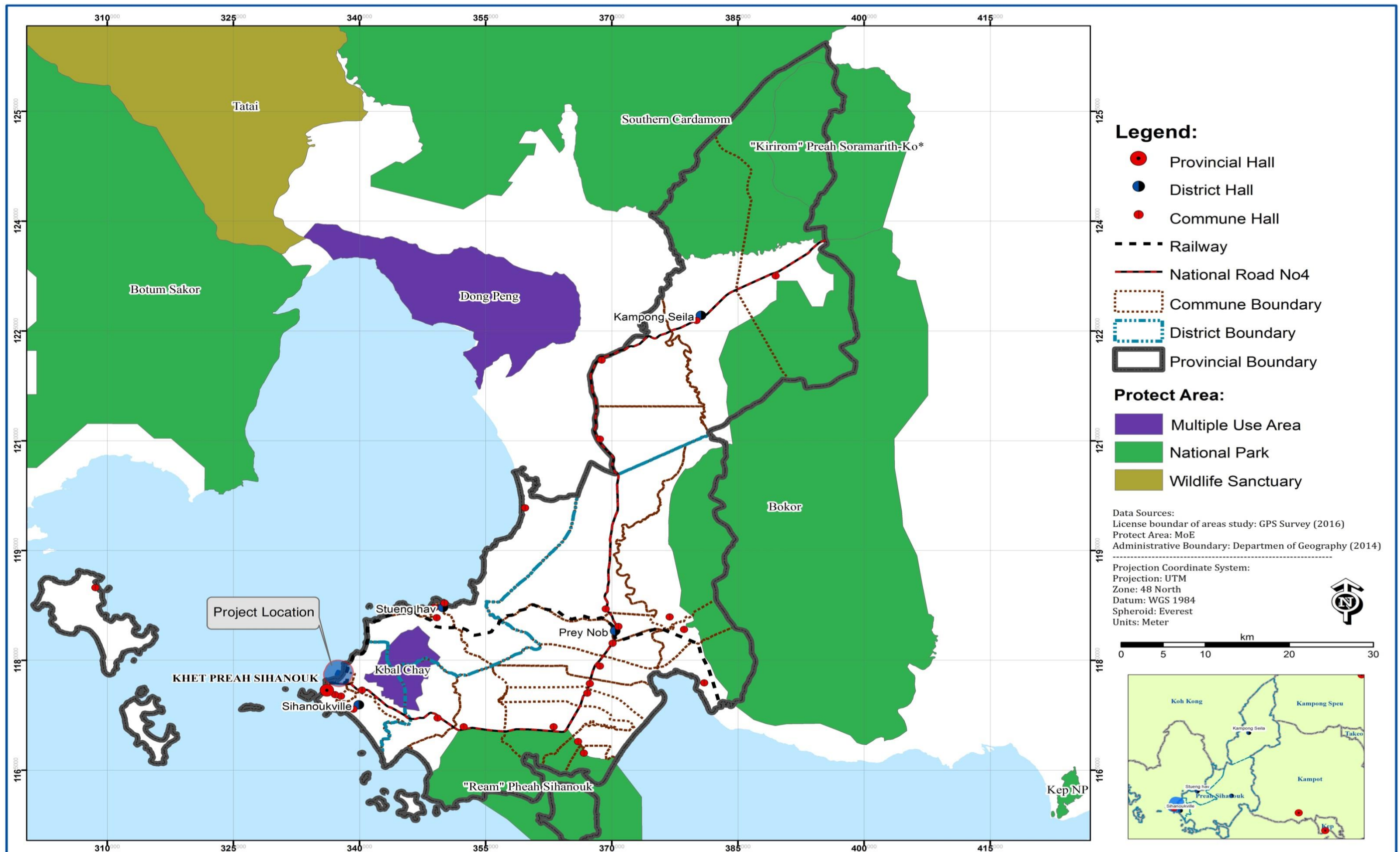


Figure 18: Map of multipurpose area, national park and wildlife sactuaries around nearby the project area

CHAPTER 6

PUBLIC CONSULTATION MEETING

6.1 INTRODUCTION

Public consultation is one of the most important parts in the process of assessing environmental and social impacts to get involved from relevant stakeholders including Preah Sihanoukville provincial authority, relevant departments, municipal and sangkat authorities and local people living near the proposed project location. Such involvement is complete and transparency and ensure that all relevant stakeholders get an equal opportunity to express their views, concerns and comments regarding the project's adversely negative impacts. The objective of this public consultation is, therefore, to:

- Provide detailed information to stakeholders;
- Provide to all stakeholders with an equal opportunity to express their views, concerns and comments on project type, project location, and project activities; and
- Collect views, concerns and comments from the stakeholders for the preparation of the ESIA report.

6.2 PUBLIC CONSULTATION

6.2.1 Consultations with Provincial Authority and Provincial Department

6.2.1.1 Provincial Authority

Consultation meeting with H.E. Yun Min, who is governor of Preah Sihanoukville province, and his colleagues, was held on August 10, 2016 at 10.30 am in meeting room of the provincial hall.

After providing the presentation of the detailed project information by the PPIc study team, he and colleagues expressed welcome and full support for the Development Project. H.E. Governor said that the provincial administration will cooperate closely with PAS to construct the project and deal with all the challenges together to improve the image of the province and the country and to suit the name of coastal tourism province (with 2 beautiful beaches). The provincial administration will also discuss with the government to resettle people living in between Sihanoukville Port Multipurpose Terminal Development Project and Sihanoukville Port New Container Terminal Development Project to other areas in the future.

6.2.1.2 Police Commissariat

Consultation meeting with Lieutenant General Nop Panha, who is Deputy Commissioner, and his colleagues, was held on August 17, 2016 at 10.15 am in the office of the Deputy Chief of Police Commissariat.

After providing the presentation of the detailed project information by the PPIc study team, he and colleagues expressed joy and full support of Sihanoukville Port New Container Terminal Development Project. Meanwhile, Mr. Deputy Commissioner and his colleagues also suggested as follows:

- 1) There is the need to facilitate boat traffic either tourism boat or fishing boats during the project construction and to disseminate project information to people in advance;
- 2) During the project construction, there should be the preparation of safety plan for road traffic and waterway;
- 3) The JICA study team should have additional study on opening a new waterway through breakwater (Tumnob Rolok) in the northern part for the traffic of ships or fishing boats;
- 4) The JICA study team should have additional parking zone for containers to avoid condensed parking that will impact on feeling of national and international tourists; and
- 5) There should have locations for construction materials storage that do not cause harm to passengers.

6.2.1.3 Chamber of Commerce

Consultation meeting with Mr. Sok Song, who is Vice President of Chamber of Commerce, and his colleagues was held on August 15, 2016 at 09.00 am at the meeting room of the Chamber of Commerce.

After providing the presentation of the detailed project information by the PPIIC study team, he and colleagues expressed joy and full support for Sihanoukville Port New Container Terminal Development Project. Meanwhile, Mr. vice president and his colleagues said that 1) there should take into account the need to avoid traffic in and out the project area 2) it should have a new parking area for containers to reduce condensed traffic along public streets, and 3) to examine environmental issues around the port area such as waste and lubricants causing water pollution and destruction of marine biodiversity.

6.2.1.4 Provincial Department of Environment

Consultation meeting with Mr. Sam Kul, who is deputy director of Provincial Department of Environment, and his colleague was conducted on August 10, 2016 at 08.30 am in meeting room of the provincial department.

After providing the presentation of the detailed project information by the PPIIC study team, he and his colleague expressed joy and full support for the Sihanoukville Port New Container Terminal Development Project. Meanwhile, he and his colleague suggested that 1) There should have a plan to avoid traffic congestion for transportation of sand for filling the project both land traffic and water traffic, 2) the project owner or the project construction contractor should manage solid and liquid wastes properly, avoiding any pollution to the sea and biodiversity, and 3) during the construction phase, the project construction contractor should respect MoE's regulations and be at a highly moral with local people living near the project area.

6.2.1.5 Provincial Department of Public Works and Transport

Consultation meeting with Mr. Chrea Tharavuth, who is deputy director of Provincial Department of Public Works and Transport, was conducted on August 12, 2016 at 15.15 pm in his office of the provincial department.

After providing the presentation of the detailed project information by the PPIIC study team, he expressed welcome and full support for the Development Project. He also

highlighted some suggestions such as: 1) JICA study team should help to expand Samdech Hun Sen Road until The Market which is in front of Tumnob Rolok and equipped with lights along the road and help to widen National Route No. 4 in a length of 300 m 2) to avoid discharging wastewater into the sea without proper treatment, and 3) to locate new parking area to reduce traffic congestion along public streets.

6.2.1.6 Provincial Dep. of Land Management, Urban Planning, and Construction

Consultation meeting with Mr. Heng Rith, who is chief of office of construction, and his colleague was conducted on October 20, 2016 at 15.10 pm in the meeting room of the provincial department.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project. He stated that: 1) PAS shall consider port construction in all forms and select one that is more economic, 2) PAS should have a parking area for container trucks to avoid parking disorderly 3) P AS or relevant authorities should make clear in advance about the project impacts to the residents living around the proposed project area and equip security and install traffic signs for road traffic and waterway.

6.2.1.7 Provincial Department of Commerce

Consultation meeting with Mr. Prom Sokcheavanda, Director of the Provincial Department of Commerce, and his colleague was held on August 16, 2016 at 09.20 am at the Meeting Room of the Provincial Department of Commerce.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project due to more big ships can come and lower transportation service fee and commodity prices. Meanwhile, the Director and his colleagues also raised some suggestions: 1) there must be an appropriate compensation to affected people and 2) during the construction, there should be traffic facilitation of ships and/or fishing boats.

6.2.1.8 Provincial Department of Water Resources and Meteorology

Consultation meeting with Mr. Heng Sophoanrith who is deputy director of Provincial Department of Water Resources and Meteorology was conducted on August 12, 2016 at 8.20 am in his office of the provincial department.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project. Meanwhile, he proposed that 1) the construction company should have traffic signs either on road or waterway so as to facilitate traffic for boats and ships.

6.2.1.9 Provincial Department of Mines and Energy

Consultation meeting with Mr. Sin Samnang, who is head of office of Mine Resources of Provincial Department of Mines and Energy, was conducted on August 12, 2016 at 14.10 pm in the meeting room of the provincial department.

After providing the presentation of the detailed project information by the PPIc study team, he expressed joy and full support for the Development Project. Meanwhile, he mentioned that 1) PAS should submit an application for sand dredging 2) there should be

clear study about impacts such as sea water pollution, loss of biodiversity ect. 3) There should study about more parking for containers to reduce traffic jam on the public roads 4) dredging ship should be studied and used other means because it can cause strong dispersion to the sea and cause of biodiversity loss and can also impact on fish farming of the villagers.

6.2.1.10 Provincial Department of Labour and Vocational Training

Consultation meeting with Mrs. Tun Vanny, who is deputy director of Provincial Department of Labour and Vocational Training, and her colleague was conducted on August 11, 2016 at 08.20 am in the meeting room of the provincial department.

After providing the presentation of the detailed project information by the PPIc study team, she and her colleague expressed welcome and full support for the Development Project. Meanwhile, she and her colleague also emphasized on various aspects such as: 1) wastes affecting on the environment or can cause health problem should be properly stored and well managed 2) all workers and staffs should be equipped with safety equipments such as: helmet, boots, gloves, masks, glasses, etc. 3) the project construction contractor should respect labor law 4) the project construction contractor shall register with the National Social Security Fund in time and 5) drivers are required to have a driver's license, driving skills and ethics.

6.2.1.11 Provincial Department of Tourism

Consultation meeting with Mr. Im Chantha, who is deputy director of Provincial Department of Tourism, and his colleague was conducted on August 15, 2016 at 14.30 pm in the meeting room of the provincial department.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project. He stated that: 1) There should expand or build a bypass road before the project construction in order to avoid traffic congestion for local and foreign tourists, and 2) the project construction contractor should equip traffic lights to facilitate boat and ship traffic during the project construction.

6.2.1.12 Provincial Department of Planning

Consultation meeting with Mr. Hong Peng Hua who is deputy director of Provincial Department of Planning was conducted on August 16, 2016 at 8.00 am in his own room of the provincial department.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project. Meanwhile, Mr. Director also mentioned that the project should minimize impacts on the people living around the project area and should have fair compensation. He finally proposed that the project should be constructed as soon as possible.

6.2.1.13 Fishery Administration

Consultation meeting with Mr. Nen Chamroeun, who is director of Fishery Administration, and his colleagues was conducted on August 15, 2016 at 16.00 pm in his own room of the provincial department.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project. Meanwhile, he also raised that: 1) the project construction contractor should avoid using sand picker machine during the project construction as it can cause carbon dioxide dispersion from sea bottom to destroy marine biodiversity and 2) the project construction contractor should open the temporary way across Tomnub Rolok for fishermen during the project construction.

6.2.1.14 Cambodian Nation Research Organization

Consultation meeting with Mr. Mr. Sok Sokhom, who is director of CNRO organization, and his colleagues was conducted on August 17, 2016 at 15.40 pm in the office of organization.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project. Meanwhile, he raised some concerns that 1) how to reduce the impact caused by the project to the minimum level for coastal areas and biodiversity, 2) in case of there is resettlement, the place to be resettled should have infrastructure such as roads, hospitals, schools and markets 3) there must be principle for compensation and suitable for affected people 4) the transport of sand must be covered to avoid dust on roads, which may pose a risk to people's health 5) PAS should study clearly about the impact on biodiversity in the sea, which caused from the dredging activities, especially aquatic lives 6) PAS has to ensure that the project will not cause serious impacts on people livelihoods during the project construction and after the project construction, and 7) PAS should arrange suitable parking area for containers to avoid traffic congestion to be impacted on local and international tourists visiting Preah Sihanoukville province.

6.2.2 Consultations with Local Authority

6.2.2.1 Municipality Authority

Consultation meeting with Mr. Reach Sovann, who is deputy governor of Preah Sihanoukville Municipality, and his colleague was conducted on August 10, 2016 at 14.30 pm in his own room of the Municipality.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project. Meanwhile, he also emphasized on few things such as: 1) the dusty and sand flowing from the trucks would pose a disturbing environment to the municipality and its passengers. PAS should thus minimize the transportation of sand across municipality so as to reduce accidents 2) PAS should take into account the location for parking containers, avoiding parking on streets causing traffic jam and 3) PAS should transport goods by railway.

