Chapter 11 Short-term Development Plan

11.1 Selection of Short-term Development Plan

11.1.1 Bujumbura Port

The target year of the short-term development is set at 2025. Based on the demand forecast and lake transport scenario previously discussed in this report, the following facilities are selected to be constructed as the short-term development projects.

- Storm water diversion
- Construction of container terminal
- Construction of ship repair facilities
- Rehabilitation of the existing general cargo berth

(1) Storm Water Diversion

The storm water drainage included in the road construction which is financed from the grant assistance of the government of Japan is designed to divert 1.39 m^3/sec. out of 12.94 m^3/sec of the storm water running through Buyenzi Canal. Unless diverted, the remaining 11.55 m^3/sec of storm water will run into the port basin and debouch sediments, sand and debris. Maintenance dredging would have to be repeated to keep the port basin deep. In this regard, the storm water diversion to prevent the port basin from getting shallow is necessary.

(2) Construction of Container Terminal

Tanzania Ports Authority (TPA) is planning for TRL to transport transit containers from Dar es Salaam to Kigoma Port by railway. TRL will start operation of one container block train between Dar es Salaam Port and Kigoma Port in 2015. It is estimated that transit containers will gradually increase to 361,000 tons in 2030 from 80,000 tons in 2015. To meet this demand, a container terminal should be built at Bujumbura Port.

(3) Construction of Ship Repair Facilities

Because the slipway at Kigoma in Tanzania, now rehabilitated and in working condition, gives preference to Tanzanian fleet for repairing, the Burundian Fleet, the largest fleet on Lake Tanganyika, cannot rely on it. The dry dock at Kalemie Port cannot be used by larger cargo ships of Burundian fleet because of its shallow navigation channel. As shown in Table 3.20 Burundian Fleet, there are 6 cargo ships, 4 tug lines and one tourism and research vessel, totaling 10 s hips, which are subject to annual inspection including underwater survey. The slipway is very necessary to inspect and repair these active ships.

In addition, there are 5 b ulk cargo barges and one tug line for which operation has been suspended. The cargo barges are moored at the inner port basin and interfering with the berthing and de-berthing of the active cargo ships. ARNOLAC, one of the shipping companies of Burundi and owner of these cargo barges, is eager to refurbish them by providing a propulsion system in order to increase the transport capacity. As it is necessary for the Burundian shipping industry to increase the lake transport capacity by deploying more ships in future, the slipway can also be used to refurbish their fleet.

(4) Rehabilitation of Existing General Cargo Berths

Due to the discharged debris and soil from the storm water canal, Buyenzi Canal, to the port basin, the water depth in front of the general cargo berths is shallower by about 1.0 m than its supposedly designed depth of 3.83 m. Therefore, MV Teza, currently having maximum draft of

3.6 m at its fully loaded condition, cannot be accommodated with appropriate underkeel clearance at the berth.

In addition, all the fenders have been lost at the quay wall and the cargo ships use rubber tires to absorb the berthing energy and reduce the berthing impacts. A proper fender system has to be installed to facilitate safe and faster berthing by the cargo ships.

(5) Others

Besides the above identified projects, installation of light beacons on the coast and procurement of rescue boats are considered necessary for safe navigation on Lake Tanganyika.

The general layout of the short term development plan in Bujumbura is shown in Figure 11.1

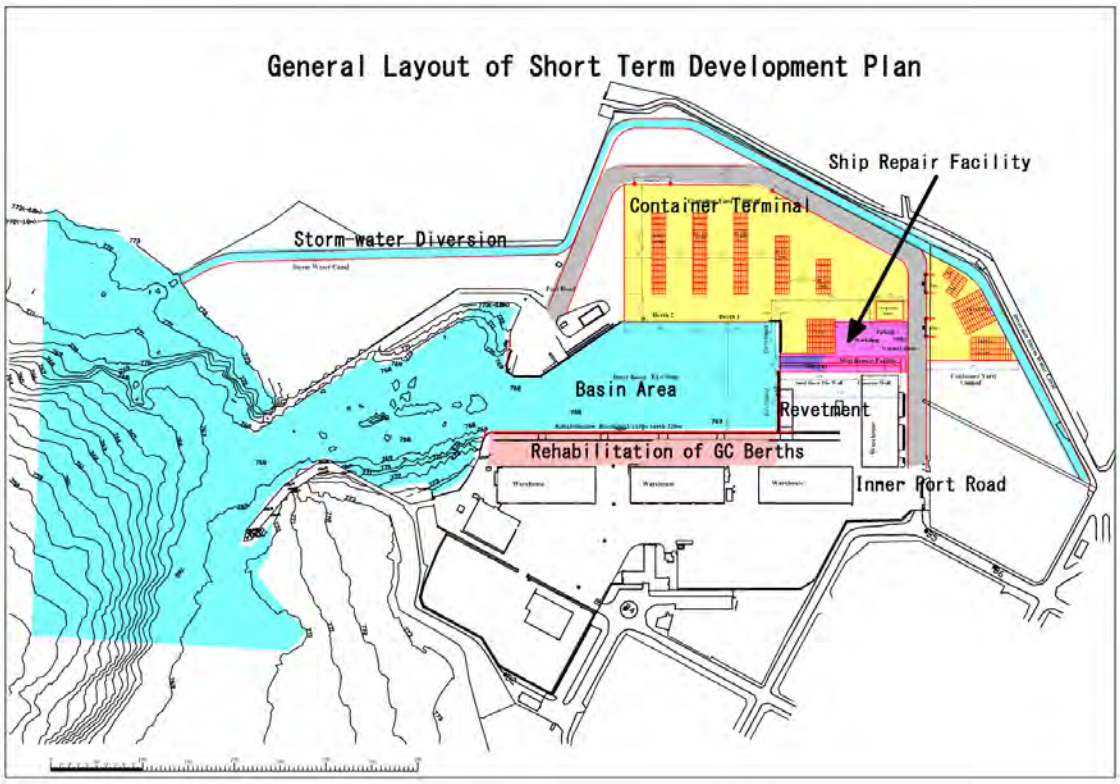


Figure 11.1: General Layout of Short Term Development Plan in Bujumbura

11.1.2 Rumonge Port

There has been constant maritime trade using small wooden cargo ships between Rumonge and its opposite shore of Lake Tanganyika of DRC. The trade is expected to continue, as Rumonge is an important cargo landing place for the people cultivating agricultural produce at the shores of DRC and exporting them to Burundi as well as consumer commodities coming mainly from Dar es Salaam. The landing and loading of goods are currently handled by manpower only. The workers receiving cargo on their shoulder from ships and carry them to the shore wading in the water. The berthing facility is necessary to improve the cargo handling by providing an appropriate berthing facility for the small wooden cargo ships, so that effective cargo landing can be materialized as well as decrease workers' burden. In addition, the facility can meet the possible increase of cargo. Layout of short term development plan in Rumonge is shown in Figure 11.2.

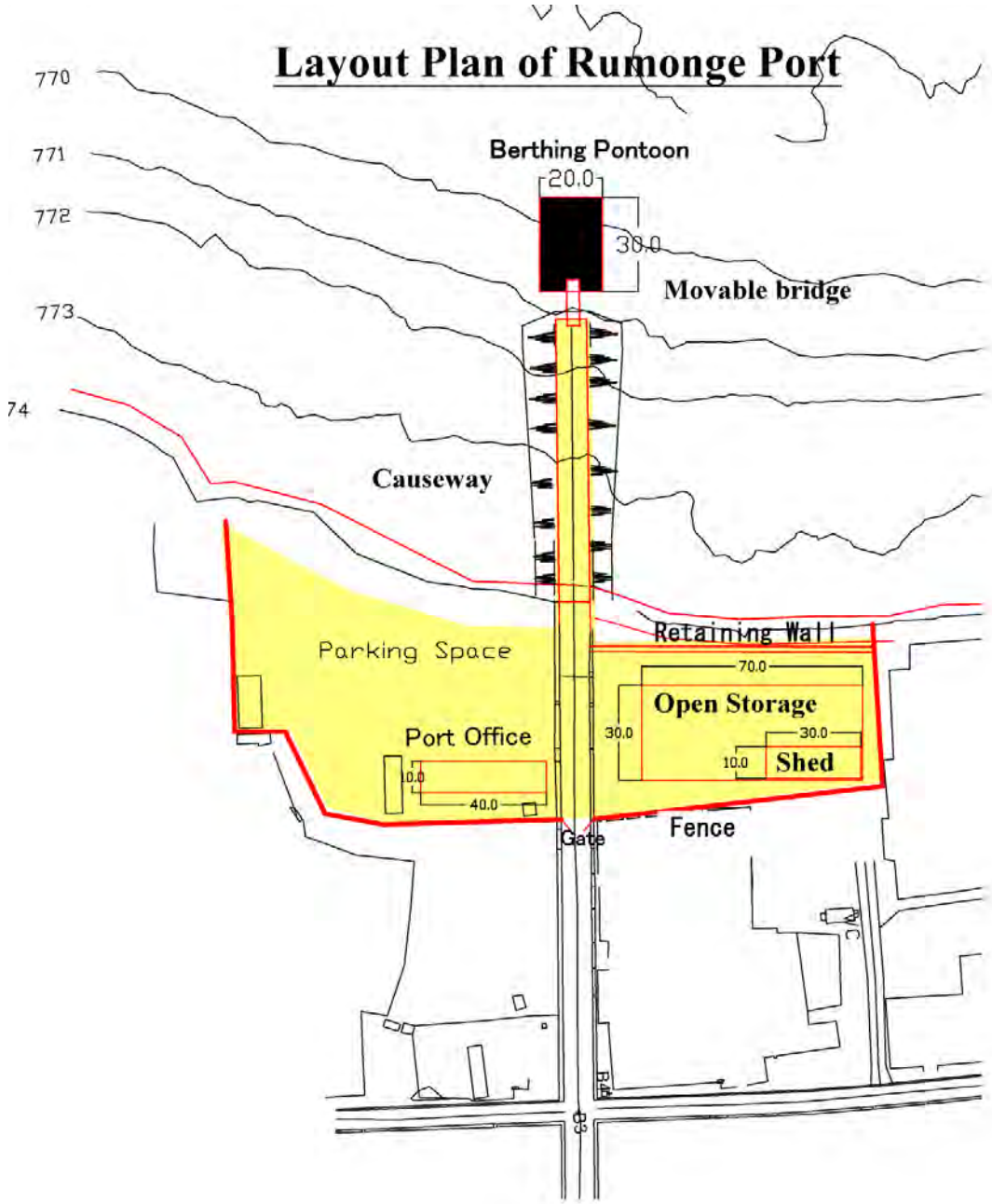


Figure 11.2: Layout Plan in Rumonge

11.2 Preliminary Design of Port Facilities

1) Design water level of Lake Tanganyika
   a) HW OST + 777.07 m Highest observed level in 1964 year
   b) H WL + 775.60 m Highest observed level for latest 20 years
   c) LWL + 773.00 m Lowest observed level for latest 20 years
   d) M WL + 774.30 m Mean water level (medium of HWL & HWL)
   e) L WOST + 772.83 m Lowest observed level in 1950 year

2) Design life span of port civil work facilities
   50 years

11.2.1 Preliminary Design of Port Facilities of Bujumbura Port

(1) Diversion of Storm Water Channel

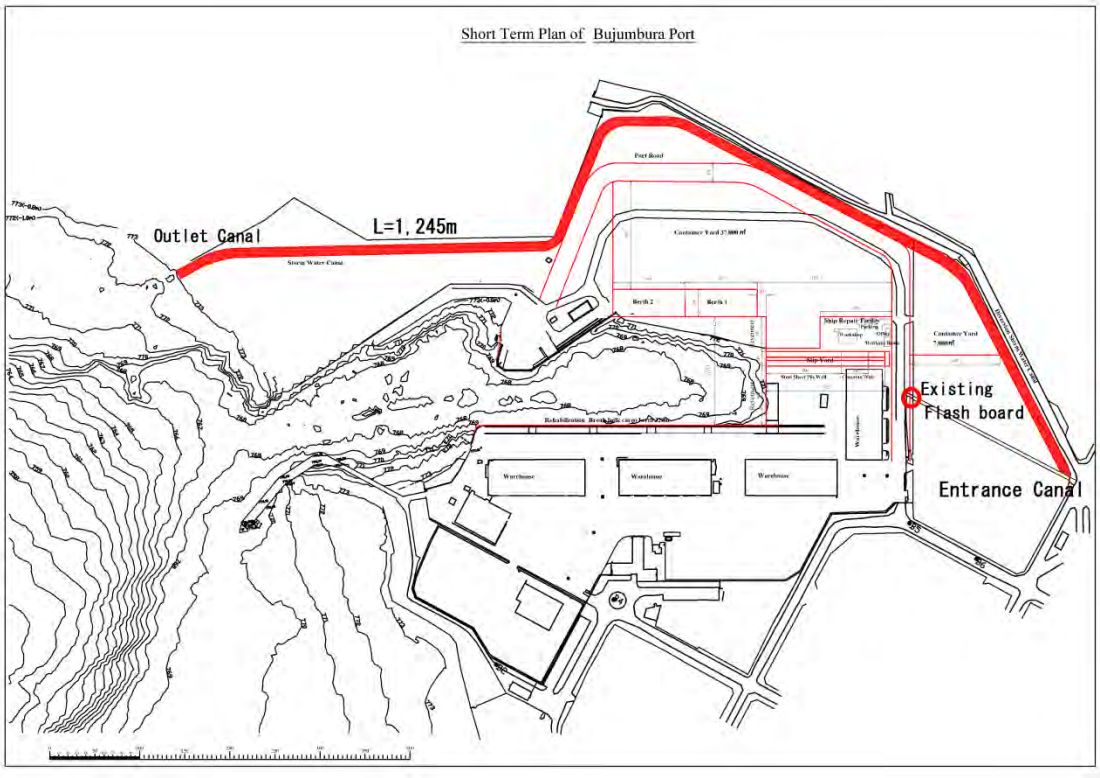


Figure 11.3: Diversion of Storm Water Channel

The volume of storm-water in the port from Bujumbura urban area is 11.55 m^3/sec, which is the design flood water amount at the point of entrance canal into the Port.

Design Flood Water mount		11.55 m^3 / sec.
Length of Canal in the Port		1,245 m
Bottom height at the entrance		EL+776.3 m
Bottom height at the outlet		EL+775.6 (=HWL)
Gradient of the Canal		0.056 %
Width of Canal		4.5 m as of assumption of 1.5 m water depth
Flow velocity	1.	78 m/sec
Critical depth	0.	88 m/sec
Normal depth	1.	44 m/sec

Photo 11.1: Canal Out of Port Fence

Photo 11.2: Outflow of the Port Canal (Plan)

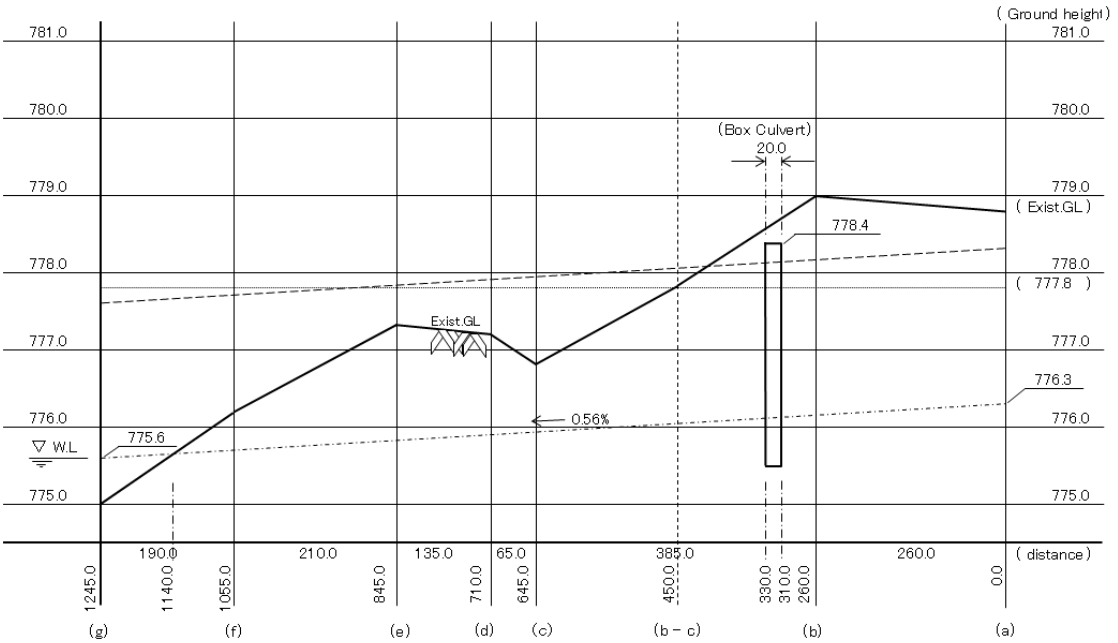


Figure 11.4: Profile of Storm-Water Canal

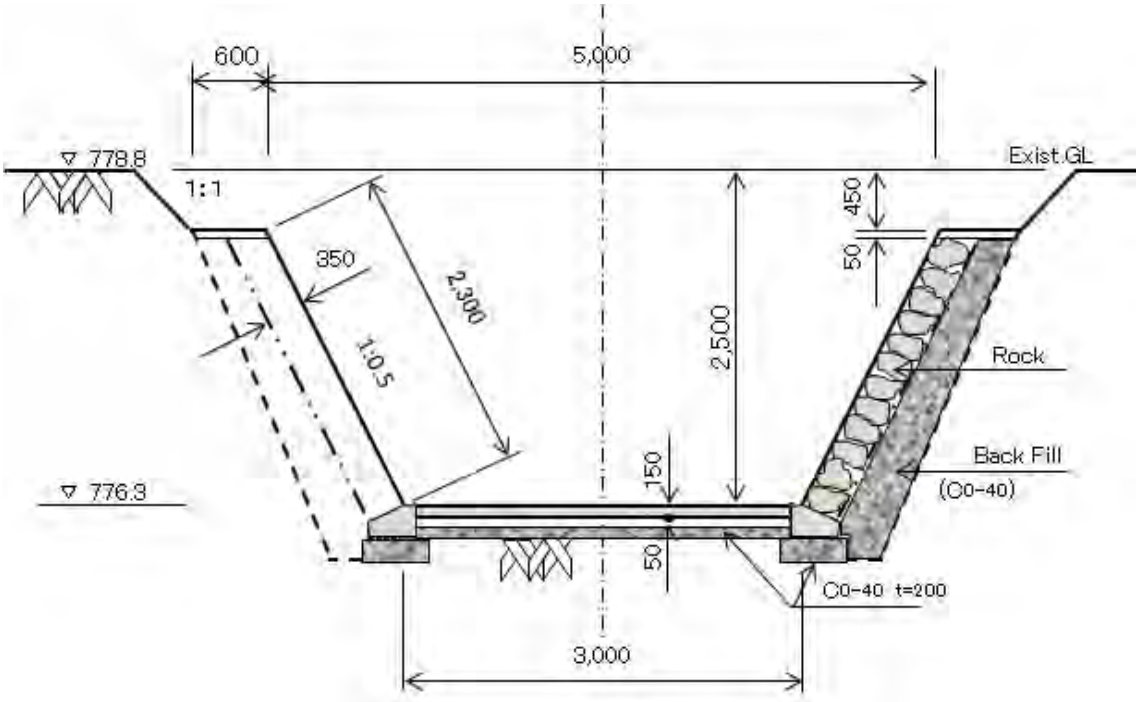


Figure 11.5: Typical Cross-Section of Open Canal

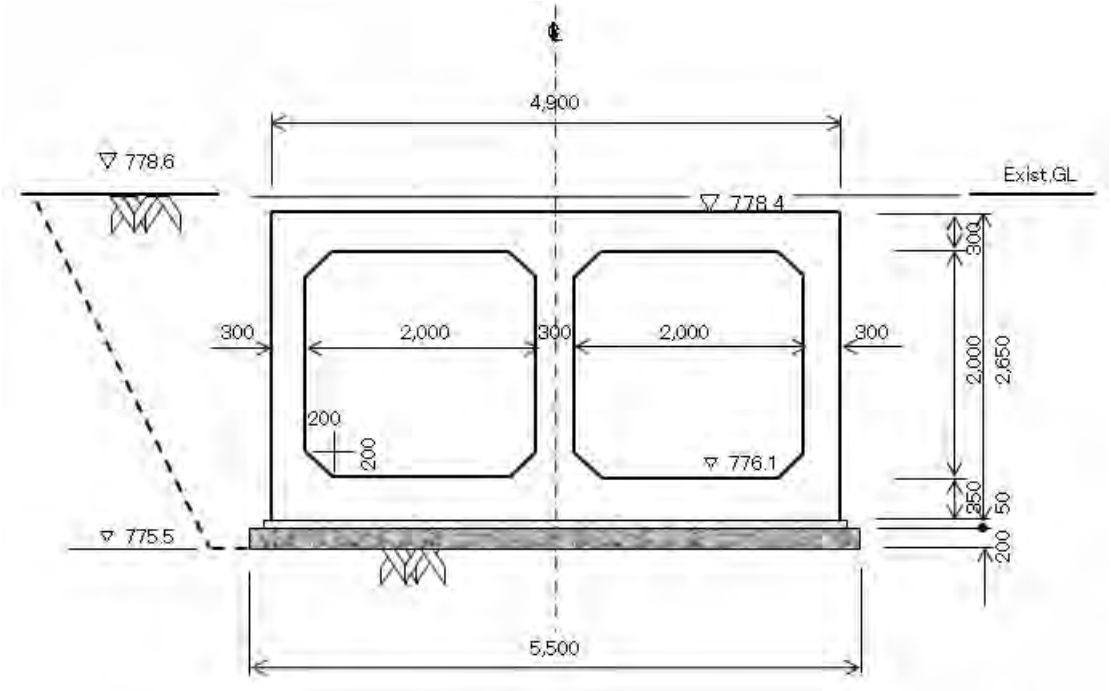


Figure 11.6: Cross-Section of Box Culvert (Across Road Area)

(2) Volume Computation

Table 11.1: Quantity of Storm Water Canal Works

Spec. No	Item No	Description	Unit	Quantity
1		**Diversion of Wastewater Channel**	Ls	1.0
	1	**Earthwork**	Ls	1.0
	1.1	Temporary Works	m^2	14,940.0
	1.2	Excavation Work	m^3	12,260.5
	1.3	Filling Work	m^3	5,719.7
	1.4	Slope Work	m	1225.0
	2	**Culvert**	Ls	1.0
	2.1	Base Course & Concrete Work	m	1245.0
	2.2	Masonry retaining wall Work	m	1225.0
	2.3	Concrete slab work	m	1225.0
	2.4	Box culvert Work	m	20.0

Dredging of Port Basin

1) Design water depth

Full load draft of target ship:	3.8 m
Necessary clearance (15% of above)	0.6 m
Allowance considering sedimentation in future	0.5 m
Design Low Water Level	EL +773.0 m
Calculated Level of Bottom	EL+768.1 m
Design Water Depth	−5.0m = (EL + 768 m)

2) Basin area for Short term plan

Basin area = 120 m × 170 m = 20,400 m^2

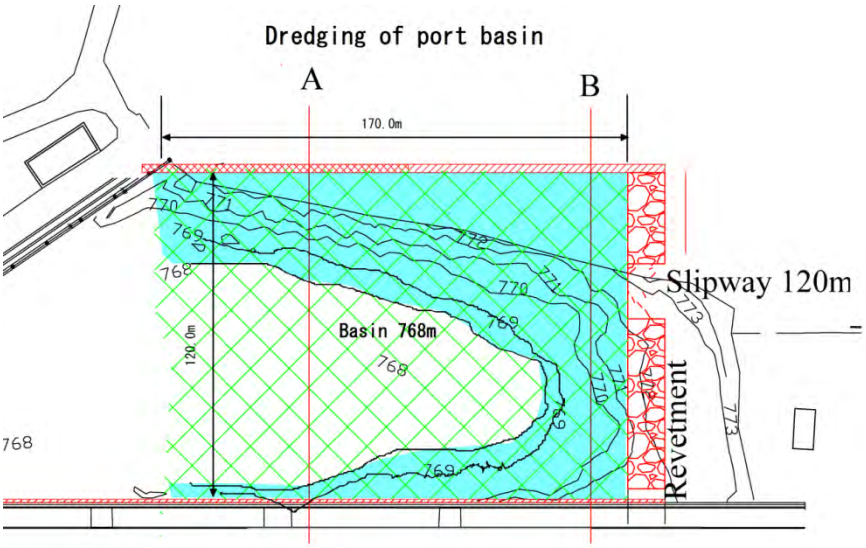


Figure 11.7: Dredging Area of Port Basin

3) Dredging volume of inner basin

The objective lake bottom will be dredged to the level of EL+768m. The area above EL+773m shall be excavated by means of on-land equipment. And the area below +773m shall be dredged by a cutter suction dredger.

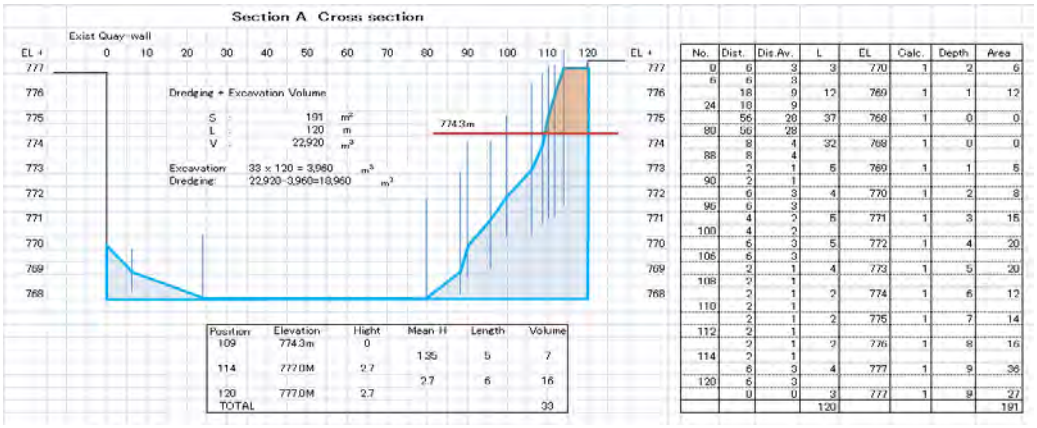


Figure 11.8: Section A of Cross-Section

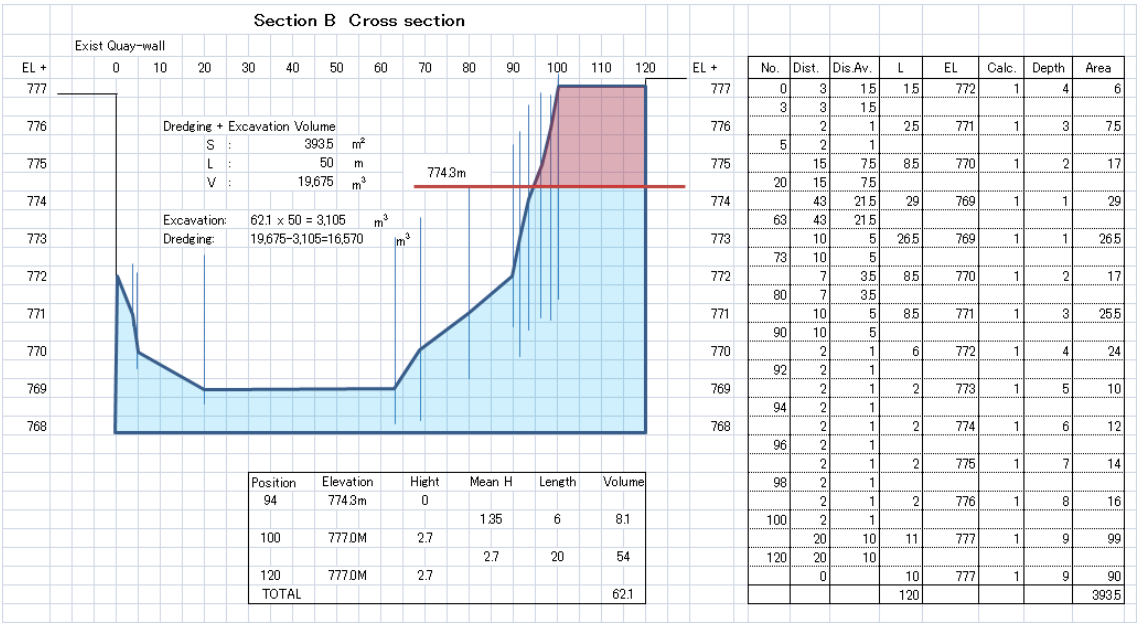


Figure 11.9: Section B of Cross-Section

Table 11.2: Dredging Volume Inner Basin

	Excavation	Dredging	Total
Cross-section A	3,960 m^3	18,960 m^3	22,920 m^3
Cross-section B	3,105 m^3	16,570 m^3	19,673 m^3
Total	7,065 m^3	35,530 m^3	42,595 m^3
Apply Volume	7,100 m^3	35,500 m^3	42,600 m^3

Construction of Container Terminal

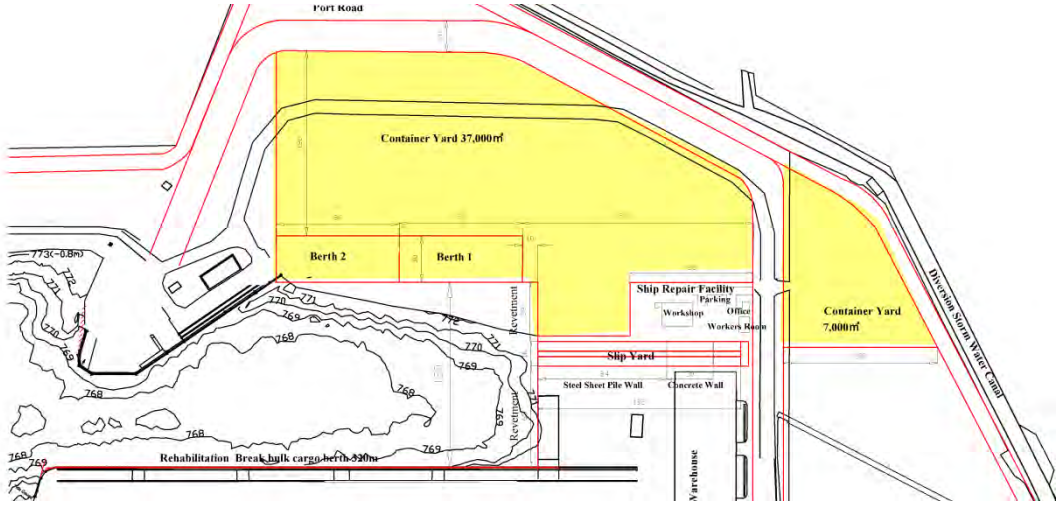


Figure 11.10: Location of Container Terminal

1) Outline of Container Terminal

Length of container berth:	80 m
Number of container berth (Quay wall)	2 berths
Water depth in front of the berth	5 m below LWL
Width of apron	30 m
Area of container stacking yard	44,000 m^2
Port road	20 m width

(3) Container Berths

Preliminary Design

Judging by the site conditions above HWL, sub surface soil down to 15 m deep is composed of a dense and high N-value sand, a steel sheet pile structure is selected among the structural types of quay-wall.

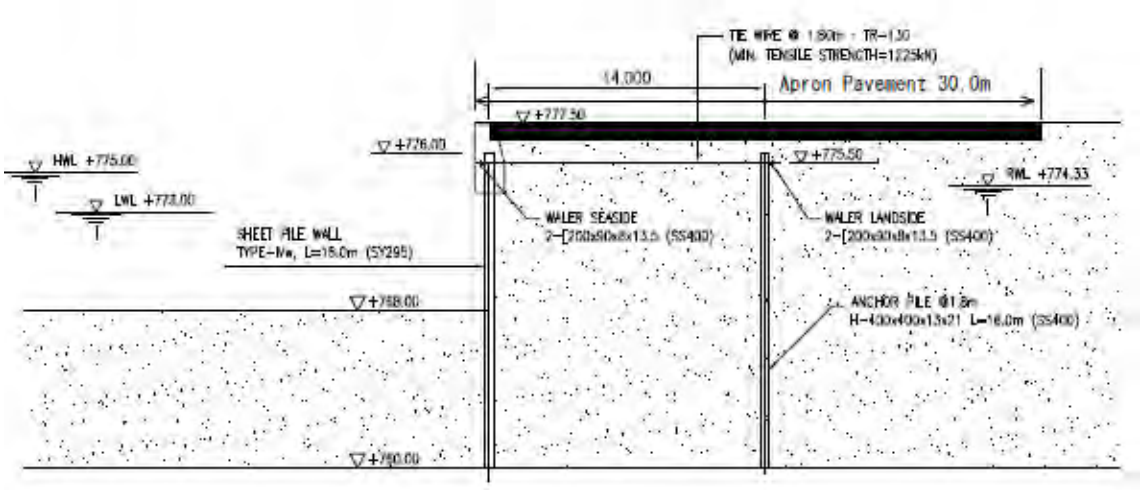


Figure 11.11: Typical Cross-Section of Container Berth

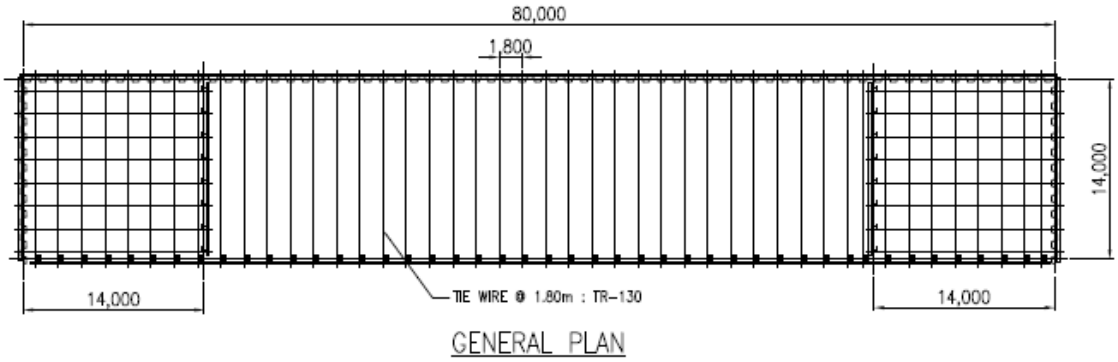


Figure 11.12: General Plan of Quay-Wall

Volume Computation

Table 11.3: Quantity Table of Container Berth

No.	Work Item	Spec	Unit	Quantity	Remarks
1)	Steel Sheet Pile & Etc.				
	Steel Sheet Pile Type-IVw, L = 16 m	SY295 Normal	t	317.0	N=178 nos, W=16 × 0.106 × 178 = 301.9t (Net) × 1.05=317.0t
	Steel Sheet Pile Type-IVw, L = 16 m	SY295 Special	t	3.4	N =2 nos, W = 16 × 0.106 × 2 = 3.4t (Net)
	H Shaped Steel Pile H-400*400 L = 16m	SS400	t	176.3	N = 61 nos, W = 16 × 0.172 × 61 = 167.9t (Net) × 1.05 = 176.3t
	Tie Wire Set L = 15 m (Ta = 34 t)	TR-130	nos	61.0	N = 61 nos
	Waling C-200*90*8*13.5	SS400	t	13.8	L = 432 m ×.0303 = 13.1 t (Net), × 1.05 = 13.8t
	Miscellaneous Steel Material	Plate, Bolt, etc.	ls	1.0	
2)	Bollard & Bit				
	25t Bollard		nos	6	
	Mooring Bit		nos	4	
3)	Rubber Fender				
	V-H250 L = 3.5 m		nos	32	80 × 80/200 = 32 nos
	DD-300HW L = 2.0 m		nos	12	30 × 80/200 = 12 nos
4)	Coping Concrete				
	Concrete		m^3	680.4	V = 6.0 m^2/m × 108 = 648.0 m^3 (Net), × 1.05=680.4 m^3
	Reinforcement Bar	SD295	t	85.6	W = 648.0 × 0.12 = 77.8t (Net), + 1.05 = 85.6t
5)	Backfilling				
	Backfill sand		m^3	9,224	65.69 × 108=7,095 m^3 (Net) × 1.3 = 9,224 m^3

(4) Apron

Performance Criteria

(a) Width of Aprons

Aprons shall be provided with the necessary dimensions for enabling safe smooth cargo handling works.

Loading / unloading of containers on the berth will be handled by a mobile container STS crane of 35 tons/lifting capacity. The crane is placed just behind of face-line of berth with the space of about 10 m width. Containers both loading and unloading are set up the same row. Behind, trailers track zone is placed by approximate 5 meters width. Reach stackers transporting

containers are active to move forward and backward crossing cross-section. The action needs 20 m width. Total required width of the apron is 30 meters.

(b) Gradient of Aprons

The surface of aprons is provided with the 2% gradient necessary for draining rainwater.

(c) Pavement materials

Aprons will be paved with concrete materials in consideration of the domestic availability and of imposed load for surcharge of a stack of containers, 35 tons/lifting mobile container STS crane, reach stacker and so on.

(d) Joint of Aprons

Expansion and construction joints shall be set up with a property interval reducing the risk of incurring damage to the pavement to intensity of cargo handling works.

Concrete Pavement

(a) Load Conditions

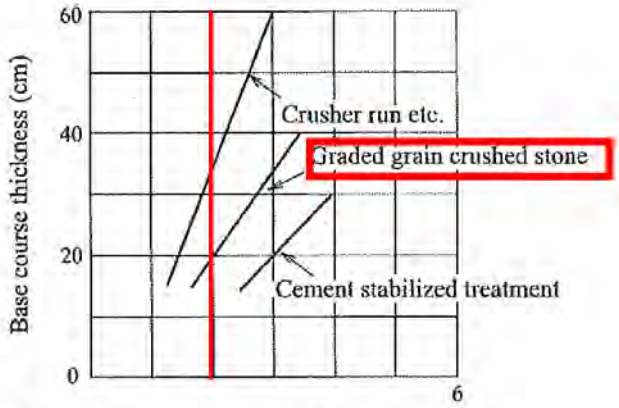
Table 11.4: Load Conditions

Characteristic Values of the Actions considered in the Performance Verification of Apron Pavements

Type of action (cargo handling equipment load)		Maximum load of an outrigger or a wheel (kN)	Ground contact area of an outrigger or a wheel (cm²)	Ground contact pressure (N/cm²)
Movable crane truck crane, rough terrain crane, all terrain crane	Type 20	220	1,250	176
	Type 25	260	1,300	200
	Type 30	310	1,400	221
	Type 40	390	1,650	236
	Type 50	470	1,900	247
	Type 80	690	2,550	271
	Type 100	830	3,000	277
	Type 120	970	3,350	290
	Type 150	1170	3,900	300
Truck	25 ton class	100	1,000	100
Tractor trailer	for 20ft	50	1,000	50
	for 40ft	50	1,000	50
Fork lift truck	2t	25	350	71
	3.5t	45	600	75
	6t	75	1,000	75
	10t	125	1,550	81
	15t	185	2,250	82
	20t	245	2,950	83
	25t	305	3,600	85
	35t	425	4,950	86
Straddle carrier		125	1,550	81

(b) Thickness of base course

1) Step-1 Verification of base course thickness



$$\frac{\text{Bearing capacity coefficient of base course}}{\text{Bearing capacity coefficient of subgrade}} = \frac{K_1}{K}$$

K_1 is the bearing capacity coefficient of base course K_{30} (200N/cm³).
K_2 is the bearing capacity coefficient of subgrade K_{30}

Figure 11.13: Design Curves of Base Course Thickness

The surface and subsoil materials on site consist of a very dense sandy soil. Therefore the value of K_1/K is expected by a less than 2.

