Chapter 5 Strategy of Port Sector Development

5.1 Role of Burundian Port Sector in the Region

5.1.1 Role of the Port Sector

The new era is coming for Bujumbura Port to play the role of a transport hub on the North-south Corridor as well as on t he East-west Corridor: The North-South Corridor spans from South Sudan to South Africa and the East-west Corridor stretches from the east coast of Africa to the western shore of Lake Tanganyika.

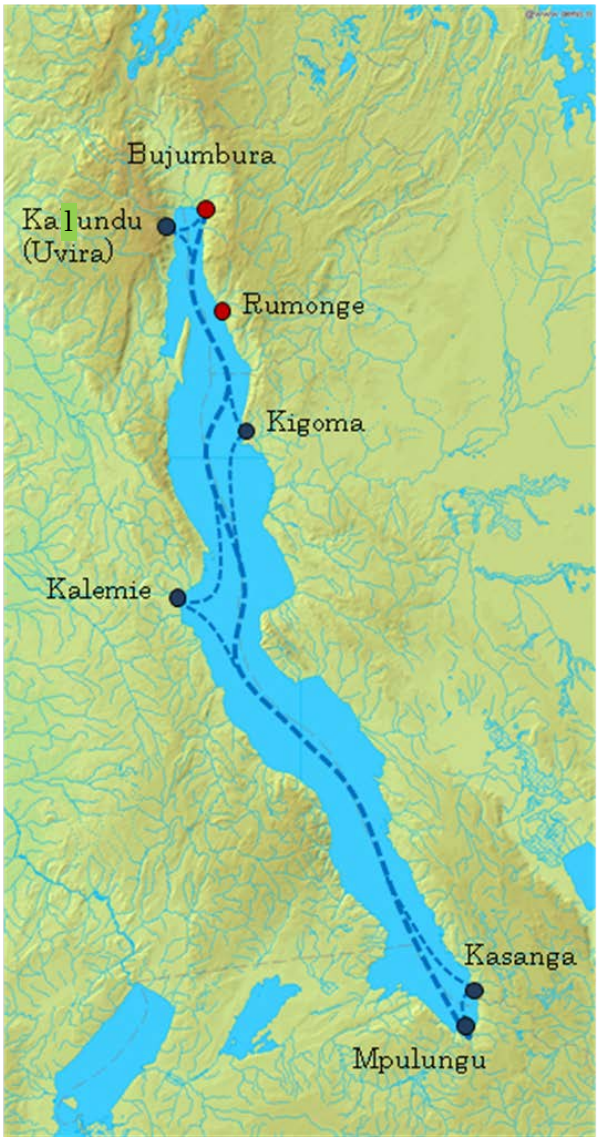


Figure 5.1: Main Ports on Lake Tanganyika

Regarding the North-South Corridor as described in the section for the demand forecast, the cargo transported from Mpulungu Port in Zambia to Bujumbura Port have been rapidly increasing. The cargo unloaded at Bujumbura Port is not only the imported cargo of Burundi but also the transit cargo to Rwanda, North-eastern part of DRC. In the future, the transit cargo to Uganda and South Sudan from the southern part of Africa including South Africa will also be handled at Bujumbura Port, as the economy of SADC countries will continue growing and the

socio-political stability of the EAC member countries will further be enhanced. In addition, the trade system of these regions is being facilitated among the members of these regional communities. Bujumbura Port is strategically located at the northern tip of Lake Tanganyika where all the cargo moving north and south find an economical pass exploiting lake transport on Lake Tanganyika. The port shall be developed as the reliable transport node on this corridor.

Regarding the East-west Corridor, the lake transport has been declining mainly because of the poor performance of Tanzania Railway Limited (TRL). Imported and exported cargo passing through Tanzania to Burundi has completely been shifted to the road from the ever-flourished trade route of the lake and railway transport via Kigoma. Under this situation, JICA is currently conducting "The Project for the Comprehensive Transport and Trade System Development Master Plan in Tanzania (called JICA Study in Tanzania)" in parallel with the master plan study of Burundian port sector development.

The revival of the TRL railway will have a great impact onto the lake transport between Kigoma Port and Bujumbura Port. As most of the cargo via Kigoma will be international container cargo and one container block train can transport about 70,800 tons in 2015 to 323,000 tons in 2030, both ports must be equipped with facilities and equipment to handle ocean going containers. Particularly Bujumbura Port has to build a container berth and procure STS container cranes and reach stackers to handle containers.

Meanwhile, the upgrading of the road from Tunduma to Kasanga Port is underway and expected to be completed in a few years. Once the road upgrading is completed, the road will be paved all the way from Dar es Salaam to Kasanga Port and all the transit cargo to the areas on L ake Tanganyika can be transported by this route, as it is the shortest between Dar es Salaam and Lake Tanganyika. To further lower transport costs, the dry port existing at Mbeya may be used as the node of modal shift between the road and TAZARA railway, running between Dar es Salaam and Lusaka, which shows a relatively better performance than the TRL railway between Tabola and Kigoma in Tanzania. Thus, Kasanga Port is a potential counterpart port to Bujumbura Port on the East-west Corridor on Lake Tanganyika in case TRL railway is not revitalized.

5.1.2 Major Routes of Lake Maritime Transport

There are 2 major maritime transport routes on Lake Tanganyika, neither alternative nor interrelated to each other. They are as follows:

- Regional Maritime Trunk Routes (including transport of transit cargo)
  At present, only Bujumbura – Mpulungu (Kasanga) route exists. Before, the Kigoma – Kalemie Route was active but this route has declined because of the poor performance of the TRL railway.
- Coastal Maritime Routes connecting Cities and Villages on the Lake
  These routes are the east-west maritime routes crossing the lake and the north-south maritime routes of a short distance connecting the cities and villages along the shore. As there is no development plan of roads as access to the small villages on the shore at present, the coastal maritime transport route will remain as they are for a considerable period of time. They are essential to provide a lifeline to the people inhabiting the shore.

The reasons for the decline of Kigoma–Bujumbura route as well as the east-west maritime route between Kigoma–Kalemie are considered below:

- Nebulous Future of TRL Railway
  As the rehabilitation program of the TRL railway has not been concluded and the upgrading of the trunk roads has been accelerated in Tanzania, the cargo transport has been shifting to the roads from the railway. As a result, the following transport routes by road have replaced the transport route via Kigoma:
  (a) From Dar es Salaam via Mbeya to the south-western shore of Lake Tanganyika
  (b) From Dar es Salaam via the mountainous land to the north-western shore of Lake Tanganyika including Burundi
- Deterioration of Kalemie Port
  As previously reported in this report, the facilities and infrastructures of Kalemie Port have not been refurbished at all since they were installed or built. In addition, because of siltation, the navigation channel has become too shallow for a large cargo ship to enter the port.