6.2.2.2 Sangkat 1 Authority

Consultation meeting with Mr. Chhith Sopthath, who is chief of Sangkat 1, and his colleague was conducted on August 18, 2016 at 08.30 am in the room of the Sangkat hall.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project. Meanwhile, he and his colleague proposed few things such as: 1) PAS should avoid impacts on fishermen

to a minimum level 2) PAS should enhance cooperation closely with Sangkat 1 during the construction phase, and 3) the project should be started as soon as possible.

6.2.2.3 Sangkat 3 Authority

Consultation meeting with Mr. Kan Loeng, who is chief of Sangkat 3, was conducted on August 17, 2016 at 14.25 pm in the Sangkat hall.

After providing the presentation of the detailed project information by the PPIc study team, he expressed welcome and full support for the Development Project. Meanwhile, he proposed few things such as: 1) PAS should avoid impacts on fishermen to a minimum level 2) there should be adequate compensation in case of any resettlement.

6.2.3 Consultations with Local People

6.2.3.1 Local Residents Mundul 3 of Sangkat 1

Consultation meeting with local residents from project related village in Sangkat 1 was conducted on August 18, 2016 at 09.30 am at office of group 34 with 42 participants, 19 of whom are female.

After providing the presentation of the detailed project information by the PPIc study team, residents expressed joy and full support for the Development Project. Meanwhile, residents showed concerns and questions as follows:

- 1) Wastewater discharges into the sea without treatment can affect sea water and its biodiversity;
- 2) PAS should provide enough compensation to the affected residents if there will be any impact from the project construction;
- 3) Will PAS keep the sea channel for local residents traveling as before or not? Will this project construction affect fishermen?
- 4) During the construction, PAS should equip with security tools and equipments such as lights for ship, fishing boat and tourism boat to reduce accidents and inform local residents in advance.
- 5) PAS should control wastes that impact on the environment and affect to public health.
- 6) Will the project construction impact on waterways of Fishermen and tourist boats or not?
- 7) How many years will the project construction take place and what is the size of the construction?

The concerns and questions are explained as follows:

- The construction company will sign a contract with the solid waste collection firm to collect, transport, and to dispose at a landfill site as defined by government institutions such as Sihanoukville authorities and Provincial Department of Environment.
- This project will not cause any impact on local residents, but if there will be any impact, PAS will the best to minimize the impacts by applying a win-win solution.
- This Development project will keep the sea channel for local residents traveling as before during the project construction. During the operation phase, the sea channel

to be travelled will be under the bridge of the project. Overall, the construction project will not affect fishermen.

- PAS and Construction Company will also set out measures to protect and control security in the project area.
- PAS will seriously consider all environmental issues so as to prevent environmental pollution and public health.
- The project construction will last for 36 months and the project will be constructed on an area of 17.5 ha.

6.2.3.2 Local Residents in Mundul 3 of Sangkat 3

Consultation meeting with local residents from project related village in Sangkat 3 was conducted on August 19, 2016 at 15.00 pm at office of group 31 with 43 participants, 26 of whom are female.

After providing the presentation of the detailed project information by the PPiC study team, residents expressed joy and full support for the Development Project. Meanwhile, residents showed concerns and questions as follows:

- 1) Wastewater discharges into the sea without treatment can affect sea water and its biodiversity;
- 2) PAS should provide enough compensation to the affected residents if there will be any impact from the project construction;
- 3) During the construction, PAS should equip with security tools and equipments such as lights for ship, fishing boat and tourism boat to reduce accidents and inform local residents in advance.
- 4) How many years will the project construction take place?

The concerns and questions are explained as follows:

- The construction company will sign a contract with the solid waste collection firm to collect, transport, and to dispose at a landfill site as defined by government institutions such as Sihanoukville authorities and Provincial Department of Environment.
- This project will not cause any impact on local residents, but if there will be any impact, PAS will the best to minimize the impacts by applying a win-win solution.
- PAS and Construction Company will also set out measures to protect and control security in the project area.
- The project construction will last for 36 months.

6.3 DISSEMINATION WORKSHOP OF THE ESIA STUDY FINDINGS

Dissemination workshop on the findings of ESIA for the project was conducted on February 17th, 2017 at 14.30 pm in Koh Tang room of the New Beach Hotel of Preah Sihanoukville province under chairmanship of H.E. Chhin Sengun, Deputy Provincial Governor, which is also a representative of H.E. Yun Min, the provincial governor.

After providing the presentation of the detailed findings of the ESIA study by the PPiC study team, he and the workshop's members expressed welcome and full support for the Sihanoukville Port New Container Terminal Development Project. However, the members also expressed comments, concerns and requests as follows:

- 1) PAS must implement mitigation measures as stated in this ESIA Report;

- 2) PAS should consider its project activities if there is any impact on fishing raising of local residents;
- 3) PAS should prevent water pollution from the project construction activities;
- 4) PAS should keep the sea channel for local residents traveling, especially residents in Tumnop Rolok;
- 5) PAS should not buy sand from Stung Hav river because there will be impact on fish raisers and mangrove;
- 6) The project construction company must respect the law on traffic;
- 7) The project construction company must respect labour law;
- 8) PAS should urge the project construction company to provide clean camp for workers;
- 9) PAS should urge the project construction company to monitor drug use by workers;
- 10) PAS must prevent any conflict if it happens between the project construction company and workers;
- 11) PAS should consider the transportation of sand by waterway to avoid traffic congestion on land traffic; and
- 12) PAS should urge the project construction company to buy sand from licensed companies.

6.4 CONCLUSION ON PUBLIC CONSULTATION

Provincial authority, provincial departments, civil society, and local people have been aware of the project during consultative meetings as well as public meetings with the PPIC study team. Overall, provincial authority, provincial departments, civil society and local people expressed welcome and full support for the Sihanoukville Port New Container Terminal Development Project. However, some points have been requested to the project owner, all of which are as follows:

- During Pre-Construction Phase
 - 5) The project owner should provide acceptable compensations to the affected households in advance prior to starting the project construction;
 - 6) PAS should consider about daily traffic for passengers in front of the new port to National Road No. 4;
 - 7) Project information dissemination should comprehensively be conducted for local residents; and
 - 8) PAS should arrange suitable parking area for containers to avoid traffic congestion to be impacted on local and international tourists visiting Preah Sihanoukville province.
- During Construction Phase
 - 6) PAS must install all traffic signs for fishing boat and tourism boat;
 - 7) The project construction company must manage solid and liquid waste properly;
 - 8) The project construction company should buy sand from licensed companies;
 - 9) The project construction company must provide personal protective equipment (PPE) such as glove, footwear, and helmet to workers; and
 - 10) The project construction company must Respect MoE's law and other relevant laws in Cambodia.

CHAPTER 7

ENVIRONMENTAL IMPACT AND MITIGATION MEASURE

7.1 INTRODUCTION

The ESIA study focuses on project geographical location, type and activities of the project, as well as the adversely negative impacts which may occur due to the project implementation. Positive impacts are collectively described, while the adversely negative impacts are described by project phases such as design phase, construction phase and operation phase. All environmental and social impacts are identified based on key databases from direct field studies and detailed project description. Meanwhile, mitigation measures for adversely negative impacts are also highlighted. Table 7-1 was used by the study team during the project field observations to identify environmental and social negative impacts.

Table 7-1: Environmental impact assessment

No.	Environmental Parameters	Description	No	Yes			Remark
				Small	Medium	High	
1. Impacts During Pre-operation Phase							
1.1 Impacts during Design phase							
	A) Natural Environment						
	A.1 Physical Resource						
	1) Topography and geology	Changing of topographical conditions due to sand dredging and sand filling for the project construction.				✓	
	2) Landscape	Changing of landscape due to forest clearance by the project activities.	✓				
	3) Soil erosion	Soil erosion at the sand dredging sites by the project activities.	✓				
	4) Ground subsidence	Loss of soil structure and ground subsidence due to the project activities.	✓				
	5) Soil quality	Oil spill and other liquid wastes from the activation of vehicles and machineries.	✓				
	6) Hydrological condition	Changing of hydrological regime of the sea due to sand filling for the project construction.	✓				
	7) Surface water quality	Water pollution in the Sea due to wastewater from the project construction sites.	✓				
	8) Ground water quality	Ground water pollution caused by the project activities.	✓				
	9) Air quality	Transportation of materials, mobilization of machineries and vehicles for the project construction and toxic gas emission that causes air pollution.	✓				
	10) Noise and vibration levels	Noise and vibration levels caused by mobilization of machineries and vehicles for the project construction.	✓				
	11) Coastal area	Impacts on coastal area due to the project activities.	✓				
	A.2 Biological Resource						
	1) Vegetation & wildlife resource	Destruction of vegetation and wildlife resource due to the project activities.	✓				
	2) Aquatic plants and animals	Obstacle to reproductive, changing of sanctuary conditions, and direct destruction of aquatic lives that lead to extinction by the project activities.		✓			
	3) Natural protected areas	Impacts on natural protected area such as wildlife sanctuary, protected landscape, and multiple use area.	✓				
	4) Wetland area	Impacts on or loss of wetland area ecology.	✓				
	B. Socioeconomic Resource						
	1) Resettlement	Resettlement due to the project activities.	✓				
	2) Residential area, farmland and buildings	Loss of residential areas, farmland, and buildings by the project activities.	✓				
	3) Local economic activities	Loss of local economic activities such as land, changing of economic activities and livelihoods by the project activities.	✓				
	4) Ethnic minority	Grabbing land, demolition of houses that impact on livelihoods of ethnic minority as a result of the project activities.	✓				

No.	Environmental Parameters	Description	No	Yes			Remark
				Small	Medium	High	
	5) Tradition and religion	Impacts on tradition and religion of local people by the project activities.	✓				
	6) Cultural heritage	Damage or loss of the value of religious temples, buried sites, heritage, artifacts or other cultural heritage by the project activities.	✓				
	7) Land use	Impacts on land use of local residents.	✓				
	8) Water use rights	Obstacle to fishing rights, water use rights and general rights.	✓				
	9) Public infrastructure	Impacts on National Road No.4, railway, electric poles, optical cable etc.	✓				
	10) Traffic condition	Impacts on schools, hospitals, and other places as well as the increase of traffic accidents by the project activities.		✓			
	11) Tourism	Impacts on local and international tourists arrivals in the province.	✓				
	12) Work safety	The occurrence of danger to staff and workers due to the project activities.	✓				
	13) Public health condition	Degradation of public health and hygiene.	✓				
	14) Navigation and port activities	Degradation of navigation and port activities by the project.	✓				
	15) National and rural roads	Impacts on national and rural roads due to transportation of materials for the project construction.	✓				
	16) Danger (Risks)	Impacts on health and safety of staff and workers regarding UXOs.		✓			
1.2 Impacts During Construction Phase							
A) Natural Environment							
A.1 Physical Resource							
	1) Topography and geology	Changing of topographical conditions due to sand dredging and sand filling for the project construction.				✓	
	2) Landscape	Changing of landscape due to forest clearance by the project activities.	✓				
	3) Soil erosion	Soil erosion at the sand dredging sites by the project activities.		✓			
	4) Ground subsidence	Loss of soil structure and ground subsidence due to the project activities.	✓				
	5) Soil quality	Oil spill and other liquid wastes from the activation of vehicles and machineries.			✓		
	6) Hydrological condition	Changing of hydrological regime of the sea due to sand filling for the project construction.	✓				
	7) Surface water quality	Water pollution in the Sea due to wastewater from the project construction sites.			✓		
	8) Ground water quality	Ground water pollution caused by the project activities.	✓				
	9) Air quality	Transportation of materials, mobilization of machineries and vehicles for the project construction and toxic gas emission that causes air pollution.			✓		
	10) Noise and vibration levels	Noise and vibration levels caused by mobilization of machineries and vehicles for the project construction.			✓		
	11) Coastal area	Impacts on coastal area due to the project activities.	✓				
A.2 Biological Resource							
	1) Vegetation & wildlife resource	Destruction of vegetation and wildlife resource due to the project activities.	✓				
	2) Aquatic plants and animals	Obstacle to reproductive, changing of sanctuary conditions, and direct destruction		✓			

No.	Environmental Parameters	Description	No	Yes			Remark
				Small	Medium	High	
		of aquatic lives that lead to extinction by the project activities.					
	3) Natural protected areas	Impacts on natural protected area such as wildlife sanctuary, protected landscape, and multiple use area.	✓				
	4) Wetland area	Impacts on or loss of wetland area ecology.	✓				
B. Socioeconomic Resource							
	1) Resettlement	Resettlement due to the project activities.	✓				
	2) Residential area and buildings	Loss of residential areas, farmland, and buildings by the project activities.	✓				
	3) Local economic activities	Loss of local economic activities such as land, changing of economic activities and livelihoods by the project activities.		✓			
	4) Ethnic minority	Grabbing land, demolition of houses that impact on livelihoods of ethnic minority as a result of the project activities.	✓				
	5) Tradition and religion	Impacts on tradition and religion of local people by the project activities.	✓				
	6) Cultural heritage	Damage or loss of the value of religious temples, buried sites, heritage, artifacts or other cultural heritage by the project activities.	✓				
	7) Land use	Impacts on land use of local residents.	✓				
	8) Water use rights	Obstacle to fishing rights, water use rights and general rights.	✓				
	9) Public infrastructure	Impacts on National Road No.4, railway, electric poles, optical cable etc.	✓				
	10) Traffic condition	Impacts on schools, hospitals, and other places as well as the increase of traffic accidents by the project activities.			✓		
	11) Tourism	Impacts on local and international tourists arrivals in the province.	✓				
	12) Work safety	The occurrence of danger to staff and workers due to the project activities.		✓			
	13) Public health condition	Degradation of public health and hygiene.	✓				
	14) Navigation and port activities	Degradation of navigation and port activities by the project.	✓				
	15) National and rural roads	Impacts on national and rural roads due to transportation of materials for the project construction.	✓				
	16) Danger (Risks)	Impacts on health and safety of staff and workers regarding UXOs.	✓				
2. Impacts During Operation Phase							
A) Natural Environment							
A.1 Physical Resource							
	1) Topography and geology	Changing of topographical conditions due to operation of the project.	✓				
	2) Landscape	Changing of landscape due to forest clearance by the project activities.	✓				
	3) Soil erosion	Soil erosion at the sand dredging sites by the project activities.	✓				
	4) Ground subsidence	Loss of soil structure and ground subsidence due to the project activities.	✓				
	5) Soil quality	Oil spill and other liquid wastes from the activation of vehicles and machineries.	✓				
	6) Hydrological condition	Changing of hydrological regime of the sea due to sand filling for the project construction.	✓				