2) Step-2 Base course thickness reference with design bearing capacity

Table 11.5: Thickness of Sub-Base Course

Reference Values for Base Course Thickness of Concrete Pavements

Design condition	Base course thickness				
Design bearing capacity coefficient of base course K_{30} (N/cm³)	Upper subbase course		Lower subbase course		Total base course thickness
	Cement stabilized base	Graded grain material	Graded grain material	Crusher run etc.	
50 or more and less than 70	– 20 25	40 – –	– 20 –	20 – 30	60 40 55
70 or more and less than 100	– – 15 15	20 20 – –	15 – 15 –	– 20 – 15	35 40 30 30
100 or more	– 15	20 –	– –	– –	20 15

3) Concrete slab thickness

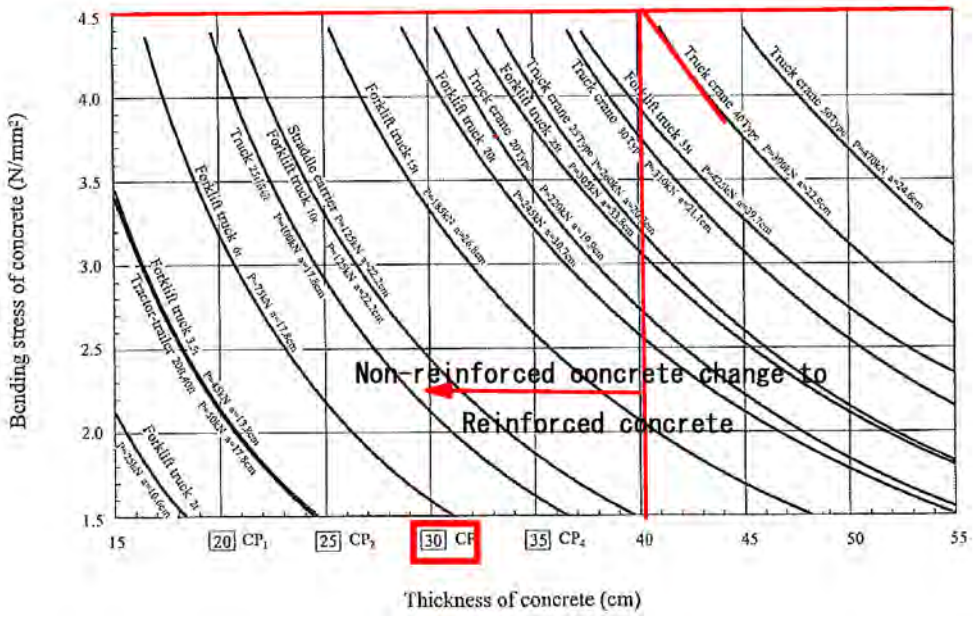


Figure 11.14: Relation between Concrete Slab Thickness and Bending Stress

Regarding the setting of concrete slab thickness based on the values given in Figure above, it is preferable to take account continuously reinforced concrete pavement for the design load exceeding CP_4 given in the table hereinafter, because non-reinforced concrete pavement needs a very thick slab.

Table 11.6: Reference Value for Concrete Slab Thickness

Action classification	Concrete slab thickness (cm)
CP_1	20
CP_2	25
CP_3	30
CP_4	35
Applied to piled pier slab	10

4) Section of apron pavement

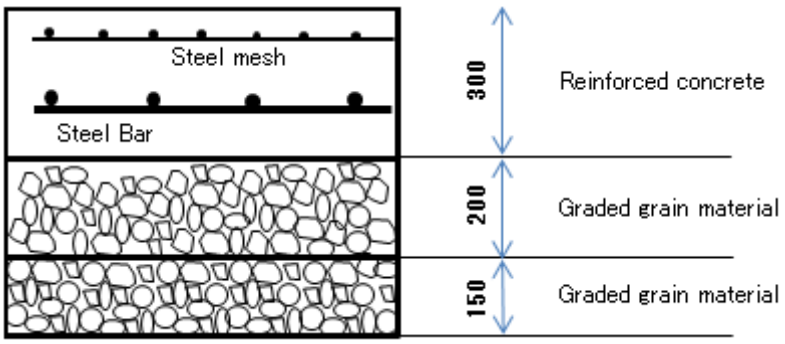


Figure 11.15: Section of Apron Pavement

5) Detail of Reinforced Concrete Pavement

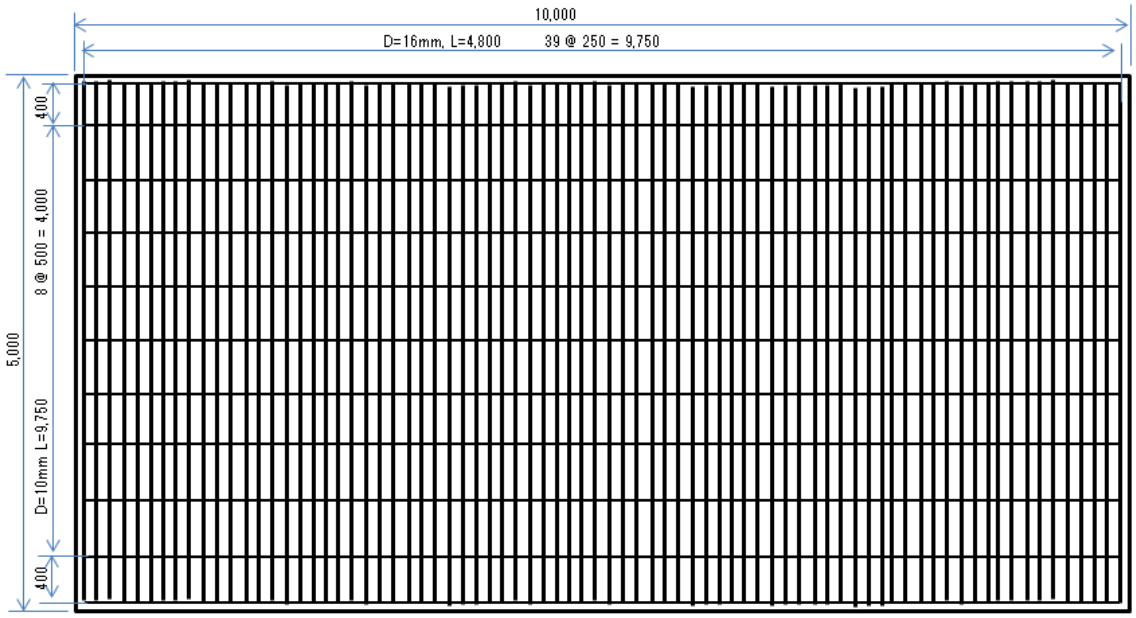
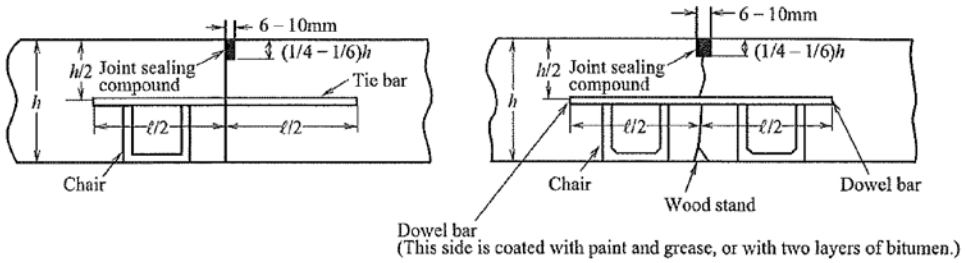


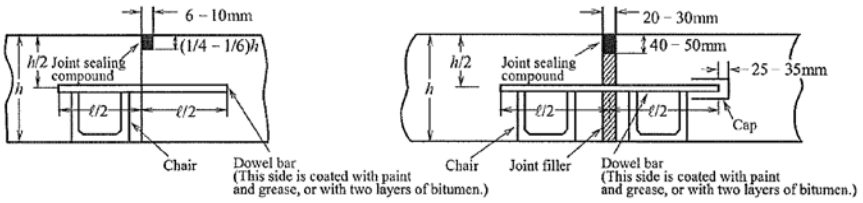
Figure 11.16: Plan of Reinforced Concrete Pavement

6) Joints

Standard joints are shown below figures.



Longitudinal construction Joint Transverse shrinkage joint



Transverse construction joint Transverse expansion joint

Figure 11.17: Joints of Aprons

7) Quantity computation

Table 11.7: Quantity of Apron

No.	Item	Spec.	Unit	Quantity	Remarks
	Area	29.5 × 80 × 2 berths	m^2	4,720	
A	Subgrade works				
1	Excavation		m^3	3,170	4,88 × 0.65
2	Leveling/compaction		m^2	4,720	
B	Subbase course				
1	Lower Subbase course	Graded grain t = 15 cm	m^3	708	
2	Upper Subbase course	Graded grain t = 20cm	m^3	944	
C	Concrete pavement				
1	Concrete	4.5 N/m m^2 bending stress	m^3	1,416	T = 0.3 m
2	Deformed steel bar	D = 16 mm	t	28.3	(4.8 × 40 × 80) × 1.56+4.3 × 40 × 16 × 1.56
3	Deformed steel bar	D = 10 mm	t	2.9	11 × 9.75 × 48 × 0.56
4	Wire-mesh		m^2	4,437	9.8 × 4.8 × 80 + 9.8 × 4.3 × 16
D	Joints				
1	Construction joints		m	834	
2	Expansion joint		m	88.5	
3	Shrinkage joint		m	160	

Container Stacking Yard

1) General Specification

1.1. Required area
44,000 m^2

1.2. Layout of container yard
37,000 m^2: Container berth area
7,000 m^2: Opposite side of Port Road
(Reserved area for Bujumbura Port)
Total 44,000 m^2

1.3. Idea plan of layout of container yard

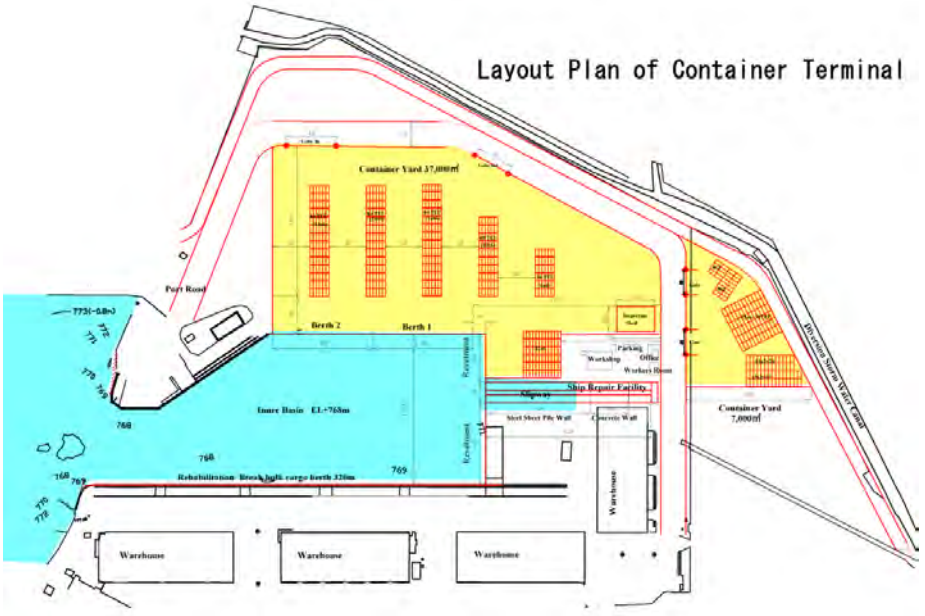


Figure 11.18: Container Stacking Yard

2) Pavement of yard

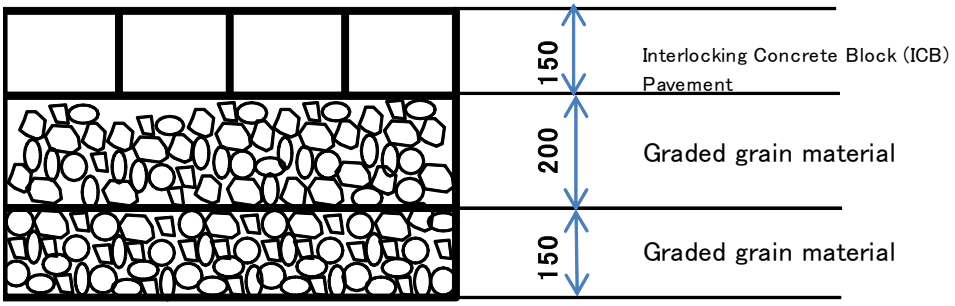


Figure 11.19: Pavement of Yard

3) Quantity Computation

Table 11.8: Quantity of Container Stacking Yard

No.	Item	Spec	Detail/calculation	Unit	Quantity
	Container yard	ICB	t=150mm	m^2	44,000
	Drainage			m	210
A	Container Yard				
1	subgrade	0.2 m thick	leveling & compaction	m^2	44,000
2	Excavation	0.5 m thick		m^3	22,000
3	Sub-base course	material	graded grain 0.35thick	m^3	15,400
4	Sub-base course	execution		m^3	15,400
5	ICB	material	t = 150 mm	m^2	44,000
6	ICB	execution		m^2	44,000

Drainage in the Container Stacking Yard

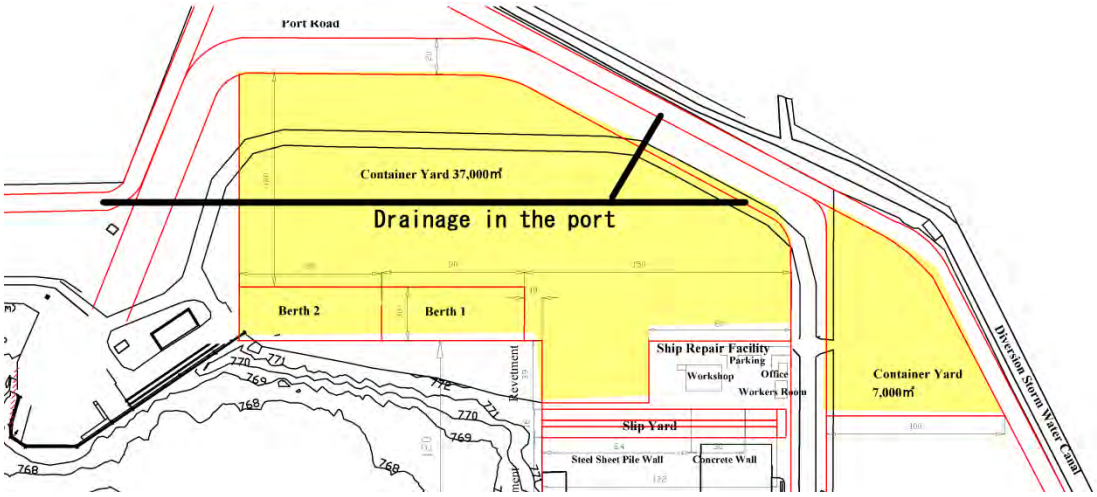


Figure 11.20: Layout of Drainage in the Container Stacking Yard

1) Preliminary Design of Drainage in the Port

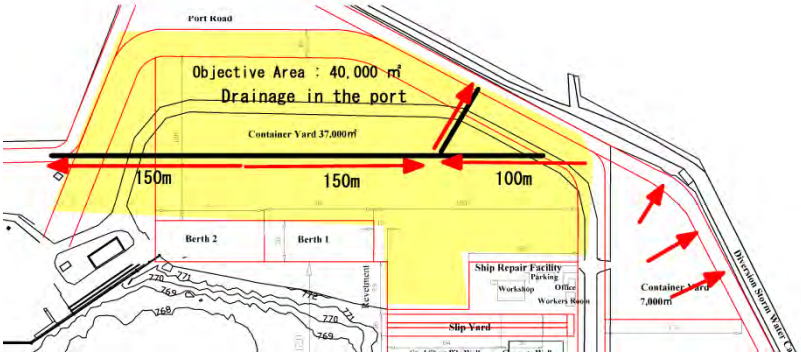


Figure 11.21: Flow of Storm-Water and the Territory

Objective Area	40,000 m^2
Length of Drainage Canal	400 m
Length of Canal after confluence	50 m
Rainfall intensity (10 minutes 10year)	117.6 mm/hour
Flow volume from objective area	1.31 m^3/sec 3 flows
Flow volume of a flow (150/400)	0.43 m^3/sec
Width of canal	60 cm
Gradient of invert	0.3%
Flow velocity	1.83 m/sec
Critical Depth	0.374 m
Normal Depth	0.391 m

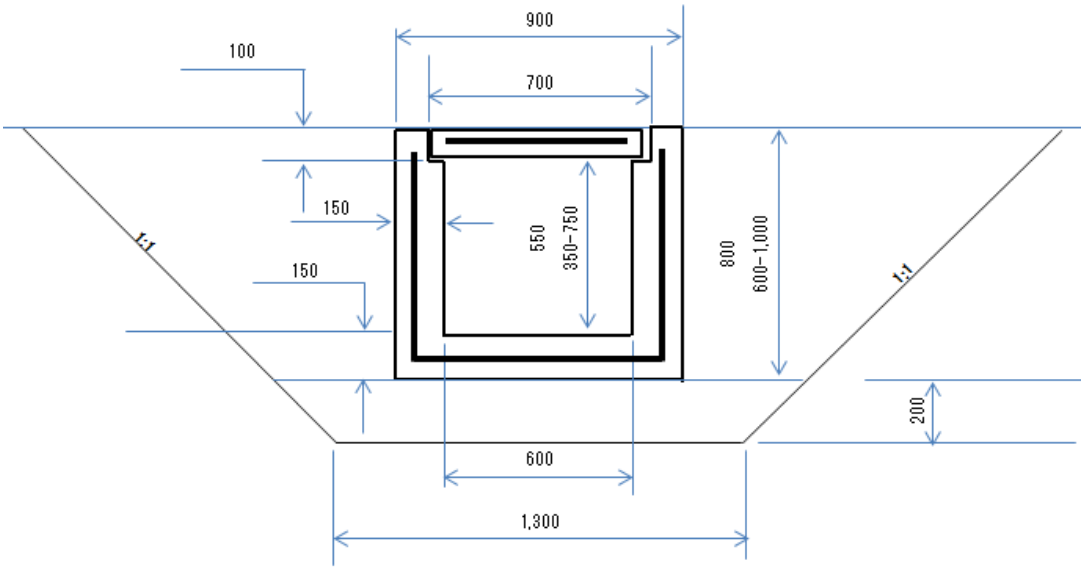


Figure 11.22: Typical Section of Drainage in the Container Yard

2) Quantity Computation

Table 11.9: Quantity of RC Drainage Canal per Meter

ITEM	Calculation	Quantity/m	
Concrete Sidewall	(0.8 × 0.15 × 2 − 0.1 × 0.1) 1.03 =	0.24	m^3
Formwork	(0.8 × 4;0 + 0.1) × 1.05 =	3.46	m^2
Invert concrete	0.15 × 0.6 × 1.1 =	0.1	m^3
Steel bar	2.05 m × 5 nos × 1.57 × 1.3 =	20.9	kg
Cover concrete	0.1 × 0.7 × 1.03	0.072	m^3
Steel bar	1.57 × 0.6 × 10 × 1.3	12.25	kg
Formwork	(0.7 × 1 + 0.1 × 3.4) × 1.03	1.07	m^2
Excavation		2.3	m^3
Gravel stone	1.5 × 0.2	0.3	m^3
Back filling	2.3 − 0.3 − 0.72=	1.28	m^3

(5) Ship Repair Facility

General

Facilities and equipments of Ship repair Facility are composed to –
For Civil Work Facilities
Both side walls of Slipway (Steel sheet piling & concrete upright type)
Slipway foundation (RC Piles, RC Beams, Foundation gravel, etc)
Winch foundation (RC Piles, Foundation concrete, side wall, etc)
For Equipment
Slipway (Cradles, Lifting winches, Rail, wire, etc)
Workshop (Factory, Spare parts, etc)
Machinery tools (Lathe, milling & drilling machines, forklift, etc)
Crane etc. (Jib crane, Mobile crane, overhead crane, etc)
Welding (Arc welder, Gas welder, Gas cutting machine, etc)
Supply/Consumable (Electric, Compressor, Gas, Oxygen, etc)

Layout of Ship Repair Facility

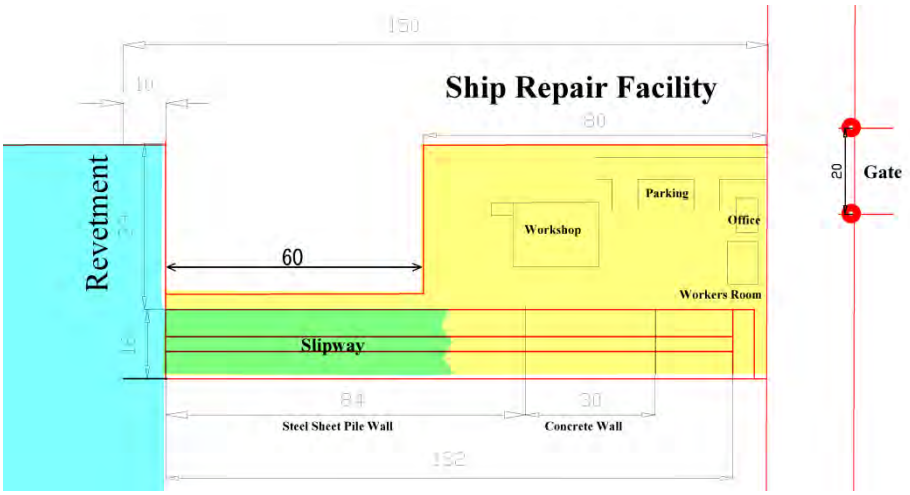


Figure 11.23: Layout of Ship Repair Facility

Slipway

Location of slipway was determined in such a way that the following requirements are satisfied.

1. The frontal water area is calm
2. The frontal water area is free from siltation and scouring.
3. Navigation and anchorage of other ships are not hindered.
4. There is an adequate space in the background for the work for ship lifting and lowering as well as for ship repair.

Specification of slipway

1. Target ship: 1,000 DWT with empty load condition
2. Gradient of slope: 1:12 single gradient
3. Height of front area at rail: EL+769.0 m (4 m below LWL = + 763.0 m)
4. Height of rear area at rail: EL+780.0 m (4.4 m above HWL = + 775.6 m)
5. Length of slipway: 132 m
6. Height of cradle base: 1.5m up to the rail height
7. Grand height behind of side walls: EL + 777.5 m
8. Capable length for ship repair: 70.8 meters
9. Width of slipway: 16m (maximum width of ship is 11m + both sides clearance of 2.5m each)

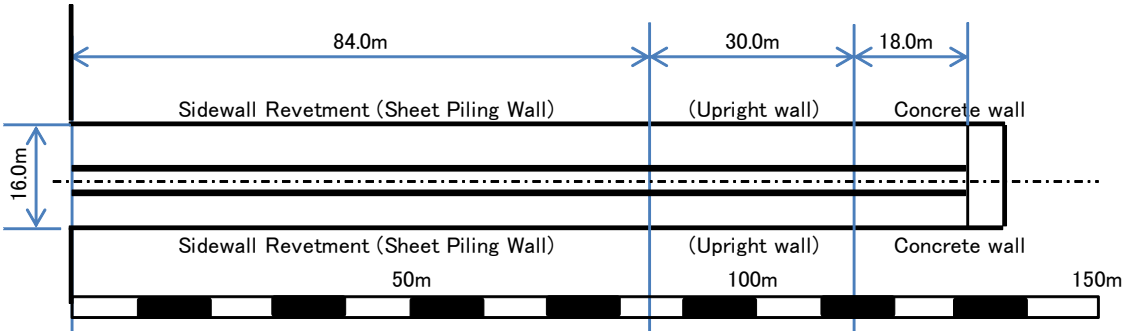


Figure 11.24: Layout of Slipway

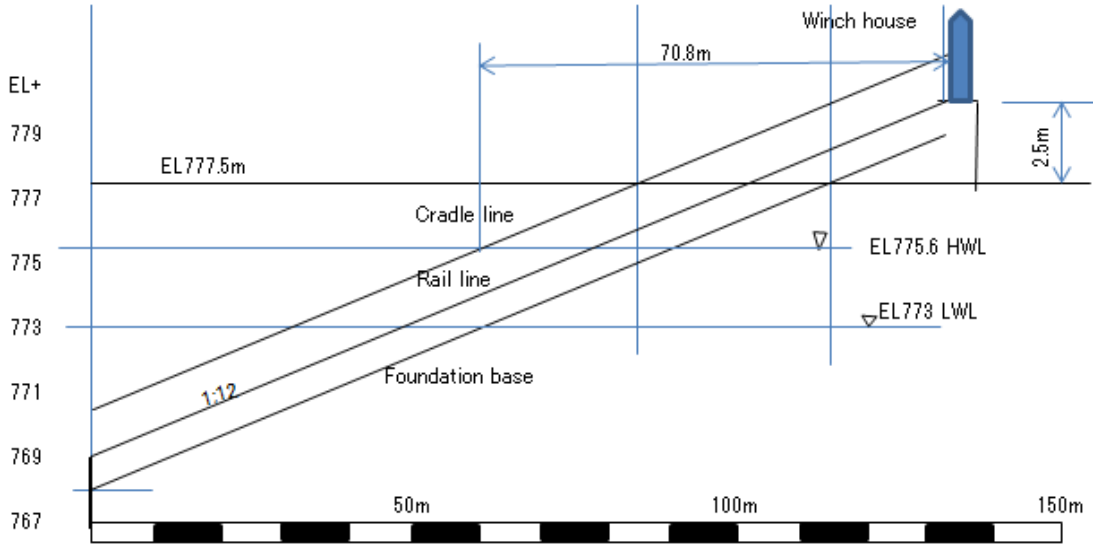


Figure 11.25: Longitudinal Center Line Section

Side wall

Crown height of the walls of slipway is EL+777.5 m. The rail level at the front area is EL+769 m and the height of wall at front area is 8.5 m. The structural type of the wall was determined to be steel sheet pile structure as well as container berths because of almost same conditions.

The wall height gradually changes to be low toward the rear area. Pile length of steel sheet pile changes according to the height of wall as shown in the longitudinal section of side-wall line.

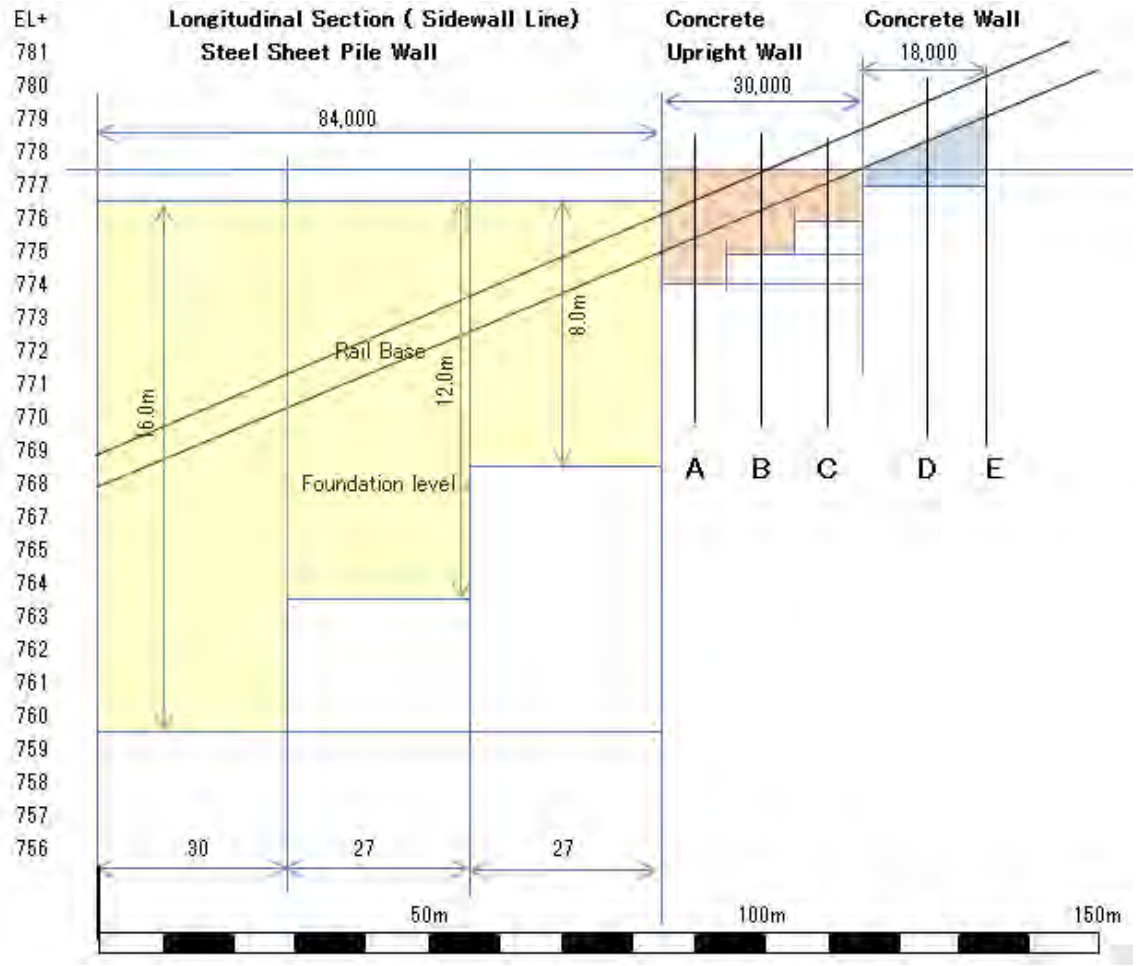


Figure 11.26: Longitudinal Section of Side-Wall Line

Sheet pile length devises to three parts regarding to visible height of the wall.

L=16.0 m	30 m (50 nos.)	visible height 8.5 m–6.0 m
L=12.0 m	27 m (45 nos.)	visible height 6.0 m–3.75 m
L= 8.0 m	27 m (45 nos.)	visible height 3.75 m–1.50 m

Upright concrete wall, next to the sheet pile wall, is designed. The wall height on the ground begins by 1.5 meters and ends to the same level of the ground. The length of the wall is 30 meters and is divided in three sections by 10 m each.

Slipway ground of upper area from the end of the upright concrete wall is higher than the periphery ground. Therefore, a wall to surround slip yard is necessary. The height wall is 1.5 m from the periphery ground, and it surrounds the winch set up zone.

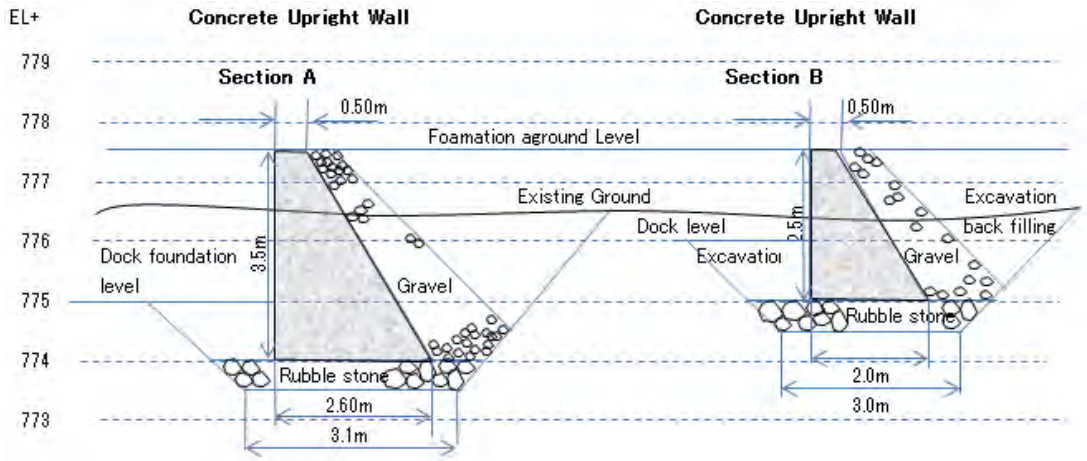


Figure 11.27: Concrete Upright Wall (1)

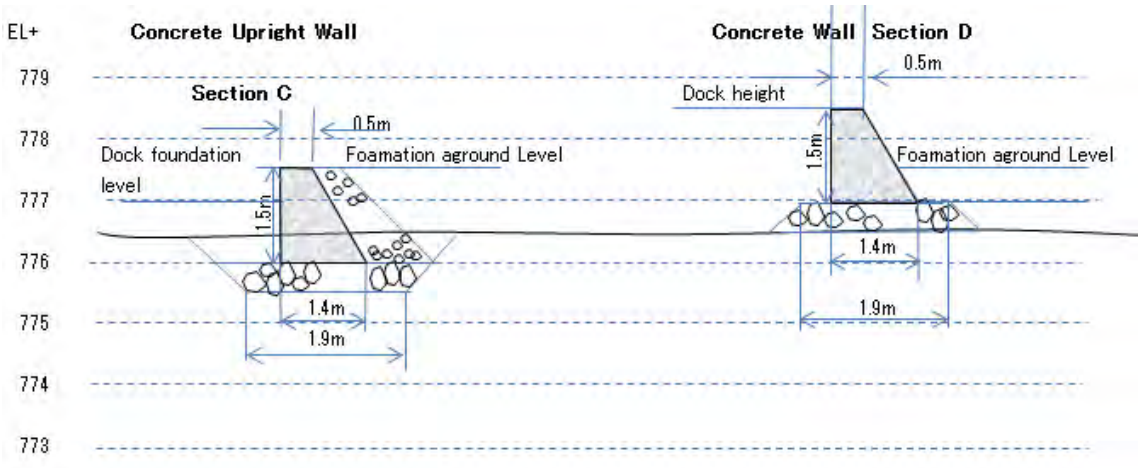
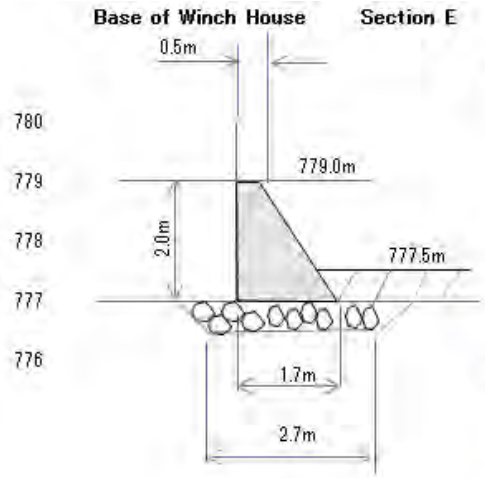


Figure 11.28: Concrete Upright Wall & Concrete Wall (2)



Upright Wall

	concrete	stone	gravel	excavate	backfill
A 20m	5.43	1.8	4.2	14.18	4
B 20m	3.13	0.88	2.5	8.88	1.69
C 20m	1.5	0.6	1.2	3.4	0.25
	10.06	3.28	7.9	26.46	5.94
Total	201.2	65.6	158	529.2	118.8

Concrete Wall

D 36m	1.43 51.5	1.2 43.2	0	0	0
E 25m	2.2 55	1.6 40	0	1.6 40	0
Total	106.5	83.2		40	

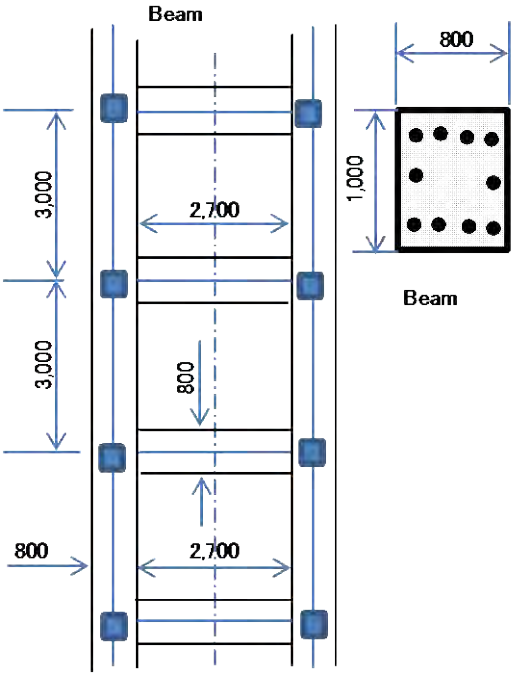
Figure 11.29: Concrete Wall (3)

Foundation of Slipway

1) Specification

- Gradient of slipway 1:12
- Span of cradle rail 3.5 m
- Rail Foundation Supported by RC beam
- Foundation RC square pile

2) Sketch of foundation



ITEM	Calculation	Quantity	
Longitudinal Beam			
Concrete 30N	0.8x132x2x1.03=	218	m^3
Steel bar	264x0.04x1.05=	11	ton
Formwork	264x2.8x1.05=	776	m^2
Transberth Beam			
Concrete 30N	2.7x45x0.8x1.03=	100	m^3
Steel bar	0.04x2.7x45x1.05	5	ton
Formwork	2.8x2.7x45=	340	m^2
Pile head			
Steel bar	0.64x0.1x90	6	ton

Figure 11.30: Outline of RC Beam

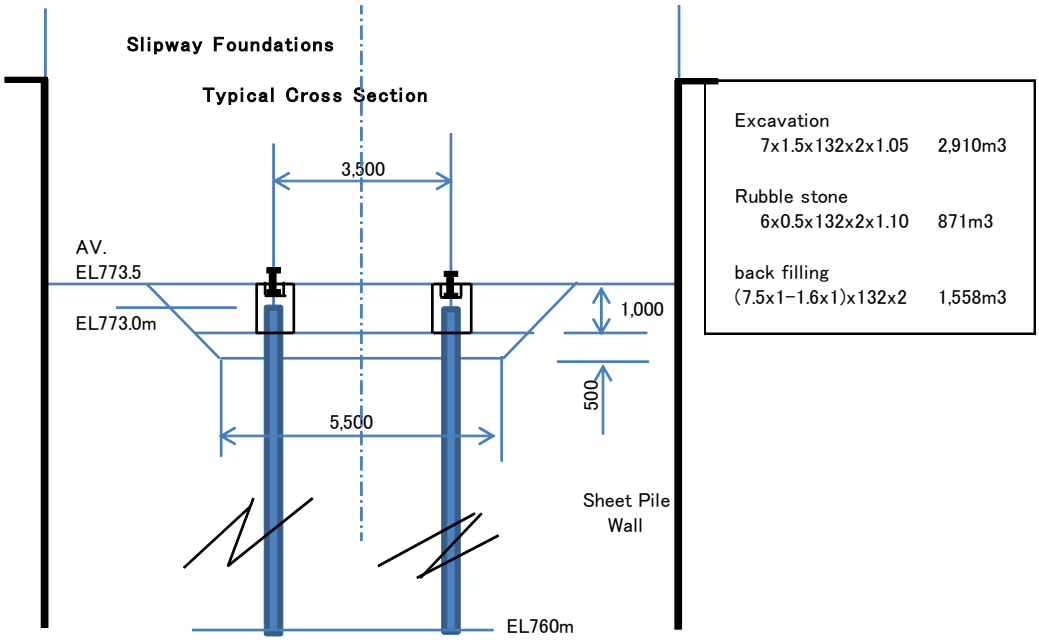


Figure 11.31: Typical Section of Slipway Foundation

3) Quantity Computation

Table 11.10: Quantity Computation of Ship Repair Facility (Civil Works)

No.	Item	Detail	Spec.	Unit	Quantity
A	Earth works				
1	Excavation in dock		(776.5 − 768) × 15 × 132 × 1/2	m^3	8,415
2	Excavation in ranes			m^3	2,910
3	Rubble stone	foundation		m^3	871
4	Back filling			m^3	1,558
5	Miscellaneous			sum	1
B	Precast RC pile				
1	Precast RC pile	AV. 13m long	0.4 × 0.4	nos	90
2	Piling works			nos	90
3	Miscellaneous			sum	1
C	RC beam		0.8 × 1.0m, 385.5 m long		
1	Concrete	Material	30N	m^3	318
2	Concrete	Execution		m^3	318
3	Steel bar	Material		t	22
4	Steel bar	Execution		t	22
5	Formworks			m^2	1,116
6	Miscellaneous			sum	1.0
D	Concrete upright wall	60 m			
1	Concrete	Material		m^3	201
2	Concrete	Execution		m^3	201
3	Steel bar	Material	precaution reinforcement	t	6
4	Steel bar	Execution		t	6
5	Formworks			m^2	372
6	Excavation			m^3	529
7	Rubble stone		Foundation	m^3	66
8	Backing gravel			m^3	158
9	Backfill			m^3	119
10	Stone works	Execution		m^3	224
11	Miscellaneous			sum	1
E	Concrete wall	61 m	around winch house		
1	Concrete	Material		m^3	107
2	Concrete	Execution		m^3	107
3	Steel bar	Material	precaution reinforcement	t	5
4	Steel bar	Execution		t	5
5	Formworks			m^2	264
6	Excavation			m^3	40
7	Rubble stone		Foundation	m^3	83
8	Rubble stone	Leveling		m^3	83
9	Miscellaneous			sum	1
F	Winch house				
1	Filling		5 × 6 × 1.5	m^3	45
2	Rubble stone		5 × 6 × 0.5	m^3	15
3	Concrete	Mass 21N	5 × 6 × 1.0	m^3	30
4	Precast RC pile	18 m		nos	4
5	Piling works			nos	4
6	Building			m^2	30
7	Miscellaneous			sum	1

(6) Rehabilitation of General Cargo Berths

Objective facility

General cargo berths 4 berths × 80 m = 320 m

Scope of works

1. Deepening of the basin in front of GC Berths
2. Fitting of rubber fenders
3. Elevating of Apron
4. Reinstallation of Crane Rail

Deepening of the Basin in front of GC Berths

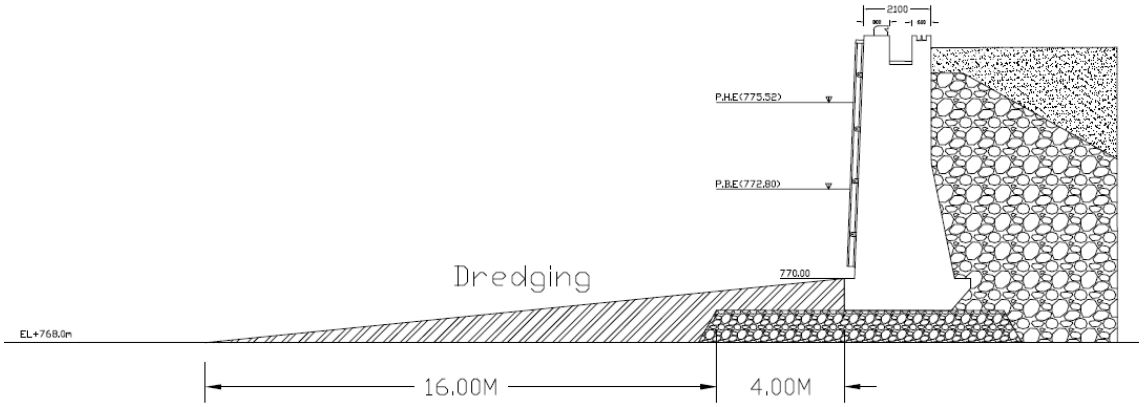


Figure 11.32: Typical Section of Dredged Area in front of GC Berths

Dredging of approximate 7,000 m^3 is required to dredge up to the level of EL+768 m at the area in front of GC Berths. The dredged volume includes b) Dredging of Port Basin.