The transport business on Lake Tanganyika will be shared by the large ship transporters who are engaged in the north-south transport on the regional trunk route using the cargo ships of 350 ton to 1500 ton class, and the small ship transporters who are engaged in the transport on the local coastal routes using wooden cargo ships of 150 ton class or less. The profit source for the large ship transporters will come from the long distance transport. Therefore, they will not be interested in the regional coastal transport. Calling to Kigoma or Kalemie will make sense for them only when their ships are engaged in cargo transport on the north-south regional trunk route. Their major concern is the development of such a transport network that may vitalize the north-south regional trunk route, as they can maximize and stabilize their profits from the development. They are also interested in alternative transport routes they can use in case social unrest takes place on one route, although the unrest has currently been subsiding in the countries surrounding Lake Tanganyika.

5.1.3 Strategy of the Port Sector Development

It is necessary for the Burundian government to take into account the above mentioned roles and current maritime transport routes in developing its port sector. Burundian government should have a development strategy consisting of the following:

- To make Bujumbura as a logistic hub in the inland region of East Africa consisting of Rwanda, North-eastern part of DRC, Uganda, Zambia and Burundi.
- To make Bujumbura Port as a gateway of the inland region of East Africa taking advantages of the transport network developments of the counties on the coast of Indian Ocean consisting of Tanzania, Mozambique and South Africa

To materialize the strategies above, the following measures should be implemented:

- To consolidate the strength of Bujumbura Port as a node between lake transport and road transport on the North-South Corridor
- To exploit the transport network developments of the coastal countries to lower transport cost
- To enhance coastal shipping for short-distance lake transport

In order to consolidate the strength as a node of transport modal shift on the North-South Corridor, the development of Bujumbura Port should be capable of handling the increasing in cargo coming from the Southern part of Africa, including South Africa. The port should be efficient in handling transit cargo to/from Rwanda, north-eastern part of DRC and Uganda. The port should lease out some areas within its premises for the convenience of the neighboring

countries. In addition, Burundian government should request the proper development of Mpulungu Port to the Zambian government for the benefit of both countries, as the cargo handling capacity of this port, having only one 20 m quay, will soon be a bottleneck of transport along the North-South Corridor.

To enhance the roles as a hub port on Lake Tanganyika, a dry port should separately be built at the suburb of Bujumbura City for the cargo coming from and going to the neighboring countries crossing the border by road. The dry port should be connected with an access road to Bujumbura Port and National Road Route 1, along which most of the cargo to and from Dar es Salaam are transported. For passengers coming from and going to the neighboring countries by road, an immigration office and international terminal may be built near the existing international airport, which has similar functions such as passport control, quarantine and customs clearance.

To exploit the transport network developments in the coastal counties, particularly container transport by railway between Dar es Salaam and Kigoma in Tanzania, a Burundian port as a counterpart port to Kigoma Port should have sufficient port premises for container stacking as well as the sufficiently long quay wall for loading/unloading of containers.

To enhance the coastal shipping for short-distance lake transport, which will carry a relatively small quantity of cargo and 50 to 100 passengers on fixed time schedule, berths to accommodate Ro/Ro ships should be taken into account.

5.1.4 Bujumbura Port Development

Bujumbura Port is mostly handling break bulk cargo. All the container cargo from/to Dar es Salaam Port is transported by road at present. Liquid bulk, which is fuel, used to be transported from Kigoma Port has been stopped for a few years. Most of the cargo coming from Mpulungu Port is break bulk cargo, as it has no equipment to handle containers. However, as operation of container block train will start in 2015 between Dar es Salaam and Kigoma and containerization will start at Mpulungu Port sooner or later, the development of the ports should focus on the container cargo to be handled. Bujumbura Port should have a container terminal equipped with container STS cranes and other container handling equipment.

In addition, as more cargo ships will be required to meet the increasing cargo demand, there should be a ship repair facility in Burundi to inspect and repair them when necessary. As the most convenient location for the ship repairing facility is the present port basin of Bujumbura Port, where ships can be moored for fitting out, a slipway and workshop should be built at the port basin.

The port needs wider premises to ensure flexibility for future cargo demand. In this regard, the expansion of the port premises should be considered. The port can be expanded to the north-west shore where the lake bed is getting shallow because of accretion caused by sandy soils debouched from the River Ntahangwa. The expansion should provide a sufficient water area for an oil berth for liquid bulk transport from Kigoma and Ro/Ro berth which may be introduced for speedy transport of a relatively small quantity of cargo and 50 to 100 passengers.

5.1.5 Rumonge Port Development

Based on the foregoing discussions, the objectives in developing Rumonge Port should be set to promote the coastal shipping for the people inhabiting the opposite shore in DRC and the eastern shore in Tanzania. Rumonge Port will not be an active player on the trunk route to/from Mpulungu in Zambia or Kasanga in Tanzania. The role as the lifeline for them will not cease

even though the road between Makamba and Mugina about 26 km to the Tanzanian border in Makamba Region will be upgraded, which can reduce the travel time to 2 hours by road from 5 hours by ship between Kigoma and Rumonge. A relatively big lot of cargo will continue to be transported by a ship capable of carrying cargo of about 150 tons which is equivalent to 150 trucks while a small lot of cargo will be transported by road.

5.2 Demands Forecast of Bujumbura Port

As mentioned in the transport demand forecast, the cargo demand of Bujumbura Port to be transported by ship will consist of cargos of "Southern Africa" and "Others" as shown in Table 4.36 and Table 4.38 in 2030 and 2020 respectively. The cargo of "Southern Africa" is called here as "Base" cargo. Cargo of "Others" is called here as "International Container Cargo" which is due to the reasons that all the break bulk cargo can be transported by truck and not by ship via between Kigoma and Bujumbura and that only the international transit container of Burundi can economically be transported by combination of railway and ship between Dar es Salaam and Bujumbura via Kigoma Port.

All the base cargo has to be transported by ship. In order to plan the cargo handling facilities of Bujumbura Port, this cargo should be divided into types of cargo and the types of cargo can be determined by the commodities to be transported by ship as well as development of containerization of break bulk cargo. The volume of commodities estimated in 2030 and 2020 tabulated in Table 4.37 and Table 4.39 respectively are used for estimation of volume of each type of cargo.

All the international container cargo is considered as the transit cargo of Burundi as the transport development of DRC on the western shore of Lake Tanganyika will not be implemented before 2030. Basically, the container traffic demand is based on the estimation made by Tanzanian Ports Authority (TPA). For estimation of facilities requirements, number of each type of containers, i.e. 20 footers and 40 footers, has to be estimated. Also, empty containers should be considered to balance container box movement between Dar es Salaam and Bujumbura Port.