No.	Environmental Parameters	Description	No	Yes			Remark
				Small	Medium	High	
	7) Surface water quality	Water pollution in the Sea due to wastewater from the project construction sites.			✓		
	8) Ground water quality	Ground water pollution caused by the project activities.	✓				
	9) Air quality	Transportation of materials, mobilization of machineries and vehicles for the project construction and toxic gas emission that causes air pollution.			✓		
	10) Noise and vibration levels	Noise and vibration levels caused by mobilization of machineries and vehicles for the project construction.			✓		
	11) Coastal area	Impacts on coastal area due to the project activities.	✓				
A.2 Biological Resource							
	1) Vegetation & wildlife resource	Destruction of vegetation and wildlife resource due to the project activities.	✓				
	2) Aquatic plants and animals	Obstacle to reproductive, changing of sanctuary conditions, and direct destruction of aquatic lives that lead to extinction by the project activities.		✓			
	3) Natural protected areas	Impacts on natural protected area such as wildlife sanctuary, protected landscape, and multiple use area.	✓				
	4) Wetland area	Impacts on or loss of wetland area ecology.	✓				
B. Socioeconomic Resource							
	1) Resettlement	Resettlement due to the project activities.	✓				
	2) Residential area and buildings	Loss of residential areas, farmland, and buildings by the project activities.	✓				
	3) Occupation and Income	Losses of income due to some areas around the project areas are prohibited.		✓			
	4) Ethnic minority	Grabbing land, demolition of houses that impact on livelihoods of ethnic minority as a result of the project activities.	✓				
	5) Tradition and religion	Impacts on tradition and religion of local people by the project activities.	✓				
	6) Cultural heritage	Damage or loss of the value of religious temples, buried sites, heritage, artifacts or other cultural heritage by the project activities.	✓				
	7) Land use	Impacts on land use of local residents.	✓				
	8) Water use rights	Obstacle to fishing rights, water use rights and general rights.	✓				
	9) Public infrastructure	Impacts on National Road No.4, railway, electric poles, optical cable etc.	✓				
	10) Traffic condition	More active regarding marine transportation and land transportation and increase of traffic density around the project area.			✓		
	11) Tourism	Impacts on local and international tourists arrivals in the province.	✓				
	12) Work safety	The occurrence of danger to staff and workers due to the project activities.	✓				
	13) Public health condition	Degradation of public health and hygiene.		✓			
	14) Navigation and port activities	Degradation of navigation and port activities by the project.	✓				
	15) Danger (Risks)	Impacts on health and safety of staff and workers regarding UXOs.					

7.2 POTENTIALLY NEGATIVE IMPACTS AND MITIGATION MEASURES

7.2.1 Design Phase

At the project design phase, there are no specific activities that cause environmental impacts. What we states here is just a forecast. At this phase, many working groups have studied on all the project related aspects. However, it is also important requiring each group to consider all the project technical aspects to avoid or minimize any potential impacts that may occur during the construction phase and the operation one.

7.2.1.1 Physical Resource

7.2.1.1.1 Topography

The project will change topographical conditions at seabed due to dredging of channel, turning basin and berth and sand/land reclamation on an area of 17.5 ha.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.*
- *The project owner/ PAS will require the project construction contractor to have rubble base, precast concrete block, precast wave dissipated concrete block and in-situ coping concrete so as to prevent from sand dispersion.*

7.2.1.2 Biological Resource

7.2.1.2.1 Aquatic plants and animals

The project could impact on aquatic plants and animals in and around the project area; especially affect more than 1,000 fish cages in Tomnub Rolok area as a result of dredging of channel, turning basin and berth and sand/land reclamation. At the same time, transportation of dredged wastes to the dumping sites near Koh Dekol will impact on aquatic plants and animals in those areas. In addition, oil spill from construction machinery, if not properly managed, will also impact on water quality.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to dredge channel, turning basin as in the plan and to monitor water quality daily during dredging of channel, turning basin and transportation of dredged wastes to the dumping sites.*
- *The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose wastes to the sea and to cooperate with local waste collector for waste disposal at the dumping sites as defined by Provincial Department of Environment and local authorities.*
- *The project owner/ PAS will require the project construction contractor to conduct a routine monitoring for the transportation of wastes to the dumping sites.*

7.2.1.3 Socio-economic Resource

7.2.1.3.1 Traffic Condition

Traffic congestion by vehicles may occur around the construction sites and Samdech Hun Sen road. This can cause disruption to local people and people passing through.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to inform local authorities about the construction period.*
- *The project owner/ PAS will require the project construction contractor to install traffic signs at the construction sites in particular traffic lights at night time to avoid accidents.*
- *The project owner/ PAS will require the project construction contractor to implement traffic management plan around the construction sites and Samdech Hun Sen road in cooperation with local authorities.*
- *The project owner/ PAS will require the project construction contractor to educate all the drivers to respect law on traffic in the Kingdom of Cambodia.*

7.2.1.3.2 Danger (Risks)

The project site is close to the coastal area. Historically, it is reported that the Sihanoukville port used to transport ammunition and tie up by military ships. Moreover, during the Civil War (1970-1975 and 1979-1993) the port area may also have the remaining ammunition dropped at that time. Mines and unexploded ordnance would be hazardous to workers and local residents during the project construction.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to cooperate with the Cambodian Mine Action Centre (CMAC) to monitor the project area to ensure that UXO is cleared before the project construction activities begin.*

7.2.2 Construction Phase**7.2.2.1 Physical Resource****7.2.2.1.1 Topography**

The project changes topographical conditions at seabed due to dredging of channel, turning basin and berth and sand/land reclamation on an area of 17.5 ha.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor must have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.*

7.2.2.1.2 Soil Erosion

Soil erosion and/or land slide might occur due to land/sand reclamation for the project. In the rainy season, soil erosion will be more seriously as a result of additional rainfalls which lead to release sediment into the sea.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to have rubble base, precast concrete block, precast wave dissipated concrete block and in-situ coping concrete so as to prevent from sand dispersion prior to starting the project construction.*
- *The project owner/ PAS will require the project construction contractor to have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.*

7.2.2.1.3 Soil Quality

Soil pollution caused by oil spills at the storage site and by spillage from vehicles and machineries. On the other hand, solid waste at the worker camps such as materials waste, office waste, plastic packaging, and food waste from workers, etc., will cause soil pollution if not properly managed.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to take proper care of and monitor vehicles and machineries to avoid any spillage and to regularly monitor fuel storage at all the construction sites to avoid any spillage.*
- *The project owner/ PAS will require the project construction contractor to properly keep all kind of solid wastes in the prepared bins. The wastes will be collected and then disposed at the dumping site/s where the local authority or the Provincial Department of Environment has determined.*
- *The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose of wastes to the sea.*

7.2.2.1.4 Surface Water Quality

Land/sand reclamation, dredging of channel, turning basin and berth and transportation of dredged wastes to the dumping sites will impact on water quality. It is notable that source of sea pollution that is critically important is dredging of channel and turning basin. Such works may have pollutants from seabed which lead to water pollution in the project area and its surrounding areas.

Wastewater from daily water consumption of management and construction personnel and waste oil may be the sources of sea pollution if not properly managed. Meanwhile, there are residual wastes from offices and other materials. In the case that the project construction contractor does not properly clean the wastes, those wastes will impact on sea water quality.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to monitor sea water quality regularly at the locations as in the design phase by taking samples to MoE's laboratory. In case that unusually high concentration of any parameter, necessary mitigation measures will then be implemented.*
- *The project owner/ PAS will require the project construction contractor to educate workers and staff not to throw away wastes into the sea and to provide sanitary latrine in the worker camps. The project construction contractor have to make sure that human wastes and construction ones will be packed and kept at the proper locations. Also, the project construction contractor will have to cooperate with local waste collecting company to transport and dispose of wastes at the dumping site.*
- *The project owner/ PAS will require the project construction contractor to clean tools and equipments at the prepared location with sedimentation tank.*
- *The project owner/ PAS will require the project construction contractor to properly prepare fuel storage location, ensuring that no any spillage occurs.*
- *The project owner/ PAS will require the project construction contractor to check sanitary latrine, avoiding any discharge to the sea.*
- *The project owner/ PAS will require the project construction contractor to select high quality dredging tools with minimal sedimentation dispersion.*
- *The project owner/ PAS will require the project construction contractor to minimize dredging time so as to minimize turbidity.*

- *The project owner/ PAS will require the project construction contractor to select high quality transportation means for dredged materials to avoid any spillage.*
- *The project owner/ PAS will require the project construction contractor to regularly monitor pollutants from dredging activities.*

7.2.2.1.5 Air Quality

Emission of toxic gases such as: Total Suspended Particulate (TSP), carbon dioxide (CO), sulfur dioxide (SO₂), and NO₂ caused by the traffic of vehicles and other heavy machineries will cause disruptions (dust and air pollution) to villagers in the surrounding project area. Due to the long-term project construction, up to 36 months, this negative impact must be considered with due diligence.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to take proper care of vehicles and machineries and to use high quality fuels. The project construction contractor will completely avoid overload transportation and congestion of vehicles, causing air pollution.*
- *The project owner/ PAS will require the project construction contractor to cover materials during transportation to reduce dust.*
- *The project owner/ PAS will require the project construction contractor to spray water regularly along the road to be expanded to reduce dust from the mobilization of vehicles and machineries.*
- *The project owner/ PAS will require the project construction contractor to monitor dust air pollution and complaint from local residents. If any complaint, the project construction contractor have to reconsider the applied technical aspects and find the ways to solve those issues.*
- *The project owner/ PAS will require the project construction contractor to prepare and to strickly implement traffic management plan at the construction sites.*

7.2.2.1.6 Noise and Vibration Levels

The traffic of vehicles and other machineries in large quantities to serve the project activities will cause disturbance (noise and vibration) directly to the local residents, especially for those living near the project area. Due to the project construction period lasts for 36 months, so this negative impact must be taken into account seriously.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to use vehicles and machineries with low noise and vibration and to take proper care of vehicles and machineries before the project construction.*
- *The project owner/ PAS will require the project construction contractor to have a clear timetable for working hours: morning from 07.00 until 11.00 am and afternoon from 13.00 to 17.00 pm.*
- *The project owner/ PAS will require the project construction contractor to advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and nearby places of residence. No driving will be allowed at night time.*

7.2.2.2 Biological Resource

7.2.2.2.1 Aquatic plants and animals

The project could impact on aquatic plants and animals in and around the project area; especially affect more than 1,000 fish cages in Tomnub Rolok area as a result of dredging of channel, turning basin and berth and sand/land reclamation. At the same time, transportation of dredged wastes to the dumping sites near Koh Dekol will impact on aquatic plants and animals in those areas.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to dredge channel, turning basin as in the plan and to monitor water quality daily during dredging of channel, turning basin and transportation of dredged wastes to the dumping sites.*
- *The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose of wastes to the sea and to cooperate with local waste collector for waste disposal at the dumping sites as defined by Provincial Department of Environment and local authorities.*
- *The project owner/ PAS will require the project construction contractor to conduct a routine monitoring for the transportation of wastes to the dumping sites.*

7.2.2.3 Socio-economic Resource

7.2.2.3.1 Local Economic Activity

The project activities will impact on local residents' occupation and income of fishermen living nearby the project area. This is due to the fact that during the dredging channel, PAS will inform to local people especially people who conduct fish raising to prolong their activities due to high turbidity. As for fishermen, some channels that they used to travel for fishing are prohibited.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to prioritize fishermen as workers and/or staff during the construction phase.*
- *The project owner/ PAS will require the project construction contractor to install traffic signs at the dredging zones.*
- *The project owner/ PAS will require the project construction contractor to comprehensively disclose information regarding the project construction to local residents so as to let them know the project activities.*

7.2.2.3.2 Traffic Condition

Traffic congestion by vehicles may occur around the construction sites and roads. This can cause disruption to local people and people passing through.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to inform local authorities about the construction period.*
- *The project owner/ PAS will require the project construction contractor to install traffic signs at the construction sites in particular traffic lights at night time to avoid accidents.*
- *The project owner/ PAS will require the project construction contractor to implement traffic management plan around the construction sites in cooperation with local authorities.*

- *The project owner/ PAS will require the project construction contractor to educate all the drivers to respect law on traffic in the Kingdom of Cambodia.*

7.2.2.3.3 Work Safety

The project activities can impact on staff and workers' health due to the negligence of staff-workers including vehicle control and careless use of equipments and so on. On the other hand, the provision of inappropriate accommodation, no clean water, and living without hygiene will impact on their health as well.

Mitigation Measure

- *The project owner/ PAS will require the project construction contractor to provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments.*
- *The project owner/ PAS will require the project construction contractor to implement all safety working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works.*
- *The project owner/ PAS will require the project construction contractor to construct sanitary latrine for staff and workers equiped with septic tanks and to provide clean water for general consumption.*
- *The project owner/ PAS will require the project construction contractor to educate staff and workers on sexually transmitted diseases. The project construction contractor will cooperate with provincial department of health for epidemics prevention around the project area.*

7.2.3 Operation Phase

7.2.3.1 Physical Resource

7.2.3.1.1 Surface Water Quality

Liquid waste and solid waste will be increased due to general operations of the port including the release of liquid waste from toilets of PAS offices, waste from kitchen, cartons etc. Besides, solid waste and liquid waste will be generated from ships transporting goods to and from Cambodia.

Mitigation Measure

- *All liquid waste from the port will be discharged to sewage system and then go to water treatment plan. This waste will be checked in advance before discharging to public sewage system.*
- *The project owner/ PAS will monitor sea water quality regularly (the sampling sites will be the same as the before-construction sampling sites) by taking samples and send them to the MoE's laboratory. In case of any parameter increase in the abnormal conditions, some mitigations will be implemented.*
- *The project owner/ PAS will educate workers and staff not to throw away wastes into the sea and will make sure that human wastes and construction ones will be packed and kept at the proper locations.*
- *The project owner/ PAS will properly prepare fuel storage location, ensuring that no any spillage occurs.*

7.2.3.1.2 Air Quality

During the project operation there will be more transportation activities by large ships to and from Cambodia and by truck. At the same time, there are cranes and cargo for handling goods and other machinery, which all are sources of increasing of carbon dioxide (CO₂) emissions. Increase of traffic density due to port operation will provide gas emissions, resulting in air pollution as well.