Fitting Rubber Fender

Berth Length		80 m
V-250H × 3,500 L	4 m interval	20 units
DD-300HW × 2,000 L	12 m interval	7 units

Elevating Apron

Existing crown height of Apron at GC Berth is average EL+777.10 m at the face line of the quay and EL+777.5 m at front point of warehouse. Finished elevating height is EL+777.5 m as the design height. Distance between the face-line of quay and front of warehouse is 30 meters.

Elevating area of Apron is 9,600 m^2, and the volume filled up concrete is 1,920 cubic meters.

Prior to elevating Apron, crane rails shall be raised up to the Apron height.

(7) Inner Port Road

Length of Inner Port road	740 m
Overall Width of Road	20 m
Width of Asphalt Pavement	15 m

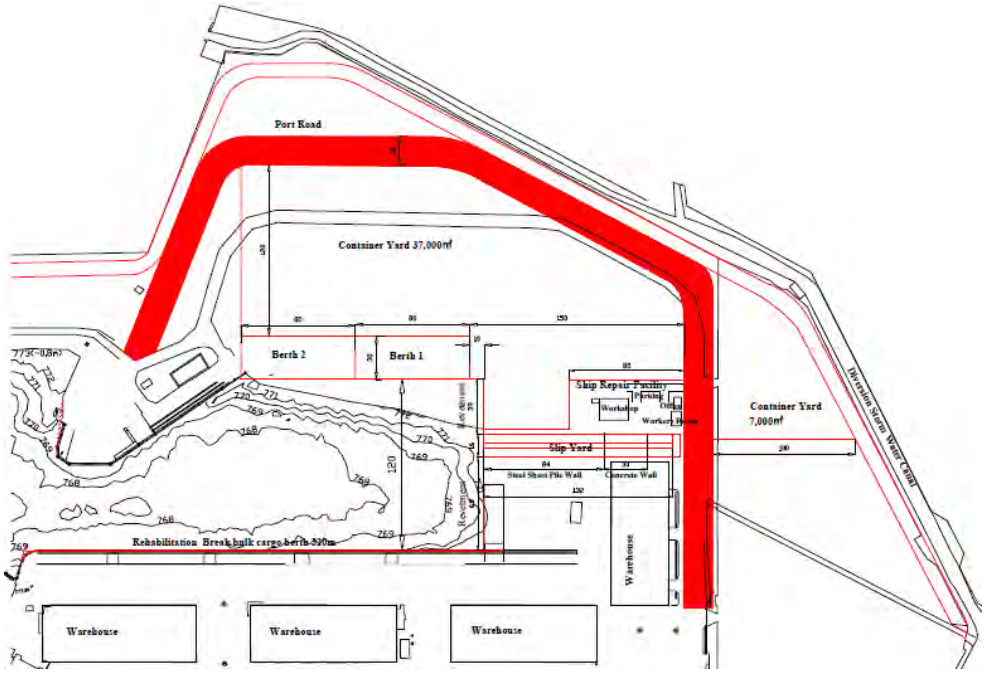


Figure 11.33: Layout of Inner Port Road

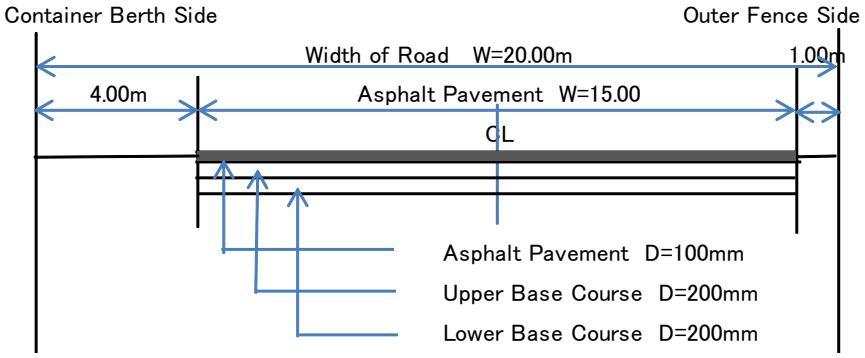


Figure 11.34: Cross Section of Road

(8) Provision of Container Handling Equipment

In the Container Berths and the Yard, following equipments listed below table shall be provided for operating cargo handling.

Table 11.11: Equipment List of Container Handling Equipment

Equipment	Capacity	Unit
Mobile Container STS Crane	35 ton at 19 m radius	2
Reach Stacker	35 ton, 3 tiers for loaded and 4 tiers for empty	2
Multi-purpose Forklift	3–5 ton	2
Tractor Head		5
Terminal Chassis		7

(9) Construction of Slipway and Workshop

Ships repair facility is located at the east end of the port basin of Bujumbura Port, having the area of over 6,000 m^2, and slipway, factory, office and necessary machines and equipment.

In order to keep a stable and safe supply of electric power, own generating system driven by diesel engines is recommendable, and required electric power for facility was also calculated.

Inclination of slipway is designed as 1/12 (4.76 degrees), and size of slipway is enough to accommodate the maximum dimension of ship (L = 60 m) in Burundi fleet.

The following facility, machineries and tools specified are necessary for ships repair and inspection.

Slipway

Rails	width 3.5 m × 132 m
Cradle with wooden bed	12 sets
Lifting Winch	El. Hyd. 15 t × 15 m/min
Wire (Lifting)	32 mm dia×1,100 m
Wire (Lowering)	22 mm dia × 300 m
Sheave Block	7-sheaves × 1, 6-sheaves × 1
Chain/Stopper	Stopper for cradles
Lighting	AC 220V, 60 Hz Fluorescent

Workshop/Office

Factory	abt. 300 m^2 (15 × 20 m) with overhead crane rails
Exhaust Fan/Duct	air change rate: 6 times/h
Office	abt. 40 m^2 with A/C & lavatory air change rate : 6 times/h
Workers Room	abt. 60 m^2 with A/C & lavatory
Generator and Pump Room	abt. 20 m^2
Gas Bottle Room	abt. 20 m^2 with exhaust vent.
Lighting	AC 220V, 60 Hz Fluorescent

Provision of Machinery

Lathe	Center dist. 2,000 mm × 1
Milling Machine	Size: 800 × 400 × 500 mm × 1
Drilling Machine	Max. 30 mm dia × 2.
Grinder	Wheel dia. 250 mm × 1
Pipe Bender	Pipe dia. max. 80 mm × 1
Pipe Cutter	Pipe dia. max. 80 mm × 1
Electric Saw	Max. 100 mm bar × 1
High Pressure Cleaning Mach.	100 kg/cm^2 × 1
Forklift	5 t × 2
Chain Block	5 t × 1, 2t × 2, 0.5t × 2
Hydro Oil Jack	10 t, 50 mm stroke
Measuring Equipment	Meter, Gauge, etc.

Crane

Jib Crane(Fixed)	El.Motor driven, 10 tons × 20 mR × 1 Lifting/Lowering speed Min. 18.0 m/min
Crane Post	Steel Construction, abt. 6 m hight
Mobile (Truck) Crane	2 tons × 15 mR × 1
Overhead Crane (Workshop)	5 tons ,span 12 m, lift 5 m × 1

Welding

Arc Welder	500A × 10
Gas Welder	10 sets
Gas Cutting Machine	8 sets
Weld. Rod Dryer	100 kg type,
Cable for Welder	25 m × 20
Welding Table/Work bench	

Power Supply

1. Electric		
	Diesel Generator	140 ps, 100 KW 440V × 2 sets
	Switch Board	
	Transformer	100 kVA A .C 440/220, 60 Hz 3-Phase
	Cable	
2. O2		
	Bottle	40 L × 30
3. Fresh Water		
	Pump	100 m^3/h × 80 m × 2
4. Comp. Air		
	Air Compressor	50 m^3/h × 10 kg/cm^2
	Reservoir	3 m^3 × 10 kg/cm^2
5. Gas		
	Acetylene, LPG Bottle	40L × 30

Layout of Ship Repair Facility

Layout of Ship Repair Facility is illustrated below.

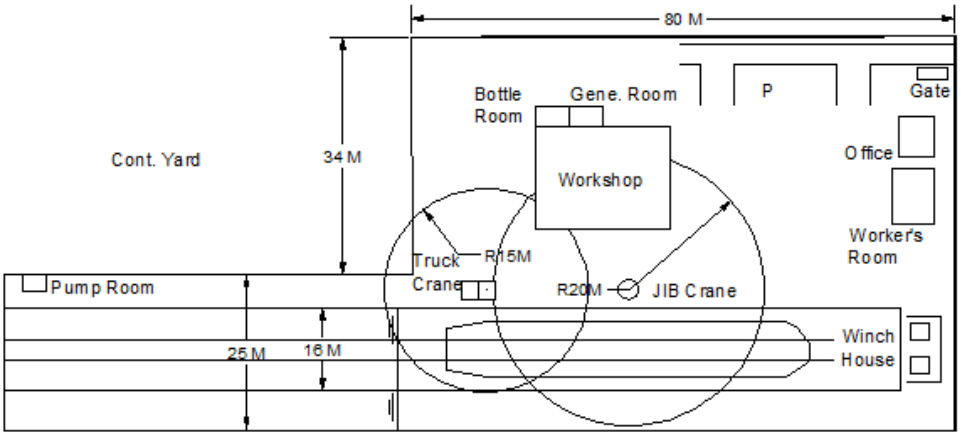


Figure 11.35: Layout of Ship Repair Facility

11.2.2 Preliminary Design of Port Facilities of Rumonge Port

a) Project Components

Port facilities of Rumonge Port are composed of Berthing pontoon, Movable ramp, Causeway, Open storage and drainage, Warehouse and Administration building.

Fences and gate which are enclosed with Port area were constructed during the JICA study term (August 2011 to April 2012).

b) Layout of Rumonge Port

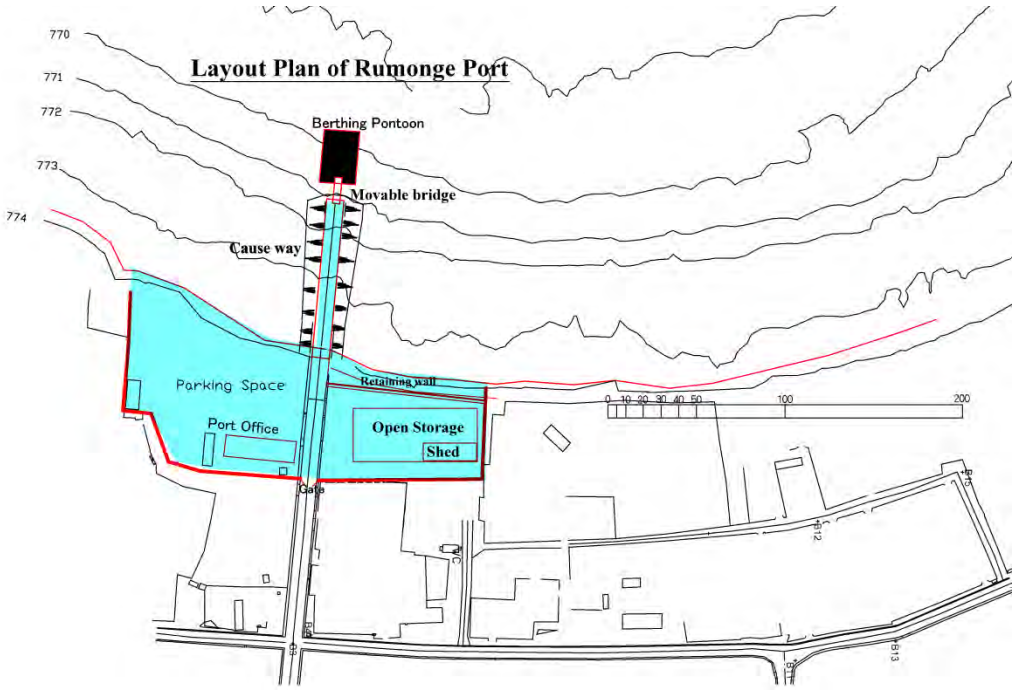


Figure 11.36: Layout Plan of Rumonge Port

c) Berthing Pontoon

In consideration with a large range of lake water level for more 80 years record, manpower loading / unloading without equipment, comparative small size of targeted cargo ship and so on, structural type of berth was decided a berthing pontoon type.

Module pontoon type was selected in the pontoon type because the module units are able to transport by container trailer.

Dimension of Berthing Pontoon:	W = 20 m × L = 30 m	600 m^2
Number of module pontoon:	6 × 8	48 units
Dimension of module pontoon:	2.5 m × 5.0 m × 2.0 m	
4 spuds equipped		
Movable bridge	2 m × 15 m	

d) Causeway

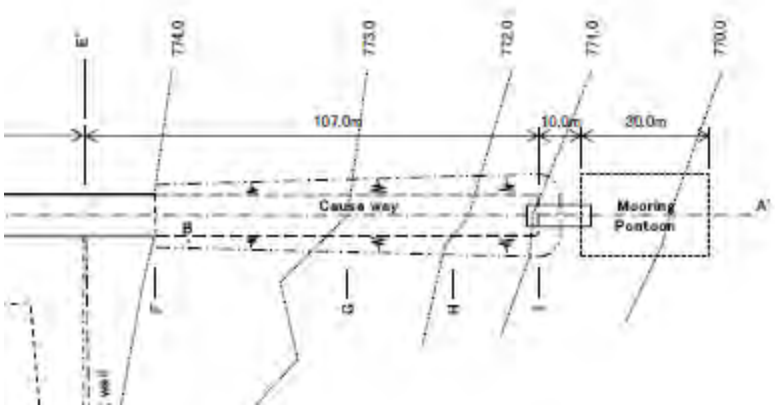


Figure 11.37: Plan of Causeway

Causeway structural type is selected a rubble mound with armor stone structure. Core stone of the mound is formed by rubble stones of 5 kg to 50 kg size. Surface of slopes are covered with armor stones.

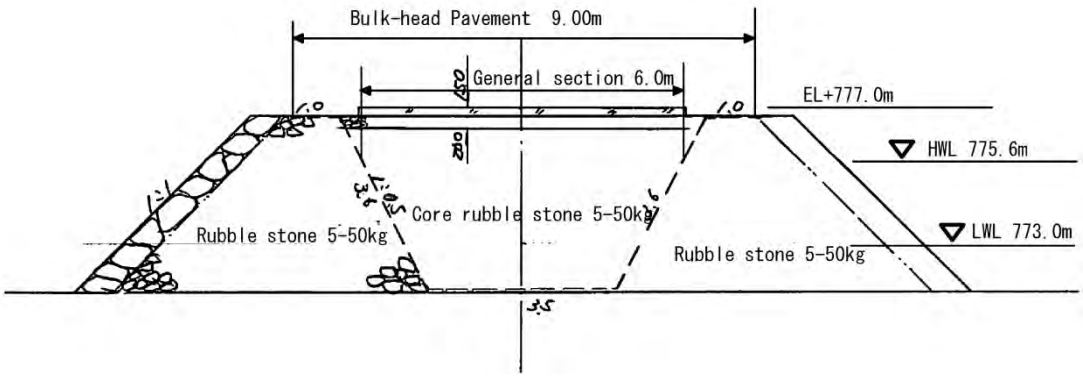


Figure 11.38: Typical Section of Causeway

e) Coastal Revetment

Shoreline is shaped from a gentle graded sandy soil. A revetment paralleled to the shoreline is designed to keep an adequate area of a flat zone for the necessary port facilities such as storage in the port area.

11.3 Implementation Schedule

11.3.1 Implementation Schedule of Project Components

There will be three (3) project components to be completed as the short-term development, i.e., Storm Water Diversion, Construction of Container Terminal and Construction of Ship Repair Facility. The construction schedule is worked out on the assumption that one contractor will carry out the works of all the project components.

Dry work is considered to build the slipway. For this purpose, the area of the underwater part of slipway will be embanked with steel sheet pile wall, which will be used as a permanent retaining wall of the slipway.

Temporary diversion of the storm water canal, called "Buyenzi Canal", is required to start before driving of steel sheet piles for the slipway embankment and quay wall of the container terminal. To prevent the steel sheet pile wall from tilting, dredging of the port basin will start after its completion. Concrete of coping beam can be placed after dredging in front of the quay wall is completed to ensure the correct alignment of the berth.

Rehabilitation of the existing general cargo berths has to be carried out berth by berth so that the cargo handling should not be hampered

It is estimated that the construction works will need 17 months in total as shown in Figure 3.39 below:

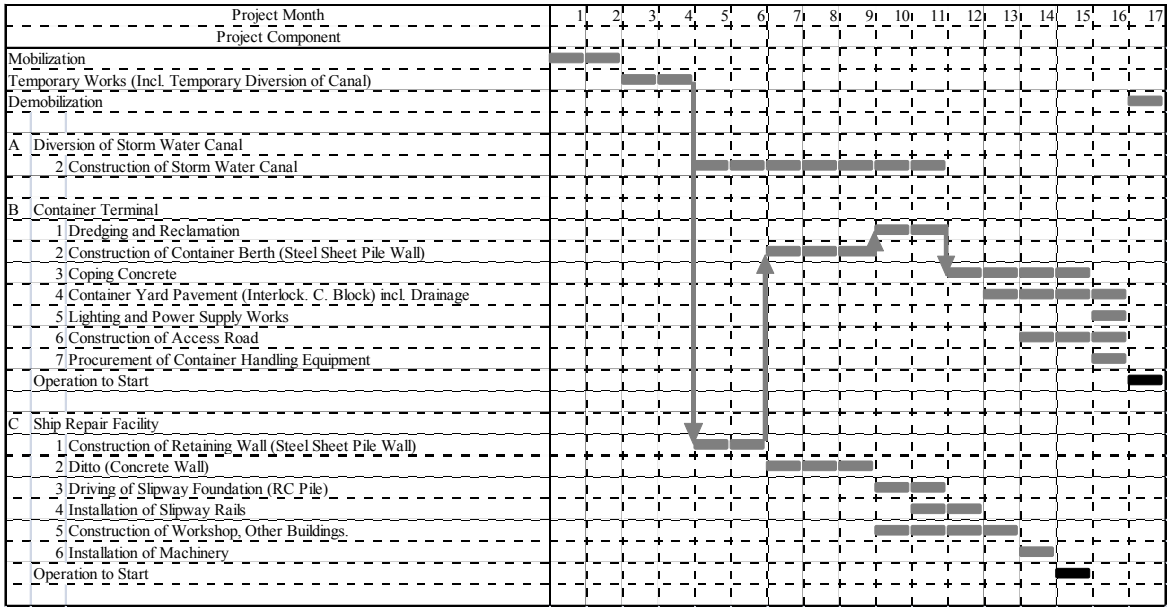


Figure 11.39: Construction Works Schedule

11.3.2 Overall Implementation Schedule

As the submission of the Final Report is scheduled in July, 2012, the schedule for project implementation is worked out from this month.

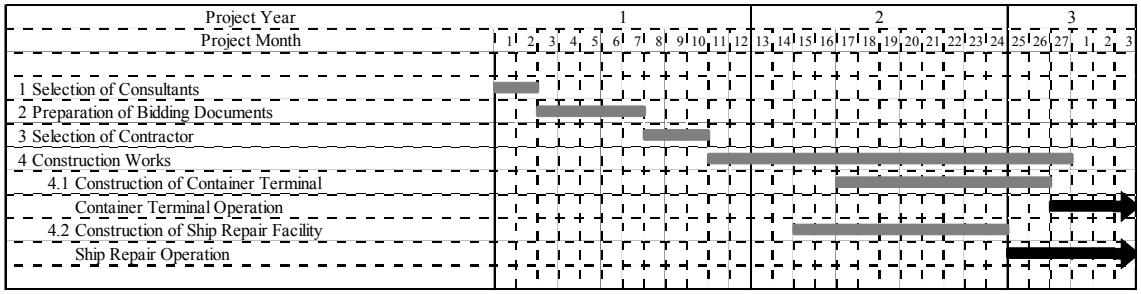


Figure 11.40: Project Implementation Schedule

11.4 Cost Estimation

Table 11.12: Construction Cost at Bujumbura Port

Exchange Rate
1 USD = 1,400 BIF

			USD	Remarks
1	Diversion of Storm Water Canal		2,057,748	
		a. Earth Work	287,872	
		b. Culvert	1,295,011	
		c. General Expenses	474,865	30% x (a+b)
2	Dredging of Port Basin		974,688	
		a. Direct Cost	749,760	
		b. General Expenses	224,928	30% x (a)
3	Constructing of Container Terminal		18,139,340	
	3.1	Container Berths	6,240,000	
		a. Steel Sheet _Pile Wall	2,580,000	
		b. Coping Concrete	1,160,000	
		c. Bollards & Bits	80,000	
		d. Rubber Fenders	810,000	
		e. Back Filling	170,000	
		f. General Expenses	1,440,000	30% x (a. - e.)
	3.2	Apron	1,136,549	
		a. Sub grade works	34,744	
		b. Sub base course	67,950	
		c. Concrete pavement	733,605	
		d. Joint	37,970	
		e. General Expenses	262,280	
	3.3	Container Yard and Drainage	5,457,153	
		a. Container Yard	4,037,810	
		b. Drainage	160,000	
		c. General Expenses	1,259,343	30% x (a. - c.)
	3.4	Steel Sheet Pile Wall	4,290,000	
		a. Steel Sheet Pile Wall (1)	600,000	Temporary Coffer Dam
		b. Steel Sheet Pie Wall (2)	2,170,000	Slipway Wall
		c. Coping Concrete	380,000	
		d. Backfilling	150,000	
		e. General Expenses	990,000	30% x (a. - d.)
	3.5	Inner Port Road	1,015,638	
		a. Sub grade works	35,880	
		b. Sub base course	135,894	
		c. Asphalt pavement	609,140	
		d. General Expenses	234,724	30% x (a. - c.)
4	Ship Repair Facility		6,957,000	
	5.1	Civil Construction Works	1,547,000	
		a. Earth Works	120,000	
		b. Pre-cast RC Piles	570,000	
		c. R.C. Beams	230,000	
		d. Concrete Upright Wall	120,000	Retaking Wall
		e. Concrete Wall	70,000	Slipway Embankment
		f. Winch House	80,000	
		g. General Expenses	357,000	30% x (a. - f.)
	5.2	Slipway (Rail, Equipment)	5,410,000	
		a. Slipway Rail	1,433,000	
		b. Workshop	1,411,000	
		c. Machining Tools	597,000	
		d. Cranes, Painting Tools, Spare Parts	926,000	
		e. Welders, Spare Parts, etc.	210,000	
		f. Supply, Consumables	833,000	
				Cost Total e xcl. VAT
a	**Construction Cost Total incl. VAT (18%)**		**28,128,776**	**23,837,946**
	breakdown			
b	1	Direct Cost	18,594,806	b=a-(c+d)
c	2	General Expenses	5,243,140	Σ(1-4)of General Expenses
d	3	VAT	4,290,830	(1-1/1.18)x a

11.4.1 Basic Costs of Materials, Equipment and Workers

Cost survey was carried out at Bujumbura city in the first field survey in August and September, 2011. The information and data were obtained from a contractor having considerable experience in execution of public works construction in Burundi.

(1) Materials Costs

Material costs = 1.18 times of purchase price

VAT (Valuable Additional Tax); 18% of being paid by end consumer

Table 11.13: Material Costs to Be Used in Burundi Port Project

				Purchase price (obtained price)		Material Cost	
	Item	**Spec.**	**Unit**	BIF	USD	USD	**Remarks**
1	Steel bar	D6–10 mm	ton	4,473,120		3,770	Import
2	Steel bar	Over 11 mm	ton	4,473,120		3,770	import
3	Cement	Portland	ton	500,000	350	420	import
4	Concrete	24-30 N/mm^2	m^3	392,606		330	
5	Concrete	18-21 N/mm^2	m^3	348,710		293	
6	Corse aggregate	Gravel (river)	m^3	40,000	23	30	27–34
7	Corse aggregate	Gravel (hill)	m^3		20	24	
8	Fine aggregate	For concrete	m^3	60,000	40	48	
9	Fine aggregate	reclamation	m^3	15,000	15	18	
10	Filling soil		m^3	29,500		21	For surface
11	Structural steel		ton	5,000,000		4,200	import
12	Rock	Armor, rubble	m^3		40	48	
13	Bitumen	From Iraq	ton		1,200	1,500	
14	Gasoline		kℓ	2,150,000		1,800	
15	Gasoil		kℓ	2,100,000		1,770	

(2) Equipment Costs

Equipment costs shown on table below are the rental cost of excluding operators, oil and miscellaneous materials. This is assumed that working hour is 8 hours and actual operating (moving equipment) hour is 6 hours.

Table 11.14: Equipment Costs to Be Used for Burundi Port Project

				Rental price (obtained price)		Equipment Cost	
	Item	**Spec.**	**unit**	BIF	USD	USD	**Remarks**
1	Bulldozer	20 tons	day	700,920		590	
2	Dump truck	20 tons	day	354,000		300	
3	Dump truck	20 tons	Mon.		3,500	4,130	Long term
4	Truck crane	10 t/lift	day	293,000		250	
5	Power shovel		day	1,180,000		1,000	
6	Truck	10 tons	day	354,000		300	
7	Crawler crane	10 tons	day	1,236,286		1,040	
8	Road Sprinkler		day		180	210	

(3) Labor Costs

Table 11.15: Labor Costs to Be Used for Burundi Port Project

	Item	Spec.	unit	Labor wage (per day) BIF	Labor wage (per day) USD	Labor Cost USD	Remarks
1	Civil engineer		day	61,000		51	
2	Mechanical eng		day	61,000		51	
3	Clerk		day	7,500		6	
4	Operator		day	9,500		8	
5	Driver		day	9,500		8	
6	Skilled labor	High skill	day	14,000		12	
7	Skilled labor		day	8,200		7	
8	Skilled labor	3rd country	day		55	65	Special skill
9	Common labor	local	Day	5,500		5	
10	Common labor	3rd country	day		7	9	Foreman

(4) Costs for Execution Works

Table 11.16: Costs of Execution Works to Be Used for Burundi Port Area

	Item	Spec.	unit	Labor wage (per day) BIF	Labor wage (per day) USD	Labor Cost USD	Remarks (material : include)
1	Excavation		m^3	6,700		5.60	
2	Filling work		m^3	41,300		35.80	material
3	Masonry work		m^2	46,000		38.60	material
4	Placing concrete		m^3	31,500		26.40	
5	Erection steel bar		ton	31,500		26.40	
6	Welding	4 hrs/day	day	72,000		60.80	
7	Formwork		m^2	16,000		13.20	material
8	Scaffolding work		m^2	3,640		3.10	
9	Dredging (Pump)	Sandy soil	m^3		10	12.00	L:100–800 m
10							

11.4.2 Cost Estimation of Project Components

The cost composed of basic costs of materials, equipment, workers and execution works as shown in 11.4.1 consists of [direct cost].

Project cost is composed of “direct cost”, “the cost of common temporary works”, ”the cost of site management expenses” and “general management cost”. Mobilization, demobilization and direct temporary cost concerned with project components are included in the direct cost.

The cost of common temporary works varies according to the components of facility construction in port project. The cost in this estimate is assumed to be 3% of the direct cost. The cost of site management expenses is approximate 17% considering total construction budget price.

General management cost is composed of costs for a contractor to construct, manage and maintain the site office, to maintain & continue company operation such as the interest payment to banks, expense for stockholders, social insurances & taxes, reservation for various risks, company profits and so on.

General management cost varies to the amount of project cost. The ratio of the general management cost is set as 10% in case the direct cost is less than USD 2 million. The ratio of indirect cost quoted from the local contractor is 30% to 50%. As the size of the projects to be implemented is considered large in Burundi, the ratio is assumed as 30%.

Project Cost C C = A + B
Direct cost A
Indirect cost B B = 30% of A
The cost of common temporary works D = 3% of A
The cost of site management expenses E = 17% of A
The general management cost F = 10% of A

(1) Diversion of Storm Water Canal

Construction Plan

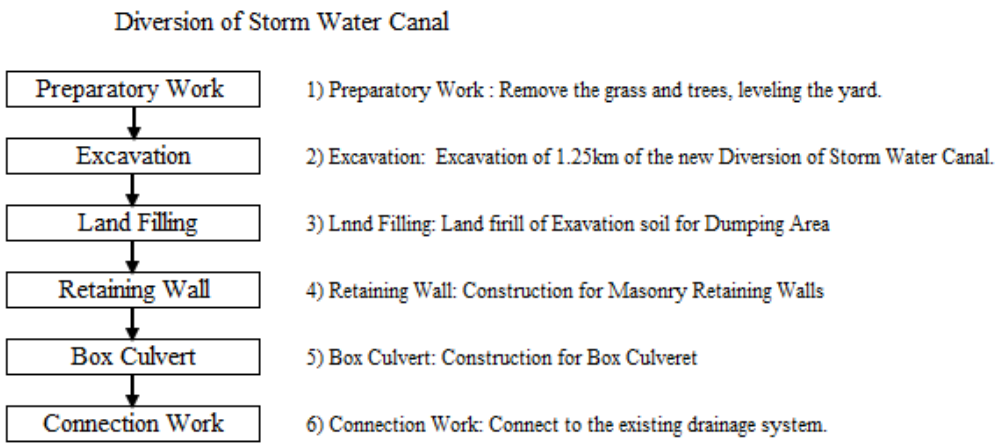


Figure 11.41: Construction Procedure of Storm Water Canal

Construction Cost

Table 11.17: Construction Cost of Storm Water Canal

Spec. No	Item No	Description	Unit	Quantity	Rate		Amount		Summary
					*Local BIF	Foreign USD	*Local BIF	Foreign USD	
1		**Diversion of Wastewater Channel**	Ls	1.0			[	1,582,883.1	]
	1	**Earthwork**	Ls	1.0			(	287,872.1	)
	1.1	Temporary Works	m^2	14,940.0		2.91		43,470.9	(leveling)
	1.2	Excavation Work	m^3	12,260.5		7.77		95,315.4	
	1.3	Filling Work	m^3	5,719.7		14.13		80,832.3	
	1.4	Slope Work	m	1225.0		55.72		68,253.5	
	2	**Culvert**	Ls	1.0			(	1,295,011.0	)
	2.1	Base Course & Concrete Work	m	1245.0		161.90		201,564.3	
	2.2	Masonry retaining wall Work	m	1225.0		628.64		770,082.1	
	2.3	Concrete slab work	m	1225.0		216.32		264,987.4	
	2.4	Box culvert Work	m	20.0		2,918.86		58,377.2	
2		**General Expenses**	Ls	1.0			[	474,864.9	] (1*30%)
		Total					((	2057748.1	))

(2) Dredging of Port Basin

1) Construction Plan

The soil above MWL (Mean Lake-Water Level) in the port basin area is excavated and loaded to dump trucks by on-land construction machinery and transported to the designated reclaimed area of comparative low land in the port area.

After that, the soil below MWL in the port basin area is dredged by a cutter suction dredger. The dredged soil is transported through discharged pipeline to the reclamation area.