5.2.1 Base Case

The base-case considers the cargo moving between the Southern African region and the areas which can be considered the hinterland of Bujumbura Port such as Burundi, Rwanda and north-eastern part of DRC. The cargo is moving between Bujumbura Port and Mpulungu Port. As there is no alternative route for this cargo to move, with the exception of cement produced at Mbeya in Tanzania which may be continually transported from Kasanga Port to Bujumbura Port, this should be considered as the base-case. The demand of the annual cargo volume is estimated at 151,600 tons, 220,800 tons, 300,900 tons and 397,900 tons in 2015, 2020 and 2025 and 2030 respectively.

At present, Mpulungu Port has only a 20 m long berth and one crawler crane to load and unload cargo to/from ships. In case the cargo is loaded to a cargo ship, a shoot is usually used. Therefore, currently the port can handle mostly break bulk cargo. As the maximum capacity to handle the break bulk cargo is considered around 195,000 tons per year even if the berth is expanded to 60 m, the break bulk cargo will exceed the capacity of Mpulungu Port. Sooner or later the cargo which can be containerized has to be containerized. To estimate the cargo demand of Bujumbura Port, the containerization at Mpulungu Port is assumed to start in 2020. Table 5.1, Table 5.2, Table 5.3 and Table 5.4 show the cargo demand of the base-case in 2015, 2020, 2025 and 2030 respectively.

Table 5.1: Demand Forecast at Bujumbura Port (Base Case) in 2015

Commodity	Base in 2015									
	1000 ton	Break Bulk		Container		Dry Bulk		Liquid Bulk		Remark
		%	1000 ton	%	1000 ton	%	1000 ton	%	1000 ton	
Animal & Animal Products	0.3	100%	0.3							No live stock
Vegetable Products	6.3	100%	6.3							
Foodstuffs	29.2	100%	29.2							
Mineral Products	79.5	95%	75.5			5%	4.0			
Mineral Fuel and Oil	8.2	20%	1.6					80%	6.6	
Chemicals & Allied Industries	2.7	100%	2.7							
Plastics / Rubbers	1.1	100%	1.1							
Raw Hides, Skins, Leather, & Furs	4.2	100%	4.2							
Wood & Wood Products	2.0	100%	2.0							
Textiles	0.7	100%	0.7							
Footwear / Headgear	0.1	100%	0.1							
Stone / Glass	4.3	100%	4.3							
Metals	10.2	100%	10.2							
Machinery / Electrical	2.2	100%	2.2							
Transportation	0.7	100%	0.7							
Total	***151.6***		***141.1***		***0.0***		***4.0***		***6.6***	

Table 5.2: Demand Forecast at Bujumbura Port (Base Case) in 2020

Commodity	Base in 2020									
	1000 ton	Break Bulk		Container		Dry Bulk		Liquid Bulk		Remark
		%	1000 ton	%	1000 ton	%	1000 ton	%	1000 ton	
Animal & Animal Products	0.4	50%	0.2	50%	0.2					No live stock
Vegetable Products	8.7			100%	8.7					
Foodstuffs	41.1			100%	41.1					
Mineral Products	119.2	95%	113.2			5%	6.0			
Mineral Fuel and Oil	11.4			20%	2.3			80%	9.1	
Chemicals & Allied Industries	3.7	50%	1.8	50%	1.8					
Plastics / Rubbers	1.5	50%	0.7	50%	0.7					
Raw Hides, Skins, Leather, & Furs	6.3			100%	6.3					
Wood & Wood Products	2.7	50%	1.3	50%	1.3					
Textiles	1.0			100%	1.0					
Footwear / Headgear	0.2			100%	0.2					
Stone / Glass	6.4	100%	6.4							
Metals	14.2	50%	7.1	50%	7.1					
Machinery / Electrical	3.1	50%	1.5	50%	1.5					
Transportation	1.0	100%	1.0							
Total	***220.8***		***133.4***		***72.4***		***6.0***		***9.1***	

Table 5.3: Demand Forecast at Bujumbura Port (Base Case) in 2025

Commodity	Base in 2025									
	1000 ton	Break Bulk		Container		Dry Bulk		Liquid Bulk		Remark
		%	1000 ton	%	1000 ton	%	1000 ton	%	1000 ton	
Animal & Animal Products	0.5	50%	0.2	50%	0.2					No live stock
Vegetable Products	11.5			100%	11.5					
Foodstuffs	54.5			100%	54.5					
Mineral Products	165.9	95%	157.6			5%	8.3			
Mineral Fuel and Oil	14.9			20%	3.0			80%	11.9	
Chemicals & Allied Industries	4.7	50%	2.4	50%	2.4					
Plastics / Rubbers	1.9	50%	1.0	50%	1.0					
Raw Hides, Skins, Leather, & Furs	8.9			100%	8.9					
Wood & Wood Products	3.5	50%	1.8	50%	1.8					
Textiles	1.3			100%	1.3					
Footwear / Headgear	0.2			100%	0.2					
Stone / Glass	8.9	100%	8.9							
Metals	18.7	50%	9.4	50%	9.4					
Machinery / Electrical	4.1	50%	2.0	50%	2.0					
Transportation	1.3	100%	1.3							
Total	***300.9***		***184.6***		***96.1***		***8.3***		***11.9***	

Table 5.4: Demand Forecast at Bujumbura Port (Base Case) in 2030

Commodity	Base in 2030									
	1000 ton	Break Bulk		Container		Dry Bulk		Liquid Bulk		Remark
		%	1000 ton	%	1000 ton	%	1000 ton	%	1000 ton	
Animal & Animal Products	0.6	50%	0.3	50%	0.3					No live stock
Vegetable Products	14.8			100%	14.8					
Foodstuffs	70.5			100%	70.5					
Mineral Products	222.9	95%	211.7			5%	11.1			
Mineral Fuel and Oil	19.1			20%	3.8			80%	15.3	
Chemicals & Allied Industries	6.0	50%	3.0	50%	3.0					
Plastics / Rubbers	2.5	50%	1.2	50%	1.2					
Raw Hides, Skins, Leather, & Furs	12.0			100%	12.0					
Wood & Wood Products	4.5	50%	2.2	50%	2.2					
Textiles	1.7			100%	1.7					
Footwear / Headgear	0.3			100%	0.3					
Stone / Glass	11.9	100%	11.9							
Metals	24.2	50%	12.1	50%	12.1					
Machinery / Electrical	5.2	50%	2.6	50%	2.6					
Transportation	1.7	100%	1.7							
Total	***397.9***		***246.8***		***124.6***		***11.1***		***15.3***	

5.2.2 International Container Cargo

Because of the poor performance of TRL railway between Dar es Salaam and Kigoma, all the cargo which used to be transported by rail between Dar es Salaam and Kigoma and by ships between Kigoma and Bujumbura has stopped. TRL railway rehabilitation is studied by the international donors like World Bank. It is also studied by JICA Study in Tanzania being conducted in parallel with this study. According to the demand increase, one more container block train will be operated in future.