Mitigation Measure

- The project owner/ PAS will regularly monitor air quality in and around port area and respect the subdecree on the Control of Air Pollution and Noise Disturbance 2000.
- The project owner/ PAS will add more waste storage sites and cooperate with local waste collecting company to transport and dispose of wastes at the dumping site.
- The project owner/ PAS will educate workers and staff about energy saving so as to reduce air pollution.
- The project owner/ PAS will have tree-seedling nursery and green space for those trees.

7.2.3.1.3 Noise and Vibration Levels

The traffic of vehicles and other machineries in large quantities to serve the project activities will cause disturbance (noise and vibration) directly to the local residents, especially for those living near the project area.

Mitigation Measure

- The project owner/ PAS will use vehicles and machineries with low noise and vibration and take proper care of vehicles and machineries. Some mitigation measures will be applied to minimize noise and vibration.
- The project owner/ PAS will advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and nearby places of residence.

7.2.3.2 Biological Resource

7.2.3.2.1 Aquatic plants and animals

Maritime transportation and land one during daytime and nighttime will provide impact on aquatic lives. Moreover, any oil spillage from ships and solid waste disposal to the sea will provide impact on marine biodiversity.

Mitigation Measure

- The project owner/ PAS will monitor solid waste and liquid one on ships regularly.
- The project owner/ PAS will consider more measures to minimize/eliminate the impact on aquatic plants and animals.

7.2.3.3 Socio-economic Resource

7.2.3.3.1 Occupation and Income

Fishing activities are expected to be declined due to some areas around the project areas are prohibited. The issues might occur for some families only.

Mitigation Measure

- The project owner/ PAS will clearly define zone for fishermen passing through for fishing activities.
- The project owner/ PAS will prioritize job opportunities for fishermen, in particular for those workers and/or staff who used to work during the construction phase.

- *The project owner/ PAS will prepare social security fund for supporting vulnerable people by the project implementation.*
- *The project owner/ PAS will provide trainings based on labour markets around the port area.*

7.2.3.3.2 Marine Transportation and Land Transportation

In this phase, marine transportation and land transportation will be more active and will then increase traffic density around the project area.

Mitigation Measure

- *The project owner/ PAS will monitor traffic in and around the project area so as to take action if any traffic congestion (particularly at the intersection of National Road No.4) occurs.*
- *The project owner/ PAS will cooperate local traffic police and local authority to manage traffic conditions and will educate drivers about law on land traffic.*
- *The project owner/ PAS will instruct ships to respect marine transportation regulations such as duration for parking etc.*
- *The project owner/ PAS will install all traffic signs for marine traffic around the project area for safety.*

7.2.3.3.3 Work Safety

The project activities can impact on staff and workers' health due to the negligence of staff-workers including vehicle control and careless use of equipments and so on. On the other hand, the provision of inappropriate accommodation, no clean water, and living without hygiene will impact on their health as well.

Mitigation Measure

- *The project owner/ PAS will provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments.*
- *The project owner/ PAS will implement all safety working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works.*
- *The project owner/ PAS will construct sanitary latrine for staff and workers equipped with septic tanks and to provide clean water for general consumption.*
- *The project owner/ PAS will establish health center in the port area equipped with medical supply and will have doctors. The project owner/ PAS will cooperate with provincial department of health for epidemics prevention around the project area.*

7.3 CLIMATE CHANGE ADAPTATION

7.3.1 Storm and Cyclone

To cope with the high wave that attacks the port, the existing breakwater especially the north breakwater should improve for about 200 m in length from the port entrance. Therefore, the additional armor stone with concrete parapet construction have recommended in the project. This countermeasure is not directly concerned the new container terminal. Therefore, this countermeasure is not included in the project scope of works. However, it is effective countermeasure to ensure the calmness of the port. Hence, the additional armor stone with concrete parapet repairing works for the north breakwater is recommended in case that enough budget for this repairing work is secured in the detailed design stage.

7.3.2 Rising Sea Tide

The reclamation area of the project is recommended to fill up to + 3.5 m (in average) which is about 30 cm higher elevation of the existing container yard. The access road have also recommended to fill up to + 4.3 m.

7.4 SUMMARY OF NEGATIVE IMPACTS AND MITIGATION MEASURES

The construction of Sihanoukville Port New Container Terminal Development Project in Preah Sihanoukville province will impact on physical resources, biological resources, and socio-economic resources. Table 7-2 summarizes environmental impacts and mitigation measures.

Table 7-2: Summary of impacts and mitigation measures

Natural and Socioeconomic Resources	Negative Impact	Scope of Impact			Mitigation Measure	Remark
		Small	Medium	High		
1. Impacts during Design Phase						
1.1 Physical Resources						
1.1.1 Topography	The project will change topographical conditions at seabed due to dredging of channel, turning basin and berth and sand/land reclamation on an area of 17.5 ha.			✓	➤ The project owner/ PAS will require the project construction contractor to have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards. ➤ The project owner/ PAS will require the project construction contractor to have rubble base, precast concrete block, precast wave dissipated concrete block and in-situ coping concrete so as to prevent from sand dispersion.	
1.2 Biological Resources						
1.2.1 Aquatic plants and animals	The project could impact on aquatic plants and animals in and around the project area; especially affect more than 1,000 fish cages in Tomnub Rolok area as a result of dredging of channel, turning basin and berth and sand/land reclamation. At the same time, transportation of dredged wastes to the dumping sites near Koh Dekol will impact on aquatic plants and animals in those areas. In addition, oil spill from construction machinery, if not properly managed, will also impact on water quality.	✓			➤ The project owner/ PAS will require the project construction contractor to dredge channel, turning basin as in the plan and to monitor water quality daily during dredging of channel, turning basin and transportation of dredged wastes to the dumping sites. ➤ The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose wastes to the sea and to cooperate with local waste collector for waste disposal at the dumping sites as defined by Provincial Department of Environment and local authorities. ➤ The project owner/ PAS will require the project construction contractor to conduct a routine monitoring for the transportation of wastes to the dumping sites.	
1.3 Socioeconomic Resources						
1.3.1 Traffic Condition	Traffic congestion by vehicles may occur around the construction sites and Samdech Hun Sen road. This can cause disruption to local people and people passing through.	✓			➤ The project owner/ PAS will require the project construction contractor to inform local authorities about the construction period. ➤ The project owner/ PAS will require the project construction contractor to install traffic signs at the construction sites in particular traffic lights at night time to	

Natural and Socioeconomic Resources	Negative Impact	Scope of Impact			Mitigation Measure	Remark
		Small	Medium	High		
					avoid accidents. ➤ The project owner/ PAS will require the project construction contractor to implement traffic management plan around the construction sites and Samdech Hun Sen road in cooperation with local authorities. ➤ The project owner/ PAS will require the project construction contractor to educate all the drivers to respect law on traffic in the Kingdom of Cambodia.	
1.3.2 Danger (Risks)	The project site is close to the coastal area. Historically, it is reported that the Sihanoukville port used to transport ammunition and tie up by military ships. Moreover, during the Civil War (1970-1975 and 1979-1993) the port area may also have the remaining ammunition dropped at that time. Mines and unexploded ordnance would be hazardous to workers and local residents during the project construction.	✓			➤ The project owner/ PAS will require the project construction contractor to cooperate with the Cambodian Mine Action Centre (CMAC) to monitor the project area to ensure that UXO is cleared before the project construction activities begin.	
2. Impacts during Construction Phase						
2.1 Physical Resources						
2.1.1 Topography	The project changes topographical conditions at seabed due to dredging of channel, turning basin and berth and sand/land reclamation on an area of 17.5 ha.			✓	➤ The project owner/ PAS will require the project construction contractor must have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.	
2.1.2 Soil Erosion	Soil erosion and/or land slide might occur due to land/sand reclamation for the project. In the rainy season, soil erosion will be more seriously as a result of additional rainfalls which lead to release sediment into the sea.	✓			➤ The project owner/ PAS will require the project construction contractor to have rubble base, precast concrete block, precast wave dissipated concrete block and in-situ coping concrete so as to prevent from sand dispersion prior to starting the project construction. ➤ The project owner/ PAS will require the project construction contractor to have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.	
2.1.3 Soil Quality	Soil pollution caused by oil spills at the storage site and by spillage from vehicles and machineries. On the other hand, solid waste at the worker camps such as materials waste, office waste, plastic packaging, and food waste from workers, etc., will cause soil pollution if not properly managed.		✓		➤ The project owner/ PAS will require the project construction contractor to take proper care of and monitor vehicles and machineries to avoid any spillage and to regularly monitor fuel storage at all the construction sites to avoid any spillage. ➤ The project owner/ PAS will require the project construction contractor to properly keep all kind of solid wastes in the prepared bins. The wastes will be collected	

Natural and Socioeconomic Resources	Negative Impact	Scope of Impact			Mitigation Measure	Remark
		Small	Medium	High		
					and then disposed at the dumping site/s where the local authority or the Provincial Department of Environment has determined. ➤ The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose of wastes to the sea.	
2.1.4 Surface Water Quality	Land/sand reclamation, dredging of channel, turning basin and berth and transportation of dredged wastes to the dumping sites will impact on water quality. It is notable that source of sea pollution that is critically important is dredging of channel and turning basin. Such works may have pollutants from seabed which lead to water pollution in the project area and its surrounding areas. Wastewater from daily water consumption of management and construction personnel and waste oil may be the sources of sea pollution if not properly managed. Meanwhile, there are residual wastes from offices and other materials. In the case that the project construction contractor does not properly clean the wastes, those wastes will impact on sea water quality.		✓		➤ The project owner/ PAS will require the project construction contractor to monitor sea water quality regularly at the locations as in the design phase by taking samples to MoE's laboratory. In case that unusually high concentration of any parameter, necessary mitigation measures will then be implemented. ➤ The project owner/ PAS will require the project construction contractor to educate workers and staff not to throw away wastes into the sea and to provide sanitary latrine in the worker camps. The project construction contractor have to make sure that human wastes and construction ones will be packed and kept at the proper locations. Also, the project construction contractor will have to cooperate with local waste collecting company to transport and dispose of wastes at the dumping site. ➤ The project owner/ PAS will require the project construction contractor to clean tools and equipments at the prepared location with sedimentation tank. ➤ The project owner/ PAS will require the project construction contractor to properly prepare fuel storage location, ensuring that no any spillage occurs. ➤ The project owner/ PAS will require the project construction contractor to check sanitary latrine, avoiding any discharge to the sea. ➤ The project owner/ PAS will require the project construction contractor to select high quality dredging tools with minimal sedimentation dispersion. ➤ The project owner/ PAS will require the project construction contractor to minimize dredging time so as to minimize turbidity. ➤ The project owner/ PAS will require the project construction contractor to select high quality transportation means for dredged materials to avoid any	

Natural and Socioeconomic Resources	Negative Impact	Scope of Impact			Mitigation Measure	Remark
		Small	Medium	High		
					spillage. ➤ The project owner/ PAS will require the project construction contractor to regularly monitor pollutants from dredging activities.	
2.1.5 Air Quality	Emission of toxic gases such as: Total Suspended Particulate (TSP), carbon dioxide (CO), sulfur dioxide (SO ₂), and NO ₂ caused by the traffic of vehicles and other heavy machineries will cause disruptions (dust and air pollution) to villagers in the surrounding project area. Due to the long-term project construction, up to 36 months, this negative impact must be considered with due diligence.		✓		➤ The project owner/ PAS will require the project construction contractor to take proper care of vehicles and machineries and to use high quality fuels. The project construction contractor will completely avoid overload transportation and congestion of vehicles, causing air pollution. ➤ The project owner/ PAS will require the project construction contractor to cover materials during transportation to reduce dust. ➤ The project owner/ PAS will require the project construction contractor to spray water regularly along the road to be expanded to reduce dust from the mobilization of vehicles and machineries. ➤ The project owner/ PAS will require the project construction contractor to monitor dust air pollution and complaint from local residents. If any complaint, the project construction contractor have to reconsider the applied technical aspects and find the ways to solve those issues. ➤ The project owner/ PAS will require the project construction contractor to prepare and to strictly implement traffic management plan at the construction sites.	
2.1.6 Noise & Vibration level	The traffic of vehicles and other machineries in large quantities to serve the project activities will cause disturbance (noise and vibration) directly to the local residents, especially for those living near the project area. Due to the project construction period lasts for 36 months, so this negative impact must be taken into account seriously.		✓		➤ The project owner/ PAS will require the project construction contractor to use vehicles and machineries with low noise and vibration and to take proper care of vehicles and machineries before the project construction. ➤ The project owner/ PAS will require the project construction contractor to have a clear timetable for working hours: morning from 07.00 until 11.00 am and afternoon from 13.00 to 17.00 pm. ➤ The project owner/ PAS will require the project construction contractor to advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and nearby places of	

Natural and Socioeconomic Resources	Negative Impact	Scope of Impact			Mitigation Measure	Remark
		Small	Medium	High		
					residence. No driving will be allowed at night time.	
2.2 Biological Resources						
2.2.1 Aquatic plants and animals	The project could impact on aquatic plants and animals in and around the project area; especially affect more than 1,000 fish cages in Tomnub Rolok area as a result of dredging of channel, turning basin and berth and sand/land reclamation. At the same time, transportation of dredged wastes to the dumping sites near Koh Dekol will impact on aquatic plants and animals in those areas.	✓			➤ The project owner/ PAS will require the project construction contractor to dredge channel, turning basin as in the plan and to monitor water quality daily during dredging of channel, turning basin and transportation of dredged wastes to the dumping sites. ➤ The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose of wastes to the sea and to cooperate with local waste collector for waste disposal at the dumping sites as defined by Provincial Department of Environment and local authorities. ➤ The project owner/ PAS will require the project construction contractor to conduct a routine monitoring for the transportation of wastes to the dumping sites.	
2.3 Socioeconomic Resources						
2.3.1 Local economic activities	The project activities will impact on local residents' occupation and income of fishermen living nearby the project area. This is due to the fact that during the dredging channel, PAS will inform to local people especially people who conduct fish raising to prolong their activities due to high turbidity. As for fishermen, some channels that they used to travel for fishing are prohibited.	✓			➤ The project owner/ PAS will require the project construction contractor to prioritize fishermen as workers and/or staff during the construction phase. ➤ The project owner/ PAS will require the project construction contractor to install traffic signs at the dredging zones. ➤ The project owner/ PAS will require the project construction contractor to comprehensively disclose information regarding the project construction to local residents so as to let them know the project activities.	
2.3.2 Traffic condition	Traffic congestion by vehicles may occur around the construction sites and roads. This can cause disruption to local people and people passing through.		✓		➤ The project owner/ PAS will require the project construction contractor to inform local authorities about the construction period. ➤ The project owner/ PAS will require the project construction contractor to install traffic signs at the construction sites in particular traffic lights at night time to avoid accidents. ➤ The project owner/ PAS will require the project construction contractor to implement traffic management plan around the construction sites in cooperation with local authorities. ➤ The project owner/ PAS will require the project construction contractor to educate all the drivers to	