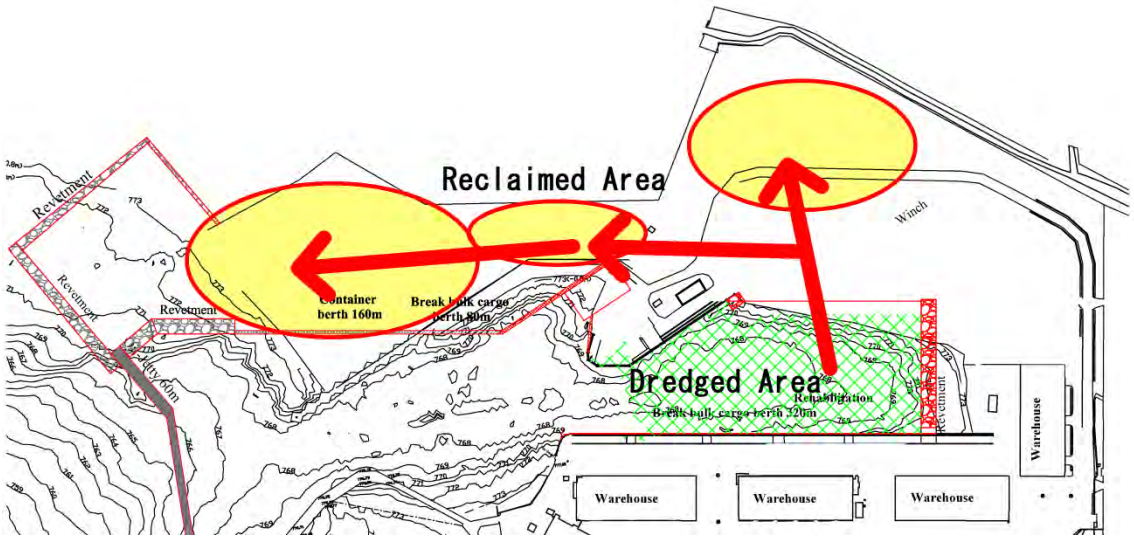


Figure 11.42: Dredging & Reclamation Area

2) Construction Cost of Port Basin

Table 11.18: Construction Cost of Port Basin

No.	ITEM	Specification	Detail	Unit	Quantity	Unit Price USD	Amount USD	Remarks
A	Direct cost							
1	Dredging	Cutter suction dredger	L = av. 500 m	m^3	35,500	12.0	426,000	
2	Excavation			m^3	7,100	5.6	39,760	
3	Transport Soil			m^3	7,100	10.0	71,000	
4	Leveling works			m^3	42,600	5.0	213,000	t = 0.3 m/m^2
	Sub Total						749,760	
B	Indirect Cost							
	General Expenses			%	30		224,928	
C	Total Cost						974,688	

(3) Construction of Container Terminal

Container Berth

1) Construction Procedure

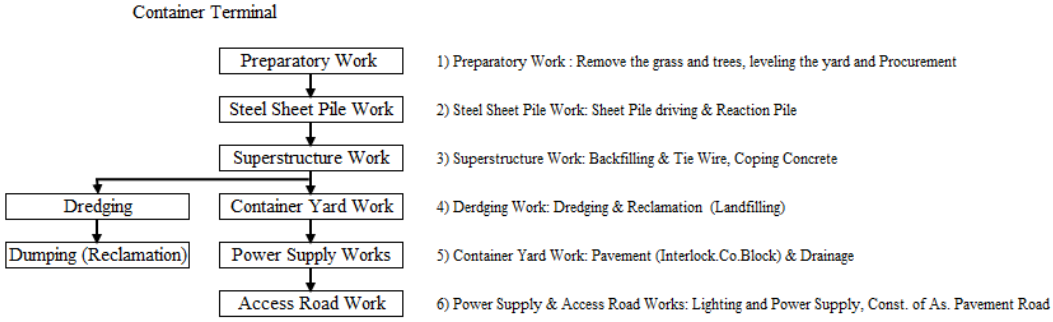


Figure 11.43: Construction Procedure of Container Berths

Construction Cost of Container Berths

Table 11.19: Construction Cost of Container Berths

No.	Item	Detail	Spec.	Unit	Quantity	Unit Price	Amount	Remarks
	Length			m	170			
a	Steel Sheet Pile Wall							
1	Steel Sheet Pile	material	Type Ivw SY295	t	591	2,100.00	1,241,100	
2	Steel Sheet Pile	execution		t	591	483.00	285,453	
3	H shaped Steel pile	material	400 × 400 L = 16 m	t	289	1,900.00	549,100	
4	H shaped Steel pile	execution		t	289	437.00	126,293	
5	Tie wire set L=15 m	material	TR-130, Ta 340 kN	nos	100	2,500.00	250,000	
6	Tie wire set	execution		nos	100	575.00	57,500	
7	Waling C -200 × 90 × 8 × 13.5	material	SS400	t	23	2,100.00	48,300	
8	Waling C -200 × 90 × 8 × 13.5	execution		t	23	483.00	11,109	
9	Miscellaneous			sum	1		11,145	
b	Coping Concrete							
1	Concrete	material		m^3	1,361	330.00	449,064	
2	Concrete	placing		m^3	1,361	26.40	35,925	
3	Formwork		(3.5 × 2 + 1.8) × 170 × 1.05	m^2	1,570	13.20	20,724	
4	Steel bar	material	0.12 t/m^3	t	171	3,770.00	644,670	
5	Steel bar	execution		t	171	26.40	4,514	
6	Miscellaneous			sum	1		5,102	
c	Bollard & Bit							
1	25 t bollard			nos	12	4,200.00	50,400	
2	Mooring Bits			nos	8	3,600.00	28,800	
3	Miscellaneous						800	
d	Rubber fender							
1	VH-250 L=3,500			nos	40	18,500.00	740,000	0.65 ft/unit
2	DD-300HW L=2.0 m			nos	12	5,760.00	69,120	
3	Miscellaneous			sum	1		880	

No.	Item	Detail	Spec.	Unit	Quantity	Unit Price	Amount	Remarks
e	Backfilling							
1	Backfill sand	dredged fill	65 × 170	m^3	11,000	15.00	165,000	
2	Miscellaneous			sum	1		5,000	
	Direct cost (Total)						4,800,000	
f	General Expenses			%	30		1,440,000	
	Total						6,240,000	

Construction of Apron

Width of Apron 30 m
Length of Apron 160 m
Area of Apron 4,800 m^2

Table 11.20: Construction Cost for Apron of Container Berths

No.	Item	Detail	Spec.	Unit	Quantity	Unit Price	Amount	Remarks
	Area		29.5 × 80 × 2 berths	m^2	4,720			
a	Sub grade works						34,744	
1	Excavation			m^3	3,170	5.60	17,752	
2	Leveling/compaction		0.3 m	m^2	4,720	3.60	16,992	
b	Sub base course						67,950	
1	Lower Sub base course	material	Graded grain t=15 cm	m^3	920	30.00	27,600	708 × 1.3
2		execution		m^3	708	1.80	1,274	
3	Upper Subbase course	material	Graded grain t=20 cm	m^3	1,227	30.00	36,810	944 × 1.3
4		execution		m^3	944	2.40	2,266	
c	Concrete pavement						773,605	
1	Concrete 4.5N/m ㎡ BS	material	t=0.3 m	m^3	1,458	330.00	481,140	1,416 × 1.03
2		placing		m^3	1,458	26.40	38,491	
3	Deformed steel bar		D=16 mm	t	30.0	3,770.00	113,100	28.3 × 1.05
4	Deformed steel bar		D=10 mm	t	3.0	3,770.00	11,310	2.9 × 1.05
5		erecting		t	31.2	26.40	824	
6	Wire-mesh			m^2	4,437	20.00	88,740	
d	Joints						37,970	
1	Construction joints			m	834	28.54	23,802	
2	Expansion joint			m	88.5	34.60	3,062	
3	Shrinkage joint			m	160	29.32	4,691	
4	Formwork		(160 × 7+29.5 × 17) × 0.3	m^2	486	13.20	6,415	
e	General Expenses						262,280	30%x(a-d)
	TOTAL						1,136,550	

Container Yard and Drainage

Area of Container Yard	44,000 m^2
Pavement methods	ICB pavement
Sub-base course	t = 35 cm thick
Sub grade	0.2 m thick grading & compaction

Table 11.21: Quantity Computation for Container Yard and Drainage

No.	Item	Spec	Detail/calculation	Unit	Quantity	Unit Price	Amount	Remarks
	Container yard	ICB	t=150 mm	m^2	44,000			
	Drainage			M	210			
a	Container Yard						4,037,810	
1	Sub grade	0.2 m thick	leveling & compaction	m^2	44,000	2.40	105,600	
2	Excavation	0.5 m thick		m^3	22,000	5.60	123,200	
3	Sub-base course	material	graded grain 0.35 thick	m^3	15,400	30.00	462,000	
4	Sub-base course	execution		m^3	15,400	4.20	64,680	
5	ICB	material	t=150 mm	m^2	44,000	50.00	2,200,000	
6	ICB	execution		m^2	44,000	24.20	1,064,800	
7	Miscellaneous			sum	1		17,530	
b	Drainage	L=400 m					160,000	
1	Concrete	material	0.34 × 400 m	m^3	136	293.00	39,848	
2	Concrete	placing		m^3	136	26.40	3,590	
3	Formwork		3.46 × 400	m^2	1,384	13.20	18,269	
4	cover concrete	material	0.072 × 400	m^3	28.8	330.00	9,504	
5	cover concrete	placing		m^3	28.8	26.40	760	
6	Steel bar	material	(12.25+20.9) × 400	T	14.5	3,770.00	54,665	
7	Steel bar	execution		T	14.5	26.40	383	
8	Formwork		1.07 × 400	m^2	428	13.20	5,650	
9	Install cover			pcs	400	35.23	14,092	
10	Excavation			m^3	920	5.60	5,152	
11	Gravel			m^3	120	35.80	4,296	
12	Back filling			m^3	512	5.60	2,867	
13	Miscellaneous			Sum	1		924	
c	General Expenses						1,259,343	30%x(a.-c.)
	Total incl. VAT(18%)						5,457,153	

Steel Sheet Pile Wall

Table 11.22: Construction Cost for Steel Sheet Pile Wall

No.	Item	Detail	Spec.	Unit	Quantity	Unit Price	Amount	Remarks
	Temporary Cofferdam	0.1305 t/m*nos	75 m × 2	m	150 m			L=2,400 m
a	Steel Sheet Pile Wall (1)						600,000	
1	Steel Sheet Pile	material	Type Ivw SY295	t	0	2,100.00	0	
2	Steel Sheet Pile	execution	Piling 150 m	t	522	483.00	252,126	
3	Steel Sheet Pile	material	Type Ivw SY295	t	0	1,900.00	0	
4	Steel Sheet Pile	execution	Pulling 120 m	t	418	437.00	182,666	
5	Tie wire set L=15 m,	material	TR-130, Ta 340 kN	nos	42	2,500.00	105,000	
6	Tie wire set	execution		nos	42	575.00	24,150	
7	Waling C -200 × 90 × 8 × 13.5	material	SS400	t	10	2,100.00	21,000	0.23t/nos
8	Waling C -200 × 90 × 8 × 13.5	execution		t	10	483.00	4,830	
9	Miscellaneous			sum	1		10,228	
	Slip yard Wall	84 × 2=168 m						L=3,400 m
b	Steel Sheet Pile Wall (2)						2,170,000	
1	Steel Sheet Pile	material	Type Ivw SY295	t	444	2,100.00	932,400	
2	Steel Sheet Pile	execution		t	444	483.00	214,452	
3	H shaped Steel pile	material	400 × 400 L=16 m	t	286	1,900.00	543,400	1.7t/m
4	H shaped Steel pile	execution		t	286	437.00	124,982	
5	Tie wire set L=15 m,	material	TR-130, Ta 340 kN	nos	94	2,500.00	235,000	
6	Tie wire set	execution		nos	94	575.00	54,050	
7	Waling C -200 × 90 × 8 × 13.5	material	SS400	t	22	2,100.00	46,200	
8	Waling C -200 × 90 × 8 × 13.5	execution		t	22	483.00	10,626	
9	Miscellaneous			sum	1		8,890	
c	Coping Concrete		168 m				380,000	3.6 m^3/m
1	Concrete	material		m^3	605	330.00	199,650	
2	Concrete	placing		m^3	605	26.40	15,972	
3	Formwork		(4+1.8) × 168 × 1.05	m^2	1,023	13.20	13,504	
4	Steel bar	material	0.06t/m^3	t	36	3,770.00	135,720	
5	Steel bar	execution		t	36	26.40	950	
6	Miscellaneous			sum	1		14,204	
d	Backfilling						150,000	
1	Backfill sand	dredged fill	(15 × 45 × 6+4 × 15 × 68)1.1	m^3	8,900	15.00	133,500	
2	Removal sand			m^3	4,000	5.60	22,400	
3	Miscellaneous			sum	1		16,500	
e	General Expenses			%	30		990,000	30%x(a.-d.)
	Total						4,290,000	

Inner Port Road

Table 11.23: Construction Cost of Inner Port Road

No.	Item	Detail	Spec.	Unit	Quantity	Unit Price	Amount	Remarks
	Area	Total	740 × 20	m^2	14,800			
	Area	Pavement	740 × 15	m^2	11,100			
a	Sub grade works						35,880	
1	Excavation	200 m × 15 × 0.4		m^3	1,200	5.60	6,720	
2	Leveling/compaction	540 × 15	0.3 m	m^2	8,100	3.60	29,160	
b	Sub base course						135,894	
1	Lower Sub base course	material	Graded grain t=15 cm	m^3	2,165	30.00	64,950	1665 × 1.3
2		execution		m^3	1,665	1.80	2,997	
3	Upper Sub base course	material	Graded grain t=15 cm	m^3	2,165	30.00	64,950	1665 × 1.3
4		execution		m^3	1,665	1.80	2,997	
c	Asphalt pavement						609,140	
1	Asphalt concrete	material	t=0.1 m	m^3	1,165	500.00	582,500	1110 × 1.05
2		placing		m^2	11,100	2.40	26,640	
d	General Expenses						234,724	30%x(a.-c.)
	Total incl. VAT(18%)						1,015,638	

(4) Construction of Slipway and Workshop

Construction Plan

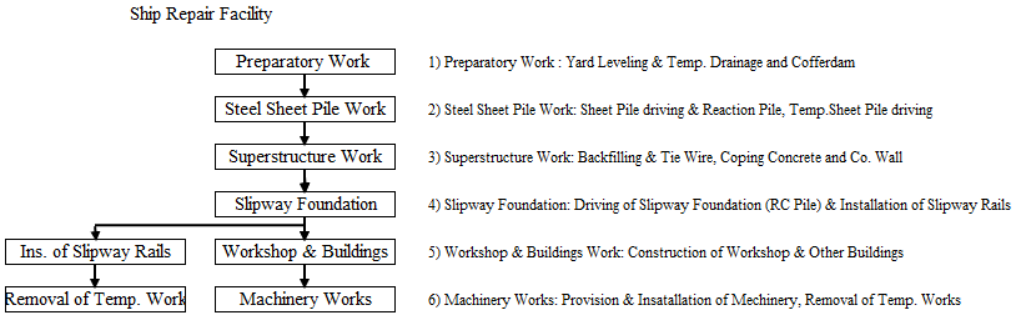


Figure 11.44: Construction Procedure of Ship Repair Facility

Table 11.24: Construction Cost for Slipway (Civil Works 2)

No.	Item	Detail	Spec.	Unit	Quantity	Unit Price	Amount
a	Earth works						120,000
1	Excavation in dock		(776.5-768) × 15 × 132 × 1/2	m^3	8,415	5.60	47,124
2	Excavation in ranes			m^3	2,910	5.60	16,296
3	Rubble stone	foundation		m^3	871	48.00	41,808
4	Back filling			m^3	1,558	5.60	8,725
5	Miscellaneous			sum	1		6,047
b	Precast RC pile						570,000
1	Precast RC pile	AV. 13 m long	0.4 × 0.4	nos	90	4,382.00	394,380
2	Piling works			nos	90	1,833.00	164,970
3	Miscellaneous			sum	1		10,650
c	RC beam		0.8 × 1.0 m, 385.5 m long				230,000
1	Concrete	Material	30N	m^3	318	330.00	104,940
2	Concrete	Execution		m^3	318	26.40	8,395
3	Steel bar	Material		t	22	3,770.00	82,940
4	Steel bar	Execution		t	22	26.40	581
5	Formworks			m^2	1,116	13.20	14,731
6	Miscellaneous			sum	1.0		18,413
d	Concrete upright wall	60 m					120,000
1	Concrete	Material		m^3	201	330.00	66,330
2	Concrete	Execution		m^3	201	26.40	5,306
3	Steel bar	Material	precaution reinforcement	t	6	3,770.00	22,620
4	Steel bar	Execution		t	6	26.40	158
5	Formworks			m^2	372	13.20	4,910
6	Excavation			m^3	529	5.60	2,962
7	Rubble stone		Foundation	m^3	66	48.00	3,168
8	Backing gravel			m^3	158	24.00	3,792
9	Backfill			m^3	119	5.60	666
10	Stone works	Execution		m^3	224	5.60	1,254
11	Miscellaneous			sum	1		8,832
e	Concrete wall	61 m	around winch house				70,000
1	Concrete	Material		m^3	107	330.00	35,310
2	Concrete	Execution		m^3	107	26.40	2,825
3	Steel bar	Material	precaution reinforcement	t	5	3,770.00	18,850
4	Steel bar	Execution		t	5	26.40	132
5	Formworks			m^2	264	13.20	3,485
6	Excavation			m^3	40	5.60	224
7	Rubble stone		Foundation	m^3	83	48.00	3,984
8	Rubble stone	Leveling		m^3	83	5.60	465
9	Miscellaneous			sum	1		4,726
f	Winch foundation						80,000
1	Filling		5 × 6 × 1.5	m^3	45	5.60	252
2	Rubble stone		5 × 6 × 0.5	m^3	15	53.60	804
3	Concrete	Mass 21N	5 × 6 × 1.0	m^3	30	319.40	9,582
4	Precast RC pile	18 m		nos	4	6,067.00	24,268
5	Piling works			nos	4	1,833.00	7,332
6	Building			m^2	30	1,000.00	30,000
7	Miscellaneous			sum	1		7,762
							80,000
g	General Expense			%	30		357,000
	Total						1,547,000

Electric Demand of Major Machinery

The cost of facility is estimated as follows.

Table 11.25: Electric Power Demand of Equipment

ITEM	No.	kw	Kw (total)	Working Condition		Remarks
				Lifting	Repairing	
Lifting Winch	1	55.0	55.0	11.0	-	2 hrs running/day
Exhaust Fan/Duct	2	4.0	8.0	8.0	8.0	for factory
Lighting	1	30.0	30.0	30.0	30.0	for factory & office
Lathe	1	7.5	7.5	3.8	3.8	
Milling Machine	1	10.0	10.0	5.0	5.0	
Drilling Machine	2	1.5	3.0	1.5	1.5	
Grinder	1	5.9	5.9	3.0	3.0	
Pipe Bender	1	0.8	0.8	0.4	0.4	
Pipe Cutter	1	1.5	1.5	0.7	0.7	
Electric Saw	1	1.0	1.0	0.5	0.5	
Cleaning Machine	1	6.2	6.2	3.1	3.1	
Jib Crane(Fixed)	1	45.0	45.0	-	36.0	No simultaneous use of winch & crane
Overhead Crane	1	3.5	3.5	1.8	1.8	
Arc Welder	10	24.0	240.0	60.0	60.0	25% simultaneous use
Weld. Rod Dryer	1	4.8	4.8	2.4	2.4	
Air Compressor	1	7.5	7.5	3.8	3.8	
Pump	2	31.0	62.0	31.0	31.0	1 pump st-by
Miscellaneous	10%	23.9	23.9	6.0	6.0	A/C, Vent, Telephone etc.
			Kw	171.8	**196.8**	
			Ps	233.4	**267.4**	ps=kw/0.736

When the crane is used for goods handling, maximum electric power supply of 196.8 kw is required. In case that electric demand is not so much occasionally, 1-diesel generator shall be stopped as stand-by for energy saving.

Cost of Ship Repair Facility

Table 11.26: Construction Cost for Ship Repair Facility (Equipment)

Ex. Rate: **1400.0** BIF/USD

Facility Name			
1. Slipway	**No.**	**USD**	**Note**
Rail	1	275,000	
Cradle with wooden bed	12	330,000	
Lifting Winch	1	344,000	
Wire (Lifting)	1	138,000	
Wire (Lowering)	1	28,000	
Sheave Block	2	55,000	
Chain/Stopper	8	110,000	
Lighting	1	25,000	*
Additional Spare Parts (3-years)	1	44,000	
Miscellaneous		84,000	
Sub Total		1,433,000	

2. Workshop	**No.**	**USD**	**Note**
Factory	1	1,000,000	*
Exhaust Fan/Duct	1	25,000	*
Office	1	63,000	*
Workers Room	1	63,000	*
Generator/Pump Room	1	13,000	*
Gas Bottle Room	1	13,000	*
Lighting	1	50,000	*
Additional Spare Parts (3-years)	1	61,000	*
Miscellaneous		123,000	
Sub Total		1,411,000	

3. Machining Tools	**No.**	**USD**	**Note**
Lathe	1	206,000	
Milling Machine	1	138,000	
Drilling Machine	2	55,000	
Grinder	1	14,000	
Pipe Bender	1	21,000	
Pipe Cutter	1	7,000	
Electric Saw	1	7,000	
High Pressure Cleaning Mach.	1	8,000	
Forklift	2	28,000	
Chain Block	4	28,000	
Hydro Oil Jack	2	6,000	
Measuring Equipment	1	14,000	
Additional Spare Parts (3-years)	1	23,000	
Miscellaneous		42,000	
Sub Total		597,000	

4. Crane etc.	**No.**	**USD**	**Note**
Jib Crane(Fixed)	1	550,000	
Crane Post	1	28,000	
Mobile (Truck) Crane	1	138,000	
Overhead Crane (work shop)	1	48,000	
Painting Tools	4	50,000	*spray, power tool
Additional Spare Parts (3-years)	1	38,000	
Miscellaneous		74,000	
Sub Total		926,000	

5. Welding	**No.**	**USD**	**Note**
Arc Welder	10	69,000	
Gas Welder	10	69,000	
Gas Cutting Machine	8	55,000	
Cable for Welder	20	14,000	
Additional Spare Parts (3-years)	1	1,000	
Miscellaneous		2,000	
Sub Total		210,000	

6. Supply/Consumables	No.	USD	Note
a. Electric			
Diesel Driven Generator	2	413,000	220ps, 160 kw × 2
Switch Board	1	28,000	
Transformer	1	69,000	
Cable	1	28,000	
Additional Spare Parts (3-years)	1	28,000	
Miscellaneous		33,000	
b. O2			
Bottle	30	38,000	*
Piping	1	25,000	*
c. Fresh Water			
Pump	2	28,000	1-pump stand by
Piping	1	13,000	*
d. Comp. Air			
Air Compressor	1	28,000	
Reservoir	1	25,000	
Piping	1	13,000	*
e. Gas			
Gas Bottle	30	38,000	*
Piping	1	13,000	*
Miscellaneous		13,000	
		833,000	

Total	**5,410,000**

For the import goods, transportation costs are taken into account as additional 10% of each cost of machineries. Installation costs of machineries are included in miscellaneous cost in each group.

Materials of items (*) marked are considered as domestic procurement.

The total cost of ship repair facility is estimated as USD 5,410,000, however it is only the cost above slipway rails, so civil engineering cost of repair yard and under rails is not included.

Cost of 1-year spare parts is included in each estimation, however considering difficult procurement of spare parts in future, the cost of 3-years spare parts is additionally listed in each group.

Provision of Container Handling Equipment

Table 11.27: Procurement Cost for Container Handling Equipment

Equipment	Capacity	Unit	Price (USD)	Amount (USD)
Mobile Container STS Crane	35 ton at 19 m radius	2	3,000,000	6,000,000
Reach Stacker	35 ton, 3 tiers for loaded and 4 tiers for empty	2	950,000	1,900,000
Multi-purpose Forklift	3 - 5 ton	2	60,000	120,000
Tractor Head		5	140,000	700,000
Terminal Chassis		7	78,000	546,000
Total				9,266,000

11.4.3 Cost Estimate of Port Facilities of Rumonge Port

Table 11.28: Construction Cost of Rumonge Port

No.	Item	Spec.	Unit	Quantity	Unit Price	Amount	Amount
					USD	USD	000 USD
	Rumonge Port Development						
1	**Earthwork**		Ls	1.0			232
1-1	Temporary Works		m^2	4,477.5	3.34		15
1-2	Filling Work		m^3	6,369.3	32.33		206
1-3	Open Storage & Gravel pavement Work		m^2	2,100.0	3.68		8
1-4	Earth retaining Work		M	33.0	95.57		3
2	**Retaining Wall**		Ls	1.0			158
2-1	Foundation works		M	90.0	599.67		54
2-2	Masonry retaining wall Work		M	90.0	379.70		34
2-3	Shore Protection work		m^2	315.0	222.48		70
3	**Causeway**		Ls	1.0			630
3-1	Mound foundation Works		m^3	2,900.7	78.81		229
3-2	Filling Work		m^3	1,504.3	97.15		146
3-3	Armor stone Work		m^2	1,101.3	170.71		188
3-4	Concrete pavement Work		m^2	960.0	69.93		67
4	**Berthing Pontoon**		Ls	1.0			3,128
4-1	Pontoon Production / Installation		Unit	48.0	46,000.00		2,208
4-2	Pontoon Transportation		f/t	1,170.0	700.00		819
4-3	Movable ramp		Ls	1.0	59,000.00		59
4-4	Ramp transportation		f/t	60.0	700.00		42
5	**Building Works**		Ls	1.0			550
5-1	Shed (Steel 1F)		m^2	300.0	533.58		160
5-2	Port Office (RC2F)		m^2	400.0	975.17		390
	SUB TOTAL	Σ (1–5)					4,698
	General Administration Expenses		%	30			1,409
	TOTAL						6,107
	VAT		%	18			932
	Total Cost without VAT						**5,176**

11.5 Operation and Maintenance Cost

11.5.1 Organization for Operation and Maintenance

Bujumbura Port should have a container terminal and ship repair facility. The container terminal is to meet the cargo demand which will be generated by operation of a container block train between Dar es Salaam and Kigoma Port. The ship repair facility is to meet the annual inspection of the ships of Burundian fleet including underwater survey. As there has been neither container terminal nor ship repair facility in Burundi ports, new responsible divisions or departments should be organized to operate them.

Ceaseless call of container ships makes it necessary to have a container terminal which operation should be independent on those of other cargo handling. The terminal needs its own organization and cargo handling equipment. The organization is different from the one for break bulk handling as its cargo handling operation is different. As containers should timely be

handled to meet the scheduled ship calls, the terminal is responsible for their proper delivery and stacking.

However, for Bujumbura Port the container ships are plying between Kigoma Port and Bujumbura Port or between Mpulungu Port and Bujumbura Port. Container handling is considered simple. Therefore, the organization should firstly be established within E.P.B or its succeeding body rather than an independent one. The employees will gradually shift from the conventional cargo handling to container handling. There will be sufficient time for them to learn the container terminal operation.

For the container terminal operation, the container terminal should have the organization as shown in Figure 11.45.

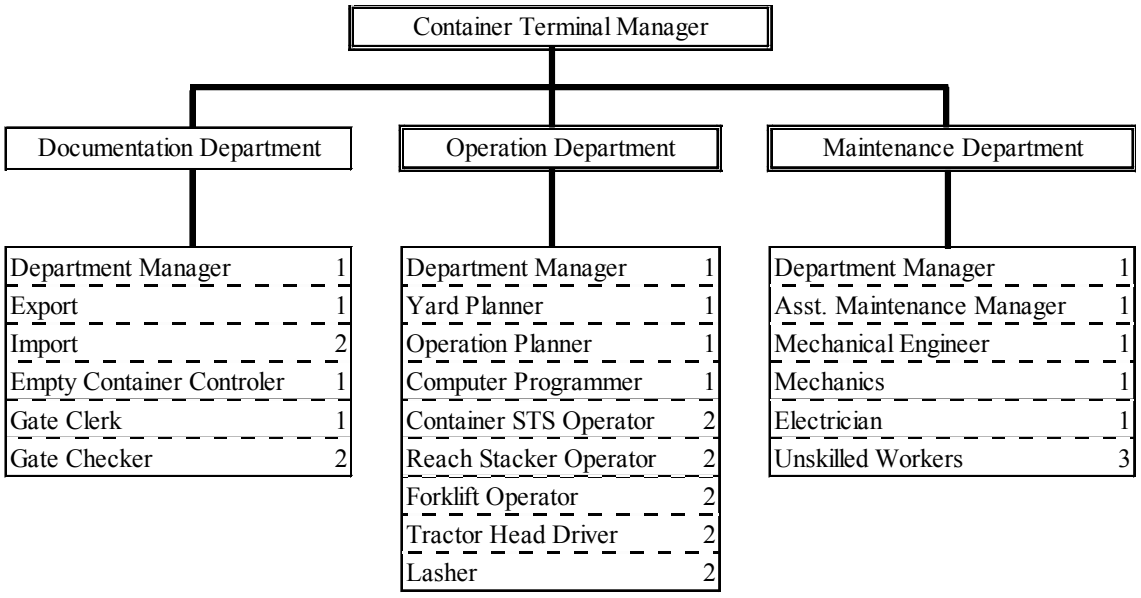


Figure 11.45: Organization for Container Terminal Operation

For the ship repair facility operation, the organization should be established as shown in the organization chart below.

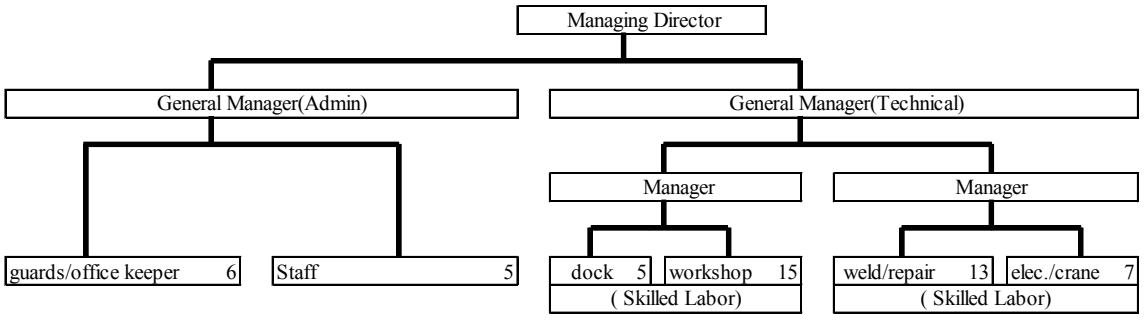


Figure 11.46: Organization for Operation of Ship Repair Facility

11.5.2 Operation and Maintenance Cost of Project Components

(1) Operation and Maintenance Cost of Container Terminal

The fuel cost of the container terminal operation is computed in the table below:

Table 11.29: Fuel Cost of Container Handling Equipment

Equipment	Output (KW)	Output (PS)	FO Consumption Ratio (g/hr/PS)	Working Hours per day	Working Hours per year	FO Consumption per year (ton)	FO Consumption per year (kl)	Fuel Price per kl (US$)	Fuel Cost per year (US$)	No. of Vehicles	Total Fuel Cost per year (US$)
Mobile Container STS Crane	450	611	160	5	1,825	178	223	1,800	401,400	2	802,800
Reach Stacker	250	340	160	10	3,650	199	249	1,800	448,200	2	896,400
Multi-purpose Forklift	64	87	160	10	3,650	51	64	1,800	115,200	2	230,400
Tractor Head		410	160	5	1,825	120	150	1,800	270,000	5	1,350,000
Terminal Chassis		0								5	0
Total									964,800		1,929,600

For financial analysis, the third of the above cost is applied in consideration of the working conditions.

The personnel cost to operate the container terminal is estimated in the table below:

Table 11.30: Personnel Cost for Container Terminal Operation

Organization and Positions	Person	Cost per day (BIF)	Cost per month (1000 BIF)	Cost per year (1000 BIF)	Cost per year (US$)
1 Terminal Management					
Container Terminal Manager	1	80,000	1,760	21,120	15,100
Secretary	1	30,000	660	7,920	5,700
2 Documentation Department					
Manager	1	50,000	1,100	13,200	9,400
Export	1	30,000	660	7,920	5,700
Import	2	30,000	1,320	15,840	11,300
Empty Container Controler	1	15,000	330	3,960	2,800
Gate Clerk	1	15,000	330	3,960	2,800
Gate Checker	2	9,500	418	5,016	3,600
3 Operation Department					
Manager	1	50,000	1,100	13,200	9,400
Yard Planner	1	30,000	660	7,920	5,700
Operation Planner	1	30,000	660	7,920	5,700
Computer Programmer	1	15,000	330	3,960	2,800
Container STS Operator	2	9,500	418	5,016	3,600
Reach Stacker Operator	2	9,500	418	5,016	3,600
Forklift Operator	2	9,500	418	5,016	3,600
Tractor Head Driver	2	9,500	418	5,016	3,600
Lalsher	2	9,500	418	5,016	3,600
4 Maintenance Department					
Maintenance Manager	1	50,000	1,100	13,200	9,400
Asst. Maintenance Manager	1	30,000	660	7,920	5,700
Mechanical Engineer	1	50,000	1,100	13,200	9,400
Mechanics	1	15,000	330	3,960	2,800
Electrician	1	15,000	330	3,960	2,800
Unskilled Workers	3	8,000	528	6,336	4,500
Total Personnel Cost per year (US$)					132,600

(2) Operation and Maintenance Cost of Ship Repair Facility

Yearly operation and maintenance costs are estimated as follows.

Maintenance Cost

Facility Total (USD)	%	Maintenance Cost (USD)	Remark
5,410,000	4.0	**216,400**	

Labor Cost

Name	No.	Wage/day (BIF)	Amount (BIF Year)	Labor Cost (USD/Year)	Remark
Managing Director	1	80,000	21,120,000	15,100	
General Manager	2	50,000	26,400,000	18,900	(*1)
Manager	2	30,000	15,840,000	11,300	(*2)
Worker(Skilled Labor)	45	15,000	178,200,000	127,300	(*3)
Guards/Office Keeper	6	8,000	12,672,000	9,100	
Total	56		254,232,000	181,700	incl. VAT 18%
Company Profit/Expense (%)			30.0%	**236,200**	

(*1) Administration 1, Technical 1
(*2) Technical 2
(*3) Administration 5,
Technical 40 (Dock 5, Workshop 15, Weld/Repair 13, Crane/Elec. 7)

Organization chart is shown in Figure 11.45.

Generator Cost

Fuel Oil	Marine Diesel Oil	Remark
FOC Ratio	160	(g/ps/h)
Working days	264	22 days/m × 12
Hours	2,640	10 h/d
PS	267.4	
FOC(g)	112,933,200	
Litre	141,167	sg=0.8
Cost/kL (USD)	1,800	
FO Cost/Year (USD)	**254,100**	

The above FO Cost corresponds to yearly electric cost of the factory.

Supply & Consumables

Items	Unit Price (USD)	Quantity	Expense (USD)	Remark
O2	100	50	5,000	40L Bottle
Gas	100	50	5,000	40L Bottle
Fresh Water	0	-	0	
Total			**10,000**	

Cost of fresh water is not considered.

Depreciation

Facility Total (USD)	Year	Depreciation (USD)	Remark
5,410,000	30	**162,300**	10% book value remain

Summary

Total Operation Cost

ITEM	Yearly Cost (USD)
1. Maintenance Cost	216,400
2. Labor Cost	236,200
3. Generator Cost	254,100
4. Supply/Consumables	10,000
5. Depreciation	162,300
Total Cost (Year)	**879,000**

Registered ships in Bujumbura Port consist of 11 numbers of active cargo ships or tug boats, and 10 barges which are moored to shore, at present. Active ships shall have the government inspection annually by domestic regulation. In addition, each ship has her own repair works, which have to be remedied during on the slipway. This repair works and/or fee of ship conversion shall be the profit of the company by their own tariff.

It seems to be possible enough to give the 15% profit to the company after bearing the above operation costs, having constant repair/inspection of active ships, and conversion ships occasionally, as stated below.

Among the operation costs, generating cost for electric takes the biggest portion, therefore repair yard company shall always try to minimize the Fuel Oil Consumption of diesel engines for cost saving.

(3) Maintenance and Repair Cost of Construction Works

Maintenance and repair cost of civil facilities of Bujumbura Port shows Table 11.31. And the breakdown of each item is shown the following tables.

Table 11.31: Maintenance and Repair Cost of Civil Facilities

ITEM		Unit	Quantity	Unit Price (USD)	Amount (USD)
	Maintenance and Repair Cost per year of Civil Facilities				
a)	Storm Water Canal	year	1		1,040
b)	Maintenance Dredging	year	1		5,000
c)	Container Terminal	year	1		2,210
d)	Ship Repair Facility	year	1		0
e)	Deepening of general Cargo Berths	year	1		0
f)	Inner Port Road	year	1		5,600
	TOTAL				13,850

Storm-water Canal

Table 11.32: Maintenance Cost of Storm Water Canal for 30 Years

ITEM			Unit	Quantity	Unit Price (USD)	Amount (USD)	Remarks
		For 30 years	times	60	520	31,200	2×30
	Cost for one time		year	1	1/30	1,040	
1	Foreman		men	1	65	65	
2	Clerk		men	2	6	12	
3	Common Labor		men	15	5	75	
4	Driver		men	1	8	8	
5	Truck	operate 2 hrs	day	0.5	300	150	
6	Fuel	2×25	ℓ	50	1.8	90	
	subtotal					400	
7	Over head		%	30		120	
	Total					520	

Dredging of Port Basin

Table 11.33: Maintenance Cost of Port Basin for 30 Years

	ITEM		Unit	Quantity	Unit Price (USD)	Amount (USD)	Remarks
	For 30 years		times	6	24,960	149,760	1 time/5 years
			year	1	1/30	4,992	
	Cost for one time					5,000	
A	Maintenance Dredging						
1	Dredging	160 m × 10 m × 1 m depth	m^3	1,600	12	19,200	
2	Over head		%	30		5,760	
	Total					24,960	
B	For revetment No maintenance for 30 years						

Construction of Container Terminal

Table 11.34: Repair Cost of Container Terminal for 30 Years

	ITEM		Unit	Quantity	Unit Price (USD)	Amount (USD)	Remarks
		For 30 years	times	10	6,630	66,300	
			year	1	1/30	2,210	
	Cost for one time						
A	Yard repair	for 5,000 m^2					
1	Foreman		men	20	65	1,300	
	Clerk		men	40	6	240	
	Common Labor		men	200	5	1,000	
	Driver		men	20	8	160	
	Truck	operate 2 hrs	day	5	300	1,500	
	Fuel	8 hrs × 25	ℓ	500	1.8	900	
	Sub total					5,100	
	Over head		%	30		1,530	
	Total					6,630	
B	No need to repair berth						
C	No need to repair berth for accessories						

Civil Works of Ship Repair Facilities

Nothing is to repair the facilities for 30 years

Deepening of General Cargo Berths

Nothing is to repair the facilities up to 2045 year.

Inner Port Road

Table 11.35: Repair Cost of Inner Port Road for 30 Years

	ITEM		Unit	Quantity	Unit Price (USD)	Amount (USD)	Remarks
		For 30 years	times	1	167,326	167,326	
			year	1	1/30	5,578	
	Cost for one time					5,600	
	Repair for 150 m						
1	Asphalt	material	m^3	225	500	112,500	
2	Asphalt	Placing	m^2	2,250	2.4	5,400	
3	Upper Sub base course	material	m^3	340	30.00	10,200	
4	Upper Sub base course	execution	m^3	340	1.80	612	
	Sub Total					128,712	
5	Over Head		%	30		38,614	
	Total					167,326	

11.5.3 New Building and Conversion on Ships

All facility is also available to use for new ship building or ships conversion works, however, in case of new building or conversion, as it occupies the slipway for long time (1-year or more), a practical and flexible countermeasure will be needed to consider. For example, only underwater survey can be postponed until new building is completed subject to permission by government.

In case of conversion work of barges to propelled type, simultaneous works seem to be possible by shifting the barge to upper end of slipway for building only engine room and propeller, while repair/inspection ships are using lower half of slipway, as illustrated below.