To estimate the containers transported by one container block train, the statistics of the international container cargo for Burundi at Dar es Salaam Port in 2006 to 2011 is used as the basic information. The statistics of the container cargo at Dar es Salaam Port together with complementary information are shown in Table 5.5.

Table 5.5: Burundi Containers Recorded at Dar es Salaam Port (2006–2011)

Transit Containers at DES Port	**2006**			**2007**			**2008**			**2009**			**2010**			**2011**			Average	
	Boxes	TEUs	Tons	Boxes	TEUs	Tons	Boxes	TEUs	Tons	Boxes	TEUs	Tons	Boxes	TEUs	Tons	Boxes	TEUs	Tons	Tons/Box	Tons/TEU
IMPORTS	4,162	5,513	68,394	4,303	5,977	72,157	5,087	7,398	87,475	5,786	8,006	95,265	7,139	9,575	120,204	7,298	9,567	123,800	16.8	12.3
20'	2,811			2,629			2,776			3,566			4,703			5,029				
40'	1,351			1,674			2,311			2,220			2,436			2,269				Share
20'	68%			61%			55%			62%			66%			69%				63.3%
40'	32%			39%			45%			38%			34%			31%				36.7%
EXPORTS	407	432	6,316	1,077	1,135	16,790	790	816	12,322	1,178	1,234	18,357	974	1,041	15,291	1,118	1,199	17,863	15.7	14.8
20'	382			1,019			764			1,122			907			1,037				
40'	25			58			26			56			67			81				Share
20'	94%			95%			97%			95%			93%			93%				94.4%
40'	6%			5%			3%			5%			7%			7%				5.6%
EMPTIES	3,755			3,226			4,297			4,608			6,165			6,180				
20'	2,429			1,610			2,012			2,444			3,796			3,992				
40'	1,326			1,616			2,285			2,164			2,369			2,188				Share
20'	65%			50%			47%			53%			62%			65%				56.8%
40'	35%			50%			53%			47%			38%			35%				43.2%

Note: The shaded cells show the statistical data.
Source: TPA

TPA has forecast the container transit cargo in tonnage to/from Burundi up to 2028 in "TPA Landlord Strategy, Update of Forecast Traffic Volumes for Dar es Salaam Port April 2011". The import and export cargo volumes are estimated. Based on TPA's forecast, TEUs, 20 footers, 40 footers and empties up to 2030 are estimated as tabulated in Table 5.6.

Table 5.6: Burundian Containers at Kigoma Port

Year		2015	2020	2025	2030
Imports	1000 tons	70.8	145.5	222.0	323.0
	TEUs	5,745	11,807	18,015	26,211
	Boxes	4,214	8,661	13,214	19,226
	20 footer	2,667	5,482	8,364	12,170
	40 footer	1,547	3,179	4,850	7,056
Exports	1000 tons	9.2	18.6	26.6	38.1
	TEUs	620	1,253	1,792	2,567
	Boxes	586	1,185	1,694	2,427
	20 footer	553	1,119	1,599	2,291
	40 footer	33	66	95	136
Empties	TEUs	5,125	10,554	16,223	23,644
	Boxes	3,628	7,476	11,520	16,799
	20 footer	2,114	4,363	6,765	9,879
	40 footer	1,514	3,113	4,755	6,920
Throughput/ Year	1000 tons	80.0	164.1	248.6	361.1
	TEUs	11,490	23,614	36,030	52,422
	Boxes	8,428	17,322	26,428	38,452
	20 footer	5,334	10,964	16,728	24,340
	40 footer	3,094	6,358	9,700	14,112
Throughput/ Day	TEUs	31	65	99	144
	Boxes	23	47	72	105
	20 footer	15	30	46	67
	40 footer	8	17	27	39

Source: TPA

As the break bulk, cargo and dry bulk will be transported by other transport means than a container block train, the cargo destined to Bujumbura Port from Kigoma Port transported by ship are considered to be containers only.

5.2.3 Combined Demand

The demand of Bujumbura Port is obtained by summing up t he cargos estimated for the base-case and the containers transported by the container block train(s). The results are shown in Table 5.7 and Figure 5.2.

Table 5.7: Cargo Demand of Bujumbura Port

1,000 ton

	2015	2020	2025	2030
Container from/to Kigoma	80.0	164.1	248.6	361.1
Container from/to Mpulungu	0.0	72.4	96.1	124.6
Break Bulk	141.1	133.4	184.6	246.8
Dry Bulk	4.0	6.0	8.3	11.1
Liquid Bulk	6.6	9.1	11.9	15.3
Total	231.6	384.9	549.5	759.0

Note: Mpulungu Port can handle containers in 2020 onwards.

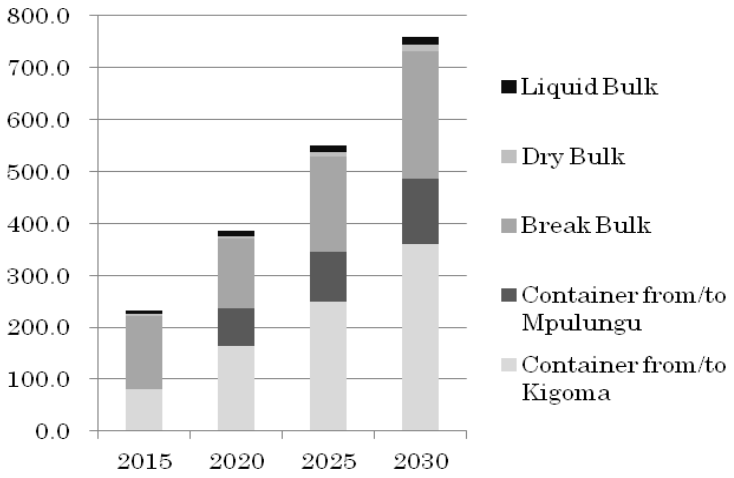


Figure 5.2: Cargo Demand of Bujumbura Port Shown in Graph (ton)

5.3 Demand Forecast of Rumonge Port

As discussed, Rumonge Port will be developed to accommodate small wooden cargo ships engaged in the coastal shipping for the people inhabiting the opposite shore in DRC and the eastern shore in Tanzania.

Majority of the cargo handled at Rumonge is the imported ones, and the export cargo is seldom. Major inbound commodities are edible flour, dry fish, rattan for furniture, charcoal, and fuel oil. The major outbound cargo is fruits and vegetables. It takes the cargo ships about 3 hours to cross the lake, about 35 km wide, to the opposite shore. Meanwhile, it is about 8 hours for the cargo ships to go to Kigoma from Rumonge.

The current lake transport centered at Rumonge is to provide a lifeline to the people living on the opposite shore in DRC, where roads along the shore are yet to be built and no town of a significant scale exists. It also provides a lifeline to the people who are living at small villages dotted along the lake shore in Tanzania, where no road access is available.