Natural and Socioeconomic Resources	Negative Impact	Scope of Impact			Mitigation Measure	Remark
		Small	Medium	High		
2.3.3 Work Safety	The project activities can impact on staff and workers' health due to the negligence of staff-workers including vehicle control and careless use of equipments and so on. On the other hand, the provision of inappropriate accommodation, no clean water, and living without hygiene will impact on their health as well.	✓			<i>respect law on traffic in the Kingdom of Cambodia.</i> ➤ The project owner/ PAS will require the project construction contractor to provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments. ➤ The project owner/ PAS will require the project construction contractor to implement all safety working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works. ➤ The project owner/ PAS will require the project construction contractor to construct sanitary latrine for staff and workers equiped with septic tanks and to provide clean water for general consumption. ➤ The project owner/ PAS will require the project construction contractor to educate staff and workers on sexually transmitted diseases. The project construction contractor will cooperate with provincial department of health for epidemics prevention around the project area.	
3. Impacts during Operation Phase						
3.1 Physical Resources						
3.1.1 Surface Water Quality	Liquid waste and solid waste will be increased due to general operations of the port including the release of liquid waste from toilets of PAS offices, waste from kitchen, cartons etc. Besides, solid waste and liquid waste will be generated from ships transporting goods to and from Cambodia.		✓		➤ All liquid waste from the port will be discharged to sewage system and then go to water treatment plan. This waste will be checked in advance before discharging to public sewage system. ➤ The project owner/ PAS will monitor sea water quality regularly (the sampling sites will be the same as the before-construction sampling sites) by taking samples and send them to the MoE's laboratory. In case of any parameter increase in the abnormal conditions, some mitigations will be implemented. ➤ The project owner/ PAS will educate workers and staff not to throw away wastes into the sea and will make sure that human wastes and construction ones will be packed and kept at the proper locations. ➤ The project owner/ PAS will properly prepare fuel storage location, ensuring that no any spillage occurs.	
3.1.2 Air Quality	During the project operation there will be more transportation activities by large ships to and from Cambodia and by truck. At the same time, there are		✓		➤ The project owner/ PAS will regularly monitor air quality in and around port area and respect the subdecree on the Control of Air Pollution and Noise Disturbance 2000.	

Natural and Socioeconomic Resources	Negative Impact	Scope of Impact			Mitigation Measure	Remark
		Small	Medium	High		
	cranes and cargo for handling goods and other machinery, which all are sources of increasing of carbon dioxide (CO2) emissions. Increase of traffic density due to port operation will provide gas emissions, resulting in air pollution as well.				➤ The project owner/ PAS will add more waste storage sites and cooperate with local waste collecting company to transport and dispose of wastes at the dumping site. ➤ The project owner/ PAS will educate workers and staff about energy saving so as to reduce air pollution. ➤ The project owner/ PAS will have tree-seedling nursery and green space for those trees.	
3.1.3 Noise and Vibration	The traffic of vehicles and other machineries in large quantities to serve the project activities will cause disturbance (noise and vibration) directly to the local residents, especially for those living near the project area.		✓		➤ The project owner/ PAS will use vehicles and machineries with low noise and vibration and take proper care of vehicles and machineries. Some mitigation measures will be applied to minimize noise and vibration. ➤ The project owner/ PAS will advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and nearby places of residence.	
3.2 Biological Resources						
3.2.1 Aquatic plants and animals	Maritime transportation and land one during daytime and nighttime will provide impact on aquatic lives. Moreover, any oil spillage from ships and solid waste disposal to the sea will provide impact on marine biodiversity.	✓			➤ The project owner/ PAS will monitor solid waste and liquid one on ships regularly. ➤ The project owner/ PAS will consider more measures to minimize/eliminate the impact on aquatic plants and animals.	
3.3 Socioeconomic Resources						
3.3.1 Occupation & Income	Fishing activities are expected to be declined due to some areas around the project areas are prohibited. The issues might occur for some families only.	✓			➤ The project owner/ PAS will clearly define zone for fishermen passing through for fishing activities. ➤ The project owner/ PAS will prioritize job opportunities for fishermen, in particular for those workers and/or staff who used to work during the construction phase. ➤ The project owner/ PAS will prepare social security fund for supporting vulnerable people by the project implementation. ➤ The project owner/ PAS will provide trainings based on labour markets around the port area.	
3.3.2 Marine Transportation and Land One	In this phase, marine transportation and land transportation will be more active and will then increase traffic density around the project area.		✓		➤ The project owner/ PAS will monitor traffic in and around the project area so as to take action if any traffic congestion (particularly at the intersection of National Road No.4) occurs. ➤ The project owner/ PAS will cooperate local traffic police and local authority to manage traffic conditions and will educate drivers about law on land traffic.	

Natural and Socioeconomic Resources	Negative Impact	Scope of Impact			Mitigation Measure	Remark
		Small	Medium	High		
					➤ The project owner/ PAS will instruct ships to respect marine transporation regulations such as duration for parking etc. ➤ The project owner/ PAS will install all traffic signs for marine traffic around the project area for safety.	
3.3.3 Work Safety	The project activities can impact on staff and workers' health due to the negligence of staff-workers including vehicle control and careless use of equipments and so on. On the other hand, the provision of inappropriate accommodation, no clean water, and living without hygiene will impact on their health as well.	✓			➤ The project owner/ PAS will provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments. ➤ The project owner/ PAS will implement all safely working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works. ➤ The project owner/ PAS will construct sanitary latrine for staff and workers equiped with septic tanks and to provide clean water for general consumption. ➤ The project owner/ PAS will establish health center in the port area equipped with medical supply and will have doctors. The project owner/ PAS will cooperate with provincial department of health for epidemics prevention around the project area.	

7.4 CUMULATIVE IMPACTS

Cumulative impacts were studied based on other project activities compared to this development project. Based on the plan of Sihanoukville Port New Container Terminal Development Project, it indicates that there is no any cumulative impacts that will occur during the construction phase because there is no any other project activity plan. However, cumulative impacts will occur during the project operation phase due to Sihanoukville Port MultiPurpose Terminal Development Project. Based on nature of the works are very similar to each other and these projects have the same project owner, the impacts can be minimized as follows:

- 1) The project owner/PAS will monitor Environmental Management Plan by each project, focusing on air quality, water quality, and noise and vibration disturbance; and
- 2) The project owner/PAS will discuss all environmental impacts with relevant stakeholders if any request from affected stakeholders.

7.5 POSITIVE IMPACTS ON ENVIRONMENT

The proposed Sihanoukville Port New Container Terminal Development Project will provide long term numerous beneficial impacts to individuals, communities, as well as to the entire province. The beneficial impacts will appear as follows:

7.5.1 Construction Phase

Three beneficial impacts are identified, all of which are (i) Employment Generation, (ii) Skill Enhancement, and (iii) Local Trade and Business Opportunity.

7.5.1.1 Employment Generation

The project will generate direct employment opportunities to the local people in the project construction area. As the project involves construction work it will offer a grand opportunity for various skilled and non-skilled work forces. The amount of money earned by the local people will directly affect the local economy thereby reducing the chances of seasonal migration of the local people. The project will provide short term direct employment benefit to majority of the construction workers. In order to augment such benefits, priority will be given to employ local laborers as far as possible.

7.5.1.2 Skill Enhancement

The construction of the project will not only provide direct employment opportunities but also ensure the transfer of skills and technical proficiency to the local workforce. The project activities such as constructing port and related infrastructures will provide transferable skills. In future these skills will be a plus point for the local staff and worker for any relevant works.

7.5.1.3 Local Trade and Business Opportunity

The project will directly bring business opportunity. As construction work involves a lot of manpower, a number of shops pertaining to food items will gain a momentum around the vicinity of the construction site. This will boost on local trade and business sector.

7.5.2 Operation Phase

During the operation phase, the presence of the project will become a new international port with a better quality, services, security as well as better environment in parallel with international standard and can compete with other ports in Asian countries. Moreover, the project will play an active role as international gateway which is able to facilitate import-export goods from and to Cambodia. This will contribute to poverty reduction and improve economic growth.

CHAPTER 8

ENVIRONMENTAL MANAGEMENT PLAN

The environmental management plan (EMP) for the project has been prepared by the project owner. The EMP will serve as the framework for the environmental management, commencing from the detailed design phase through the operation phase. The full implementation of the EMP by the works contractor will ensure that adequate protection measures are in place to avoid or mitigate the project impacts.

The general EMP is included as part of the Special Provisions of the Specification and Performance Requirement (One of the Sections in the documents for procurement contracts for civil works). The works contractor will incorporate the EMP into his/her planning and site control and will be required to prepare an EMP for the works and report periodically.

8.1 SUMMARY IMPACTS AND MITIGATION MEASURES

Main environmental impacts and its mitigation measures are summarized as in table 8-1.

Table 8-1: Summary of main environmental impacts

Natural and Socioeconomic Resources	Negative Impact	Mitigation Measure	Responsible Institution	Cost Estimation (USD)
1. Impacts during Design Phase				
1.1 SocioeconomicResources				
1.1.1 Danger (Risks)	The project site is close to the coastal area. Historically, it is reported that the Sihanoukville port used to transport ammunition and tie up by military ships. Moreover, during the Civil War (1970-1975 and 1979-1993) the port area may also have the remaining ammunition dropped at that time. Mines and unexploded ordnance would be hazardous to workers and local residents during the project construction.	➤ The project owner/ PAS will require the project construction contractor to cooperate with the Cambodian Mine Action Centre (CMAC) to monitor the project area to ensure that UXO is cleared before the project construction activities begin.	- The project owner/ PAS - The project construction contractor	Included in the contract
2. Impacts during Construction Phase				
2.1 Natural Resources				
2.1.1 Topography	The project changes topographical conditions at seabed due to dredging of channel, turning basin and berth and sand/land reclamation on an area of 17.5 ha.	➤ The project owner/ PAS will require the project construction contractor must have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.	- The project owner/ PAS - The project construction contractor	Included in the contract
2.1.2 Soil Erosion	Soil erosion and/or land slide might occur due to land/sand reclamation for the project. In the rainy season, soil erosion will be more seriously as a result of additional rainfalls which lead to release sediment into the sea.	➤ The project owner/ PAS will require the project construction contractor to have rubble base, precast concrete block, precast wave dissipated concrete block and in-situ coping concrete so as to prevent from sand dispersion prior to starting the project construction. ➤ The project owner/ PAS will require the project construction contractor to have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.	- The project owner/ PAS - The project construction contractor	Included in the contract
2.1.3 Soil Quality	Soil pollution caused by oil spills at the storage site and by spillage from vehicles and machineries. On the other hand, solid waste at	➤ The project owner/ PAS will require the project construction contractor to take proper care of and monitor vehicles and machineries to avoid any	- The project owner/ PAS - The project construction contractor	Included in the contract

Natural and Socioeconomic Resources	Negative Impact	Mitigation Measure	Responsible Institution	Cost Estimation (USD)
	the worker camps such as materials waste, office waste, plastic packaging, and food waste from workers, etc., will cause soil pollution if not properly managed.	spillage and to regularly monitor fuel storage at all the construction sites to avoid any spillage. ➤ The project owner/ PAS will require the project construction contractor to properly keep all kind of solid wastes in the prepared bins. The wastes will be collected and then disposed at the dumping site/s where the local authority or the Provincial Department of Environment has determined. ➤ The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose of wastes to the sea.		
2.1.4 Surface Water Quality	Land/sand reclamation, dredging of channel, turning basin and berth and transportation of dredged wastes to the dumping sites will impact on water quality. It is notable that source of sea pollution that is critically important is dredging of channel and turning basin. Such works may have pollutants from seabed which lead to water pollution in the project area and its surrounding areas. Wastewater from daily water consumption of management and construction personnel and waste oil may be the sources of sea pollution if not properly managed. Meanwhile, there are residual wastes from offices and other materials. In the case that the project construction contractor does not properly clean the wastes, those wastes will impact on sea water quality.	➤ The project owner/ PAS will require the project construction contractor to monitor sea water quality regularly at the locations as in the design phase by taking samples to MoE's laboratory. In case that unusually high concentration of any parameter, necessary mitigation measures will then be implemented. ➤ The project owner/ PAS will require the project construction contractor to educate workers and staff not to throw away wastes into the sea and to provide sanitary latrine in the worker camps. The project construction contractor have to make sure that human wastes and construction ones will be packed and kept at the proper locations. Also, the project construction contractor will have to cooperate with local waste collecting company to transport and dispose of wastes at the dumping site. ➤ The project owner/ PAS will require the project construction contractor to clean tools and equipments at the prepared location with sedimentation tank. ➤ The project owner/ PAS will require the project construction contractor to properly prepare fuel storage location, ensuring that no any spillage occurs. ➤ The project owner/ PAS will require the project	- The project owner/ PAS - The project construction contractor	Included in the contract

Natural and Socioeconomic Resources	Negative Impact	Mitigation Measure	Responsible Institution	Cost Estimation (USD)
		construction contractor to check sanitary latrine, avoiding any discharge to the sea. ➤ The project owner/ PAS will require the project construction contractor to select high quality dredging tools with minimal sedimentation dispersion. ➤ The project owner/ PAS will require the project construction contractor to minimize dredging time so as to minimize turbidity. ➤ The project owner/ PAS will require the project construction contractor to select high quality transportation means for dredged materials to avoid any spillage. ➤ The project owner/ PAS will require the project construction contractor to regularly monitor pollutants from dredging activities.		
2.1.5 Air Quality	Emission of toxic gases such as: Total Suspended Particulate (TSP), carbon dioxide (CO), sulfur dioxide (SO ₂), and NO ₂ caused by the traffic of vehicles and other heavy machineries will cause disruptions (dust and air pollution) to villagers in the surrounding project area. Due to the long-term project construction, up to 36 months, this negative impact must be considered with due diligence.	➤ The project owner/ PAS will require the project construction contractor to take proper care of vehicles and machineries and to use high quality fuels. The project construction contractor will completely avoid overload transportation and congestion of vehicles, causing air pollution. ➤ The project owner/ PAS will require the project construction contractor to cover materials during transportation to reduce dust. ➤ The project owner/ PAS will require the project construction contractor to spray water regularly along the road to be expanded to reduce dust from the mobilization of vehicles and machineries. ➤ The project owner/ PAS will require the project construction contractor to monitor dust air pollution and complaint from local residents. If any complaint, the project construction contractor have to reconsider the applied technical aspects and find the ways to solve those issues. ➤ The project owner/ PAS will require the project construction contractor to prepare and to strictly implement traffic management plan at the	- The project owner/ PAS - The project construction contractor	Included in the contract