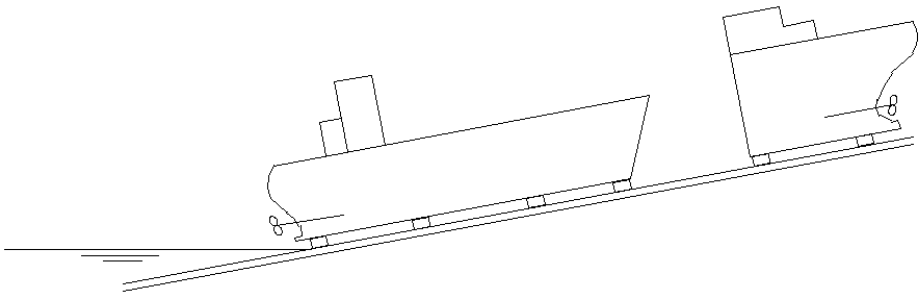


Figure 11.47: Illustlation of Slipway

11.6 Financial Analysis

11.6.1 Purpose and Methodology for Financial Analysis

As proposed in Chapter 8, the primary goal of the Master Plan is set "***to reduce the cost and increase the effectiveness of international transportation by modernization of transportation on Lake Tanganyika***". Therefore, financial analysis must explore not only financial feasibility but also cost factors like transaction costs in port activities.

As the current port operation has been carried out by the concessionaire and a concession scheme expects to continue, it is essential to meet the financial requirements of the stakeholders such as the government and the private sector (a concessionaire). However, the purpose of the financial analysis is set to examine financial aspects of ***the project***, instead of financial simulation of a concessionaire who will be responsible for whole activities (not only shipment activities but truck station activities[1]) in the Port of Bujumbura.

Taking the above into account, the following major aspects are explored.

- The soundness and profitability of the project cash flow are verified by Financial Internal Rate of Return (hereinafter referred as FIRR)[2]. An analysis is conducted in order to determine whether the project cash flow itself provides sufficient return.

[1] Revenue from handling charge related to truck activities accounts almost 70% of whole revenue from handling charge in the port of Bujumbura (E.P.B. (2011) *Report de Commissariat aux Comptes, periode du 1 janvier au 31 december 2011*)

[2] For examination of profitability, FIRR is used. FIRR is an indicator to analyze the financial affordability, which allow for comparisons among several options. FIRR is commonly used to evaluate the desirability of projects. The higher a project's internal rate of return is the more desirable to be undertaken. Two types of FIRR (Project IRR, Equity IRR) are commonly used to measure the rate of return. Project IRR represents the weighted average cost of capital for a project. It is usually calculated from all of the non-financing project cash flows, including capital costs, operating and maintenance costs, revenues and working capital adjustments. The Equity IRR represents the return to investors after taking account of debt service. In this exercise, Project IRR is applied.

- It is examined whether/what extents a gap fund from public institutions (e.g. grants from donors) are needed for a preparation of whole infrastructure which copes with future traffic demand, vis-à-vis what components a concessionaire should bear. In another word, demarcation of Public-Private is explored.
- As cost factors in the port operation, the level of tariff as one of major transaction cost is tested.

In Chapter 11.1, Short-term Development Plant is selected as most feasible options by semi-qualitative assessment. This section examines such plan from financial viewpoints for considerations by the Government of Burundi, as well as JICA.

In this section, first assumptions/conditions which would determine preciseness of analysis and options are elaborated in Chapter from 11.6.2 to 11.6.4. Then, based on those assumptions financial models are run are figured out in Chapter 11.6.5. As conclusion of this section, outcomes of financial analysis are discussed in Chapter 11.6.6.

11.6.2 General Assumptions and Conditions

i) Coverage of the project for the financial analysis

As mentioned above, this analysis focuses on the financial aspects of *the project*, not the whole port activities which has currently been operated. Therefore, the coverage of financial analysis is as follows;

[Revenue]

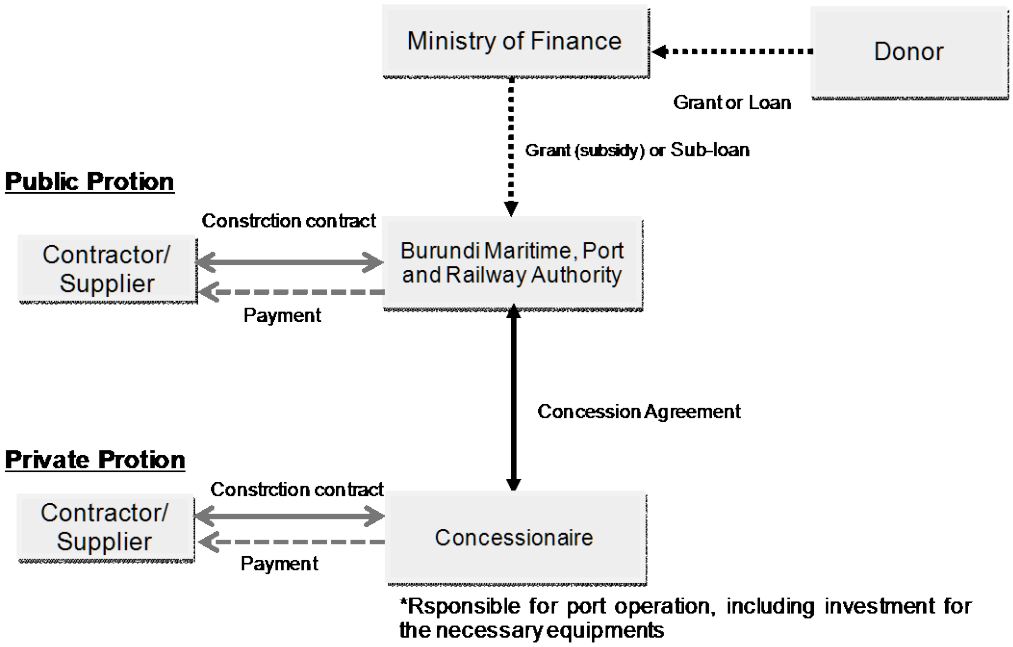
- Revenue from the shipment activities (revenues from handling and storage based on tariff)
- Revenue from the ship repair activities
- Revenue from the truck activities (parking, loading/unloading), non-operating income and other income are not considered in the analysis.

[Expense]

- Capital expenses (initial cost) proposed in Chapter 11.4
- Operational expenses related to the shipment and the ship repair activities

ii) Fund Flow

The fund flow for the project is show in the below figure.



Source: JICA Study Team

Figure 11.48: Fund Flow

iii) Project life

Project life is set as 30 years from 2014 (commencement of preparation works).

iv) Project Schedule

The construction period will be from 2014 to 2015. Operation will commence in 2016 until 2043.

v) Inflation Rate

Inflation rate 5% is assumed.

Basis of the assumption is that inflation rate is expected to decline gradually stabilize at about 5 percent over the long term[3], although average growth rate of the inflation in the past nine years was 9.27% (see Table 11.36).

Table 11.36: Inflation Rate

2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
−1.4	10.8	7.9	13.5	2.8	8.3	24.1	11	6.4	9.27%

Source: The World Bank (http://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?page=1)

vi) Exchange rate

BIF is applied for all calculation in financial analysis.

BIF 1,400 = 1 USD

vii) Tax

Corporate income tax rate is 35%. Other tax (VAT, and so on) is not taken into account in the financial analysis.

[3] IMF (2010) *Main Macroeconomic Assumptions, 2010–30, Joint IMF/World Bank Debt Sustainability Analysis 2010*

11.6.3 Assumptions for Cash Flow

(1) Cash Inflow

i) Traffic Volume

The demand forecast for container and bulk indicated in Chapter 4.1 will be used as the base traffic volume.

ii) Handling charges

The following charges are set upon referring a current tariff "TARIFS DEL'EXPLOITATION DU PORT DE BUJUMBURA (no 750/330/C.M./2007).

Container

BIF 75,300/40 foot container
BIF 42,350/20 foot container
BIF 7,030/Empty container

Assumptions for financial analysis

- Charge including ship-to-stack, stack-vehicle/ground, and truck to the storage area
- Tariff "20 tons and over" is applied to a 40 foot
- Tariff "from 15 tons to 19.999 tons" is applied to a 20 foot
- Tariff "less than 5 tons" is applied to an empty container

Bulk

BIF 2,380/ton for goods in imports
BIF 1,180/ton for goods in exports
BIF 2,380/ton for goods in transit

Assumptions for financial analysis

- Tariff for "import goods in bags" (BIF 2,380 per tons) is applied to all import goods.
- Tariff for "coffee" (BIF 1,180 per tons) is applied to all export goods.
- Tariff for "import goods in bags" (BIF 2,380 per tons) is applied to all transit goods.

iii) Storage charges

The following charges are set upon referring a current tariff "TARIFS DEL'EXPLOITATION DU PORT DE BUJUMBURA (no 750/330/C.M./2007).

Container (Import)

BIF 0 (free)/day/container: during a period of 7 days from the date of arrival
BIF 3,540/day/container: from 8 to 14 days

Assumptions for financial analysis

- This tariff is applied to 20 foot container. A tariff for another container is adjusted in proportion to the area occupied by containers (40 foot container: 1.5 times of 20 foot container)
- A period of storage for imported container is assumed ten (10) days (i.e. chargeable for 3 days).

Container (Export)

BIF 0 (free)/day/container: during a period of 10 days from the date of arrival
BIF 2,380/day/container: from 11 days

Assumptions for financial analysis
- This tariff is applied to 20 foot container. A tariff for another container is adjusted in proportion to the area occupied by containers
- A period of storage for imported container is assumed one (1) day.

Container (Transit)

BIF 0 (free)/day/container: during a period of 14 days from the date of arrival
BIF 3,510/day/container: from 15 to 30 days

Assumptions for financial analysis
- This tariff is applied to 20 foot container. A tariff for another container is adjusted in proportion to the area occupied by containers
- A period of storage for imported container is assumed fifteen (15) day (i.e. chargeable for 1 day).

Bulk in warehouse (Import)

BIF 0 (free)/tons/day: during a period of 7 days from the date of arrival
BIF 110/tons/day: from 8 to 14 days
BIF 600/tons/day: from 15 days until the removal

Assumptions for financial analysis
- This tariff is applied to 20 foot container. A tariff for another container is adjusted in proportion to the area occupied by containers
- A period of storage for imported container is assumed thirty (30) days.

Bulk in warehouse (Export)

BIF 0 (free)/tons/day: during a period of 10 days from the date of arrival
BIF 110/tons/day: from 11 to 60 days

Assumptions for financial analysis
- This tariff is applied to 20 foot container. A tariff for another container is adjusted in proportion to the area occupied by containers
- A period of storage for imported container is assumed thirty (30) days.

Bulk in warehouse (Transit)

BIF 0 (free)/tons/day: during a period of 14 days from the date of arrival
BIF 600/tons/day: from 15 to 30 days

Assumptions for financial analysis
- This tariff is applied to 20 foot container. A tariff for another container is adjusted in proportion to the area occupied by containers
- A period of storage for imported container is assumed sixteen (16) days.

iv) Weighing

Container

BIF 48,000/40 foot container
BIF 24,000/20 foot container

Assumptions for financial analysis
- Tariff "a long truck or truck trailer chassis for BIF 48,000" is applied to a 40 foot
- Tariff "a single truck for BIF 24,000" is applied to a 20 foot

Bulk

BIF 200/ton

Assumptions for financial analysis
- Tariff "a single truck" is regarded 12 tons per a truck.

v) Harbor dues

BIF 3,555/ship

Assumptions for financial analysis
Tariff "Class D: length of ship is 50m to 60m" is applied in consideration with the average size of the fleet.

vi) Inspection/Repair in ship repair facility

Revenue from repair in the ship repair facility is assumed BIF 1,003,380,000 per year.

Assumptions for financial analysis
- Bottom inspection regulated the domestic rule (once a year): for 11 ships per year
- Repair for malfunction ships at the slipway and/or work shop, if damages are fund at inspection
- Operation for 300 days per year

(2) Cash Outflow

i) Capital Expense

Total capital expenditures are summarized in the below respectively.

Table 11.37: Capital Expense Summary

	Civil Works	Equipment	TOTAL
Diversion of Stormwater Canal	2,437,245,763	0	2,437,245,763
Dredging of port basin	924,925,424		924,925,424
Container Terminal	15,746,440,678		15,746,440,678
Container Handling Equipment		12,972,400,000	12,972,400,000
Revetment	3,176,600,000		3,176,600,000
Port Road	1,205,008,475		1,205,008,475
Ship Repair Facitity	6,910,364,407	7,266,056,000	14,176,420,407
Contingency	5,063,904,075		5,063,904,075
Consultant cost (D/D, S/V)	5,063,904,075		5,063,904,075
Total	40,528,392,895	20,238,456,000	60,766,848,895

Source: JICA Study Team

ii) Allocation of Construction Works

Table 11.38: Allocation of Construction Works

Construction Years	2014	2015
%	40%	60%

Source: JICA Study Team

iii) Operational expenses

Assumption for financial analysis

- Annual fuel cost for container operation (mobile crane, folk lift and so on) are BIF 897,120,000 (60 boxes per day basis)
- Annual personal cost for container operation are BIF 185,640,000 (60 boxes per day basis)
- Annual fuel cost for equipments in bulk operation are BIF 89,000,000 (year 2010 basis), which gradually increase in correspondence with feature traffic volume
- Annual fuel cost for vehicle in bulk operation are BIF 32,800,000 (year 2010 basis), which gradually increase in correspondence with feature traffic volume
- Annual operation and maintenance cost (labour, electricity, etc) for slipway and workshop are BIF 1,003,380,000
- Inflation is applied to the above operational expense during the project period.

iv) Depreciation

Assets in private will be amortized within the project period.

v) Concession fees

Concession fees to the Government are assumed as zero (BIF0) in the financial analysis.

11.6.4 Options

Several scenarios are compared to validate the financial feasibility of the project. The following 6 Scenarios based on variations of funding source (ODA or the private investment) will be analyzed in 11.6.5(3)

i) Case 1

Case 1 is scenario that all components of the project are financed by private (a concessionaire) without public fund (ODA).

Table 11.39: Case 1

Case 1		
	Public	Private
Container Terminal (Civil)		○
Dredging of port basin/Revetment/Port Road (Civil)		○
Container Handling Equipmen (Equipments)		○
Ship Repair Facitity (Civil)		○
Ship Repair Facitity (Equipments)		○
Diversion of Stormwater Canal (Civil)		○
Contingency		○
Consaltant cost (D/D, S/V)		○
Operation & Mauntenace		○

Source: JICA Study Team

ii) Case 2

Case 2 is scenario that components related to civil works are borne by a public, while other components corresponding to equipments (container cranes, equipments for slipway) are financed by a private (a concessionaire).

In line with landlord principle, funding to preparations of base infrastructure is made by public, private portion are financed by a concessionaire/operator. Private portion cover superstructure and equipments, as well as operation and maintenance cost.

Table 11.40: Case 2

Case 2		
	Public	Private
Container Terminal (Civil)	○	
Dredging of port basin/Revetment/Port Road (Civil)	○	
Container Handling Equipmen (Equipments)		○
Ship Repair Facitity (Civil)	○	
Ship Repair Facitity (Equipments)		○
Diversion of Stormwater Canal (Civil)	○	
Contingency	○	
Consaltant cost (D/D, S/V)	○	
Operation & Mauntenace		○

Source: JICA Study Team

iii) Case 3

Case 3 is scenario that component related to civil works and equipments for slipway (ship repairmen facility) are constructed by a public, and container cranes are financed by a private (a concessionaire).

In line with landlord principle, funding to preparations of base infrastructure is made by public, private portion are financed by a concessionaire/operator. Private portion cover superstructure and equipments, as well as operation and maintenance cost.

Table 11.41: Case 3

Case 3		
	Public	Private
Container Terminal (Civil)	○	
Dredging of port basin/Revetment/Port Road (Civil)	○	
Container Handling Equipmen (Equipments)		○
Ship Repair Facitity (Civil)	○	
Ship Repair Facitity (Equipments)	○	
Diversion of Stormwater Canal (Civil)	○	
Contingency	○	
Consaltant cost (D/D, S/V)	○	
Operation & Mauntenace		○

Source: JICA Study Team

iv) Case 4

Case 4 is scenario that ship repairmen facilities both civil works and equipments are excluded from the project, then components related to civil works are constructed by a public, while container cranes are financed by a private (a concessionaire).

In line with landlord principle, funding to preparations of base infrastructure is made by public, private portion are financed by a concessionaire/operator. Private portion cover superstructure and equipments, as well as operation and maintenance cost.

Table 11.42: Case 4

Case 4		
	Public	Private
Container Terminal (Civil)	○	
Dredging of port basin/Revetment/Port Road (Civil)	○	
Container Handling Equipmen (Equipments)		○
Ship Repair Facitity (Civil)	–	–
Ship Repair Facitity (Equipments)	–	–
Diversion of Stormwater Canal (Civil)	○	
Contingency	○	
Consaltant cost (D/D, S/V)	○	
Operation & Mauntenace		○

Source: JICA Study Team

v) Case 5

Case 5 is scenario that all components of the project are financed by public fund (ODA).

Table 11.43: Case 5

Case 5		
	Public	Private
Container Terminal (Civil)	○	
Dredging of port basin/Revetment/Port Road (Civil)	○	
Container Handling Equipmen (Equipments)	○	
Ship Repair Facitity (Civil)	○	
Ship Repair Facitity (Equipments)	○	
Diversion of Stormwater Canal (Civil)	○	
Contingency	○	
Consaltant cost (D/D, S/V)	○	
Operation & Mauntenace		○

Source: JICA Study Team

vi) Case 6

Case 5 is scenario that ship repairmen facilities both civil works and equipments are excluded from the project, and all components of the project are financed by public fund (ODA).

Table 11.44: Case 6

Case 6		
	Public	Private
Container Terminal (Civil)	○	
Dredging of port basin/Revetment/Port Road (Civil)	○	
Container Handling Equipmen (Equipments)	○	
Ship Repair Facitity (Civil)	–	
Ship Repair Facitity (Equipments)	–	
Diversion of Stormwater Canal (Civil)	○	
Contingency	○	
Consaltant cost (D/D, S/V)	○	
Operation & Mauntenace		○

Source: JICA Study Team

11.6.5 Financial Outcomes in Each Case

To compare financial aspects in each case, financial analysis is done. The followings are the outcomes from the analysis.

(1) Total Project Cost and Profitability by Demarcation of Public-Private

Total project cost (total capital expenses and operation expenses), total revenue and FIRR in each case are calculated and summarized in the below table. In general, in case of examining comparative analysis of profitability for several cases, indicator FIRR is commonly used.

As shown in the below table, FIRR in Case 1 is impossible to calculate, because no financial return is generated through the project period (i.e. the total revenues are smaller than total capital expense/operational expenses).

Case 2, 3 and 4 indicates low level of FIRR, since cash flows does not generate enough return due to the low level of the current tariff structure[4].

Cash flow of Case 5 and 6 are quite soundness, which could be recognized as highly profitable. However, FIRR in Case 5 cannot be calculated due to FIRR's characteristics of calculation system. Because Case 5 doesn't have any investment in its cash flow in private, therefore internal return from investment is, by nature, not exist.

Table 11.45: Total Project Cost and IRR

Unit: BIF

	Total Capex (Public)	Total Capex (Private)	Total Opex (Private)	Total Reveneu (Private)	Net cashflow (Private)	IRR (Private)
Case 1	0	60,766,848,895	146,608,328,194	177,335,065,520	▲ 30,040,111,569	*Negative (impossible caluculation)*
Case 2	40,528,392,895	20,238,456,000	146,608,328,194	177,335,065,520	4,884,432,403	*1.91%*
Case 3	47,794,448,895	12,972,400,000	146,608,328,194	177,335,065,520	10,088,662,327	*5.37%*
Case 4	30,782,744,407	12,972,400,000	88,008,344,695	113,192,809,366	5,501,703,150	*4.07%*
Case 5	60,766,848,895	0	146,608,328,194	177,335,065,520	19,205,030,551	*Positive (impossible caluculation)*
Case 6	43,755,144,407	0	88,008,344,695	113,192,809,366	14,834,972,750	*Positive (impossible caluculation)*

Source: JICA Study Team

(2) The Level of Tariff

i) Expected tariff level for Case 1 to Case 5

As shown in the previous section, FIRR itself is not perfect to carry out comparative analysis for each case. Therefore, in this exercise, appropriate level of tariff to satisfy profitability is tested. For the purpose of this exercise, tariff levels gradually increase up to FIRR 15% which a concessionaire can secure its financial return.

The outcomes in each case are summarized in the below respectively.

[4] The tariff of the port of Bujumbura is the lowest in the region. For comparison, Rwanda (MAGERWA) which are in similar condition to the Port of Bujumbura, charge 17 U.S. dollars per ton, while the E.P.B. bills to less than 4 U.S. dollars. (E.P.B. (2010) *Rapport annuel d'activité 2010, SOCIETE CONCESSIONNAIRE DE L'EXPLOITATION DU PORT DE BUJUMBURA*)

Table 11.46: Tariff Levels to Reach IRR 15%

Unit: BIF

	Total Capex (Public)	Total Capex (Private)	Total Opex (Private)	Tariff level % of increase to reach IRR 15%	Reveneu after tariff revision (Private)	IRR
Case 1	0	60,766,848,895	146,608,328,194	**528%**	661,800,289,608	*15.00%*
Case 2	40,528,392,895	20,238,456,000	146,608,328,194	**216%**	308,683,724,385	*15.00%*
Case 3	47,794,448,895	12,972,400,000	146,608,328,194	**159%**	244,118,823,046	*15.00%*
Case 4	30,782,744,407	12,972,400,000	88,008,344,695	**161%**	182,240,423,080	*15.00%*
Case 5	60,766,848,895	0	146,608,328,194	**already reached**	N/A	*15.00%*
Case 6	43,755,144,407	0	88,008,344,695	**already reached**	N/A	*15.00%*

Source: JICA Study Team

(3) Analysis

To access financial characteristics of each case, the analysis focuses on the following key aspects;

- Extent of financial burden in Public and/or Private
- Tariff levels

i) Case 1

In the case that all components of the project are financed by private (a concessionaire) without public fund (ODA), private will bear a large amount of financial burden for initial costs (capital expenses), which are summed up B IF 60,766 million. Taking the risks (traffic volume risk, tariff collection risks, etc) into account, this case could be not realistic.

For a private to secure decent financial return (FIRR 15%), tariff level should increase almost 5.3 times more than the current level. Such jump in tariff would hinder the effort to reduce cost of international transportation.

ii) Case 2

This case assumes that components related to civil works are constructed by a public, while other components corresponding to equipments (container cranes, equipments for slipway) are financed by a private (a concessionaire). Public fund (ODA) is amounted to BIF 40,528 million, and investments by private are summed BIF 20,238 million. Financial burden in private is still significant, so there remain doubts whether private can invest such amount.

This case also does not generate the cash flow which is necessary for the private portion, to secure decent financial return (FIRR 15%), tariff level should increase almost 2.2 times of the current level. Rising tariffs would affect to transaction cost in transportation on Lake Tanganyika.

iii) Case 3

In this case, it is assumed that component related to civil works and equipments for slipway (ship repairmen facility) are constructed by a public, and container cranes are financed by a private (a concessionaire). Public fund (ODA) is amounted to BIF 47,794 million, while investments by a private are summed BIF 12,972 million. Like Case 1 and 2, total operation expenses are significant. It is estimated BIF 146,608 million for 28 years operation, which container operation accounts for almost 35 percent, slipway operation for around 40 percent of whole operation expenses.

This case also does not generate the cash flow required to invest private portion. To secure decent financial return (FIRR 15%), tariff level should increase almost 1.6 times more than the current level.

iv) Case 4

It is assumed that components related to civil works are constructed by a public, while container cranes are financed by a private (a concessionaire). Ship repair facilities both civil works and equipments are excluded. Public fund (ODA) is amounted to BIF 30,782 million, and investments by a private are summed BIF 12,972 million. Total operation expenses are comparably manageable. It is estimated BIF 88,008 million for 28 years operation, total operation expenses in first year of operation (in 2016) stand BIF 953 million.

In this case, ship repair facilities are excluded from the project, although the age of the fleet is pointed out as insecurity. In the section for assumption, both the amount of revenues from ship repair and a level of operational cost are assumed, but it must be said that exact prediction of revenues from this operation is difficult. If falling into high operation costs with less revenue, there are risks that such facilities will not be utilized. Private investor might not choose such unpredictable business.

This case also does not generate the cash flow required to invest private portion. To secure decent financial return (FIRR 15%), tariff level should increase almost 1.6 times more than the current level.

v) Case 5

In case that all components of the project are financed by public fund (ODA) without a private fund (from a concessionaire), profitability of the project is quite high thanks to no investment cost in a private. On the other hand, Public will bear a large amount of financial provision for initial costs (capital expenses), which are summed up BIF 60,766 million.

As private already secure profitability, tariff level does not have to increase from the current level. It should be remarked that cash flow in private could get a margin to pay concession fee to public from the profit during the project period[5].

vi) Case 6

In case that components except Ship repair facilities both civil works and equipments are financed by public fund (ODA) without a private fund, profitability of the project is quite high thanks to no investment cost in a private. Public will have a moderate financial burden for initial costs (capital expenses), which is almost 70% of Case 5, and it is summed up BIF 43,755 million.

As private already secure profitability, tariff level does not have to increase from the current level. Like Case 5, cash flow in private could get a margin to pay concession fee to public from the profit during the project period.

11.6.6 Conclusion

Improving international connections is a top priority for Burundi as a highly landlocked country. However, in reality, the obsolescence of its infrastructures, the silting of the port, and the age of the fleet seriously affected navigation on Lake Tanganyika, although it is the most of the country's international trade passes. While modernization of the port of Bujumbura is a heart of improvement of the effectiveness of international transportation on Lake Tanganyika, it might be difficult to invest all facilities to cope with all obstacles surrounding the port due to financial situation.

[5] Exact concession fees cannot be determined at this stage, which will be set in the process of bidding for a concessionaire.

In order to realize the modernization of the port, various financial resources should be mobilized not only from the national budget and international assistance but also from domestic and international private investment.

To satisfy financial requirements, grants[6] from the donors could be possible options. But, in the decision making process for the provision of grants, the total project costs including operational expenses which would be borne by private should be adequately taken into account.

While the concession scheme expects to continue, investments by a concessionaire would be confined to the range of their profit from the operation during a certain period. Taking the current tariff levels (together with traffic volume risk) into account, it could not be expected that a large amount of investments from private will be made easily. In other words, in only a case where concessionaires judge that certain traffic volume and proper tariff levels can be secured, they could make a decision for a capital investment upon counting future profits which would be generated from the later stage of cash flow.

As shown in the above analysis, in all cases which concessionaires expect to invest for infrastructure (Case 1, 2, 3 and 4), financial feasibility cannot be verified. This is largely due to the low level of the current tariff structure and traffic volumes. For those reasons, the study team proposes Case 5 or 6 that all facilities are financed by grants.

In addition, the current tariff structure has not followed inflation, though inflation rate including fuel has been raised around 10% during the past decade. At lease the tariff should increase gradually upon considering the current trend of inflation.

11.7 Financial Plan

11.7.1 Principal Idea of Financial Plan

Public investment portion shall be financed by grants from donors. To secure operations by a concessionaire, swift funding to preparations of base infrastructure is essential. The Grant from the donors enables to meet urgent needs of financing public finance portion.

Conditions of the grant are;

- Coverage: 100 percent of the eligible portion
- Currency: US dollars

11.7.2 ODA Amount

As proposed in 11.6.6, financial plan for both Case 5 and 6 are provided in the below table. Selection of component should be made upon discussion between the Government of Burundi and donors. Disbursement is made according to the progress of the Project.

[6] Loans are unrealistic for the project because the project can not generate money to pay back debt services. IMF encourage the Government of Burundi to continue to rely on grants and highly concessional loans to meet financing needs, because that almost all other debt indicators will exceed their indicative debt burden thresholds (IMF (2010) *Staff Report for the 2010 Article IV Consultation*).

Table 11.47: Financial Plan (Case 5)

Ex. Rate: **1400.0** BIF/USD

Item No.	Description	Amount (BIF)	Amount (USD)	Remarks
(a)	Diversion of Stormwater Canal (civil works)	2,437,245,763	1,740,890	
(b)	Container Terminal (civil works)	15,746,440,678	11,247,458	
(c)	Dredging of port basin (civil works)	924,925,424	660,661	
(d)	Revetment (civil works)	3,176,600,000	2,269,000	
(e)	Port Road (civil works)	1,205,008,475	860,720	
(f)	Ship Repair Facitity (civil works)	6,910,364,407	4,935,975	
(g)	Ship Repair Facitity (equipment)	7,266,056,000	5,190,040	
(h)	Container Handling Equipmen (Equipment)	12,972,400,000	9,266,000	
(i)	Total (a)+(b)+(c)+(d)+(e)+(f)	50,639,040,746	36,170,743	
(j)	Contingency	5,063,904,075	3,617,074	
(k)	Consaltant cost (D/D, S/V)	5,063,904,075	3,617,074	
	Total (i)+(j)+(k)	60,766,848,895	43,404,892	

Table 11.48: Financial Plan (Case 6)

Ex. Rate: **1400.0** BIF/USD

Item No.	Description	Amount (BIF)	Amount (USD)	Remarks
(a)	Diversion of Stormwater Canal (civil works)	2,437,245,763	1,740,890	
(b)	Container Terminal (civil works)	15,746,440,678	11,247,458	
(c)	Dredging of port basin (civil works)	924,925,424	660,661	
(d)	Revetment (civil works)	3,176,600,000	2,269,000	
(e)	Port Road (civil works)	1,205,008,475	860,720	
(f)	Ship Repair Facitity (civil works)			Out of the project
(g)	Ship Repair Facitity (equipment)			Out of the project
(h)	Container Handling Equipmen (Equipment)	12,972,400,000	9,266,000	
(i)	Total (a)+(b)+(c)+(d)+(e)+(f)	36,462,620,339	26,044,729	
(j)	Contingency	3,646,262,034	2,604,473	
(k)	Consaltant cost (D/D, S/V)	3,646,262,034	2,604,473	
	Total (i)+(j)+(k)	43,755,144,407	31,253,675	

Chapter 12 Selection of Urgent Projects

12.1 Candidate Projects

This study identifies the following projects or procurements as necessary for the development of the port sector of Burundi:

To meet the cargo demand
- Container Terminal Construction
- Construction of Ship Repair Facility

To implement the above projects
- Diversion of Storm Water Canal

To improve the general cargo berths
- Rehabilitation of General Cargo Berths

To ensure safety of lake navigation
- Installation of Light Beacons
- Procurement of Rescue Boats

To improve the cargo handling
- Development of Rumonge Port

(1) Container Terminal Construction

As the JICA Study in Tanzania concludes that a container block train between Dar es Salaam and Kigoma will be operated in 2015. This is considered necessary to lower the transportation cost between the sea ports of East Africa and land locked countries like Burundi. A separate container block train will shuttle between Dar es Salaam and Isaka, to and from where containers of Rwanda will be transported by truck. Therefore, all the international containers to be transported by the container block train between Dar es Salaam and Kigoma are import and export containers of Burundi. Between Kigoma Port and Bujumbura Port, they will be transported daily by ship. International cargo for DRC will be negligible small up to 2030. The operation of the container block train between Dar es Salaam and Kigoma has a big impact on Bujumbura Port, as the port virtually handle no container at present.

A container terminal will be indispensable at Bujumbura Port after the container block operation starts. The terminal should be built to be independent of the existing port facilities, as containers and break bulk cargo cannot be handled at the same handling yard.

To handle stuffed 40 foot containers, the maximum weight of which is 35 tons, purpose-built container handling equipments are necessary. As the container terminal is of a small size, mobile container STS cranes and reach stackers are suitable.

(2) Construction of Ship Repair Facility

The container ships have to be operated according to the time schedule in order to transport the containers coming from and going to Dar es Salaam from Bujumbura Port via Kigoma Port. The operation will require 3 c ontainer ships in 2015. Moreover, there are active cargo ships and barges, 8 vessels in total, which will be in service between Bujumbura Port and Mpulungu Port, and occasionally Kasanga Port, on the north-south maritime route on Lake Tanganyika. They have to be in full operation to meet the cargo demand in 2015. Therefore, their annual

inspection including underwater survey has to be timely conducted without interruption, particularly of the scheduled operation of container ships.

Meanwhile, the slipway at Kigoma puts preference to the Tanzania fleet of vessels and also Kalemie Dry Dock has a navigation channel which is too shallow for the cargo ships of the Burundian fleet to navigate.

In this regard, the ship repair facility is necessary to be built in or before 2015.

(3) Diversion of Storm Water Canal

A storm water canal, called Buyenzi Canal, flows into the port basin and debouches sediments and debris; consequently the port basin is gradually getting shallower. Debouched sediments and debris require maintenance dredging. Without diversion of this storm water canal, the quay wall of the container terminal will continue getting shallower and the slipway of the ship repair facility will be embedded in the sediments. Therefore, the diversion of the Buyenzi canal is important to economically operate Bujumbura Port by reducing the maintenance cost.

(4) Rehabilitation of Existing General Cargo Berth

The existing general cargo berth was built in 1950's. The elevation of the quay wall and depth of water in front were supposedly based on the previous water elevation of the Lake Tanganyika. Therefore, the top elevation of the general cargo berths was determined to be +777.0 m. This elevation is lower than the highest water level of 777.07 m recorded in 1964. It is necessary to elevate the general cargo berths to cope with the highest water elevation of Lake Tanganyika.

Besides, the sediments accumulated in front of the berth prevents the largest cargo ship, MV Teza, to berth in fully loaded condition and all the fenders have been lost at present.

Therefore, the rehabilitation of the general cargo is necessary to ensure operation even at the time of the highest water recorded in 1964 and to avoid damages of ships when berthing. The rehabilitation works can be carried out as a mid-term development project, to be completed in 2025.

(5) Installation of Light Beacons

As reported in Chapter 9.2 Improvement of Marine Safety, all the light beacons which were installed at Bujumbura, Magara, Rumonge, and Nyanza-Lac are missing except for the south beacon at the entrance of Bujumbura Port, which is too dim to guide night navigation. As many fishing boats are utilized during night and early morning, light beacons with proper luminance should be installed. They would also enable Bujumbura Port to manage the cargo increase which may need night navigation in future.

(6) Procurement of Rescue Boats

Also as reported in Chapter 9.2 Improvement of Marine Safety, all the major marine accidents on the lake water near Burundi occurred along the coast of DRC because passengers exceeded the capacity of the ships. This is assumed due to the fact that there is no road along the coast of DRC for passenger transport, unlike in Burundi where people travel along National Road Route 3. However, marine accidents may take place along the coast of Burundi any time in future when the RoRo ships operated by a private sector gain popularity as lake transport. At present, however, there is no rescue boat for the BMPRA to employ in case a marine accident occurs. There are navy boats which can be mobilized for rescue operations but they are suffering from shortage of fuel and considered unavailable for accidents. It is necessary to keep one rescue boat each at Bujumbura and Rumonge to cover the entire Burundian coast.

(7) Development of Rumonge Port

The development of Rumonge Port is to improve cargo handling between shore and small wooden cargo ships mainly plying between Rumonge and the west shore of Lake Tanganyika in DRC. The construction of a jetty consisting of a causeway and berthing pontoon will reduce burdens of workers currently carrying cargo on their shoulders and wading between shore and ships. Therefore, the execution of the project mostly depends on the political decision.

(8) Summary of Candidate Projects

The above-mentioned project, accompanied with their completion year or procurement cost are summarized in the table below:

Table 12.1: Candidate Projects with Cost and Target Year

Year			Urgent	2015	2020	2025	Remarks
Project Components							
1	Container Terminal						As a container block train will be operated from 2015, at least one container berth with a container stacking yard and container handling equipment has to be built on or before 2015. Container handling equipment can be purchased by a concessionaire if operation concession is contracted.
	1.1	1st Berth including CY		✓			
		(Cost, million US$)		6.8			
	1.2	2nd Berth including CY			✓		
		(Cost, million US$)			6.8		
	1.3	Handling Equipment		✓			
		(Cost, million US$)		9.3			
2	Storm Water Diversion			✓			Storm Water Diversion has to be built at the same time with container terminal construction.
		(Cost, million US$)		1.7			
3	Ship Repair Facility						To meet container cargo demand from/to Kigoma Port, 3 container ships will be put into service in 2015. To ensure their regular service, Ship Repair Facility has to be built in 2015. Workshop quipped with machinery can be built by a concessionaire if workshop concession contracted
	3.1	Slipway		✓			
		(Cost, million US$)		4.9			
	3.2	Workshop with Equipment		✓			
		(Cost, million US$)		5.1			
4	Rehabilitation of G. Cargo Berths					✓	Exiting general cargo berths can be rehabilitated after container berths fully be operated to reduce burden of break bulk cargo.
		(Cost, million US$)				4.5	
5	Installation of Light Beacons		✓				This concerns navigation safety as well as the means to increase lake transport capacity by enabling night navigation.
		(Cost, million US$)	1.3				
6	Procurement of Rescue Boats		✓				This is concerned with safety of navigation
		(Cost, million US$)	0.2				
7	Development of Rumonge Port					✓	Development is intended to ease cargo handling between shore and small cargo ships.
		(Cost, million US$)				5.2	
		Total Cost (million US$)	1.5	27.8	6.8	9.7	

Notes: 1) Cost of 1st Berth and 2nd Berth are assumed 50% of total construction cost of container terminal.
2) Technically, construction of 2 berths by one contractor is more economical. In project implementation, therefore, 2 berths are assumed to be constructed under one project.

If concession contract is successfully contracted, container handling equipment and workshop machinery for the ship repair facility can be procured by the concessionaire.

12.2 Environmental Scoping of Candidate Projects

12.2.1 Environmental Scoping

(1) Port Bujumbura

The environmental scoping is carried out, based on both the project outline of the selected short-term port improvement projects and existing environmental and social conditions (see Table 12.2). It is noted that the selected project consists of following three components:

(a) Construction of slipway and relevant facilities (e.g., ship building, workshop)
(b) Construction of container berth and relevant facilities (e.g., container yard = 31,000 m^2)
(c) Diversion of Buyenzi Canal

It is noted that the environmental scoping for the proposed canal diversion is carried out due to its engineering features of that project, separately.