The annual cargo volume handled at Rumonge is estimated at about 25,000 tons (100 ton cargo ships × 10 ship calls per week × 25 weeks per year = 25,000 tons/year). This estimate is based on the information and discussion with an advisor of the Rumonge mayor and MTTPE official. As the population will not increase much in the remote small villages without access from the land, the cargo volume is considered to be the same in the future, i.e. 25,000 tons per year.

Chapter 6 Development Master Plan of Burundian Ports

6.1 General

In Chapter 5, the demands of cargo which will be transported by ship at Both Bujumbura Port and Rumonge Port are discussed. In this chapter, the master plan of the port development is discussed on the volume and types of cargo to be handled, particularly at Bujumbura Port. As in Chapter 5 cargo volume is estimated in four types, i.e. container, break bulk, dry bulk and liquid bulk in 2015, 2020, 2025 and 2030, the master plan is drawn on the estimated volumes of each type of cargo.

The requirements of facilities of Bujumbura Port are discussed according to the demand of each type of cargo at first. Then, the required facilities in future will be laid out in consideration of the present layout and conditions of the port facilities. The natural conditions discussed in Chapter 4 are also taken into consideration, especially the bathymetry of the lake shore where port expansion can economically be implemented and diversion of storm water canal which currently runs into the port basin. Finally, two alternative master plans including their pros and cons are discussed for selection of the master plan which is recommendable.

For Rumonge Port, the demand forecasted in future is rather simple. Therefore, the development layout is worked out in consideration of a large change of the water level of Lake Tanganyika, which is 4.24 m in past 81 years, and small wooden cargo ships plying between Rumonge and western shore of Lake Tanganyika of DRC.

6.2 Development of Bujumbura Port

6.2.1 Facilities Requirements

In view of the demand forecast discussed in Chapter 5, the development plan of Bujumbura Port is worked out as follows by identifying requirements of each facility.

(1) Break Bulk Berth

The demand of the break bulk cargo for Bujumbura Port is shown in the table below:

Table 6.1: Demand of Break Bulk Cargo

Year	2015	2020	2025	2030
Break Bulk Cargo (1000 ton)	141.1	133.4	184.6	246.8

The required berth length to handle the above volumes of break bulk cargo is estimated based on the following conditions:

- The break bulk cargo and containers will be handled at different berths.
- As the major cargo is cement and cannot be handled while it is raining, the annual working days for unloading from ships is assumed 300 days per year.
- The unloading of break bulk cargo is assumed to be 250 tons per gang per day.
- Each cargo ship has 1.6 gangs of workers for cargo unloading on average (2 gangs for 5 vessels and 1 gang for 3 ships according to the existing fleet).
- The required quay length for one cargo vessel is assumed to be 80 m, 60 m (ship length) plus 10 m allowance at bow and stern.

As a result, the berth length for the break bulk cargo required in 2015, 2020, 2025 and 2030 is estimated in the table below:

Table 6.2: Required Berth Length for Break Bulk Cargo

Year	Cargo (1000 ton/year)	Working Days per year	Ton/gang/day	Gang per vessel	Calling Vessels per day	Berth per Vessel (m)	Required Berth Length (m)
2015	141.4	300	250	1.6	2	80	160
2020	133.4	300	250	1.6	2	80	160
2025	184.6	300	250	1.6	2	80	160
2030	246.8	300	250	1.6	3	80	240

Currently Bujumbura Port has a 350 m long berth, which can be used to handle the demand of break bulk cargo estimated in 2030. However, in order to meet the large draft of the vessels and/or low water level in future, the quay wall should be rehabilitated in due course.

(2) Container Berth

Containers will be transported from/to Kigoma Port and from/to Mpulungu Port. The majority of containers transported from/to Kigoma Port are those transported from/to Dar es Salaam Port. Their ratio between 40 foot and 20 foot containers for export, import and empty ones is computed from the statistics summarized by TPA from 2006 to 2011 as shown in Table 5.5 (Chapter 5).

The containers which come from and go to Mpulungu Port are considered as non ocean-going ones but as regional ones moving on the north-south logistic route and stuffed with regional cargo. Therefore, the weight per TEU is assumed to be 14.8 tons. The import containers to Burundi are much more than those exported from Burundi. The ratio of the inbound transit containers over the outbound ones is considered to be similar to the ratio of the import containers over the export ones of Burundi. As a result, it is assumed that empty containers will be transported to balance the inbound container boxes and outbound ones. Table 6.3 shows the computation results of containers to be transported between Mpulungu Port and Bujumbura Port.

Table 6.3: Containers from/to Mpulungu Port

Import					Export				
(1000 ton)	Stuffed		20 foot	40 foot	(1000 ton)	Stuffed		20 foot	40 foot
	(TEU)	(Box)				(TEU)	(Box)		
0.0	0	0	0	0	0.0	0	0	0	0
20.7	1,399	1,287	1,192	95	1.6	108	100	93	7
29.0	1,962	1,804	1,670	134	2.2	146	135	125	10
39.2	2,649	2,436	2,256	180	2.8	191	176	163	13

Transit									
(1000 ton)	Transit	Inbound				Outbound			
	Total	Total		20 foot	40 foot	Total		20 foot	40 foot
	(TEU)	(Box)				(TEU)	(Box)		
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.1	3,385.0	3,142.4	2,963.0	2,797.0	166.0	242.6	229.0	216.0	13.0
64.9	4,389.0	4,085.0	3,851.0	3,635.0	216.0	304.0	287.0	271.0	16.0
82.6	5,579.0	5,203.8	4,906.0	4,631.0	275.0	375.2	354.0	334.0	20.0

Empty (Outbound)		
(TEU)	20 foot	40 foot
	(Box)	
0	0	0
4,433	3,680	241
5,901	4,909	324
7,662	6,390	422

Year	Throughput		
	(TEU)	20 foot	40 foot
		(Box)	
2015	0	0	0
2020	9,325	7,978	522
2025	12,398	10,610	700
2030	16,081	13,774	910

Table 6.4 shows the total containers in TEU and box which will be transported from/to Kigoma Port and Mpulungu Port.