Natural and Socioeconomic Resources	Negative Impact	Mitigation Measure	Responsible Institution	Cost Estimation (USD)
2.1.6 Noise & Vibration level	The traffic of vehicles and other machineries in large quantities to serve the project activities will cause disturbance (noise and vibration) directly to the local residents, especially for those living near the project area. Due to the project construction period lasts for 36 months, so this negative impact must be taken into account seriously.	<i>construction sites.</i> ➤ The project owner/ PAS will require the project construction contractor to use vehicles and machineries with low noise and vibration and to take proper care of vehicles and machineries before the project construction. ➤ The project owner/ PAS will require the project construction contractor to have a clear timetable for working hours: morning from 07.00 until 11.00 am and afternoon from 13.00 to 17.00 pm. ➤ The project owner/ PAS will require the project construction contractor to advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and nearby places of residence. No driving will be allowed at night time.	- The project owner/ PAS - The project construction contractor	Included in the contract
2.1.7 Aquatic plants and animals	The project could impact on aquatic plants and animals in and around the project area; especially affect more than 1,000 fish cages in Tomnub Rolok area as a result of dredging of channel, turning basin and berth and sand/land reclamation. At the same time, transportation of dredged wastes to the dumping sites near Koh Dekol will impact on aquatic plants and animals in those areas.	➤ The project owner/ PAS will monitor solid waste and liquid one on ships regularly. ➤ The project owner/ PAS will consider more measures to minimize/eliminate the impact on aquatic plants and animals.	- The project owner/ PAS - The project construction contractor	Included in the contract
2.2 Socioeconomic Resources				
2.2.1 Local economic activities	The project activities will impact on local residents' occupation and income of fishermen living nearby the project area. This is due to the fact that during the dredging channel, PAS will inform to local people especially people who conduct fish raising to prolong their activities due to high turbidity. As for fishermen, some channels that they used to travel for fishing are prohibited.	➤ The project owner/ PAS will require the project construction contractor to prioritize fishermen as workers and/or staff during the construction phase. ➤ The project owner/ PAS will require the project construction contractor to install traffic signs at the dredging zones. ➤ The project owner/ PAS will require the project construction contractor to comprehensively disclose information regarding the project construction to local residents so as to let them know the project activities.	- The project owner/ PAS - The project construction contractor	Included in the contract
2.2.2 Traffic condition	Traffic congestion by vehicles may occur	➤ The project owner/ PAS will require the project	- The project owner/ PAS	Included in the

Natural and Socioeconomic Resources	Negative Impact	Mitigation Measure	Responsible Institution	Cost Estimation (USD)
	around the construction sites and roads. This can cause disruption to local people and people passing through.	construction contractor to inform local authorities about the construction period. ➤ The project owner/ PAS will require the project construction contractor to install traffic signs at the construction sites in particular traffic lights at night time to avoid accidents. ➤ The project owner/ PAS will require the project construction contractor to implement traffic management plan around the construction sites in cooperation with local authorities. ➤ The project owner/ PAS will require the project construction contractor to educate all the drivers to respect law on traffic in the Kingdom of Cambodia.	- The project construction contractor	contract
2.2.3 Work Safety	The project activities can impact on staff and workers' health due to the negligence of staff-workers including vehicle control and careless use of equipments and so on. On the other hand, the provision of inappropriate accommodation, no clean water, and living without hygiene will impact on their health as well.	➤ The project owner/ PAS will require the project construction contractor to provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments. ➤ The project owner/ PAS will require the project construction contractor to implement all safety working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works. ➤ The project owner/ PAS will require the project construction contractor to construct sanitary latrine for staff and workers equipped with septic tanks and to provide clean water for general consumption. ➤ The project owner/ PAS will require the project construction contractor to educate staff and workers on sexually transmitted diseases. The project construction contractor will cooperate with provincial department of health for epidemics prevention around the project area.	- The project owner/ PAS - The project construction contractor	Included in the contract
3. Impacts during Operation Phase				
3.1 Natural Resources				
3.1.1 Surface Water Quality	Liquid waste and solid waste will be increased due to general operations of the port including the release of liquid waste from toilets of PAS	➤ All liquid waste from the port will be discharged to sewage system and then go to water treatment plan. This waste will be checked in advance before	- The project owner/ PAS - Provincial Department of Environment	-

Natural and Socioeconomic Resources	Negative Impact	Mitigation Measure	Responsible Institution	Cost Estimation (USD)
	offices, waste from kitchen, cartons etc. Besides, solid waste and liquid waste will be generated from ships transporting goods to and from Cambodia.	discharging to public sewage system. ➤ The project owner/ PAS will monitor sea water quality regularly (the sampling sites will be the same as the before-construction sampling sites) by taking samples and send them to the MoE's laboratory. In case of any parameter increase in the abnormal conditions, some mitigations will be implemented. ➤ The project owner/ PAS will educate workers and staff not to throw away wastes into the sea and will make sure that human wastes and construction ones will be packed and kept at the proper locations. ➤ The project owner/ PAS will properly prepare fuel storage location, ensuring that no any spillage occurs.		
3.1.2 Air Quality	During the project operation there will be more transportation activities by large ships to and from Cambodia and by truck. At the same time, there are cranes and cargo for handling goods and other machinery, which all are sources of increasing of carbon dioxide (CO2) emissions. Increase of traffic density due to port operation will provide gas emissions, resulting in air pollution as well.	➤ The project owner/ PAS will regularly monitor air quality in and around port area and respect the subdecree on the Control of Air Pollution and Noise Disturbance 2000. ➤ The project owner/ PAS will add more waste storage sites and cooperate with local waste collecting company to transport and dispose of wastes at the dumping site. ➤ The project owner/ PAS will educate workers and staff about energy saving so as to reduce air pollution. ➤ The project owner/ PAS will have tree-seedling nursery and green space for those trees.	- The project owner/ PAS - Provincial Department of Environment	-
3.1.3 Noise and Vibration	The traffic of vehicles and other machineries in large quantities to serve the project activities will cause disturbance (noise and vibration) directly to the local residents, especially for those living near the project area.	➤ The project owner/ PAS will use vehicles and machineries with low noise and vibration and take proper care of vehicles and machineries. Some mitigation measures will be applied to minimize noise and vibration. ➤ The project owner/ PAS will advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and	- The project owner/ PAS - Provincial Department of Environment	-

Natural and Socioeconomic Resources	Negative Impact	Mitigation Measure	Responsible Institution	Cost Estimation (USD)
		<i>nearby places of residence.</i>		
3.2 Socioeconomic Resources				
3.2.1 Occupation & Income	Fishing activities are expected to be declined due to some areas around the project areas are prohibited. The issues might occur for some families only.	➤ The project owner/ PAS will clearly define zone for fishermen passing through for fishing activities. ➤ The project owner/ PAS will prioritize job opportunities for fishermen, in particular for those workers and/or staff who used to work during the construction phase. ➤ The project owner/ PAS will prepare social security fund for supporting vulnerable people by the project implementation. ➤ The project owner/ PAS will provide trainings based on labour markets around the port area.	- The project owner/ PAS	-
3.2.2 Marine Transportation and Land One	In this phase, marine transportation and land transportation will be more active and will then increase traffic density around the project area.	➤ The project owner/ PAS will monitor traffic in and around the project area so as to take action if any traffic congestion (particularly at the intersection of National Road No.4) occurs. ➤ The project owner/ PAS will cooperate local traffic police and local authority to manage traffic conditions and will educate drivers about law on land traffic. ➤ The project owner/ PAS will instruct ships to respect marine transportation regulations such as duration for parking etc. ➤ The project owner/ PAS will install all traffic signs for marine traffic around the project area for safety.	- The project owner/ PAS	-
3.2.3 Work Safety	The project activities can impact on staff and workers' health due to the negligence of staff-workers including vehicle control and careless use of equipments and so on. On the other hand, the provision of inappropriate accommodation, no clean water, and living without hygiene will impact on their health as well.	➤ The project owner/ PAS will provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments. ➤ The project owner/ PAS will implement all safety working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works. ➤ The project owner/ PAS will construct sanitary latrine for staff and workers equipped with septic tanks and to provide clean water for general consumption.	- The project owner/ PAS	-

Natural and Socioeconomic Resources	Negative Impact	Mitigation Measure	Responsible Institution	Cost Estimation (USD)
		➤ <i>The project owner/ PAS will establish health center in the port area equipped with medical supply and will have doctors. The project owner/ PAS will cooperate with provincial department of health for epidemics prevention around the project area.</i>		

8.2 TRAINING PROGRAM

The training program is one of the important parts of the EMP. In this regard, Sustainable development needs to have adequate human resources to work either in technical works or environmental works. Therefore, the project owner/PAS will require the project construction contractor to train staff and workers on the following topics:

- The use of machineries and vehicles at the beginning of construction period to all related staff and workers;
- Techniques for the construction of project related infrastructure
- Work safely;
- Environmental protection in and around the construction site;
- Solid waste management in and around the construction site; and
- Sexually transmitted diseases and other diseases.

8.3 ENVIRONMENTAL MONITORING PROGRAM

The environmental monitoring to be occurred during pre-construction, construction, and operation phases is an important work. Responsible institutions and budgets for this work are included in the Environmental Monitoring Program. The budget for environmental monitoring in the construction phase is the responsibility of the project construction contractor. During the operation phase, the environmental monitoring is the responsibility of the project owner. Detailed cost estimates are attached in Annex 10.

8.3.1 Composition of Environmental Monitoring Members

The implementation of EMP for this project is the direct responsibility of the project construction contractor. The contractor has to conduct its own monitoring and follow-up monitoring of the working groups, including:

- a) National working group
 - Ministry of Environment
 - Ministry of Public Works and Transport
 - National Committee on Coastal Area Management and Development
- b) Sub-national working group
 - Provincial authority of Preah Sihanoukville province
 - Provincial Department of Environment
 - Provincial Department of Public Works and Transport
 - Provincial Department of Water Resources and Meteorology
 - Provincial Department of Mines and Energy
 - Provincial Department of Labour and Vocational Training
 - Provincial Dep. of Land Management, Urban Planning, and Construction
 - Provincial Department of Agriculture, Forestry and Fisheries
 - Authority of Preah Sihanoukville Municipality
 - Authority of Sangkat 1 and Sangkat 3.

Table 45: Environmental Monitoring Program

Mitigation Measure		Parameters to be monitored	Place	timing	Monitoring Institution	Responsible Institution	Cost (USD)
1. Impacts during Construction Phase							14,200
Topography	The project owner/ PAS will require the project construction contractor to have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.	-	The project area	Every month	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Provincial Department of Land Management, Urban Planning, and Construction - Provincial Department of Mines and Energy - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS - The project construction company	Included in the contract
Soil Erosion	- The project owner/ PAS will require the project construction contractor to have rubble base, precast concrete block, precast wave dissipated concrete block and in-situ coping concrete so as to prevent from sand dispersion prior to starting the project construction. - The project owner/ PAS will require the project construction contractor to have engineer to monitor such works and to make sure that the works are carried out according to acceptable technical standards.	- Coastal Area	The project area and surrounding areas	Every month	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Provincial Department of Land Management, Urban Planning, and Construction - Provincial Department of Mines and Energy - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS - The project construction company	Included in the contract
Soil Quality	- The project owner/ PAS will require the project construction contractor to take proper care of and monitor vehicles and machineries to avoid any spillage and to regularly monitor fuel storage at all the construction sites to avoid any spillage. - The project owner/ PAS will require the project construction contractor to properly keep all kind of solid wastes in the prepared bins. The wastes will be collected and then disposed at the dumping site/s where the local authority or the Provincial Department of Environment has determined. - The project owner/ PAS will require the project construction contractor to educate workers, not allowing to dispose of wastes to the sea.	- Soil condition and pollution	Construction sites	Every 6 months	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Provincial Department of Land Management, Urban Planning, and Construction - Provincial Department of Mines and Energy - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS - The project construction company	1,700

Mitigation Measure		Parameters to be monitored	Place	timing	Monitoring Institution	Responsible Institution	Cost (USD)
Surface Water Quality	➤ The project owner/ PAS will require the project construction contractor to monitor sea water quality regularly at the locations as in the design phase by taking samples to MoE's laboratory. In case that unusually high concentration of any parameter, necessary mitigation measures will then be implemented. ➤ The project owner/ PAS will require the project construction contractor to educate workers and staff not to throw away wastes into the sea and to provide sanitary latrine in the worker camps. The project construction contractor have to make sure that human wastes and construction ones will be packed and kept at the proper locations. Also, the project construction contractor will have to cooperate with local waste collecting company to transport and dispose of wastes at the dumping site. ➤ The project owner/ PAS will require the project construction contractor to clean tools and equipments at the prepared location with sedimentation tank. ➤ The project owner/ PAS will require the project construction contractor to properly prepare fuel storage location, ensuring that no any spillage occurs. ➤ The project owner/ PAS will require the project construction contractor to check sanitary latrine, avoiding any discharge to the sea. ➤ The project owner/ PAS will require the project construction contractor to select high quality dredging tools with minimal sedimentation dispersion. ➤ The project owner/ PAS will require the project construction contractor to minimize dredging time so as to minimize turbidity. ➤ The project owner/ PAS will require the project construction contractor to select high quality transportation means for dredged materials to avoid any spillage. ➤ The project owner/ PAS will require the project construction contractor to regularly monitor pollutants from dredging activities.	pH, Temperature, Turbidity, Salinity, DO, TSS, BOD, COD, Oil & Grease, TN, TP, As, Total Fe, Total Hg, and Total Coliform	6 sampling sites as the same to the design phase	Every 6 months	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS - The project construction company	3,200
Air Quality	➤ The project owner/ PAS will require the project construction contractor to take proper care of vehicles and machineries and to use high quality fuels. The project construction contractor will completely avoid overload transportation and congestion of vehicles, causing air pollution. ➤ The project owner/ PAS will require the project construction contractor to cover materials during transportation to reduce dust. ➤ The project owner/ PAS will require the project construction contractor to spray water regularly along the road to be expanded to reduce dust from the mobilization of vehicles and machineries. ➤ The project owner/ PAS will require the project construction contractor to monitor dust air pollution and complaint from local residents. If any complaint, the project construction contractor have to reconsider the applied technical aspects and find the ways to solve those issues. ➤ The project owner/ PAS will require the project construction contractor to prepare and to strictly implement traffic management plan at the construction sites.	CO, NO ₂ , SO ₂ , Pb, TSP, PM ₁₀ , and PM _{2.5}	2 sampling sites as the same to the design phase	Every 6 months	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS - The project construction company	6,500
Noise & Vibration level	➤ The project owner/ PAS will require the project construction contractor to use vehicles and machineries with low noise and vibration and to take proper care of vehicles and machineries before the project construction. ➤ The project owner/ PAS will require the project construction contractor to have a clear timetable for working hours: morning from 07.00 until 11.00 am and afternoon from 13.00 to 17.00 pm. ➤ The project owner/ PAS will require the project construction	Monitor source of noise and vibration	2 sampling sites as the same to the design phase	Every 6 months	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS - The project construction company	2,000