Table 12.2: Preliminary Environmental Scoping Results (Bujumbura Port Improvement)

Environmental Factor			Evaluation		Comments
			Construction	Operation	
Socio-Cultural Env	1	Involuntary Resettlement	D	D	
	2	Local Job Market and Economy	D	D	
	3	Land use and Utilization of Local Resources	D	D	
	4	Social Institutions	D	D	
	5	Existing social infrastructures and services	D	D	
	6	The poor	D	D	
	7	Indigenous of ethnic group	D	D	
	8	Misdistribution of benefit and damage	D	B	Minor effects on land transport delivery
	9	Cultural Heritage	D	D	
	10	Landscape	D	D	
	11	Local Conflict of interests	D	D	
	12	Water use/or water right	D	D	
	13	Genders	D	D	
	14	Children's right	D	D	
	15	Infectious Disease (e.g., HIV.AIDS)	B	D	Possibility of temporal spreading of infectious diseases due to construction workers.
	16	Working Environment	B	D	Need precaution for working safety.
Bio-Physical Env	17	Environmental Reserves	D	D	
	18	Regional Ecosystem	C	C	Loss of grass grazing places for hippopotamus. Disturbance to Hippopotamus habitat. Likely to relocate to nearby grass land.
	19	Hydrological Condition	B	D	Temporal disturbance of local drainage.
	20	Topography and Geology	D	D	
Pollution	21	Air Quality	B	B	Temporal roadside air quality degradation due to temporal increase of construction vehicle.
	22	Water Quality	A	B	Temporal water quality degradation due to earthwork/or dredging.
	23	Soil Contamination	A	D	Soil contamination sites (heavy metal) exits.
	24	Waste	A	D	Soil/sedimentation contamination (heavy metal) sites exist.
	25	Noise/Vibration	B	B	Temporal degradation of roadside noise/vibration environment due to temporal increase of construction vehicle.
	26	Ground subsidence	D	D	
	27	Obnoxious smell	B	D	Possibility of accidental spill of construction chemical
	28	River bed/Benthos	B	D	Dredging work inside/around existing port is planned.
Others	29	Accidents	B	B	Possibility of temporal increase of traffic accident due to temporal increase of construction vehicle.
	30	Trans-boundary effects and/or Global Warming	B	B	Temporal increase of CO2 loading during construction phase.

Note A: significant, B: major, C: minor, D: less significant, U: Unknown
Source: JICA Study Team, 2012

(2) Buyenzi Canal Diversion

The environmental scoping is carried out, based on both the project outline of the canal diversion project and existing environmental and social conditions (see Table 12.3). Typical

engineering features of this diversion project are as follows (see Chapter 11 of this report for more detailed descriptions).

Design Flood Flow = 11.55 m^3/sec.
Canal Diversion Length = 1,245 m
Channel Bottom Elevation at the Starting Point = 776.3 E.L.m
Channel Bottom Elevation at the Outlet Point = 775.6 E.L.m
Averaged Canal Gradient = 0.056 %
Canal Width = 4.5 m (water depth = 1.5 m)

Table 12.3: Preliminary Environmental Scoping Results (Buyenzi Canal Diversion)

Environmental Factor			Evaluation		Comments
			Construction	Operation	
Socio-Cultural Env	1	Involuntary Resettlement	D	D	
	2	Local Job Market and Economy	D	D	
	3	Land use and Utilization of Local Resources	D	D	
	4	Social Institutions	D	D	
	5	Existing social infrastructures and services	D	D	
	6	The poor	D	D	
	7	Indigenous of ethnic group	D	D	
	8	Misdistribution of benefit and damage	D	D	
	9	Cultural Heritage	D	D	
	10	Landscape	D	D	
	11	Local Conflict of interests	D	D	
	12	Water use/or water right	D	D	
	13	Genders	D	D	
	14	Children's right	D	D	
	15	Infectious Disease (e.g., HIV.AIDS)	B	B	Possibility of spreading of infectious diseases such as waterborne diseases and/or insect-borne diseases (e.g., Malaria).
	16	Working Environment	B	D	Need precaution for working safety.
Bio-Physical Env	17	Environmental Reserves	D	D	
	18	Regional Ecosystem	C	C	Loss of grass grazing places for hippopotamus. Disturbance to Hippopotamus habitat. Likely to relocate to nearby grass land.
	19	Hydrological Condition	B	B	Disturbance of local drainage.
	20	Topography and Geology	B	B	Interference with the Ntahangwa River
Pollution	21	Air Quality	B	D	Temporal roadside air quality degradation due to temporal increase of construction vehicle.
	22	Water Quality	B	B	Temporal water quality degradation due to earthwork/or dredging. Direct discharge of untreated city sewage after construction.
	23	Soil Contamination	A	D	Soil contamination sites (heavy metal) exits.
	24	Waste	A	D	Soil contamination (heavy metal) sites exist.
	25	Noise/Vibration	B	D	Temporal degradation of roadside noise/vibration environment due to temporal increase of construction vehicle.
	26	Ground subsidence	D	D	
	27	Obnoxious smell	D	B	Possibility of bad smell of untreated sewage water discharged at upstream site.
	28	River bed/Benthos	D	D	
Others	29	Accidents	B	D	Possibility of temporal increase of traffic accident due to temporal increase of construction vehicle.
	30	Trans-boundary effects and/or Global Warming	B	D	Temporal increase of CO_2 loading during construction phase.

Note A: significant, B: major, C: minor, D: less significant, U: Unknown
Source: JICA Study Team, 2012

(3) Impact on Hippopotamus Habitat

As mentioned in Chapter 9, several hippopotamus are observed around the aquatic vegetation area, near to Naval Base at Port Bujumbura. Those hippopotamus use open grass land, located inside of Port Bujumbura, as part of their feeding places, and it is most likely those grass grazing lands will be disappeared due to the implementation of the proposed port improvement plan.

There are many aquatic vegetation places around Port Bujumbura, and some of those hippopotamus move along the lake shoreline quite frequently (see Source: This Study, 2012). So, it is expected that those hippopotamus would relocate their habitats to nearby grassland area during and/after the implementation of the proposed port improvement project.

Lakeside vegetation around Port Bujumbura

Herd of hippopotamus observed at Bujumbura City

Source: This Study, 2012

Photo 12.1: Lakeside Vegetation and Hippopotamus

(4) Port Rumonge

The environmental scoping is carried out, based on both the project outline of the selected short-term port improvement project and existing environmental and social conditions (see Table 12.4). It is noted that the selected project consists of following three components:

(a) Construction of causeway (L = 90 m, W = 9 m)
(b) Construction of relevant port facilities (e.g., Port Office, Opening storage)
(c) Construction of mooring pontoon (20 m x 30 m) and its movable bridge (L = 10 m)

Proposed causeway mainly consists of large-sized rock (i.e., local material) which would allow for the creation of spaces therein (the averaged porosity is of around 30%), and, thus, will not be hamper the local coastal currents severely.

Table 12.4: Preliminary Environmental Scoping Results (Port Rumonge Improvement)

Environmental Factor			Evaluation		Comments
			Construction	Operation	
Socio-Cultural Env	1	Involuntary Resettlement	D	D	
	2	Local Job Market and Economy	D	D	
	3	Land use and Utilization of Local Resources	D	D	
	4	Social Institutions	D	D	
	5	Existing social infrastructures and services	D	D	
	6	The poor	D	D	
	7	Indigenous of ethnic group	D	D	
	8	Misdistribution of benefit and damage	D	B	Minor effects on land transport delivery
	9	Cultural Heritage	D	D	
	10	Landscape	D	D	
	11	Local Conflict of interests	D	D	
	12	Water use/or water right	D	D	
	13	Genders	D	D	
	14	Children's right	D	D	
	15	Infectious Disease (e.g., HIV.AIDS)	B	D	Possibility of temporal spreading of infectious diseases due to construction workers.
	16	Working Environment	B	D	Need precaution for working safety.
Bio-Physical Env	17	Environmental Reserves	D	D	
	18	Regional Ecosystem	D	D	
	19	Hydrological Condition	D	D	
	20	Topography and Geology	D	D	
Pollution	21	Air Quality	B	B	Temporal roadside air quality degradation due to temporal increase of construction vehicle.
	22	Water Quality	B	B	Temporal water quality degradation due to earthwork/or dredging.
	23	Soil Contamination	D	D	
	24	Waste	D	D	
	25	Noise/Vibration	B	B	Temporal degradation of roadside noise/vibration environment due to temporal increase of construction vehicle.
	26	Ground subsidence	D	D	
	27	Obnoxious smell	B	D	Possibility of accidental spill of construction chemical
	28	River bed/Benthos	B	D	Dredging work inside/around existing port is planned.
Others	29	Accidents	B	B	Possibility of temporal increase of traffic accident due to temporal increase of construction vehicle.
	30	Trans-boundary effects and/or Global Warming	B	B	Temporal increase of CO_2 loading during construction phase.

Note A: significant, B: major, C: minor, D: less significant, U: Unknown
Source: JICA Study Team, 2012

12.2.2 ToR of Environmental Study

Based on the environmental scoping results, mentioned above, ToR of environmental study is developed (see Table 12.5). The official EIA study to be required for the environmental license application is to be conducted by the Government of Burundi after the basic design of selected short-term projects are finalized, while some of important environmental studies, summarized in Table 12.5, are conducted within this JICA Study. It is noted that results of those environmental studies, conducted by the JICA Study Team, can be incorporated into EIA report, to be prepared by the Government of Burundi. More detailed description of ToR of environmental studies, conducted by the JICA Study Team, is described in next section.

Table 12.5: ToR of Environmental Study for Selected Short-term Projects

Factors	Evaluation	Topics	Methodology	Implementation
Air Quality	B/B	1. Baseline roadside A/Q 2. Impact Prediction during construction/operation phases	1. Baseline data collection 2. Field Survey. 3. Impact prediction	To be conducted within EIA Study.
Water Quality	A/B	1. Baseline W/Q 2. Impact Prediction during construction/operation phases	1. Baseline data collection. 2. Field Survey 3. Impact Prediction	Preliminary W/Q surveys are conducted within JICA Study.
Soil Contamination	A/D	1. Baseline soil and sediment contamination condition. 2. Collect past dredging and sediment treatment records. 3. Impact evaluation during construction/operation phases.	1. Baseline data collection. 2. Field Survey 3. Impact Prediction	Preliminary soil survey is conducted within JICA Study. Comprehensive Soil and Sediment surveys are to be conducted within EIA study.
Waste	A/D	1. Estimation of amount of construction wastes to be generated by earthwork of contaminated soil (e.g., Construction of Container Berth and Yard). 2. Selection of proper treatment of contaminated soil.	1. Estimate of Construction wastes, in particular, amount of construction wastes to be generated by earthwork of contaminated soil. 2. Treatment methods of Construction wastes in Burundi. 3. Selection of proper treatment of contaminated soil.	To be conducted within EIA Study after basic design of relevant facilities are finalized.
Noise/ Vibration	B/B	1. Baseline roadside noise/vibration 2. Impact Prediction during construction/operation phases	1. Baseline data collection. 2. Field Survey 3. Impact Prediction	To be conducted within EIA Study.
Accidents	B/B	1. Study future traffic accidents during operation phase	1. Establish traffic safety program for construction workers.	To be conducted within EIA Study.
Stakeholder Meeting		Conduct one stakeholder meeting at Bujumbura and Rumonge, respectively after selection of short-term projects.	Conduct stakeholder meetings at Bujumbura and Rumonge at late March and early April, 2012 after short-term development projects are selected.	To be conducted within JICA Study. Follow-up stakeholder meetings shall be conducted within EIA Study.

Note: Sever evaluation scores such as A or B are listed based on contents of Table 12.2, Table 12.3 and Table 12.4
Source: JICA Study Team, 2012

12.2.3 Preliminary Environmental Studies

(1) ToR of Preliminary Environmental Studies

As mentioned in previous section, several environmental studies are conducted for selected short-term development projects (see Table 12.6). Basically, the study selection is based on contents of Table 12.5. This study consists of following four tasks; i.e., (i) data collection of baseline environmental condition, (ii) soil survey, (iii) water quality survey, and (iv) stakeholder meetings (see Table 12.6). It is noted that ACVE, local environmental NGO, is hired for the implementation of this study. All study results are summarized in the separate report, entitled as "Environmental study for selected short-term development projects". Several major results such as the water quality study are to be described in following sections.

Table 12.6: Major Environmental Tasks

	Items to be conducted
1	**Descriptions of Baseline Environment Condition**
	Describe environmental baseline condition of selected pre-feasibility projects. 1) Bio-Physical condition 2) Socio-Cultural condition
2	**Environmental Field Survey**
	Carry out following environmental surveys, 1) Soil/Sediment Survey 2) Water Quality Survey
3	**Public Involvement**
	Organize stakeholder meeting at Bujumbura and Rumonge, respectively, and collect comments and/or questions from all stakeholders for selected short-term port development projects.

Source: JICA Study Team, 2012

(2) Soil Study

Outline of Field Survey

As described previously, certain amounts of contaminated sediment were removed (or dredged) from Port Bujumbura to the nearest open lands during the last dredging work, conducted in 2007 and 2008. After that, no measures such as the removal and/or the neutralization of toxic substances (i.e., heavy metal) as well as comprehensive containment, have been taken for these dredged sediment sites so far. Within this study, several short-term development projects such as the construction of the container yard and the diversion of Buyenzi Canal are proposed, and it is likely that some of those projects may cause some physical disturbances across those dredged sediment sites.

So, in order to grasp the current soil condition around sites of selected short-term development projects across Port Bujumbura, the field measurement of the soil survey is carried out. Within this measurement, 10 parameters, listed in Table 12.7, are of concern. Upon considering the topographic features of study sites, twenty four (24) points are chosen as sampling points for this measurement (see Figure 12.1). Table 12.7 summarizes the outline of this soil survey. All collected soil samples were sent to the laboratory in Nairobi, Kenya after the soil sampling. Full-set of analytical results of all collected soil samples and relevant discussions are summarized within the separate report of the environmental study.

Table 12.7: Soil Survey Measurement

	Total number of sampling points = 24. Sampling period: March 2012 Sampling depth: 30 cm below the ground surface
Parameter	Hg, Nickel, Arsenic, Cr (III), Cr (VII), Cu, Zn, Mn, Pb, Cd
Lab	Analyzed at AgriQ Quest Limited, Nairobi, Kenya.

Note: "☆" shown in this map indicates a rough location of soil sampling point. 24 soil samples are taken on March 12, 2012.
Source: JICA Study Team, 2012

Figure 12.1: Location of Soil Sampling Points

Results and Discussions

Table 12.8 summarizes the study results of this soil survey. No nickel, cadmium, chrome, arsenic, or mercury was detected within this study. Also, maximum values of zinc (Zn), copper (Cu), manganese (Mn) and lead (Pb) are 26.8, 5.65, 115.0 and 4.5 mg/kg, respectively. Compared with relevant environmental standard of soil, those values are smaller than those standards (e.g., environmental standard for lead is of 150 mg/kg).

Based on this study result and CTB's (see Chapter 8 for more detailed descriptions of CTB's sediment survey), following possibilities can be derived:

Possibility 1: All contaminants such as PCB and arsenics, landed during the last dredging work, still remain somewhere across the dredged sediment site. In other words, more intense soil samples should be collected and analyzed. In Japan, at least, one (1) soil sampling point shall be established with every 100 m^2 (equivalent to one cell of 10 m × 10 m sampling grid) and two samples at two different depths shall be collected (i.e., two soil samples per one sampling point). Within this study, corresponding grid size would be of roughly 100 m × 50 m, so it can be said that the sampling spacing, implemented within this study, is still too coarse to detect heavy metals contained with dredged sediments.

Possibility 2: Pollutants contained within dredged sediments have been physically moved by a rainfall-oriented natural drainage and/or by the seepage of the groundwater to nearby places. It is plausible that some of those contaminants maybe back to the port via existing drainage channel and Buyenzi Canal. Within this study, the soil parameter, PCB and others, conducted in past CTB study were not included due to the budget restriction. It is recommended to have more comprehensive soil survey, based on reputable international anti-soil contamination regulations.

Table 12.8: Soil Study Results

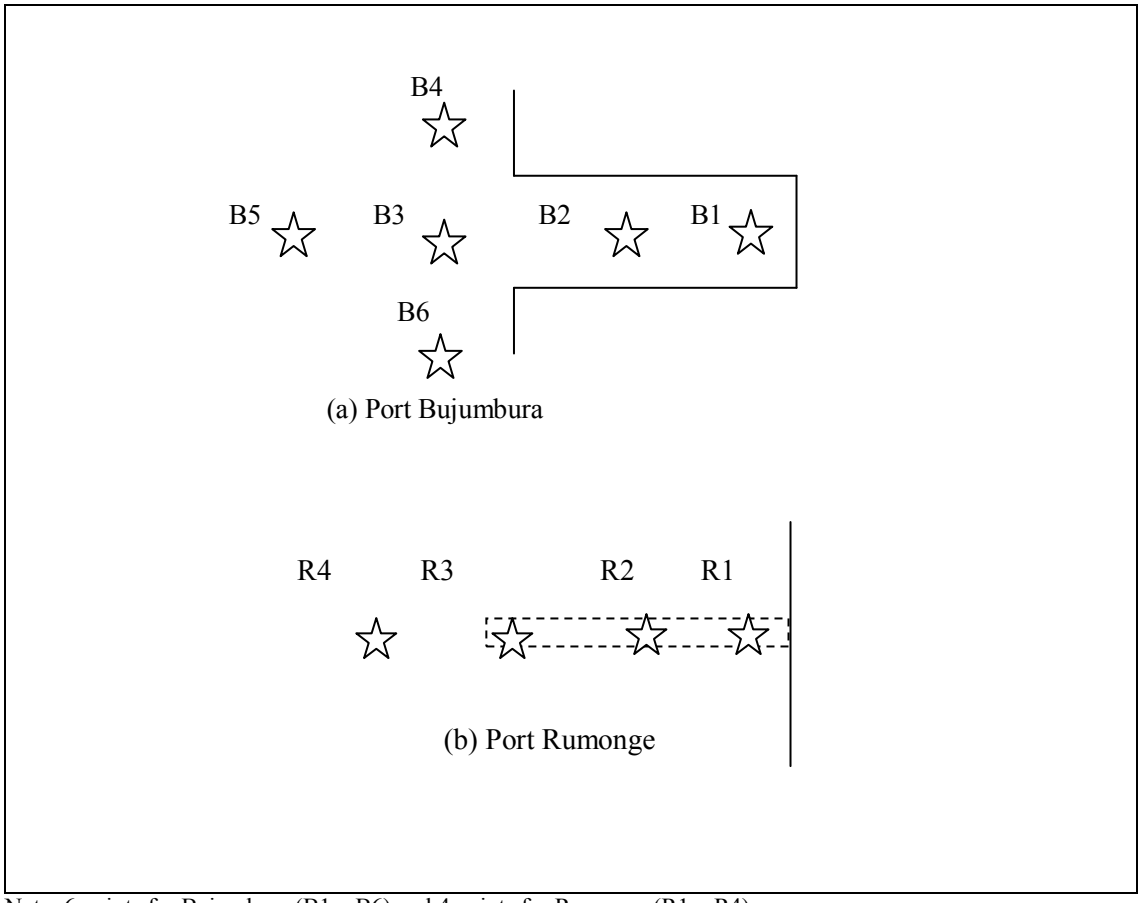
				Zn (mg/kg	Cu (mg/kg	Mn(mg/kg	Pb (mg/kg
Site 1	781 m	S3°22.531'	E29°20.608'	0.42	0.22	1.54	0.03
Site 2	777 m	S3°22.517'	E29°20.615'	0.96	0.98	7.79	0.29
Site 3	776 m	S3°22.503'	E29°20.634'	2.16	0.86	14.6	0.24
Site 4	779 m	S3°22.503'	E29°20.649'	0.62	0.49	6.95	0.03
Site 5	786 m	S3°22.494'	E29°20.662'	0.62	0.71	13.8	0.21
Site 6	781 m	S3°22.465'	E29°20.662'	0.01	0.07	8.3	0.01
Site 7	777 m	S3°22.415'	E29°20.669'	1.37	0.78	38.5	0.27
Site 8	788 m	S3°22.421'	E29°20.661'	3.11	1.33	43.1	0.56
Site 9	777 m	S3°22.423'	E29°20.679'	1.94	0.71	32.6	0.79
Site 10	781 m	S3°22.448'	E29°20.698'	26.8	2.12	57.2	1.19
Site 11	785 m	S3°22.468'	E29°20.700'	21.6	2.43	48	2.45
Site 12	786 m	S3°22.461'	E29°20.727'	1.24	0.26	10.1	0.18
Site 13	781 m	S3°22.427'	E29°20.718'	21.5	5.65	115	3.62
Site 14	780 m	S3°22.393'	E29°20.698'	0.01	0.14	8.4	0.02
Site 15	786 m	S3°22.388'	E29°20.717'	1.44	0.95	6.57	0.14
Site 16	785 m	S3°22.417'	E29°20.735'	23.8	5.35	97.8	4.5
Site 17	779 m	S3°22.458'	E29°20.760'	4.72	1.17	24.6	0.68
Site 18	785 m	S3°22.398'	E29°20.763'	0.96	0.56	7.1	0.04
Site 19	779 m	S3°22.372'	E29°20.749'	3.21	0.91	25.5	0.43
Site 20		S3°22.368'	E29°20.780'	0.3	0.08	4.72	0.04
Site 21	780 m	S3°22.364'	E29°20.797'	0.85	0.38	9.35	0.1
Site 22	780 m	S3°22.367'	E29°20.822'	1.77	0.58	17.7	0.17
Site 23	778 m	S3°22.400'	E29°20.846'	1.22	0.86	11.3	0.14
Site 24	773 m	S3°22.415'	E29°20.829'	0.73	0.39	14.6	0.14

Note: 1st column indicates the ground elevation, and 2nd and third ones indicate the GPS coordinates.
Source: This Study, 2012

(3) Water Quality Study

Outline of Field Survey

In order to determine the current water quality condition around project sites of selected short-term development projects, the field measurement of the water quality is carried out. Within this measurement, ten parameters, listed in Table 12.9 are of concern. Upon considering the topographic features of study sites, ten (10) points are chosen as sampling points for this measurement (see Figure 12.2). Table 12.9 summarizes the outline of this water quality measurement.



Note: 6 points for Bujumbura (B1 – B6) and 4 points for Rumonge (R1 – R4)
Source: JICA Study Team, 2012

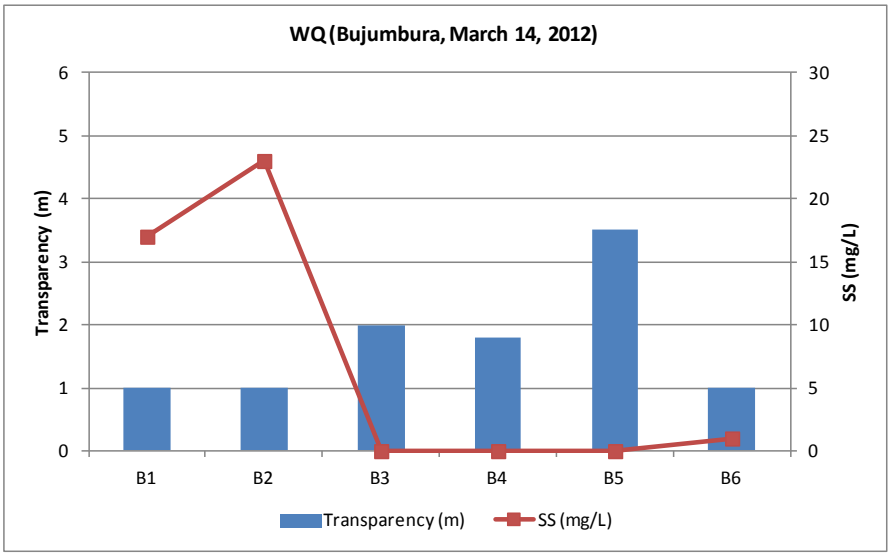
Figure 12.2: Schematic Diagram of Water Quality Sampling Points

Table 12.9: Water Quality Measurement

	Total number of sampling points = 10. Measuring period: March 2012
Parameter	Transparency, Temperature, pH, Turbidity, Conductivity, TSS, DO, BOD, COD, E-Coli-form, Total Coli-form
Lab	Analyzed at LABORATOIRE D'ANALYSE DES EAUX AFRICAINES S.A.

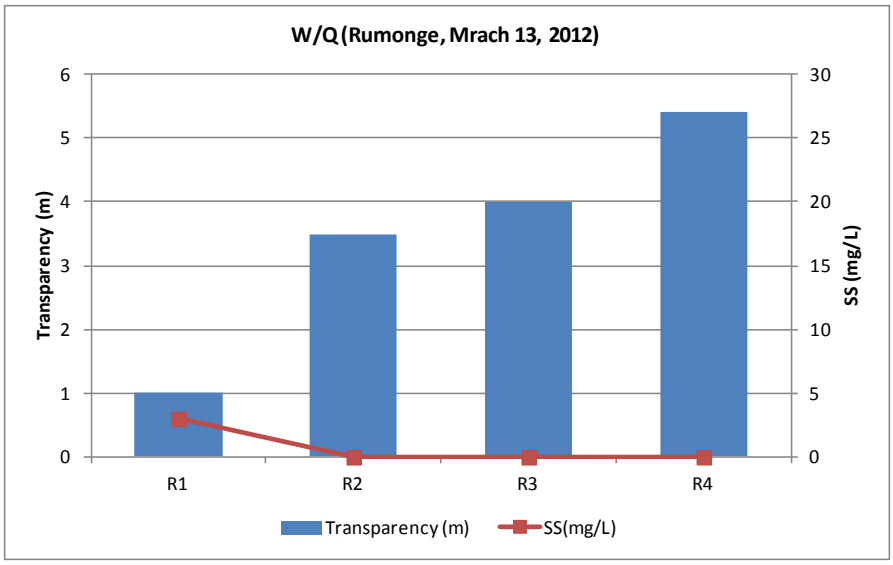
Results and Discussions

Figure 12.3 to Figure 12.6 show some of water quality laboratory results of all collected samples. Full-set of this water quality analytical result is summarized within the separate report of the environmental study. From these figures, it can be said that the current water quality conditions at Ports Bujumbura and Rumonge are relatively good. Water quality conditions of the near-shore region (B1, B2, and R1) are worse than those of off-shore region of Lake Tanganyika. It is noted that the water quality conditions around the outlet of Buyenzi Canal (B1), tend to be the worst due to the direct discharge of effluents of untreated sewerage generated around the upstream side of this canal.



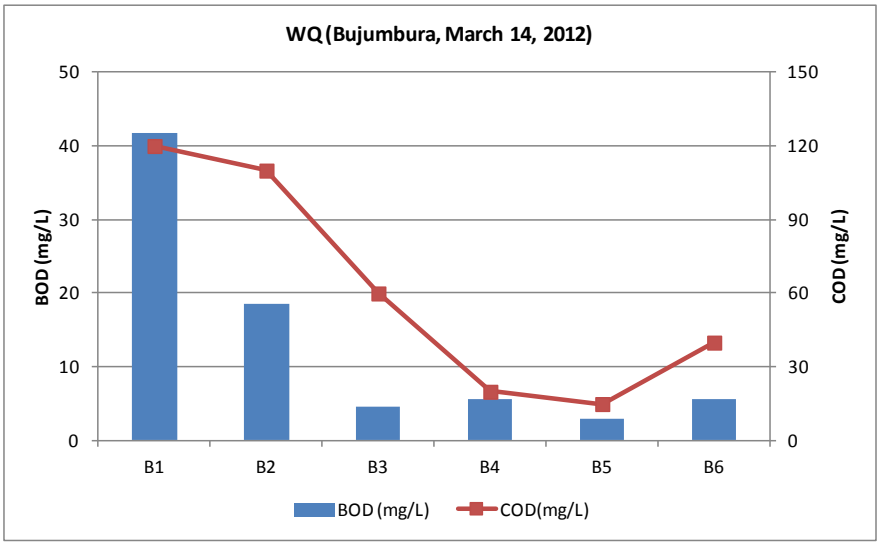
Source: JICA Study Team, 2012

Figure 12.3: Results of Water Quality Analysis (Bujumbura), Transparency and SS



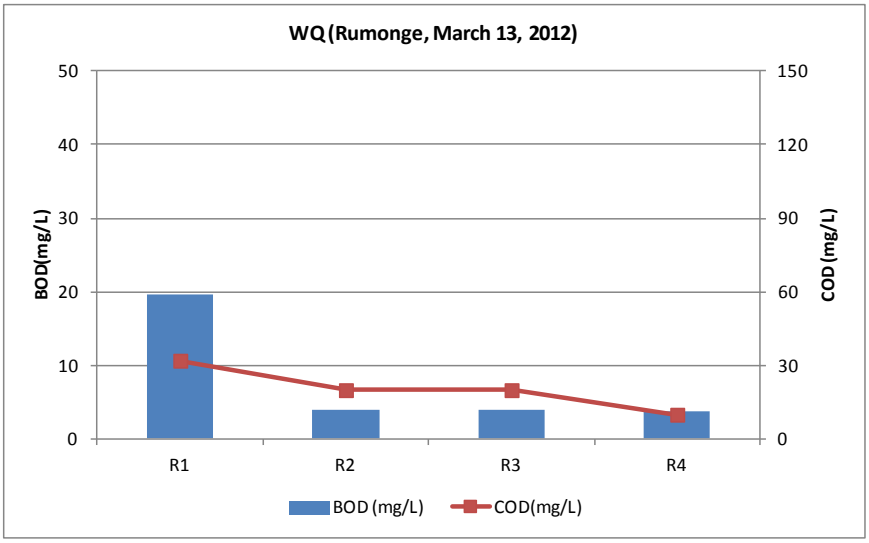
Source: JICA Study Team, 2012

Figure 12.4: Results of Water Quality Analysis (Rumonge), Transparency and SS



Source: JICA Study Team, 2012

Figure 12.5: Results of Water Quality Analysis (Bujumbura), BOD and COD



Source: JICA Study Team, 2012

Figure 12.6: Results of Water Quality Analysis (Rumonge), BOD and COD

(4) Stakeholder Meetings

Introduction

Based on JICA Guideline, two (2) stakeholder meetings, regarding the selected short-term development projects for Ports Bujumbura and Rumonge, are held (see Table 12.10). Major objectives of these stakeholder meetings are to enhance the public participation from various stakeholders, establish comprehensive information disclosure, share common knowledge and understanding about proposed short-term port improvement projects among stakeholders, and to support a smooth establishment of the project consensus. Summary of each stakeholder meeting is described in following section, separately.

Table 12.10: Schedule of Stakeholder Meeting

	Date	Place	Main Topics
1	March 30, 2012 (Fri)	Conference Room of Tanganyika Lodge, Rumonge	1. Project Outline of Port Rumonge Improvement Project 2. JICA Guideline for Environmental and Social Considerations 3. W/Q of Port Rumonge 4. Others
2	April 09, 2012 (Mon)	Conference Room of Star Light Residence, Bujumbura	1. Project Outline of Port Bujumbura Improvement Project 2. JICA Guideline for Environmental and Social Considerations 3. W/Q of Port Bujumbura 4. Others

Source: JICA Study Team, 2012

Beside these stakeholder meetings, a questionnaire-based public opinion survey, regarding the proposed short-term development project, was conducted. Some of study results are described in following sections.

Rumonge Stakeholder Meeting

Stakeholder meeting was held on 20 March 2012 at the conference hall of Tanganyika Lodge, Rumonge. Registration started at 8:30 a.m. of March 20, and the meeting itself started at 11:00 a.m. of this morning. 56 people attended at this stakeholder meeting (see Photo 12.2). Relevant information such as the list of participants, the minutes of meeting, and others are summarized in the separate report of the environmental study.

Rumonge Stakeholder Meeting

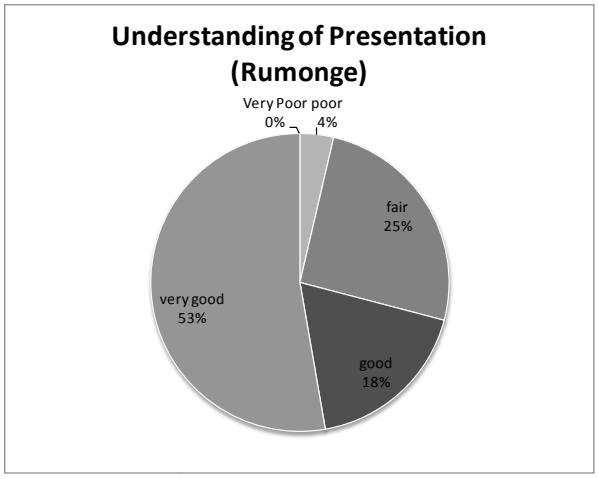
Explanation of Short-Term Development Project

Source: JICA Study Team, 2012

Photo 12.2: Photo Records of Rumonge Stakeholder Meeting

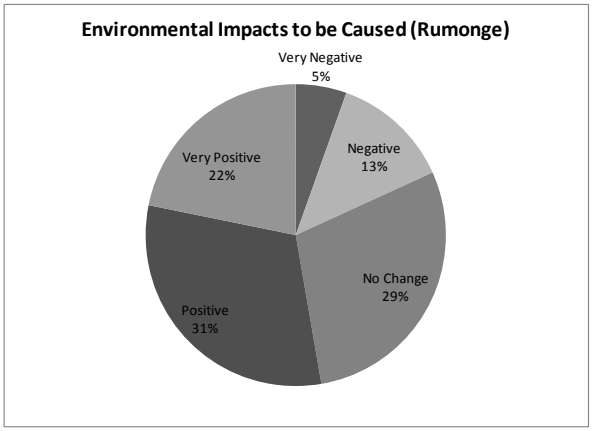
In order to evaluate overall achievement of this stakeholder meeting, a simple questionnaire survey was conducted for all participants after all questions and answers session process was ended. There were 55 respondents for this post-meeting survey.

96% of respondents (i.e., 53 persons) said they understood the outline of proposed short-term port improvement project presented within this stakeholder meeting (see Figure 12.7). 18% (10 persons) said the proposed port improvement project would cause negative environmental impacts on the surrounding environment (see Figure 12.8), and 98% (54 persons) said their situations would be improved if this short-term port improvement project were implemented (see Figure 12.9). Lastly, 96% (53 persons) said they understood and/or were familiarized with the concepts and policy considerations of JICA Guidelines for Social and Environmental Considerations by attending this stakeholder meeting (see Figure 12.10).



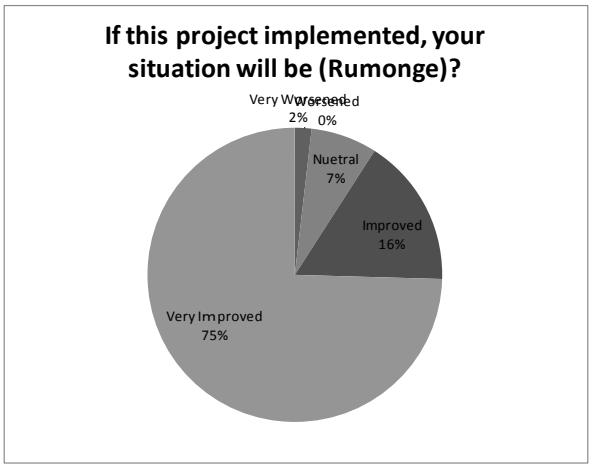
Source: JICA Study Team, 2012

Figure 12.7: Post-Meeting Survey Results (Understanding of Meeting: Rumonge)



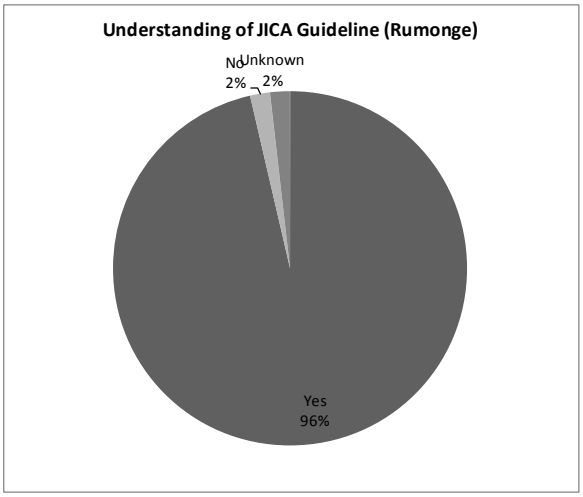
Source: JICA Study Team, 2012

Figure 12.8: Post-Meeting Survey Results (Environmental Impacts to be Caused: Rumonge)



Source: JICA Study Team, 2012

Figure 12.9: Post-Meeting Survey Results (Effect of Port Improvement: Rumonge)



Source: JICA Study Team, 2012

Figure 12.10: Post-Meeting Survey Results (Understanding of JICA Guideline: Rumonge)

Bujumbura Stakeholder Meeting

Stakeholder meeting was held on 9 April (Mon), 2012 at the conference hall of Start Light Residence, Bujumbura. Registration started at 8:30 a.m. of 9 April, and the meeting itself started at 10:00 a.m. of this morning. In total, 42 people attended at this stakeholder meeting (see Photo 12.3). Relevant information such as the list of participants, the minutes of meeting and others are summarized in the separate report of the environmental study. It is noted that some of invited ministry officials canceled the meeting due to their sudden intra-ministerial meeting, organized on the same day.

Explanation of Project layout

Opening Remarks

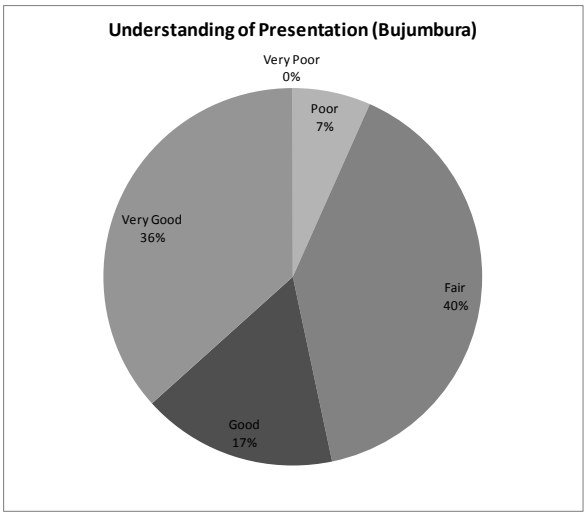
Source: JICA Study Team, 2012

Photo 12.3: Photo Records of Bujumbura Stakeholder Meeting

In order to evaluate overall achievement of this stakeholder meeting, a simple questionnaire survey was conducted for all participants after all questions and answers session process was ended. There were 30 respondents for this post-meeting survey.

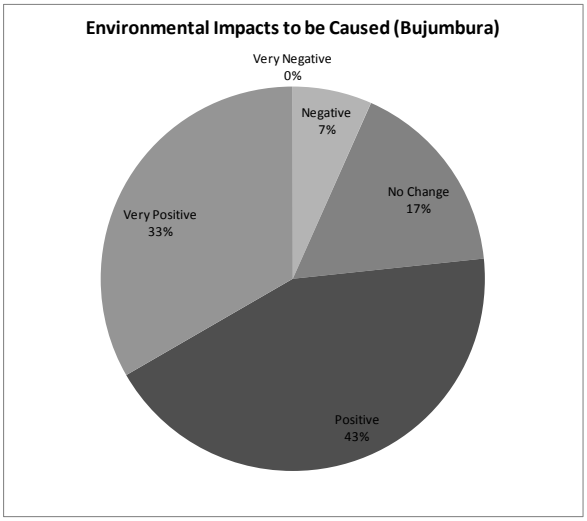
97% of respondents (i.e., 28 persons) said they understood the outline of proposed short-term port improvement project, presented within this stakeholder meeting fairly (see Figure 12.11). 7% (2 persons) said the proposed port improvement project would cause negative

environmental impacts on the surrounding environment (see Figure 12.12), and 70% (21 persons) said their situations would be improved if this short-term port improvement project were implemented (see Figure 12.13). Lastly, 83% (24 persons) said they understood and/or were familiarized with concepts and policy considerations of JICA Guidelines for Social and Environmental Considerations by attending this stakeholder meeting (see Figure 12.14).