Table 6.4: Containers to Be Handled at Bujumbura Port

Year	**2015**	**2020**	**2025**	**2030**
From/to Kigoma Port (1000 ton)	80.0	164.1	248.6	361.1
Throughput (TEU)	11,490	23,614	36,030	52,422
Throughput (Boxes)	8,428	17,322	26,428	38,452
From/to Mpulungu Port (1000 ton)	0.0	72.4	96.1	124.6
Throughput (TEU)	0	9,325	12,398	16,081
Throughput (Boxes)	0	8,500	11,310	14,684
Total Throughput in TEU	11,490	32,939	48,428	68,503
Total Throughput in Box	8,428	25,822	37,738	53,136

From the table above, the daily throughputs at the quay wall is computed as shown below:

Table 6.5: Daily Container Throughput at Bujumbura Port

Year	2015	2020	2025	2030
From/to Kigoma Port (TEU/day)	31	65	99	144
From/to Mpulungu Port (TEU/day)	0	26	34	44

On the assumption that container ships having a 60 TEU capacity will be put in services between Kigoma Port and Bujumbura Port, its call will be once every two days up to almost 2020 and once a day up to sometime between 2025 and 2030, as its capacity in terms of throughput at the quay is 120 TEU (unloading/loading). In other words, from 2020, 3 container ships of a 60 TEU capacity will be put into services and one of them will call Bujumbura Port every day up to the time when the daily container throughput reaches 120 TEU. In 2030, one additional container ships of a 60 TEU capacity will be required to transport containers once every 5 days.

For containers transported between Mpulungu Port and Bujumbura Port, it is also assumed a container ship having a 60 TEU capacity will be put into services because it can be used if one of the container ships is out of service between Kigoma Port and Bujumbura Port. However, at the beginning of containerization when containers are not many, a combo-type cargo ship like MV Teza can be put into service. A container ship will need 5 days plying between Mpulungu Port and Bujumbura Port, half day for unloading/loading at each port and 2 day navigation. Therefore, one container ship will be required to transport containers in 2020 and 2 ships and 3 ships will be required in 2025 and 2030 respectively. In other words, one container ship will call Bujumbura Port every 5 days, 3 days and 2 days in 2020, 2025 and 2030 respectively.

As a result, the berth requirement for the container ships is estimated as shown below:

Table 6.6: Required Berth Length for Container Cargo

Year	2015	2020	2025	2030
Berth for Container Ships from/to Kigoma Port	0.5	1.0	1.0	1.2
Berth for Container Ships from/to Mpulungu Port	0.0	0.2	0.3	0.5
Total Berths	1.0	2.0	2.0	2.0
Berth Length (m)	80	160	160	160

Even though, in 2015 one berth will suffice the demand, two berths will soon be necessary in 2020. Besides, technically speaking, a phased construction of neighboring two berth of this size is not economical, as a certain extension of quay wall is required to retain the reclamation against the deep lakebed for safe berthing of ships. Two berth should be built from the beginning.

(3) Dry Bulk Handling

The demand forecast expects a small quantity of dry bulk, varying from 4,000 tons in 2015 to 11,100 tons in 2030. The maximum volume will be about 1,000 tons per month even in 2030.

This volume of break bulk will be transported by a cargo or lighter vessel both of which have a box type hull and wider hatches on the deck. They can be moored at the break bulk berth. The bulk barge will be unloaded by use of a wharf crane attached with a purpose-built bucket, shell type or peel type to fit the characteristics of the cargo. In case the bulk cargo should not be wet, they will be transferred to the warehouse by truck or other transport means and piled therein. In case they can be wet like iron ore they can be piled at the open yard to prevent hindering traffic.

(4) Oil Tanker Berth

The demand forecast predicts the liquid bulk to be transported in 2030 will be 6,600 tons in 2015 to 15,300 tons in 2030. It is assumed that the oil barge owned by ARNOLAC, MT Cohoha (DWT = 336 tons, Loa = 42.36 m, Beam = 7.00 m, Full-loaded Draft = 2.71 m) will be

employed for the liquid bulk transport from Kigoma Port (Oil Jetty capable of accommodating 2 tankers at the same time with a maximum DWT of 1,000 tons) to Bujumbura Port. As its capacity is 335 DWT, one oil tanker berth is considered sufficient even in 2030. The current tanker berth is located along the north breakwater as it is near to the tank yards. In future, the tanker berth should be located along the new breakwater so that there will be some distance from the other cargo and ships and the pipelines to the tank yards will not cross the port premises.

However, the following points in implementing the oil berth construction needs to be consulted with the tank yard operators:

- Operation and maintenance philosophy
- The number of transport lines to handle petroleum products. (It is possible to handle two or more products by a single line. However, in that operation, some off-specification product will be generated because of the mixed product.)
- The loading and unloading plan when an oil barge comes to the berth.

(5) Warehouses

Break bulk cargo like cement and sugar, major commodities handled at Bujumbura Port, have to be stored in the warehouses as practiced at present. The required number of warehouses which dimensions are the same with the present ones is estimated as shown in the table below:

Table 6.7: Required Number of Warehouses

Year	Cargo (1000 ton/year)	Dwelling Time (day)	Ton-day/year	Efficency (ton/m2/day)	Requied Area (m2)	Space of Warehouse (m2)	Required No. of Warehouses
2015	141.4	16	2,262,400	1.13	5,485	2,300	3
2020	133.4	16	2,134,400	1.13	5,175	2,300	3
2025	184.6	16	2,953,600	1.13	7,161	2,300	4
2030	246.8	16	3,948,800	1.13	9,574	2,300	5

Notes: 1) Cargo including dry bulk
2) Dwelling time assumed to be 16 days
3) Efficiency of storage assumed to be 1.13 ton/m2 per day, 25 % increase from 0.9 ton/m2 per year in 2010

From the table above, in 2025 no additional warehouse will be needed, as there are 4 warehouses at present, and until 2030 o ne additional warehouse is to be built to meet the demand. As the current workshop will be relocated well before 2030 to the northern side of the port basin where a slipway is to be built, a new warehouse can be built at the area where the workshop currently exists.

(6) Container Stacking Yard

The number of container boxes to be handled at Bujumbura Port is estimated in the table below:

Table 6.8: Containers to Be Handled at Bujumbura Port

Year	2015	2020	2025	2030
From/to Kigoma Port (Box/day)	23	47	72	105
From/to Mpulungu Port (Box/day)	0	116 every 5 days	93 every 3 days	80 every 2 days
Boxes to be handled per day	23	163	165	185

For container handling, small-size mobile container STS cranes and reach stackers will be employed as the container ships are small and number of boxes to be handled will be 185 boxes per day even in 2030. As these handling equipment need a side space, 30 m distance in between container stacking lots (3 row × 10 TEU) and loaded and empty containers will be stacked 1.5 tiers and 2.5 tiers on average respectively. Two mobile container STS cranes should be employed from the beginning for the case one is under repair or breakdown.