Mitigation Measure		Parameters to be monitored	Place	timing	Monitoring Institution	Responsible Institution	Cost (USD)
	contractor to advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and nearby places of residence. No driving will be allowed at night time.						
Traffic condition	➢ The project owner/ PAS will require the project construction contractor to inform local authorities about the construction period. ➢ The project owner/ PAS will require the project construction contractor to install traffic signs at the construction sites in particular traffic lights at night time to avoid accidents. ➢ The project owner/ PAS will require the project construction contractor to implement traffic management plan around the construction sites in cooperation with local authorities. ➢ The project owner/ PAS will require the project construction contractor to educate all the drivers to respect law on traffic in the Kingdom of Cambodia.	Traffic activities, Traffic signs	In front of the old port, along Samdech Hun Sen road, and around construction sites	Daily Weekly Monthly	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS - The project construction company	Included in the contract
Work Safety	➢ The project owner/ PAS will require the project construction contractor to provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments. ➢ The project owner/ PAS will require the project construction contractor to implement all safety working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works. ➢ The project owner/ PAS will require the project construction contractor to construct sanitary latrine for staff and workers equipped with septic tanks and to provide clean water for general consumption. ➢ The project owner/ PAS will require the project construction contractor to educate staff and workers on sexually transmitted diseases. The project construction contractor will cooperate with provincial department of health for epidemics prevention around the project area.	Monitor the provision of PPE to staff and workers including clean water and sanitary latrine	the construction site	Monthly	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS - The project construction company	800
2. Impacts during Operation Phase							
Surface Water Quality	➢ All liquid waste from the port will be discharged to sewage system and then go to water treatment plan. This waste will be checked in advance before discharging to public sewage system. ➢ The project owner/ PAS will monitor sea water quality regularly (the sampling sites will be the same as the before-construction sampling sites) by taking samples and send them to the MoE's laboratory. In case of any parameter increase in the abnormal conditions, some mitigations will be implemented. ➢ The project owner/ PAS will educate workers and staff not to throw away wastes into the sea and will make sure that human wastes and construction ones will be packed and kept at the proper locations. ➢ The project owner/ PAS will properly prepare fuel storage location, ensuring that no any spillage occurs.	pH, Temperature, Turbidity, Salinity, DO, TSS, BOD, COD, Oil & Grease, TN, TP, As, Total Fe, Total Hg, and Total Coliform	6 sampling sites as the same to the design phase	Every 6 months	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS	3,200
Air Quality	➢ The project owner/ PAS will regularly monitor air quality in and around port area and respect the subdecree on the Control of Air Pollution and Noise Disturbance 2000. ➢ The project owner/ PAS will add more waste storage sites and cooperate with local waste collecting company to transport and dispose of wastes at the dumping site. ➢ The project owner/ PAS will educate workers and staff about energy saving so as to reduce air pollution. ➢ The project owner/ PAS will have tree-seedling nursery and green space for those trees.	CO, NO ₂ , SO ₂ , Pb, TSP, PM ₁₀ , and PM _{2.5}	2 sampling sites as the same to the design phase	Every 6 months	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS	6,500

Mitigation Measure		Parameters to be monitored	Place	timing	Monitoring Institution	Responsible Institution	Cost (USD)
Noise & Vibration level	➤ The project owner/ PAS will use vehicles and machineries with low noise and vibration and take proper care of vehicles and machineries. Some mitigation measures will be applied to minimize noise and vibration. ➤ The project owner/ PAS will advise all drivers to drive at a low speed without exceeding 60 dB(A) for residential areas and not exceeding 45 dB (A) in some places: schools, hospitals, pagodas and nearby places of residence.	Monitor source of noise and vibration	2 sampling sites as the same to the design phase	Every 6 months	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS	2,000
Marine Transportation and Land One	➤ The project owner/ PAS will monitor traffic in and around the project area so as to take action if any traffic congestion (particularly at the intersection of National Road No.4) occurs. ➤ The project owner/ PAS will cooperate local traffic police and local authority to manage traffic conditions and will educate drivers about law on land traffic. ➤ The project owner/ PAS will instruct ships to respect marine transportation regulations such as duration for parking etc. ➤ The project owner/ PAS will install all traffic signs for marine traffic around the project area for safety.	Traffic activities	In front of the old port, along Samdech Hun Sen road, and around the project area	Daily Weekly Monthly	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS	5,000
Work Safety	➤ The project owner/ PAS will provide training for staff and workers to have a better understanding of the use of vehicles, machineries and related equipments. ➤ The project owner/ PAS will implement all safety working standards. The provision of PPE (glove, footwear, and helmet) will be provided to staff and workers based on nature of works. ➤ The project owner/ PAS will construct sanitary latrine for staff and workers equipped with septic tanks and to provide clean water for general consumption. ➤ The project owner/ PAS will establish health center in the port area equipped with medical supply and will have doctors. The project owner/ PAS will cooperate with provincial department of health for epidemics prevention around the project area.	Monitor the provision of PPE to staff and workers including clean water and sanitary latrine	the construction site	Monthly	- Ministry of Environment - Ministry of Public Works and Transport - Provincial Department of Environment - Preah Sihanoukville Authority - Sangkat 1 and Sangkat 3 Authority	- The Project owner/PAS - The project construction company	800

Remark: The above cost excluded the cost on staff and others of the project construction company.

Cost estimates for the EMP are US\$ 14,200 /year and US\$ 17,500 for the construction phase and for the operation phase, respectively.

8.4 ENVIRONMENTAL AND SOCIAL FUNDS

In order to improve environmental quality, the project owner/PAS will provide environmental and social fund in the amount of USD 2,000/year to MoE, starting from July 2019 as follows:

- 1) Environmental Fund: the project owner/PAS will provide USD 1,000/year for i) environmental restoration, biodiversity improvement and ecology system, ii) technical research on environment, iii) disclosure of environment information, and iv) training on human resources for environment and natural resources.
- 2) Social Fund: the project owner/PAS will provide USD 1,000/year for i) clear water supply, education, and health and ii) rehabilitation of public infrastructure.
- 3) the project owner/PAS will provide USD 1,000/year for environmental endorsement fund, starting from July 2019.

The contribution fund shows the support of and the serious attention on environmental quality improvement and harmonization in Cambodia.

CHAPTER 9

ECONOMIC ANALYSIS AND ENVIRONMENTAL VALUE

9.1 ECONOMIC ANALYSIS

The purpose of the economic analysis is to assess the economic feasibility of the Project on the target year, from the viewpoint of the national economy. In this clause, the economic benefits and costs are calculated with economic price and to evaluate whether the benefits exceed those that could be obtained from other investment opportunities in Cambodia. Economic benefit concept; items and measurement are applied and used in the economic analysis from the report of The Project for the Study on Strengthening Competitiveness and Development of Sihanoukville Port.

9.1.1 Premises and Methodology of Economic Analysis

9.1.1.1 Base Year

The year of 2016 is set as the base year.

9.1.1.2 Project Life

The project life (the calculation period) in the economic analysis is assumed to be forty two years from the year 2016 to the year 2057.

9.1.1.3 Foreign Exchange Rate

The exchange rate is the same (USD 1.0 = Yen 104.57) as cost estimation.

9.1.1.4 With-case” and “Without-case”

A cost-benefit analysis is conducted on the difference between the “With-case” in which an investment is made and the “Without-case” in which no investment is made, that is; the benefits and costs arising from the investment in the Project are compared.

The Sihanoukville Port does not have extra facilities to handle the estimated container cargo volume unless the Projects are implemented. In addition, port congestion including ship waiting and small container ship berthing will continue under the current capacity of the port.

It is assumed that vessels divert to other neighboring ports when capacity of existing berths of Sihanoukville Port are full. An alternative is the transportation of cargoes of the diverting vessels are barged by waterways from Cai Mep Port of Vietnam. Therefore, comparing the difference of cost between the waterways, land route, and direct service to Sihanoukville Port, directs service is defined as an economic benefit of the Project.

It is generally said that large vessel operations reduce the average cost of sea transportation by a merit of scale, which means entering large vessels into Sihanoukville Port contribute to saving sea transportation costs.

The flowchart for the economic analysis is shown in figure 9.1.

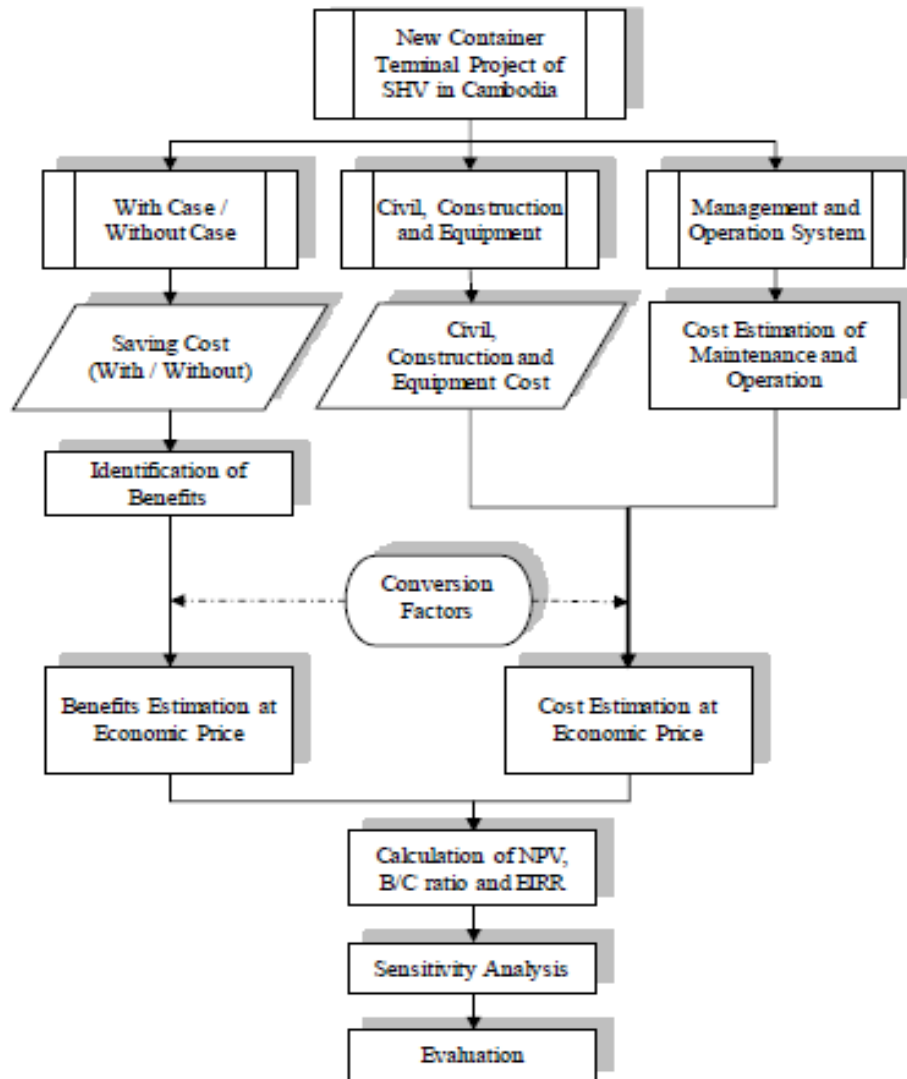


Figure 9-1: Procedure of Economic Analysis

9.1.1.5 Economic Price

9.1.1.5.1 General

For the economic analysis, all prices must be expressed as economic prices. In general, the construction costs, the operation costs, and the maintenance costs are estimated at market prices. In addition, the market prices often include transfer items, such as customs duties, subsidies, etc. Therefore, the market prices have to be converted into economic prices by using a conversion factor and eliminating these transfer elements.

9.1.1.5.2 Standard Conversion Factor (SCF)

Customs duties create a price difference between the domestic market and the international market. The SCF is used to determine the economic price of non-tradable goods that have only market prices.

The conversion factor is set at 0.98 on the basis of trade statistics data of Cambodia, for conversion into the economic price from the project cost estimated based on the market prices, shown in table 9-1.

Table 9-1: Trade statistics of Cambodia and Standard Conversion Factor

Mil. USD		2010	2011	2012
Import (CIF)	M	4,897	6,141	7,062
Export (FOB)	X	5,584	6,702	7,838
Import Tax	Tm	248	251	289
Export Tax	Tx	28	46	42
Export Subsidy	Sx	0	0	0
SCF		97.94%	98.43%	98.37%

Source: Jica Study Team

9.1.2 Economic Benefits of the Project

9.1.2.1 Benefit Items

Considering the above mentioned “With-case” and “Without-case”, the following economic benefits of the Project are measurable quantitatively.

- a) The saving of transportation costs
- b) The saving of port congestion surcharges.

9.1.2.2 Calculation of Benefit

The evaluation of benefit is conducted as economic price converted by SCF on the basis of a middle demand forecast scenario.

9.1.2.2.1 Saving of Transportation Cost

a) Sea Transportation Cost to/from Cai-Mep from/to Phnom Penh

In the case that container throughput at Sihanoukville Port will reach its capacity of 800,000 TEUs and overflowing containers will be transported through Phnom Penh Port or Cai Mep Port, sea transportation cost of overflowing containers will be higher than if they were transported through Sihanoukville Port. Savings of sea transportation cost and time for overflowing containers are deemed as a benefit to the national economy.