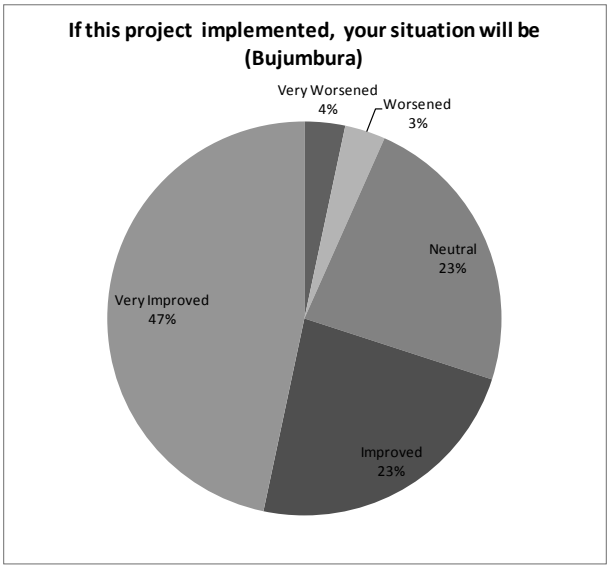
Source: JICA Study Team, 2012

Figure 12.11: Post-Meeting Survey Results (Understanding of Meeting: Bujumbura)



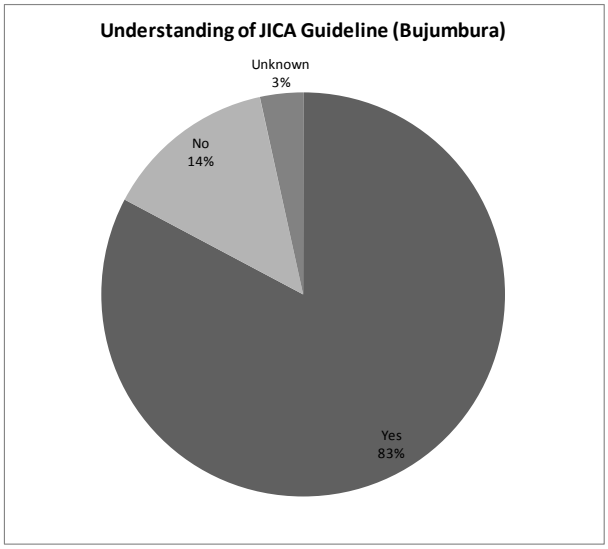
Source: JICA Study Team, 2012

Figure 12.12: Post-Meeting Survey Results (Environmental Impacts to Be Caused: Bujumbura)



Source: This Study, 2012

Figure 12.13: Post-Meeting Survey Results (Effect of Port Improvement: Bujumbura)



Source: JICA Study Team, 2012

Figure 12.14: Post-Meeting Survey Results (Understanding of JICA Guideline: Bujumbura)

Conclusions

Stakeholder meetings were held and project outlines of Ports Bujumbura and Rumonge were discussed. Based on post-meeting survey, it was found that most of attendants showed positive attitudes to both port improvement projects. Also, it was found that majority understood the concept of JICA Guideline for environmental and social considerations.

Due to the time constraint of this port-sector master plan study, only one-time stakeholder meeting was held at Bujumbura and Rumonge, respectively. The stakeholder meeting is one of important processes to achieve project consensus among various stakeholders. It is

recommended to periodically have successive stakeholder meetings in order to achieve more wide-spectral project consensus while deepening the understanding of the proposed port improvement projects among various stakeholders within the continued project cycle of the proposed port improvement projects after the termination of this master plan study.

12.2.4 EIA Schedule (Tentative)

As mentioned earlier, the EIA process of all development projects in Burundi is still at rudimentary stage. A tentative EIA schedule is prepared based on both information, summarized in Chapter 7, and the scoping results of selected short-term development projects (see Table 12.11). It is noted that environmental administration framework of Burundi is not adequately consolidated. So, it is recommended to monitor the progress of EIA study periodically by outside auditors in order to check if the entire EIA process required for selected short-term projects, is abided by JICA Guideline for environmental and social considerations as well as other reputable international guideline.

Table 12.11: Tentative Schedule of Environmental Certificate Application Process

	1 (Month)	2	3	4	5	6	7	8
ToR Development	——							
Consultant Selection	———							
EIA study		———	———	———	———			
Submission of EIA D/F Report						☆		
Report Examination							———	———
Certificate Approval								☆

Note: It is assumed that EIA Study will take about 4 months.
Source: JICA Study Team, 2012

12.2.5 Development of Impacts Mitigation Program

(1) Introduction

As mentioned earlier, official EIA studies for selected short-term development projects are to be conducted by the Government of Burundi after the basic design of each projects are finalized. Relevant mitigation plans and environmental management program are to be established within those EIA studies, to be conducted by the Government of Burundi.

After all potential significant negative environmental impacts are clearly identified within the EIA study, it is essential to comprehensively develop effective mitigation strategies (i.e., avoidance, reduction, and elimination) for the negative impacts of the project's pre-construction, construction, and operation phases. The mitigation plan addresses the negative impacts caused by the construction works and its operation. These impacts are mostly of a temporary nature, lasting only for the construction period of about several years. Principal purposes of this mitigation measure for these port improvement projects are as follows:

a. Maintain comfortable port environment throughout the project.
b. Minimize effects of water quality degradation during construction phases.
c. Minimize risk of disturbance of contaminated soil (heavy metal), located within existing Port Bujumbura during construction phase.
d. Minimize risk of disturbance of contaminated sediment (heavy metal), located within existing Port Bujumbura during construction phase.

e. Harmonize new port facilities with surrounding communities
f. Establish integrity with basin-wide Lake Tanganyika Management.
g. Establish estuary harmonization of Ntahangwa River and Canal Diversion Project.

Among them, it is very important to pay attention to existing dredged contaminated sediment (see Chapter 7 for more detailed descriptions). Thus, a comprehensive mitigation plan will be established in order to minimize the risk regarding the accidental spreading of contaminated soil and sediment.

Mitigation measures must be incorporated into tender documents prepared under the engineering component of this project in order to ensure that the contractor is obliged to comply with measures in the environmental management plan (EMP).

(2) Treatment of Construction Wastes (Excavated Soil)

Within this study, constructions of the container berth and the container yard (A≈31,000 m^2) are proposed as the short-term development project for Bujumbura Port. This yard is to be constructed across the dredged contaminated sediment deposits (see Figure 12.15), and there are high possibilities of some physical disturbances across these deposits due to the earthwork. As mentioned earlier, no treatment was implemented for those contaminated sediment, and it is inevitable to cause physical disturbances of those dredged sediment due to the construction to some extent.

Direction1 (To the Port)

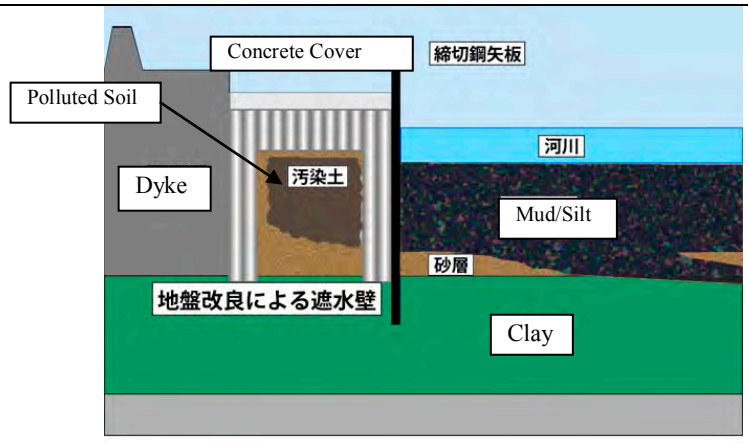
Direction 2 (To the Oil Tank)

Source: JICA Study Team, 2012

Photo 12.4: Overview of Proposed Container Yard Sites (photo taken in March 2012)

The following are three options for the reduction of risk of spreading contaminated soil.

1. Restriction of Trespassing (e.g., install fence and warning sign) and install anti-spreading sheets and/or covers (temporal ones).
2.Full containment of contaminated soil by pavements (concrete and/or asphalt)
3. Soil remediation



Example Image of Containment of contaminated Soil
(Source: http://www.chemico.co.jp/09environment/01/shut.html)

Figure 12.15: Example Image of Containment of Contaminated Soil

A preliminary soil survey, conducted within this study, provide limited results. For instance, PCB, detected in previous CTB sediment survey, was not included due to the budget restriction. It would be essential to have more detailed soil survey, abiding by relevant anti-soil contamination laws and/or regulation such as that of Japan, and determine the precise distribution of contaminated soils. In Japan, it is mandatory to install one soil sampling point at every 100 m^2 (i.e., need to set up 10 m × 10 m Grid) of the area of concerns at two different depths (e.g., 30 cm and 1 m from the ground surface). Within this project, the total area of the proposed container yard would be of 31,000 m+, so that, it would be better to have soil analyses of about 620 (= 310 × 2) soil samples at least for the precise and reliable estimation of the total amount of contaminated soil.

(3) Control of Sediment Spreading

Within the proposed short-term development projects, construction of the container berth is planned at the north-eastern part of existing Bujumbura Port, region around the outlet of Buyenzi Canal (see Photo 12.5). According to the sediment study, conducted within previous CTB Study, it was reported that sediment contamination with heavy metals around the outlet of Buyenzi Canal was in severe condition, and a certain amount of contaminated sediment still existed since there were no detailed records regarding the dredged volume and location of the last dredging work. It is very important to carry out more detailed sediment survey in order to check the existence of heavy metals that were detected in previous study. Also, it is essential to establish a comprehensive environmental management program while implementing proper anti-spreading sediment from the construction site.

Overview of Existing Port
around Outlet of Buyenzi Canal
(Photo taken in Sep. 2011)

North-Side Overview of Existing Port
(Photo taken in April 2012)

Source: JICA Study Team, 2012

Photo 12.5: Overview of Proposed Container Berth Sites

The following are three options for anti-spreading of contaminants contained within the sediment.

1. Physical removal (i.e., dredging) of contaminated sediment.

Use Sheet Pile for preventing spreading of turbid water during Construction

2. Install cover-up sand layer above the contaminated sediment.
3. On-site consolidation of contaminated sediment.

Figure 12.16: Physical Removal of Contaminated Sediment

As the Port Bujumbura continues to Lake Tanganyika, one of important water reservoir for entire Bujumbura City, it is imperative to establish a strict anti-water pollution measure, combined with other methods such as the silt fence.

12.2.6 Environmental Management Plan (EMP)

(1) Introduction

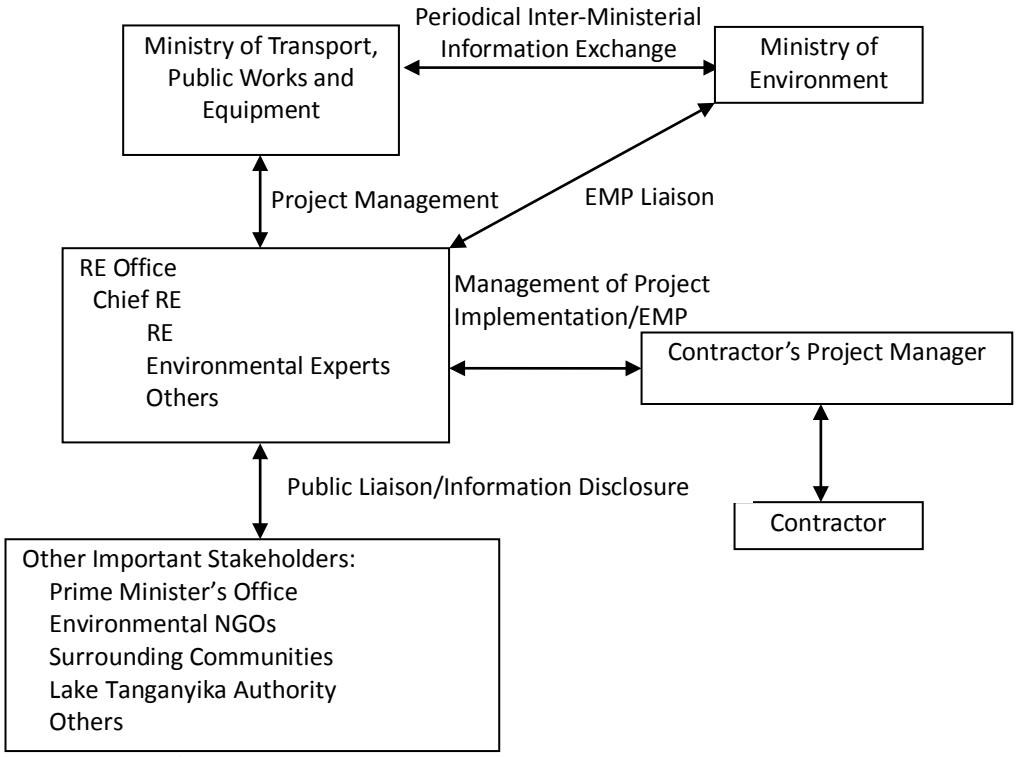
Within the selected short-term port improvement projects, environmental management regarding the dredged contaminated sediment and the proposed dredging work around the outlet of Buyenzi Canal would be critical. Therefore, it is very important to develop a comprehensive EMP after the basic designs of each port improvement projects are finalized. Key directions for the development of appropriate EMP to be required for the selected projects are summarized within this section.

The main purpose of the EMP is to ensure that the various environmental protection measures selected through the project planning phase are properly implemented during the rehabilitation/or construction phase, so that the environmental degradation and pollution resulting from construction activities can be minimized.

In general, any environmental management programs shall be carried out as an integrated part of project planning and its execution, making a significant and continuous contribution to the overall development of the scheme. It must not be regarded merely as an activity limited to monitoring and regulating activities using a pre-determined checklist of required actions. Rather, it must interact dynamically as the project implementation proceeds, dealing flexibly with environmental impacts – both expected and unexpected as they arise. For this reason, the plan provides for periodic audits, which will evaluate compliance of on-site environmental management practices according to the EMP requirements and also to refocus the plan itself in the light of experience and issues arising. Specific objectives of this plan are to:

1. Define organizational and administrative arrangements for the environmental monitoring, including the definition of responsibilities of staff, coordination, liaison and reporting procedures.
2. Discuss procedures for pro-active environmental management, so that potential problems can be identified and mitigation measures can be adopted prior to the construction commencement.

Resident Engineer (RE) shall monitor each step of construction activities while establishing good liaison with relevant agencies such as the Ministry of Transport, Public Works and Equipment, Ministry of Environment, Lake Tanganyika Authority, and ACVE, along with surrounding communities and other key stakeholders (see Figure 12.17). Key directions for the EMP of contaminated soil and sediment are summarized in the following sections.



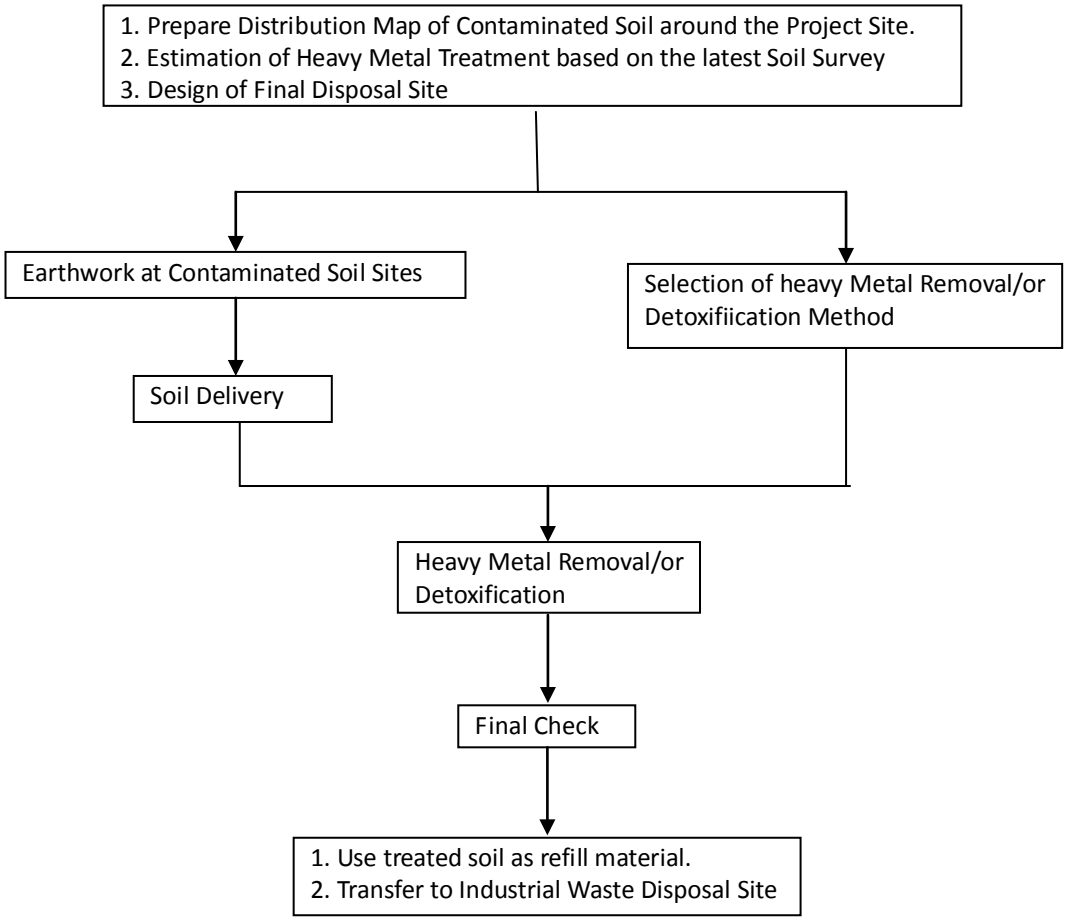
Source: JICA Study Team, 2012

Figure 12.17: EMP Liaison Framework

(2) EMP for Contaminated Soil

As mentioned earlier, most of the proposed container yard (A = 31,000 m^2) for Port Bujumbura is to be constructed across the existing dredged contaminated sediment sites. Moreover, it is likely to have a certain amount of additional excavated soils, generated from the construction of Buyenzi Canal diversion, to be conducted across the dredged contaminated sediment sites. Also, some of those contaminated soil may have physical disturbances due to construction work, and may be used as the refill material for relevant projects such as the reclamation of the delta (located around the river mouth of the Ntahangwa River) required for the improvement of the northern breakwater. So, it is essential to establish an environmental management program regarding the treatment of these contaminated soils after the basic design of both the container yard and the channel diversion are finalized in order to minimize the risk of the spreading of contaminated soils.

Furthermore, it is important to establish an on-site heavy metal treatment/or removal system after the total amount of contaminated soil to be excavated is precisely estimated. This estimation shall be conducted, based on the comprehensive soil survey that would take one sediment sample at least one point per every 100 m^2 (i.e., needs to set up 10 m x 10 m Grid). Based on that survey result, proper detoxification methods to be applied for the contaminated soil shall be selected while preparing an appropriate final disposal site (see Figure 12.18).

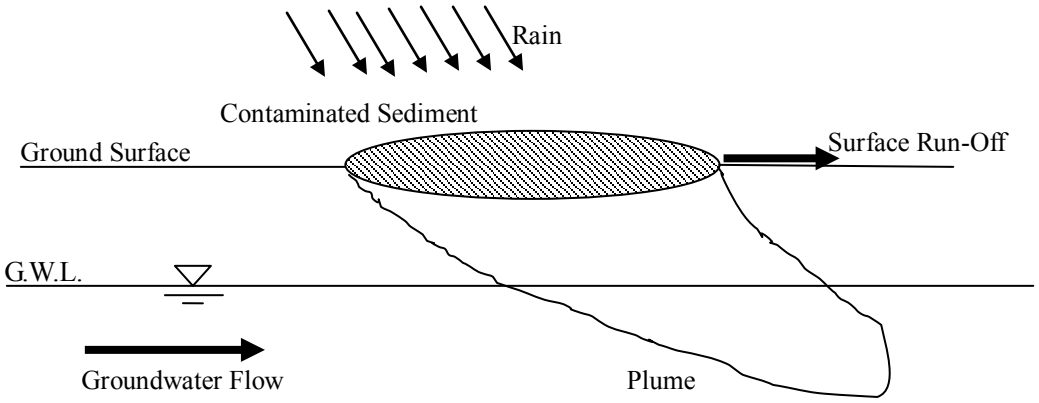


Source: JICA Study Team, 2012

Figure 12.18: Flowchart of Contaminated Soil Treatment

(3) EMP for Groundwater Contamination

It is inevitable to avoid the physical disturbance across the dredged sediment sites due to the construction of both the proposed container yard and canal diversion. Currently, no anti-spreading sheets and/or covers are used for the dredged contaminated sediment site. Thus, a direct surface exposure to the rainfall during the rainy seasons after 2008, may have caused spreading of contaminants across the dredged sediment site as a result of natural drainage and infiltrations of contaminants into the groundwater (see Figure 12.19).



Source: JICA Study Team, 2012

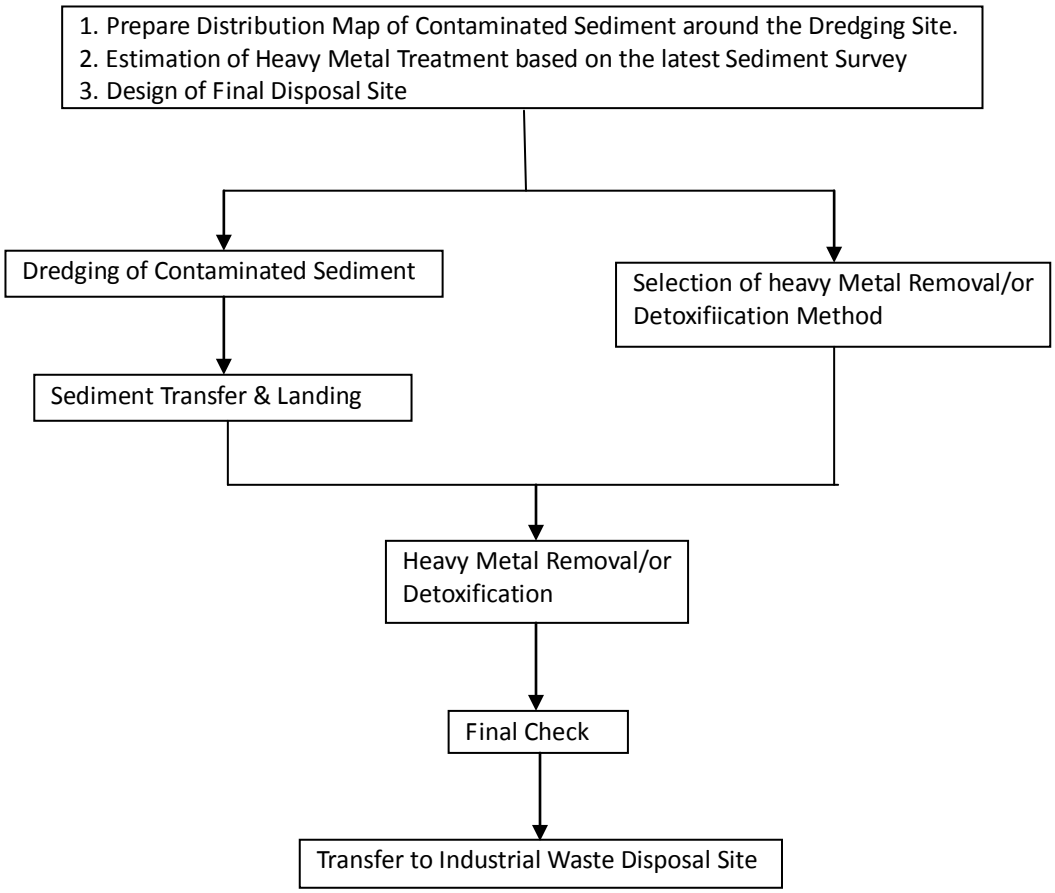
Figure 12.19: Schematic Diagram of Groundwater Contamination

No information of the regional groundwater level distribution around the project site is available (no measurement record exists). Upon considering the geographic features around Port Bujumbura, it can be said that regional groundwater level is slightly higher than the water level of Lake Tanganyika. Thus, it can be said that the risk of groundwater contamination due to the seepage of contaminants from the dredged sediment sites cannot be ignored.

Conclusively, it can be said that there are some possibilities of accidental spreading of contaminants, contained within the existing dredged sediments. Therefore, it is essential to establish an environmental management program regarding the treatment of these contaminated soils while designing a long-term groundwater quality monitoring program, after the basic design of both the container yard and the channel diversion are finalized, in order to check the occurrence of polluted groundwater leakage to the nearest water body (i.e., Lake Tanganyika). More detailed discussion regarding this groundwater monitoring is summarized in following section.

(4) EMP for Contaminated Sediment

Due to the construction of the container berth, certain amounts of sediment around the outlet of Buyenzi Canal are to be dredged. As mentioned earlier, the sediment around this proposed dredging site has high possibility of containing heavy metals such as PCB or arsenic, so it is important to establish an on-site heavy metal treatment/or removal system after the total amount of contaminated sediment to be dredged is estimated precisely. This estimation shall be conducted, based on the comprehensive sediment survey that would take one sediment sample at least one point per every 100 m^2 (i.e., needs to set up 10 m × 10 m Grid). Based on that survey result, proper detoxification methods to be applied for the dredged contaminated sediment shall be selected while preparing an appropriate final disposal site (see Figure 12.20).



Source: JICA Study Team, 2012

Figure 12.20: Flowchart of Contaminated Sediment Treatment

12.2.7 Environmental Monitoring

(1) Introduction

Main objectives of the environmental monitoring are to provide continuous feedback regarding project implementation to identify actual or potential successes/or problems at early stage, to implement timely adjustments to whole project management work, and to develop a cost-effective approach to monitor the contractors' environmental performance. Monitoring is a continuous assessment of project implementation and must be integrated as part of good management during the rehabilitation.

The objective of the monitoring system is to assist the project management through:

1. Defining requirements and procedures for the environmental monitoring (type of equipment to be used, monitoring schedule, parameters to be monitored, and so on).
2. Identifying targets and objectives for project implementation.
3. Keeping environmental records for project evaluation.
4. Identifying problems arising from the project and figuring out procedures for the environmental remediation in the event of the pollution or similar incidents.
5. Providing readily available results of related environmental analysis for decision-making.

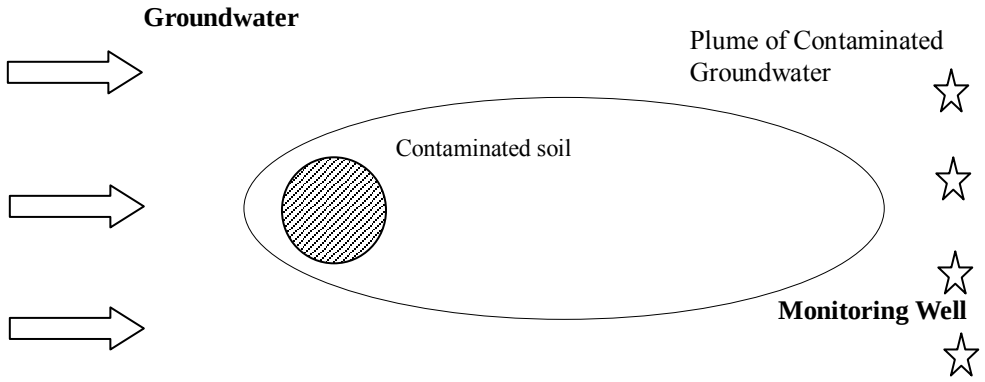
The scope of the monitoring plan is:

1. To identify the monitoring tasks during the construction phase.
2. To identify the nature and the schedule of the monitoring.
3. To identify samples to be taken for analysis and parameters to be measured.

It is recommended that monitoring results shall be put into the public domain periodically and/or presented at the public involvement-related meetings in order to share common knowledge of the rehabilitation project and enhance the deep understanding of projects among various stakeholders.

(2) Groundwater Monitoring Framework

In general, development of the long-term groundwater monitoring program is highly project-specific, thus details of this monitoring framework shall be elaborated after the basic design of the entire project is finalized (see Figure 12.21). It is noted that weekly-based groundwater quality monitoring at multiple points around the project site is desirable. Specific time interval for this periodical groundwater quality monitoring program depends on geo-hydrological features of the project site (e.g., if the order of the magnitude of the hydraulic conductivity is of 10-5 m/s, the daily movement of pollutant would be less than 1 m).



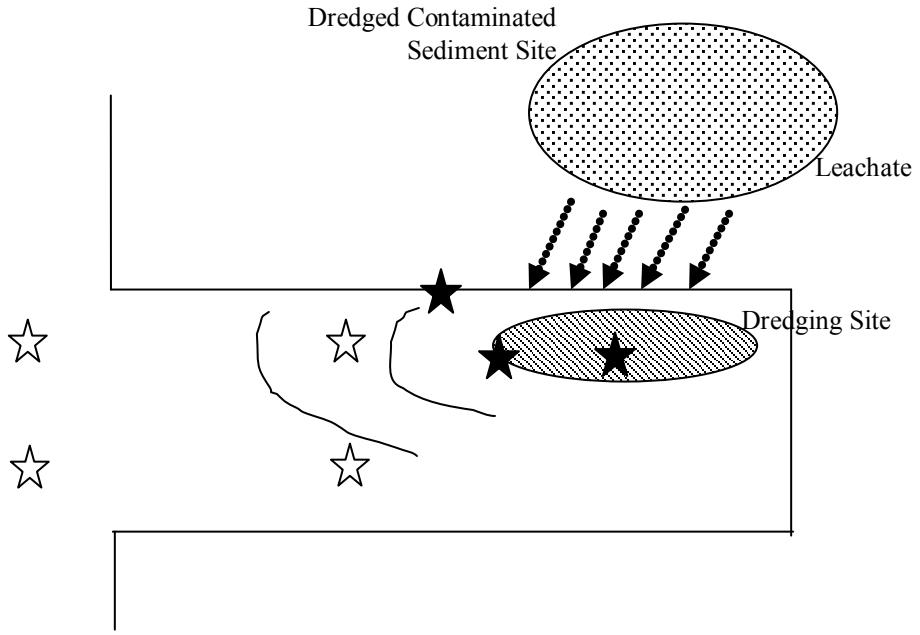
Note: Several groundwater quality monitoring wells are installed at the downstream side of the regional groundwater flow in order to check the occurrence of the groundwater pollution.
Source: JICA Study Team, 2012

Figure 12.21: Schematic Diagram of Groundwater Quality Monitoring Framework

(3) Water Quality and Sediment Monitoring Framework

On a similar note, it is important to establish a long-term water quality monitoring program during the construction phase. Suitable water quality monitoring network shall be designed around the project site, in particular, the proposed dredging site of Port Bujumbura and water bodies such as tributaries and/or lake, located in adjacent areas of both the future waste disposal site and reclaimed site. The design of each monitoring network is site-specific, so it is better to initiate relevant study after the basic design and the construction schedules of the entire port improvement project are delineated. Using this monitoring network, it is imperative to have a periodical water quality measurement in order to monitor the regional water quality condition.

Apart from the water quality monitoring activity, it is important to conduct sediment survey periodically. The monitoring results shall be analyzed intensively, compared with both baseline water quality and sediment study results, and shall be collected prior to the construction phase (see Figure 12.22).



Note: "☆" and "★" indicate monitoring point of the water quality and sediment, respectively. Exact number of water quality and sediment monitoring points would depend on both the scale of dredging work and local flow hydrodynamics.
Source: JICA Study Team, 2012

Figure 12.22: Schematic Diagram of Water Quality Monitoring Framework

(4) Periodical Channel Maintenance

The outlet of the diverted channel is to be located very near to that of the Nthahangwa River, crossing the delta of the Nthahangwa River. As mentioned in Chapter 7, the morphology of this river, in particular, the river course running through this delta, is unstable, and this river frequently changed its main course within past flood events while destructive to nearby facilities such as walls (see Photo 12.6). In other words, the risk of partial and/or complete closure of the proposed channel outlet due to the rapid sediments, conveyed by the flood events of the Nthahangwa River cannot be ignored. In addition, it is imperative that the diverted channel shall be robust to destructive forces of flood events of the Nthahangwa River. Thus, comprehensive precautions as well as the periodical channel inspection are essential for the smooth discharge of the storm water through the proposed diverted channel.

Also, the proposed diverted channel has several bending points. This design feature may increase the chance of local sedimentation and/or trapping of garbage along the proposed channel (see Photo 12.7). It is noted that a city-wide waste treatment system of Bujumbura is still at the rudimentary stage and people tend to throw some of household wastes into the nearby channels/or rivers. As a result, tons of garbage are accumulated at all endpoints of tributaries, and sometime interferes the smooth flow discharge. So, it is important to have periodical channel inspection frequently as well as to establish channel clean-up program.

Flow of Nthahangwa River during 2009 flood event broke several brick wall of Port Bujumbura.

Nthahangwa River Delta during 2009 flood event. Broken wall exists in the middle of photo. Beyond of that wall is the Nthahangwa River. Inside of this wall is exiting port property.

Courtesy of Clay Disposal, 2011

Photo 12.6: Nthahangwa River Delta during 2009 Flood Event

Garbage Trapped at the canal (located port outside) during past flood events (photo taken on March 2012).

Clean-up work of Buyenzi Channel (Photo taken on March 2012)

Source: JICA Study Team, 2012

Photo 12.7: Garbage/Sedimentation and Cleanup Work of Buyenzi Canal

12.2.8 Conclusions

As mentioned previously, official EIA/or IEE process of these selected short-term development projects are to be conducted by Government of Burundi after contents of the basic designs are finalized. Several environmental factors regarding the handling of deposits of dredged contaminated sediments due to the construction of the proposed container yards (A ≈31,000 m^2) would be critical for the implementation of the port improvement of Port Bujumbura. Also, it is expected to have some physical disturbances across the sediment around the outlet of Buyenzi Canal. So, it is imperative to establish a comprehensive EMP so the handling and/or the treatment of contaminated soil and sediment shall be properly addressed during the official EIA study for the improvement project of Port Bujumbura.

Recently, the environmental administration system and its relevant legal framework of Burundi have begun to be modernized, but EIA process in Burundi is still at the rudimentary stage. So, it would be important to provide technical assistance for the implementation of successful EIA/or IEE studies that would satisfy Burundian environmental codes, JICA Guideline for Environmental and Social Considerations and other reputable international environmental guidelines.

12.3 Conclusions and Recommendations

Conclusions with respect to the port development in near future are as follows:

1. The urgent projects are installation of light beacons and procurement of rescue boat for safe lake transport.
2. Container terminal has to be built to cope with the container transport on the lake in 2015 when daily operation of a container block train between Dar es Salaam and Kigoma will be commenced.
3. Ship repair facility has to be built to maintain the Burundian fleet of ships to cope with the cargo increase, particularly to maintain container ships which need daily operation.
4. To materialize construction of the container terminal and ship repair facility, it is necessary to divert the storm water canal currently flowing into the port basin.
5. Rehabilitation of the existing general cargo berths is needed to cope with both the highest water and lowest water of the lake. However, the rehabilitation can be carried out after the container terminal is completed.
6. Execution of the Rumonge Port development mainly depends on political decision. It should be carried out when fund is available.

Recommendations for the development of the ports of Burundi are summarized below:

1. To urgently install light beacons and procure rescue boats for safe navigation.
2. To divert the storm water canal to the construct container terminal and ship repair facility
3. To construct the container terminal in, or by, 2015. If fund is not sufficient to complete 2 berths accompanied with their stacking yard, it is recommended to only construct 1 berth with minimum stacking yard. It is recommendable that container handling equipment be procured by the public sector.
4. To construct the ship repair facility in, or before, 2015. The public sector should build the slipway and workshop, and procure necessary machinery and equipment.
5. To rehabilitation the general cargo berths after the container terminal is completed.
6. To develop Rumonge Port when the political decision is made and the fund becomes available.

Chapter 13 BMPRA-To-Be and New Concession Contract

13.1 General

In Chapter 4, by-laws by which BMPRA (Burundi Maritime, Port and Railway Authority) was established, E.P.B. as the current concessionaire of Bujumbura Port and its concession contract together with relevant issues are discussed. As Burundian Government is planning to cease the current concession contract with E.P.B. when it is expired in December 2012 and employ a new concessionaire to succeed the port management and operation from E.P.B., BMPRA is required to draw the bidding documents for the new concession contract. In this regard and in response to the request of BMPRA, JICA Study Team evaluated the current concession contract in Chapter 4. In this Chapter key issues to be corrected in preparation of the bidding documents for the new concession contract are identified. Recommendations will follow as rectification for the new concession contract.

13.2 BMPRA To-Be

Although the BMPRA has been created very recently it is difficult to define the to-be position at this stage of the life cycle of the organisation. The recommendations on the to-be position mainly originate from the consultants knowledge of best practices of the Landlord port model, benchmarked against the as-is position of the current port authority. Indeed the Presidential Decree supports the potential of the BMPRA to be developed as a Landlord port model and the Landlord model will contribute to successful implementation of the Master Plan.

13.2.1 Administrative Organization

The organisation as stipulated in the Presidential Decree is certainly subject to improvement. First of all, the Supervisory Board should be established without delay. Secondly, special attention should be given to the organisation of the Port Authority. In the landlord port model, normally a distinction is made between two divisions in the Port Authority namely the Nautical Division on the one hand and the Operations-Finance division on the other hand. Indeed, the nautical and none nautical operational aspects are split up into two different business units within the Port Authority.

The nautical division takes care of the vessel management in the port and the access channels to the port. The objective of the nautical division is to guarantee efficient, secure and safe handling of all ships (e.g. dangerous goods) in the port and in the access channels to the port. The Nautical Division is managed by the Harbour Master. As the Maritime Authority in the BMPRA takes care of the nautical aspects, there is no need to establish a separate Harbour Master in the Port Authority. However, in the Maritime Authority it is recommended to make a distinction between the port related nautical issues and the none-port related nautical issues (rest of the lake). Indeed, the Harbour Master will be responsible for the port related nautical issues within the Maritime Authority.