Sea transportation cost and time for containers to/from USA and South East Asia have no significant difference between cases through Phnom Penh Port or Sihanoukville Port. Containers to/from Europe and East Asia have to pay higher freight rates if they are transported through Phnom Penh Port or Cai Mep Port. Savings of sea transportation cost and time for containers to/from Europe and East Asia are estimated as a benefit of the “With-case”. While savings of sea transportation cost and time for export containers are not of direct benefit to Cambodian shippers, those savings are supposed to be finally transferred to the Cambodian economy. The saving cost is summarized in table 9-2.

Table 9-2: Cost Saving of Transportation per Container

Time cost to EU	25 USD per 20' box	49 USD per 40' box
Freight Difference of EU (Share: percentage)	100 USD of Export (39.5%)	60 USD of Import (2.45%)
Freight Difference of E-Asia (Share: percentage)	50 USD of Export (21.9%)	50 USD of Export (34.3%)

Source: Jica Study Team

b) Land Transportation Cost to/from Cai-Mep from/to Phnom Penh

As the same manor mentioned above, in the case that container throughput at Sihanoukville Port will reach its capacity of 800,000 TEUs and overflowing containers will be transported through Phnom Penh Port or Cai Mep Port from/to Phnom Penh, land transportation cost of the overflowing containers will be higher than if they were transported through Sihanoukville Port. Overflow export containers will be transported by barge based on the statistics data, however, the transportation cost of barge is at the almost same land transportation cost between Sihanoukville Port and Phnom Penh. While overflow import containers will be transported by truck and the land transportation cost between Cai Mep Port and Phnom Penh have to pay higher freight rates than that of between Sihanoukville Port and Phnom Penh. Savings of land transportation cost and time for the overflowing import containers are deemed as a benefit to the national economy and the saving cost is assumed at 338 USD exclusive of fees such as boarder clearance based on the interview survey.

c) Merit of Scale

All container cargo will benefit by a merit of scale by using large vessels into Sihanoukville Port in the case that larger container vessels will be deployed for services at Sihanoukville Port resulting from the development of the new deep water container terminal, ocean freight rates to/from Sihanoukville Port may be lowered due to merit of scale. Importers' savings of maritime transportation cost are estimated as a benefit of the "With-case". Reduction of maritime transportation cost of export containers may reduce CIF price at foreign ports and not directly contribute to shippers income. However, it may finally promote the production of Cambodian manufactures and contribute to the national economy. Reduction of maritime transportation cost for export containers is also estimated as a benefit of the "With-case".

Assuming a case of typical maritime transportation, unit cost for transportation of a 20'/40' container on a 2,000 TEU ship and a 4,000 TEU ship is estimated in "Manual of Cost Benefit Analysis for Port Development, 2004, MLIT, Japan" as table 9-3.

Table 9-3: Maritime Transportation Cost per Container

Case of 2 days voyage	20 feet container box	40 feet container box
2,000 TEU Ship	157.9 USD	236.9 USD
4,000 TEU Ship	123.6 USD	185.3 USD
Difference	34.3 USD	51.6 USD

Source: Jica Study Team

9.1.2.2.2 Saving of Port Congestion Surcharge

Shipping lines levy approximately USD 60 per TEU as port congestion surcharge around Asia ports if port congestion creates additional cost to them. It is assumed that the port congestion surcharge will be levied to the cargo volume of current capacity of Sihanoukville Port because overflow cargo will be handled at other ports if no investment is implemented.

In the case that the new container terminal is not developed, container handling capacity of Sihanoukville Port is assessed at 800,000 TEUs, subject to installing two more quay gantry cranes. When container handling volume reaches that capacity, the overflowing cargo will shift to Phnom Penh Port and will be carried to Cai Mep Port by barge, or will be carried to HCM directly by land transportation. Shipping companies will levy congestion surcharges on shippers due to the situation at Sihanoukville Port. Range of such congestion surcharges is wide but sometimes the surcharges reach over USD 700 per 20' container at congested African ports, the minimum surcharge is supposed to be USD 50 per 20' container (USD 100 per 40' container, cf. Yangon port in 2016). In the case of Karachi Port in Pakistan and Shuwaik Port in Kuwait, congestion surcharges of USD 100 per 20' container and USD 200 per 40' container were imposed in 2014, and in the case of Batangas of Philippines, USD 225 per 20' container and USD 450 per 40' container were imposed in 2015. As congestion surcharges are increased in connection with the extent of ship congestion, this economic analysis is made on the assumption that congestion surcharges will be imposed at a rate of USD 60 per 20' container and USD 120 per 40' container if the demand for container throughput exceeds 800,000 TEUs at Sihanoukville Port, and those will be increased by 15% if the demand exceeds 1,200,000 TEUs.

Supposing that no congestion takes place and no congestion surcharge is imposed in the “with case”, the total amount of congestion surcharges to be imposed on import containers is estimated as a benefit of the “With-case”.

In the case of export containers, such congestion surcharges will be imposed on foreign consignees as part of CIF price, so the savings of congestion surcharges may not be of economic benefit to the Cambodian economy. However, such surcharges will be transferred to Cambodian shippers as lower FOB prices, and may cause loss of shippers. Taking into account that congestion surcharges on export containers will be finally settled by Cambodian shippers, congestion surcharges to be imposed on export containers is also estimated as a benefit of the “With-case”.

9.1.3 Economic Cost of the Project

9.1.3.1 Project Costs

The economic analysis of the Project indicates the cost necessary for the national economy. Import duties and VAT are therefore excluded from economic costs. Since the initial cost estimated in section 10.2 excludes import duties but includes VAT in local cost, economic analysis is made based on cost estimates without VAT and it is converted into economic price by using standard conversion factor. The results from the conversion and deduction are summarized in table 9-4.

Table 9-4: Project Cost in Economic Price ('000 USD)

Year	2019	2020	2021	2022	2023	Total
Construction (Package 1)	770	50,069	44,127	30,465	84	128,305
1) Construction Cost	327	48,361	41,460	28,092	0	118,239
2) Engineering Service	444	1,708	2,667	2,373	84	10,066
Equipment (Package 2)	0	12,726	30,077	17,857	0	60,659
1) Buildings & Equipment	0	12,726	30,077	17,857	0	60,659
Source: JICA Survey Team				Grand Total		188,964

9.1.3.2 Operation and Maintenance Costs

Cost of items for management / operation and maintenance are assessed as table 9-5:

Table 9-5: Operation and Maintenance Cost

Operating Expenses	Unit	New Terminal
1) Fuel and motor oil for operation	USD/box	26.2
2) Supplies for Workshop & Spare-parts	USD/box	4.9
3) Annual Salaries and Bonus <i>Number of employees</i>	USD/person/year	20,382* <i>314 (450,000TEU)</i>
4) Maintenance Cost of Infrastructure	USD/year	0.3-2% of the initial investment
Maintenance Cost of Equipment		1-3% of the initial investment
5) Administration & Others	USD/box	11.9

9.1.3.3 Operation Renewal Investment Costs

Renewal investment is conducted at the year when the lifetime of each equipment is reached. The lifetime is set at 10, 15 and 25 years for trailer/chassis/top-lifter, RTG and QC, respectively.

9.1.4 Economic Evaluation of the Project

9.1.4.1 Result of EIRR

The result of EIRR is shown in Table 9-6. The estimated EIRR is at 15.76%, and a discount rate as threshold of the EIRR is set at 10.0% which is generally used for infrastructure projects. Thus, the Project can be said to be feasible.

Table 9-6: EIRR Calculation

Year	Capital Cost		Replace & Maintenance		Operation	Total Cost	Scale Merit	Time Merit	Efficiency Merit	Total Benefit	Benefit - Cost
	New CNT Construction	New CNT Equipment	Replace-ment of facilities	Mainte-nance	Fuel and Personnel Cost		Tmasporta-tion Cost Savings by Larger Ships	Tmasporta-tion Cost/Time Savings*	Savings of Congestion Surcharge**		
2017	374	0				374					-374
2018	2,416	0				2,416					-2,416
2019	770	0				770					-770
2020	50,069	12,726				62,795					-62,795
2021	44,127	30,077				74,204					-74,204
2022	30,465	17,857				48,321					-48,321
2023	84	0		974	7,111	8,169	534	5,667	28,573	34,774	26,606
2024			0	1,947	9,493	11,440	1,068	9,951	28,573	39,592	28,152
2025			0	1,947	12,711	14,658	1,601	14,473	28,573	44,648	29,990
2026			0	1,947	15,929	17,876	2,135	19,170	28,573	49,878	32,003
2027			0	1,947	17,120	19,067	2,402	23,138	28,573	54,114	35,047
2028			0	1,947	17,120	19,067	2,402	26,091	28,573	57,067	38,000
2029			0	1,947	17,120	19,067	2,402	27,813	28,573	58,788	39,722
2030			0	1,947	17,120	19,067	2,402	27,813	28,573	58,788	39,722
2031			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2032			9,200	1,947	17,120	28,267	2,402	27,813	32,859	63,074	34,808
2033			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2034			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2035			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2036			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2037			18,247	1,947	17,120	37,314	2,402	27,813	32,859	63,074	25,760
2038			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2039			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2040			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2041			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2042			9,200	1,947	17,120	28,267	2,402	27,813	32,859	63,074	34,808
2043			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2044			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2045			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2046			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2047			31,445	1,947	17,120	50,512	2,402	27,813	32,859	63,074	12,563
2048			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2049			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2050			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2051			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2052			27,447	1,947	17,120	46,514	2,402	27,813	32,859	63,074	16,560
2053			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2054			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2055			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2056			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
2057			0	1,947	17,120	19,067	2,402	27,813	32,859	63,074	44,008
											EIRR=
											15.76%

9.1.4.2 Sensitivity Analysis

In order to see whether the project is still feasible if some conditions change, a sensitivity analysis is made for the following three alternatives.

Case 1: Project cost increases by 10%

Case 2: Benefit volume decreases by 10%

Case 3: Both Case 1 and Case 2 occur simultaneously

The results of the sensitivity analysis are derived as follows.

Table 9-7: Economic Result of Sensitivity Analysis

Case	Base	Case 1	Case 2	Case 3
EIRR	15.76%	13.98%	13.79%	12.06%

Even in Case 3 of sensitivity analysis, the economic feasibility of the Project is exceeding threshold value i.e. EIRRs are above 10.0%. Therefore, the Project is recommended to be implemented as early as possible from the viewpoint of the national economy.

9.2 ENVIRONMENTAL VALUE

Environmental values in and around the project area is hard to make an estimation. However, in order to support the estimation of environmental value PPIC study team uses Inter-ministerial Prakas No. 410 on Basic Price Determination of Natural Resources for Restoration was signed on August 18, 2017. This Prakas aims to set Basic Price Determination of Natural Resources for Restoration. It needs to be implemented for law enforcement and to prevent and crack down natural resources illegal activities. In the Prakas, There is one item called **For Illegal Activities on Fisheries Resource**, specifically point No. 47 Seagrass. This item means that the project owner must pay 2.5-12.5 USD/m² for natural resources restoration to the government.

Based on the nature of the project area having no any seagrass and no any significant environmental value, the minimal value 2.5 USD/m² was calculated. As a result, the environmental value to be impacted by the project area (17.5 ha) is about **USD 87,500**. This value is excluded the locations of access channel and dumping sites.

CHAPTER 10

CONCLUSION AND RECOMMENDATION

10.1 CONCLUSION

The project aims to construct a deep sea port on an area of 17.5 hectare and other related structures in Sangkat 3, Preah Sihanoukville Municipality, Preah Sihanoukville province in order to improve economic growth. Environmentally and socioeconomically, the positive impacts will much surpass the limited negative ones. Due to type of the project and the existing environmental conditions in and around the project area, the project will provide impacts as follows:

During the design phase *the project will cause high impacts on physical resource such as topography, and cause small impacts on biological resource and socioeconomic one.*

During the construction phase, *the project will cause high impacts on physical resources such as topography and cause medium impacts on air pollution, noise and vibration disturbance, water quality, soil quality, and provincial roads. Besides, the project will cause small impacts on physical and biological resources.* Moreover, the project will cause small impacts on socioeconomic resources such as local economic activities, public infrastructure, work safety and public health conditions, and *cause medium impacts on traffic condition.*

During the operation phase, the project will also cause medium impacts on physical resources such as *air quality, noise and vibration disturbance, water quality, traffic condition* that require more attention from the project owner/PAS.

The environmentally negative impacts will be limited or minimized due to the implementation of the mitigation measures. Overall, the final project impacts will be limited due to the implementation of the mitigation measures.

Based on public consultation meetings with relevant stakeholders, the project is welcomed from relevant provincial authority, provincial departments, local authorities as well as local people. Meanwhile, the proposed development project will provide long term numerous beneficial impacts to individuals, communities as well as to the entire province. During the construction phase, three beneficial impacts are identified, all of which are (i) Employment Generation, (ii) Skill Enhancement, and (iii) Local Trade and Business Opportunity. During the operation phase, the presence of the project will become a new international port with a better quality, services, security as well as better environment in parallel with international standard and can compete with other ports in Asian countries. Moreover, the project will play an active role as international gateway which is able to facilitate import-export goods from and to Cambodia. This will contribute to poverty reduction and improve economic growth.

In conclusion, the proposed project can be implemented in the environmentally and socioeconomically acceptable manner.

10.2 RECOMMENDATION

To implement the project smoothly with environmental protection responsibilities and to make the project sustainable, some recommendations must be implemented by the project owner/PAS and/or the project construction contractor which are as follows:

- The project owner/PAS and/or the project construction contractor must strictly adhere the EMP as stated in this ESIA report;
- The project construction contractor must provide personal protective equipments to staff and workers during the construction phase;
- The project construction contractor must collaborate closely with local authorities and relevant institutions to monitor any environmental changes;
- The project construction contractor must contribute to maintaining and protecting the environment and security in the region with good cooperation with local authorities and relevant departments in the province;
- The project owner/PAS and/or the project construction contractor should consider the suggestions and comments of the stakeholders as stated in Chapter 6 and respond to the requests if possible.

At the end, the project owner/PAS promises to follow the EMP as outlined in this ESIA report in order to minimize the environmental impacts. Therefore, the project owner proposes to the Ministry of Environment to facilitate and create favorable conditions for approving the ESIA report so that the project owner/PAS can proceed to detailed engineering design phase in accordance with the planned schedule.

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