Furthermore, there should be a clear regulation with regards to the position of the office responsible for the security of ports and nautical access. As BMPRA was established in January 2012, such office has not clearly been organized. BMPRA should organize the office responsible for the security under the mandate of the Harbour Master for the port related nautical issues.

The Finance and Operations divisions are responsible for all commercial, technical, operational, administrative and financial aspects in the port. As there is currently a separate unit in the

BMPRA that is responsible for Administration and Finance, there is no need to have an Administration and Finance department in the Port Authority.

13.2.2 Staffing

The management of the organisation, consisting of a CEO and three division directors is in place and the hiring of the staff is the highest priority of the management. Within the Port Authority three major skills are required namely commercial, technical and operational skills. The commercial staff will be responsible for the commercial relations with the port users (vessel owners, shippers etc.) and the port operator. The relation with the port operator will be regulated by the concession contract as signed by the operator and the BMPRA. The technical skills will be very important specifically for the implementation of the Master Plan that will result in major nautical and infrastructure developments. Furthermore, these skills support the maintenance efforts within the port. The operational skills will support the commercial and technical skills. Our understanding is that the Ministry of Transport will be primarily responsible for labour recruitment. Within Finance and Administration additional recruitment is required although limited. The establishment of the Harbour Master's function within the Maritime Authority demands the development of the nautical skills.

The recruitments should be supported by an ongoing programme of capacity building.

13.2.3 Finance

On the Finance and Administration as stipulated in the Presidential Decree, the concession payments from the Port Operator should be collected by the BMPRA. Indeed the BMPRA needs cash inflow to take care of its obligations as the Landlord of namely the nautical access and the infrastructure developments. This of course does not exclude the BMPRA which also has to fulfil financial obligations to the Government. Additionally, the BMPRA, specifically the Administration and Finance division, should have the responsibility for allocating these funds properly.

13.2.4 Mission Statement

Last but not least the Management of the BMPRA has to develop a business plan for the next 10 to 20 years and a major component of the Business Plan is the Master Plan that supports the business plan. The Business Plan should also be in line with the mission statement and the respective roles and tasks of the organisation as formulated in the Presidential Decree. The Business Plan should be supported by an implementation plan that also takes into consideration the recommendations as formulated in the to-be position.

13.3 New Concession Contract

13.3.1 Issus to Be Resolved

(1) The Directoire and the New Concession Contract

By virtue of a decree n° 121/VP2/009 dated January 12, 2011 (the "Decree"), the State of Burundi, in its capacity as conceding party, replaced the Board of Directors by a Directoire (steering committee) controlled de facto by the State of Burundi and having full powers and authority over the company. The Directoire has the same power as the Board of Directors which has been deprived from its powers and authority.

The Directoire is in charge of the management of the company and the General Director acts as secretary of the Directoire. The Decree also provides that any decisions made by the Directoire cannot be challenged by the shareholders of E.P.B. The JICA Study Team understands that the

Decree was adopted in order to put an end to a conflict raised between private and public shareholders.

Notwithstanding the fact that the State of Burundi cannot create an entity outside the by-laws of a private company which would supersede corporate entities (i.e., Board of Directors, General Director and shareholders' meetings), such Decree reveals that the State of Burundi considers E.P.B. as a public company irrespective of the fact that E.P.B. is a private company and that the State of Burundi only owns a minority stake in E.P.B.

Without prejudice to the foregoing, the major aspect of the Decree is that it provides that the Directoire is in charge of the "management of the negotiation of the new concession" (article 2). In this respect, the JICA Study Team was provided with a draft of a concession contract established by the Directoire but which cannot be regarded as satisfactory as currently drafted. Moreover article 7 of the decree provides that the Directoire shall be valid and in force until the appointment of the new directors of the Board of Directors such appointment being "on the basis of the new concession contract which shall enter into force by the latest on 24 December 2012". Those two provisions of the Decree (Articles 2 and 7) are ambiguous and raise legal concerns.

Since E.P.B. is the current concessionaire, the company cannot be in charge, even through a Directoire, of the negotiation of the new concession agreement. Indeed, the concession can only be granted by the State of Burundi, and preferably through the BMPRA, and not by the former concessionaire. If E.P.B., through its Directoire, is in charge of the drafting and of the negotiation of the concession agreement, the company will not be able to bid for the granting of the new concession agreement. Otherwise, rules and provisions governing procurement in Burundi would be violated and any interested third party would be entitled to challenge the new concession agreement in order to have it declared null and void before the Burundi jurisdictions on the ground of violation of procurement regulations.

It emerged from the foregoing that in order for E.P.B. to validly compete for the granting of a new concession agreement it would be advisable for the Burundi State to withdraw the Decree. Moreover, in order for E.P.B. to attract private investors, as shareholders or partners whatever the form, in view of the investments to be made under the new concession contract, it would be advisable for the State of Burundi to put up for sale its shares in E.P.B. Indeed, the Decree reveals that as long as the State of Burundi shall be a shareholder of E.P.B., the company shall be considered as under public control.

(2) Business Issues

E.P.B. was incorporated for the operation of the port of Bujumbura and its corporate purpose (Article 3 of the by-laws) clearly states that the purpose of the company is the operation of the port of Bujumbura according to the concession agreement granted by the State of Burundi as well as activities in connection with the transport sector.

While article 3 refers to additional activities in the transport sector, it clearly results from the current business of E.P.B. and its location (i.e., within the port area) that E.P.B. has been incorporated as the concessionaire of only the Port of Bujumbura. Accordingly, if E.P.B. were not selected as the new concessionaire on 24 December 2012, the company would have to modify its by-laws, transfer its registered office outside the port not to say that it could be liquidated on the legal ground of loss of corporate purpose.

13.3.2 New Concession Contract

(1) Specific Issues of Current Concession Contract

The specific issues of the current concession contract are pointed out in Chapter 4. Those issues are re-discussed below together with their recommendable rectifications.

Installations, Superstructures, Infrastructures and Equipment Operated by the Concessionaire

The current concession contract provides for an unusual definition of the infrastructures, superstructures and equipment to be operated by the concessionaire (article 3).

- The first category consists of the superstructures and infrastructures put at the disposal of the concessionaire but which property and maintenance remain to the State. This is very unusual. This kind of installation defined as "***biens de retour***" (installations retuning to the conceding party at the end of the concession) are usually maintained by the concessionaire and replaced or developed by the conceding party. For obvious reasons, it is practically impossible for the conceding party to maintain on a day to day basis installation operated by the concessionaire.

  Under standard concession practice, *"biens de retour"* are defined as those installations and equipment which are **required** for the performance of the public service. The public service could not exist without those installation and equipment.
  One of the main characteristic of a *"bien de retour"* is that it retransferred to the conceding party at the end of the concession contract **without any right for compensation or indemnification whatsoever for the concessionaire**.

- The second category consists in "permanent works" (not defined) and equipment put at the disposal of the concessionaire which property remain at the State but which maintenance is transferred to the concessionaire. The renewal of such "permanent works" and equipment remain within the State's responsibility.

  Under standard concession practice, such "permanent works" and equipment should be defined as "*biens de retour"*.

- The third and last category consists in "permanent works" and equipment which are the concessionaire's property, the latter being bound to maintain and renew such "permanent works" and equipment.

  Under standard concession practice, such "permanent works" and equipment and defined *as "biens de reprise"* which means "permanent works" and equipment which are useful but not required for the performance of the public service. Since such "permanent works" and equipment are financed and owned by the concessionaire, at the end of the concession contract the conceding party may require the transfer of such as "*biens de reprise*" subject to compensate the concessionaire with the price of such "*biens de reprise*".

It is definitely suggested that the standard definition of installation, equipment and assets operated by a concessionaire be adopted. All and any installation, equipment and assets operated by the concessionaire under the concession contract, whatever its owner, shall be maintained by the concessionaire. The conceding party shall be bound to renew only the "*biens de retour*" (mainly infrastructures).

Third Parties within the Limits of the Concession

Pursuant to article 5 of the concession contract, the concessionaire is bound to accept, without any compensation, the setting up within the limits of the port various public entities such as the customs (which is standard) and the armed force (which is not standard) but also entities which are not in charge of any public services such as the Office des Cafés du Burundi (Office of Cafés of Burundi).

While it may be acceptable that limited public services are set up within the limits of the Port, this must not result in substantial restrictions in the capacity of the Port and its forthcoming development (i.e., geographic development of the ports on lands within the limits of the ports and occupied by the armed forces).

Furthermore, if non-public services are set up within the limits of the Port, such setting should be conditioned as follows:

- Authorizations should be given only by the concessionaire under temporary authorizations and not by the conceding party,
- Authorizations should be given only against compensation under the form of rents, royalties or otherwise.

Tariffs and Royalties

Under the current concession contract, tariffs are fixed by E.P.B. on the basis of the forecast of its proceeds and forecast of its charges and are submitted for authorization to the Ministry of transport. In case of dispute between E.P.B. and the Ministry, the dispute is deemed to be settled by the Committee in charge of privatization.

In the new concession contract it is suggested that the tariffs setting be defined in detail in order to avoid any uncertainty and potential discretionary power of the Ministry of Transport.

Royalties, defined under article 20, consist of a rent which amount is determined on the basis of the socio-economic situation of the country. Article 20 also provides that until 2005, the rent is equal to 10% of the revenue of E.P.B. and thereafter determined by common consent of the parties.

Such formula which is obviously of key importance for the success of the bidding process will have to be redrafted entirely. Indeed the concept of using the socio-economic situation of the country to determine the amount of rent is vague and uncertain.

The drafting must avoid any uncertainty and discretionary power of the conceding party. The drafting could be made for example on the basis of the following example, subject to adjustments considering the current tariffs and investments to be undertaken by the concessionaire:

> *"The Concessionaire may propose to increase the Public Service Royalties beyond the maximum prescribed by the concession contract if, given the quality of the service provided, said Public Service Royalties appear to be set at a level below the level of market in the sub-region for comparable services or if there is no elasticity of demand resulting from a lack of competition or alternative means. The conceding party cannot oppose the increase of the Public Service Royalties without just cause duly justified.*
>
> *Notwithstanding the foregoing, the Public Service Royalties are subject to revision every [____] (__) years after opinion of the conceding party on the basis of the*

concessionaire' s proposal, taking into account the adjustment mechanism provided below.

The concessionaire will provide the conceding party for approval and increase of Public Service Royalties at most equal to the amount of average inflation recorded in the last five (5) years. For this purpose, the concessionaire shall provide the conceding party with economic information in Burundi of which the suggested increase has been calculated."

Interference with Governance

Article 22 of the current concession contract contains provisions which must be regarded as an interference of the conceding party in the corporate organization of the concessionaire. Indeed, this article deals with legal reserve of E.P.B. and the distribution of dividends by the shareholders' meeting to E.P.B.

It is strongly suggested any interference with the corporate organization of the new concessionaire be avoided.

13.3.3 Concession Contract To-Be

As previously mentioned, the new concession contract must be drafted according to the current international standards and must be consistent with (i) the objective of the Burundi's State, i.e., a logistic platform and (ii) the nature and level of investments to be made by the State of Burundi, in particular on t he basis of any grants and by the forthcoming investors/ concessionaire.

In order to attract investors having the capacity to achieve or participate in achieving of the objectives of a new Port of Burundi, the concession contract which will have to be attached to the call for tenders must be clear in all its aspects especially in regard to investments, maintenance, status of the infrastructures, superstructures, assets and equipment to be operated, indemnification and compensation at the end of the concession or in case of early termination, royalties to be paid to the conceding party and fixing of the tariffs.

The concession contract must avoid any uncertainty in regard to the rights and obligations of either the conceding party of the concessionaire and must avoid or limit (with compensation in case of limitation) any discretionary power of the conceding party.

Concerning the form of the new concession contracts, an option is offered to the Government: the first option consists of a sole and unique agreement containing both the specific terms and conditions and the general terms of conditions. The second option consists of considering the specific terms and conditions as the concession agreement, the general terms and conditions being regarded as the exhibit to the specific terms and conditions. The general terms and conditions shall contain provisions that cannot be negotiable during the bidding process, whereas the specific terms and conditions will be adjusted in order to take into account the winning bidder's offer.

(1) The Specific Terms and Conditions Should Cover All or Part of the Following Issues

PART I - PURPOSE, DEFINITIONS AND NATURE OF THE PUBLIC SERVICE CONCESSION

Article 1 - Definitions
Article 2 - General and Introductory
2.1 - Definition of the Port of Bujumbura
2.2 - Objectives of the Proposed Port of Bujumbura
2.3 - Constitution of the Project Company (if any)
2.4 - Recovery of commitments and statements of the tenderer
2.5 - Transfer of shares in the capital of the new Concessionaire
2.6 - Participation of shareholders of Burundi in the share capital of the Concessionaire
Article 3 - Purpose of the Concession
3.1 - Operation of Public Service
3.2 - Public Service Missions
3.3 - General Principles of Public Service
3.4 - Related Activities performed by the Concessionaire
Article 4 - General Obligations of the Parties
4.1 - General obligations of Conceding party
4.2 - General obligations of the Concessionaire
Article 5 - Startup of operation of the Port of Bujumbura and startup of Works
5.1 - Startup of operations
5.2 - Startup of work

PART II - RULES OF LIABILITY

Article 6 - Liability of the Conceding party
Article 7 - Liability of the Concessionaire
Article 8 - Financial Sanctions: Penalties
8.1 - Principle of penalties
8.2 - Penalty Amounts
8.3 - Method of calculation and payment of penalties
Article 9 - Coercive Penalties
Article 10 - Insurance
Article 11 - First Demand Guarantee
11.1 - Issuance and renewal of First Demand Guarantees
11.2 - Reconstruction of First Demand Guarantees

PART III - FINANCIAL REGIM

Article 12 - Financial balance of the Concession (equilibrium of the concession)
Article 13 - Recourse to loan
Article 14 - Opening balance sheet of the Concession
Article 15 - Royalties due to the Conceding party
15.1 - Determination of Royalties
15.2 - Payment of Royalties
Article 16 - Entry right (if any)
Article 17 - Royalties based on the occupation of public lands (if any)
Article 18 - Taxes

PART IV - TERM AND TERMINATION OF THE CONCESSION

Article 19 - Duration of the concession - date of entry into force - starting date
Article 20 - Identification of the installation, infrastructures, superstructures equipment the startup of the Concession
20.1 - Biens de Retour
20.2 - Biens de Reprise
20.3 - Biens Propres (goods owned by the Concessionaire which are neither required nor needed for the operation of public services)
Article 21 - Resumption/recovery of the legal obligations of the Concessionaire with the exception of those to be purely of financial nature
Article 22 - Commitments of pure financial nature
Article 23 - Settlement of accounts of the Concession
Article 24 - Appointment of a liquidator (if any)
Article 25 - Early termination and conventional of the Convention
Article 26 - Termination of Concession through no fault of the Concessionaire
Article 27 - Termination of the Concession for Concessionaire's default
Article 28 - Dissolution, liquidation
Article 29 - Termination on the ground of force majeure

PART V - MISCELLANEOUS

Article 30 - Meeting Clause
Article 31 - Monitoring Committee
Article 32 - Power to amend of the Conceding party
32.1 - Content of the right to amend
32.2 - Conditions for exercising the right to amend
32.3 - Procedure
32.4 - Disruption of the equilibrium of the Concession
Article 33 - Force Majeure
Article 34 - Hardship
Article 35 - Settlement of Disputes
35.1 - Litigation between Concessionaire and Conceding party
35.2 - Reconciliation
35.3 - Arbitration
35.4 - Disputes between the Concessionaire and the users of the Port
Article 36 Applicable Law
Article 37 Publication costs (if any)

LIST OF APPENDICES

(2) The General Terms and Conditions should Cover All or Part of the Following Issues

PART I - DEFINITIONS - SYSTEM OF PROPERTY - TRANSFERED CONTRACTS

Article 1 - Definitions
Article 2 - Perimeter of the Concession
2.1 - Delimitation of the Perimeter of the Concession
2.2 - Increase the Perimeter of the Concession
2.3 - Planning and reduction of the Perimeter of the Concession (if any)
Article 3 - General regime of the Concession’s Assets
3.1 - Biens de Retour
3.2 - Biens de Reprise
3.3 - Inventory of the Concession’s Assets
3.4 - Amortization of the Biens de Retour

PART IV - EXERCISE OF THE AUTHORITY OF THE CONCEDING PARTY
Article 23 - Procedures for the exercise of the authority of the Conceding party
Article 24 - Transparency rules - accounting and financial management
Article 25 - Annual Performance Report of the Concession
Article 26 - Statistical information on the Traffic

PART V - INCLUSION OF THE DEVELOPMENT OF THE PORT IN THE ENVIRONMENT
Article 27 - Environmental Impact and Information
27.1 - Consideration of the environmental impact
27.2 - Information on environmental impacts

PART VI - PUBLIC SERVICE TARIFFS
Article 28 - Fixing of Tariffs
28.1 - Guidelines
28.2 - Allowed Variations in fixed tariffs
28.3 - Initial Fixed Tariffs
Article 29 - Publicity and communication of Public Service Tariffs
Article 30 - Amendment of Public Service Tariffs

LIST OF TECHNICAL APPENDIX

13.4 Recommendations to BMPRA for Selecting a Concessionaire

13.4.1 Objectives Public Private Partnership as Defined by BMPRA

The new concessionaire (port operator) should develop a modern port:

- Modern port in terms of service level based on best practices in a competitive environment
- Modern port in terms of investments in fixed assets

13.4.2 Principles of Public Private Partnership

The tender process and tender documents will be guided by the following three principles.

(1) Operations

Given the importance of the port of Bujumbura for Burundi's economy and the fact that the operation of the port is a public service, it is not acceptable that the operations could be disrupted as result of the tender process. Continuation of the operation of the port should always be guaranteed.

(2) Competition

The tender process should introduce competition allowing multiple potential operators to participate in the public tendering and provide competitive offers.

(3) Landlord Port Model

Best practices in the port industry prove that the service port model is less and less applied anymore and that the landlord port model is the preferred model. Critical success factor for implementing a landlord model is the creation of a Port Authority which has been already achieved in Burundi. Landlord model specifies the obligation of the Port Authority to invest in

maritime access and infrastructure (dredging, quay walls, internal roads, utilities…) and the private operator to invest in superstructure (pavement, warehouses…) and equipment.

13.4.3 Strategic Options

A distinction is made on "what" will be the subject of the public tender and "how" BMPRA will do the public tender.

(1) ''What" Will Be the Subject of the Public Tender

Two options are retained:

Option 1: Tendering shares of E.P.B.
Option 2: Tendering concession

Option 1: Tendering Shares of EPB

As the Burundi State presently participates (co-owner) in the share capital of E.P.B. there is the possibility to apply for a public tender for the shares owned by the Burundi State either directly or through public or public/private entities. This option is only valid if E.P.B. first secures a new concession contract for the years after December 2012 (between 10–30 years for example) before the public tender.

Indeed E.P.B. has no commercial value if it cannot renew the expiring concession contract first. If a new concession contract is secured the shares to be tendered will have a substantial value in the market.

In addition, the option is only valid if the State can sell or cause the sale of the majority of the shares in E.P.B.'s share capital. Indeed, it is quite doubtful that private operators or investors would be interested in acquiring a minority stake in E.P.B..

Option 2: Tendering Concession

The present concession contract expires in December 2012 and a new concession contract will be tendered.

Preferred Option

Option 2 is recommendable and the rational is the ease of implementation.

(2) ''How" We Will Do the Public Tender

Two options are retained:

Option 1: Value driven deal
Option 2: Transaction driven deal

Option 1: Value Driven Deal

This option is driven by the potential decision by a potential donor to allow substantial grants for developing the port of Bujumbura.

As this Study will officially be concluded in May or June in 2012, Government of Burundi (GOB) will soon be able to negotiate financial assistance with a potential donor for the several projects based on the study results. Therefore, GOB can include in the bidding documents for

concession, if such financial assistance is ensured, the condition that the projects shall be implemented by GOB by use of financial assistance committed by such donor.

Potential projects that GOB could implement by use of financial assistance committed by such donor are:

- Diversion of storm water canal
- Construction of the slipway with workshop
- Construction of container terminal with quay wall
- Procurement of container handling equipment

In this option the public tender process is suggested only to start after confirmation and commitment obtained from the donor to grant the investment funds for the port. It is understood that the budgeting for the grants is planned for 2013–2014.

In this option it is suggested that the concession contract of the present operator be amended for an additional period allowing the tender process to start after commitment grants by the donor. As an example the expiring concession contract could be amended allowing a continuation of operations for another 18 months.

The to-be position in this option will be very different from the as-is position meaning that the new concession contract to be developed will introduce major changes compared to the present concession contract that will expire in December 2012.

This also means the to-be position will be much better than the as-is position.

Option 2: Transaction Driven Deal

The transaction driven deal suggests that the public tender procedure should be started without delay allowing time for getting the new concession contract signed in December 2012.
The to-be position in this option will be not that different from the as-is position meaning the new position will not be much better than the as-is position. In this option one should consider the possibility the tender is not successful and consequently allowing to make amendments to the present concession contract to extend operational activities of E.P.B. beyond December 2012.

Indeed if Option 2 is not successful, Option 1 will be applied which of course results in additional transactions cost and time.

Preferred Option

With the objectives and guiding principles of the transaction taken into account, Option 1 is preferable.

It should be underlined that the maritime access and port infrastructure which are put on the market in Option 1 is completely different and superior to what are put on the market in Option 2.

Option 1 indeed allows room for incorporating the potential financial assistance from a potential donor based on the results of this Study.

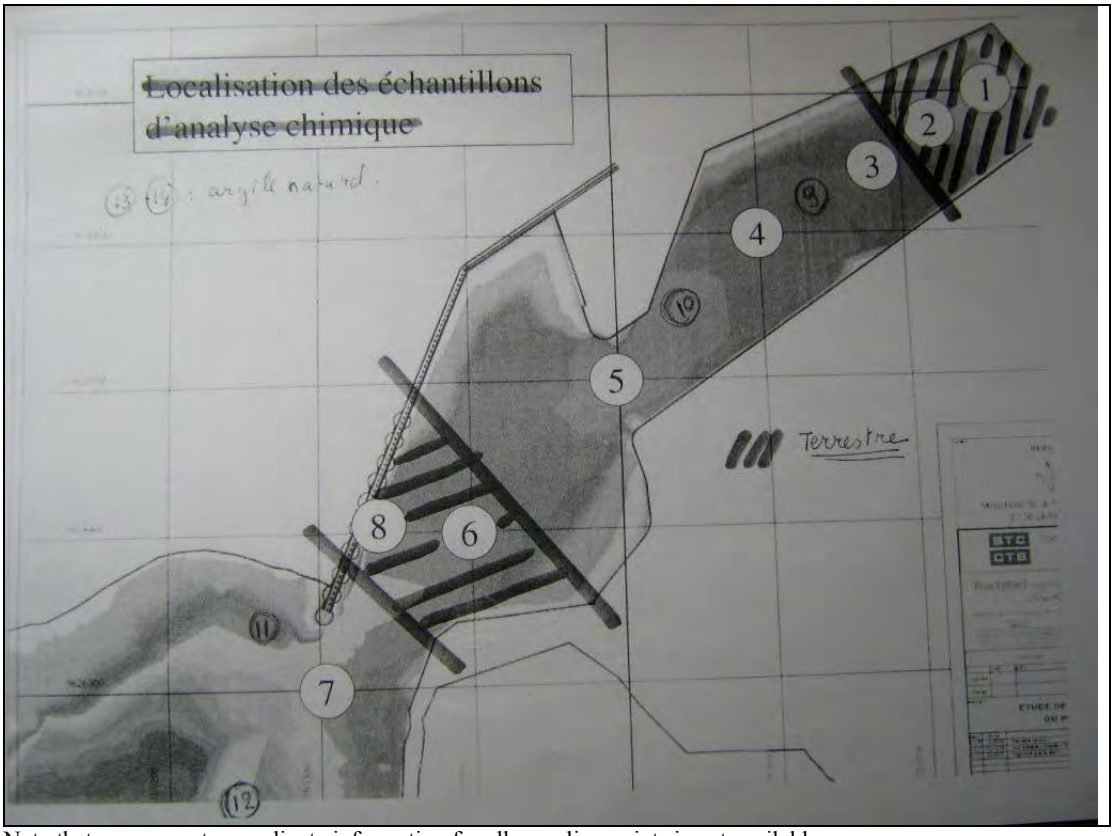
13.4.4 Final Consideration

Independent of the discussed options, the exit of the State of Burundi from the share capital of E.P.B. either through a sale of its shares to existing shareholders or the annulment of its shares is recommendable. Indeed, whatever the option chosen for the transaction by the Government, the best and most acceptable scenario in a concession transaction is that the State should only be the conceding party, either directly or indirectly through the Port Authority. Being the conceding party, the Government should not be a shareholder of the operator. Indeed, such situation will always result in conflict of interest.

Nevertheless, in many countries, the government has minor share of the capital of an operator to encourage the private sector to participate in port operation. In this regards, the Government of Burundi has decided to own 10 % of the share of a new operator to be selected.

Appendices

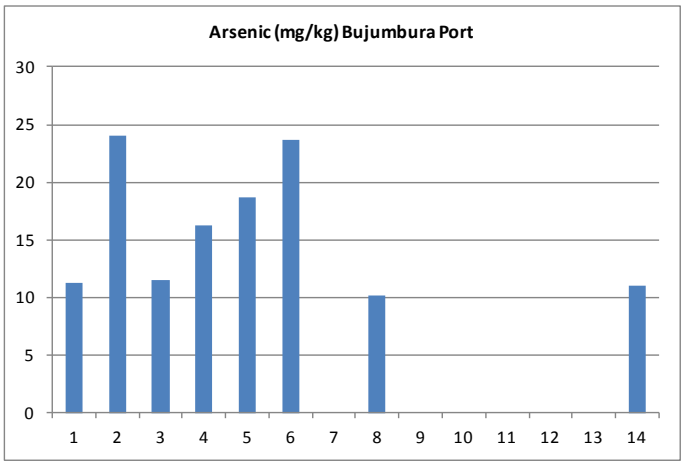
Appendix 1 Location Information of Sediment Sampling, Conducted by CTB



Note that any accurate coordinate information for all sampling points is not available
Clay Disposal, personal communication, 2011.

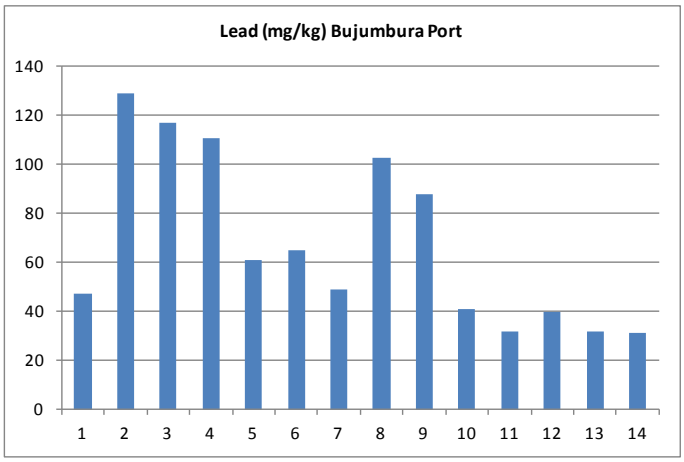
Figure 1.1: Sketch of Sediment Sampling Points of CTB Study

Appendix 2 Analytical Results (Port Sediment Survey, 2007)



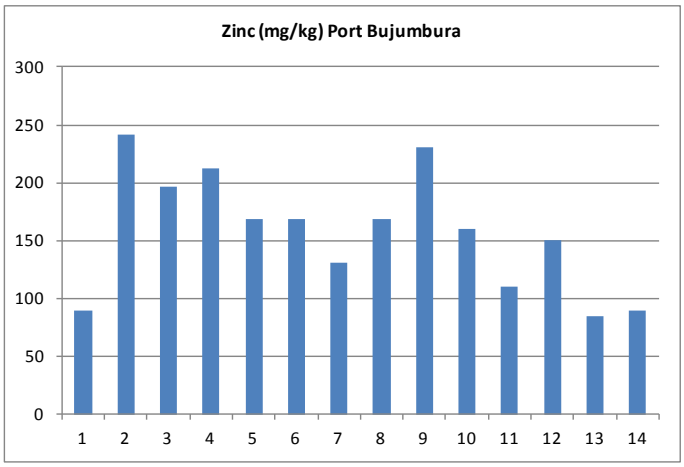
Courtesy of Clay Disposal, 2011

Figure 2.1: Analytical Results (Arsenic, Port Sediment)



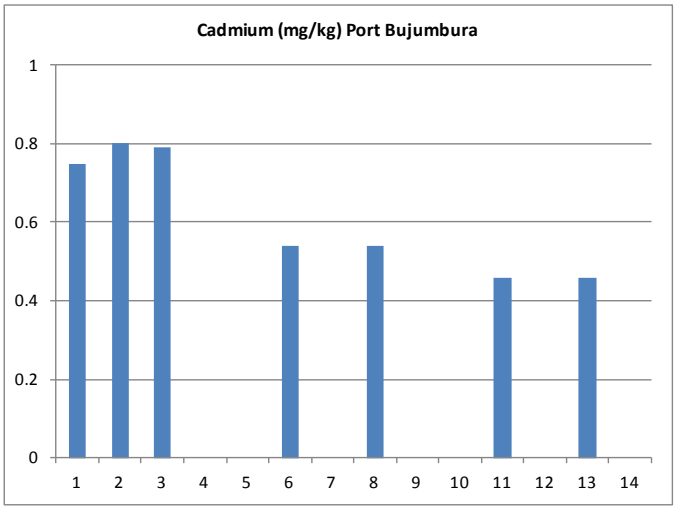
Courtesy of Clay Disposal, 2011

Figure 2.2: Analytical Results (Lead, Port Sediment)



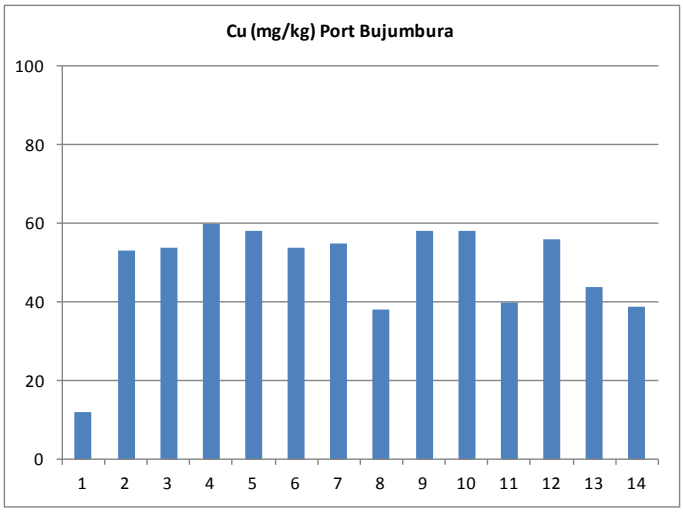
Courtesy of Clay Disposal, 2011

Figure 2.3: Analytical Results (Zinc, Port Sediment)



Courtesy of Clay Disposal, 2011

Figure 2.4: Analytical Results (Cadmium, Port Sediment)



Courtesy of Clay Disposal, 2011

Figure 2.5: Analytical Results (Cu, Port Sediment)

Appendix 3 Questionnaire at Stakeholder Meeting

Understanding Survey on
Port Bujumbura Improvement Project (PBIP) Study

First Stakeholders Meeting

April 9, 2012

1. How do you evaluate your understanding of Port Bujumbura Improvement Project (PBIP), presented today?

Confused			Fair		Very Informative
1	2	3	4	5	

2. What kind of environmental impacts this PBIP would cause in general?

Very Negative			No		Very Positive
1	2	3	4	5	

Please specify Type of Impacts you can imagine,
Natural _____
Social _____
Others _____

3. If this project is implemented successfully, your situation will be?

Worsened			No Change		Improved
1	2	3	4	5	

4. Do you wish to have this PBIP impelmented?

Yes **No** **Unknown**

5. Is your understanding about JICA Guideline getting deeper and/or, are you more familiar with the concept of this guideline, presented today?

Yes **No** **Unknown**

6. Please give us any opinion and/or suggestion regarding this PBIP,

Thank you for your co-operation!

Understanding Survey on
Port Rumonge Improvement Project (PRIP) Study

First Stakeholders Meeting

March 30, 2012

1. How do you evaluate your understanding of Port Rumonge Improvement Project (PRIP), presented today?

Confused			Fair			Very Informative
1	------	2	------	3	------	4 ------ 5

2. What kind of environmental impacts this PRIP would cause in general?

Very Negative			No			Very Positive
1	------	2	------	3	------	4 ------ 5

Please specify Type of Impacts you can imagine,
Natural _____
Social _____
Others _____

3. If this project is implemented successfully, your situation will be?

Worsened			No Change			Improved
1	------	2	------	3	------	4 ------ 5

4. Do you wish to have this PRIP impelmented?

Yes **No** **Unknown**

5. Is your understanding about JICA Guideline getting deeper and/or, are you more familiar with the concept of this guideline, presented today?

Yes **No** **Unknown**

6. Please give us any opinion and/or suggestion regarding this PRIP,

Thank you for your co-operation!

Questionnaire of
Bujumbura Port Improvement Project (PBIP) Study

We study on oppinion from diferent community for the development in Bujumbura port.
In this questionnaire, there are several questions on your oppinion for Bujumbura port.
There are some recommendation in the development plan as presernted before.
We would like to know your concern and oppinions for the development in the area.
In addition, the information from this questionnaire will be used for our research only.

① Household composition

age:

sex: ☐male ☐female

Montly income:

occupation:

☐Fisherman ☐Waterside worker ☐Hotel worker ☐Administrator ☐Police ☐Military
☐other worker<specify: > ☐part-time job
☐housewife ☐unemployer ☐student ☐others<specify: >

Area you live:

☐Bujumbura ☐outside of Bujumbura <specify: >

Number of year you live in present place:

numbers of family members you live with:

② Your oppinion on present situation in Bujumbura

1 What are the current main concerns or issues in Bujumbura?

a. Social **Less Fair Major** 1------2-----3-----4-----5

Comment:

b. Economy **Less Fair Major** 1------2-----3-----4-----5

Comment:

c. Environment **Less Fair Major** 1------2-----3-----4-----5

Comment:

Questionnaire of
Port Bujumbura Improvement Project (PBIP) Study

③ Your oppinion on PRIP Study

2 What kinds of concerns or issues the plan may cause?

2-1 Social	Bad	Neutoral	Good
a. Avairability of social service	1	2	3 4 5
b. Safety and security	1	2	3 4 5
c. Emplyment opportunities	1	2	3 4 5
d. Improvement of infrastructure	1	2	3 4 5
e. Avairability of education service	1	2	3 4 5
f. Others (specify)	1	2	3 4 5

Comment:

2-2 Economy	Bad	Neutoral	Good
a. Increasing of Income	1	2	3 4 5
b. Popuration and freight amount growth	1	2	3 4 5
c. Development of lake transport	1	2	3 4 5
d. Others (specify)	1	2	3 4 5

Comment:

2-3 Environment	Bad	Neutoral	Good
a. Water Quality	1	2	3 4 5
b. Noise and Air	1	2	3 4 5
c. Soil	1	2	3 4 5
d. Local flora/fauna	1	2	3 4 5
e. Fishery area	1	2	3 4 5
f. Others (specify)	1	2	3 4 5

Comment:

3 What is the priority issue to improve in Bujumbura?	Less	Fair	Major
a. Development of transport network	1	2	3 4 5
b. Facility development	1	2	3 4 5
c. Development of tourist industry	1	2	3 4 5
d. Improvement of educational serivice	1	2	3 4 5
e. Others (specify)	1	2	3 4 5

Comment:

4 What kinds of port would you wish to be developed in Bujumbura in 2030?

☐ Freight ☐ Passenger ☐ Tourism ☐ Other(Specify) :_____

Reason:

5 Which stakeholder may get bad influence upon this Master Plan?

Stakeholder: Reason:

Thank you for your co-operation!

Questionnaire of
Port Rumonge Improvement Project (PRIP) Study

We study on oppinion from diferent community for the development in Rumonge port.
In this questionnaire, there are several questions on your oppinion for Rumonge port.
There are some recommendation in the development plan as presernted before.
We would like to know your concern and oppinions for the development in the area.
In addition, the information from this questionnaire will be used for my research only.

① Household composition

age:

sex: ☐male ☐female

Montly income:

occupation:

☐Fisherman ☐Waterside worker ☐Hotel worker ☐Administrator ☐Police ☐Military
☐other worker<specify: > ☐part-time job
☐housewife ☐unemployer ☐student ☐others<specify: >

Area you live:

☐Rumonge ☐outside of Rumonge <specify: >

Number of year you live in present place: years

numbers of family members you live with: person

② Your oppinion on present situation in Rumonge

1 What are the current main concerns or issues in Rumonge?

a. Social **Less Fair Major**
1------2------3------4------5

coments:

b. Economy **Less Fair Major**
1------2------3------4------5

coments:

c. Envirnment **Less Fair Major**
1------2------3------4------5

coments:

Questionnaire of
Port Rumonge Improvement Project (PRIP) Study

③ Your oppinion on PRIP Study

2 What kinds of concerns or issues the plan may cause?

2-1 Social	Bad	Neutoral	Good
a. Avairability of social service	1------2------3------4------5		
b. Safety and security	1------2------3------4------5		
c. Emplyment opportunities	1------2------3------4------5		
d. Improvement of infrastructure	1------2------3------4------5		
e. Avairability of education service	1------2------3------4------5		
f. Others (specify)	1------2------3------4------5		

coments:

2-2 Economy	Bad	Neutoral	Good
a. Increasing of Income	1------2------3------4------5		
b. Popuration and freight amount growth	1------2------3------4------5		
c. Development as Hub-port	1------2------3------4------5		
d. Others (specify)	1------2------3------4------5		

coments:

2-3 Envirnment	Bad	Neutoral	Good
a. Water Quality	1------2------3------4------5		
b. Noise and Air	1------2------3------4------5		
c. Soil	1------2------3------4------5		
d. Local flora/fauna	1------2------3------4------5		
e. Fishery area	1------2------3------4------5		
f. Others (specify)	1------2------3------4------5		

coments:

3 What is the priority issue to improve in Rumonge?	Less	Fair	Major
a. Development of transport network	1------2------3------4------5		
b. Facility development	1------2------3------4------5		
c. Struggle for the refugee issues	1------2------3------4------5		
d. Improvement of educational serivice	1------2------3------4------5		
e. Others (specify)	1------2------3------4------5		

coments:

4 Do you wish to support the plan?

☐ Yes ☐ No

Reason:

Thank you for your co-operation!