The number of the stuffed and empty containers from/to Kigoma Port and Mpulungu Port is computed as shown in the table below:

Table 6.9: Stuffed and Empty Containers to Be Handled at Bujumbura Port

Year	2015	2020	2025	2030
Stuffed Containers from/to Kigoma Port (TEU)	6,365	13,060	19,807	28,778
Stuffed Containers from/to Mpulungu Port (TEU)	0	5,135	6,801	8,794
Stuffed Conatiners in Total (TEU)	6,365	18,195	26,608	37,572
Empty Containers from/to Kigoma Port (TEU)	5,125	10,554	16,223	23,644
Empty Containers from/to Mpulungu Port (TEU)	0	4,433	5,901	7,662
Empty Conatiners in Total (TEU)	5,125	14,987	22,124	31,306
Total (TEU)	11,490	33,182	48,732	68,878

The required stacking container area is estimated as shown in the table below:

Table 6.10: Required Area for Container Stacking Yard

Year	Containers per Year (TEU)		Capacity (TEU/m2*year)	Requied Area (m2)	Required Area in Total (m2)	Ditto, if square (m)
2015	Stuffed	6,365	0.745	8,544	12,673	113
	Empty	5,125	1.241	4,130		
2020	Stuffed	18,195	0.745	24,423	36,499	191
	Loaded	14,987	1.241	12,077		
2025	Stuffed	26,608	0.745	35,715	53,543	231
	Loaded	22,124	1.241	17,828		
2030	Stuffed	37,572	0.745	50,432	75,659	275
	Empty	31,306	1.241	25,226		

From the table above, the north-eastern area where a construction contractor temporarily using has to be annexed and utilized as a container stacking yard. It is foreseen, however, that the area of the present port premises will be insufficient to stack containers in future. The port premises have to be expanded. The expansion can be implemented by reclaiming the area at the northern side of the existing breakwater, where accretion has been taking place and the lake has been shallow. The reclamation will be accompanied with a new breakwater construction so that port facilities which may be necessary in future can be built at the current outer port basin.

(7) Slipway

As the cargo transported between Bujumbura Port and Kigoma Port as well as Mpulungu Port, the capacity of the fleet of cargo ships has to be increased and they have to be timely inspected and repaired to maintain their transport capacity. At present, there are no ship-repairing facilities in Burundi. They used to be sent to Kigoma in Tanzania or Kalemie in DRC. At Kigoma, the slipway was rehabilitated in 2011 for use. But the slipway at Kigoma gives preference to Tanzanian fleet for repairing. The Burundian fleet cannot rely on it. At Kalemie, there is a dry dock, which cannot be used by larger cargo ships of Burundian fleet because of its shallow

navigation channel. Thus, it is reasonable to have the ship repairing facilities within their territorial water. As it is most economical to build such facilities near or within the premises of the port, construction of a new slipway and workshop is taken into consideration in development of Bujumbura Port.

On assumption that the largest ship to be repaired is MV Teza type (Loa = 60 m, B = 11 m and DWT = 1,500 tons (Light loaded weight is considered about 600 tons), the dimensions of the slipway will be as follows:

Rail gauge = 3.5 m
Rail length = 120 m
Slope = 1–10
Winch capacity = 20 tons

Workshop, lifting equipment, and other ancillary machinery are necessary. To increase the transport capacity of the Burundian fleet, the slipway can be used to refurbish the cargo barges currently idling and moored at the port basin into motorized cargo ships, when it becomes viable.

(8) Ro/Ro Berth

One Ro/Ro berth should be provided in future, as it is learnt from the experience of maritime transport on Lake Victoria, where the private sector has been involved in lake transport to put Ro/Ro ships put into services for the maritime routes of rather short distance. When the cargo transport is more frequent between Bujumbura Port and the western coast of Lake Tanganyika of DRC, Ro/Ro ships will be employed by the private sector to materialize more frequent cargo and passenger transport. The dimensions of Ro/Ro ships will be 60 m long and 12 m wide. Its draft will be about 3.6 m. The slope of the ramp should be less than 1 to 6 m. The Ro/Ro berth may be located as a horse hitch near the port entrance, as they frequently navigate between Bujumbura and other ports due to their mobility. Ro/Ro ships will transport loaded trucks and general cargo on palettes handled by a forklift. For reference, the design drawing of Ro/Ro ship envisaged by MSCL of Tanzania is shown as follows:

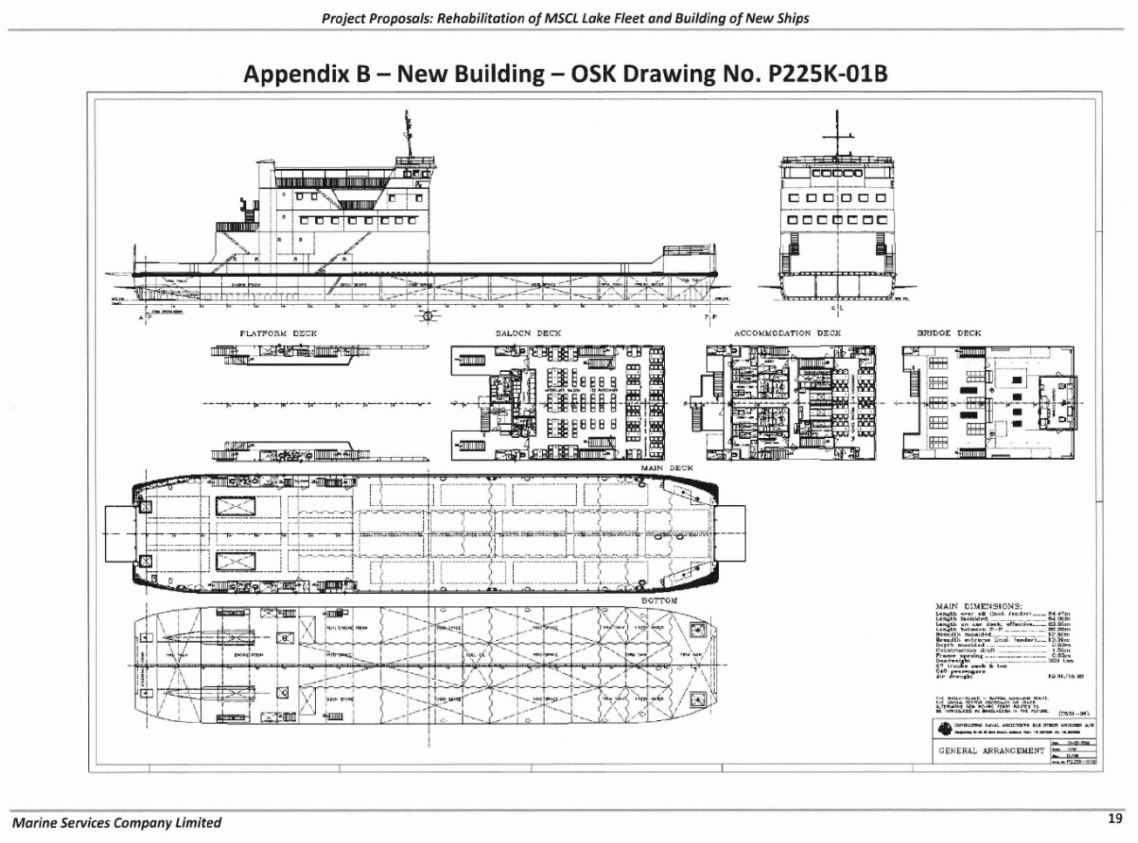


Figure 6.1: Ro/Ro Ships MSLC to Build

6.2.2 Alternative Master Plans

The master plan for the development of Bujumbura Port is worked out on the following principles:

1) To ensure sufficient port premises which can meet the future containerization of cargo to be transported on Lake Tanganyika, particularly those from/to Dar es Salaam via TRL railway and Kigoma Port
2) To secure the shallow water area made with sand and boulders debouched from the River Ntahangwa so that the port premises can be expanded to there in future
3) To build a container berth to meet the container demand to be generated by a TRL container block train and containerization of break bulk cargo
4) To build a slipway accompanied by a workshop at the inner part of the port basin to repair and inspect the fleet of Burundian ships
5) To secure the sufficient port basin for Ro/Ro berth and oil-tanker berth which will be required in future

Regarding the navy base currently located at the south bank of the outer port basin of Bujumbura Port, the principle is set not to change its location in laying out the master plan since the existence of the navy base will not interfere with the expansion of the port and the Study aims at the port development to meet the traffic demand in future. However, as a result of the implementation of the master plan, the water area of the navy base will be calmer being sheltered by the new north breakwater and mooring of the navy vessels will be easier. In case the expansion of the navy base is required, a new berthing facility can be developed by

relocating the existing jetty to the southerly direction. The south breakwater will be demolished and a new jetty cum new south breakwater can be built at the south of the existing jetty.

Based on the principles, two alternatives are made and examined as follows:

(1) Master Plan Layout Alternative (A)

Tanzania Ports Authority is planning for TRL to transport the transit containers of Burundi from/to Dar es Salaam Port to/from Kigoma Port by railway. Operation of a container block train is expected to start in 2015. The container demand will almost be doubled after this operation starts and the container berth should be extended to meet such demand in future. Therefore, the container berth should have a long straight quay wall for efficiency of ship berthing and container loading/unloading. Thus, **Alternative (A)** assumes the demolition of the so called existing "Container Berth" to build a long and straight quay for container cargo.

The merits of the **Alternative (A)** are considered below:

- The first two container berths can be built with much less cost than **Alternative (B)**, by developing the opposite side of the existing general cargo berth.
- The container berth can be built straight for efficiency of ship berthing and container loading/unloading
- The wider port basin can be materialized for easier ship maneuvering.

The demerits of the **Alternative (A)** are considered below:

- Demolishing of the exiting "Container Berth," as it can be seen as abandonment of the government asset.

In case of **Alternative (A)**, the port development can be made at the following phases:

Phase 1:
- To divert the storm water canal
- To build container berths and slipway
- To dredge the inner port basin
- To build access road and yard pavement, and ancillary works

Phase II:
- To rehabilitate the exiting general cargo berths
- To deepen the port basin
- To build a new warehouse

Phase III:
- To reclaim the northern part of the existing northern breakwater
- To build the new northern breakwater
- To demolish the exiting northern breakwater and so-called "Container Berth"
- To extend the container berth and expand the stacking yard
- To dredge the outer port basin

(2) Master Plan Layout Alternative (B)

As comparison to **Alternative (A)**, **Alternative (B)** is considered to utilize the "Container Berth" as a quay wall to fit out ships under repair or lift/launch a small ship to repair or repaired as it has been used. A slipway is located on the same alignment of the "Container Berth" which

is to be used as the fitting out quay. As a result the usable waterfront at the opposite side of the existing general cargo berths will be occupied with slipway, workshop and other ancillary facilities for ship repairing. Thus, a new container berth has to be built at the outer port basin. This means the northern breakwater has to be removed and reconstructed at the initial stage of development in order to provide a sufficient space of the container berths.

The merits of the **Alternative (B)** are considered below:

- The existing "Container Berth" can be used as fitting out quay for ship repair.
- No demolishing of existing asset is needed.

The demerits of the **Alternative (B)** are considered below:

- Initial stage of construction will be costly, as it will consist of new breakwater, demolition of existing breakwater, dredging and reclamation, and container berth with stacking yard

Figure 6.2 and Figure 6.3 show the Master Plan Layout **Alternative (A)** and Master Plan **Alternative (B)**.

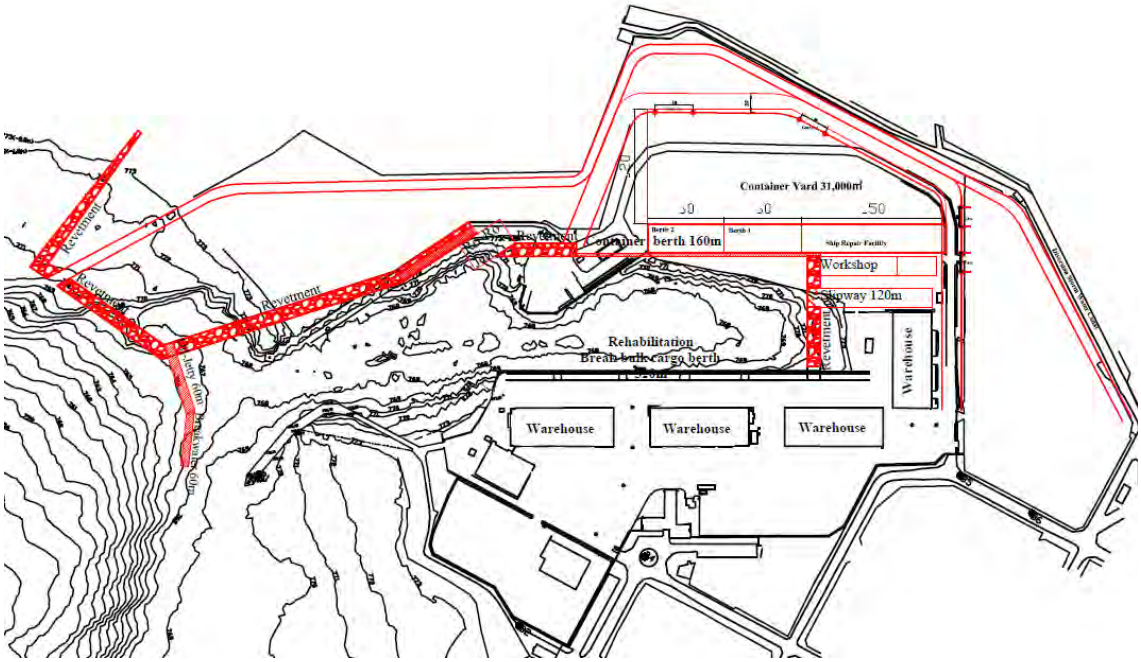


Figure 6.2: Master Plan Layout Alternative (A)

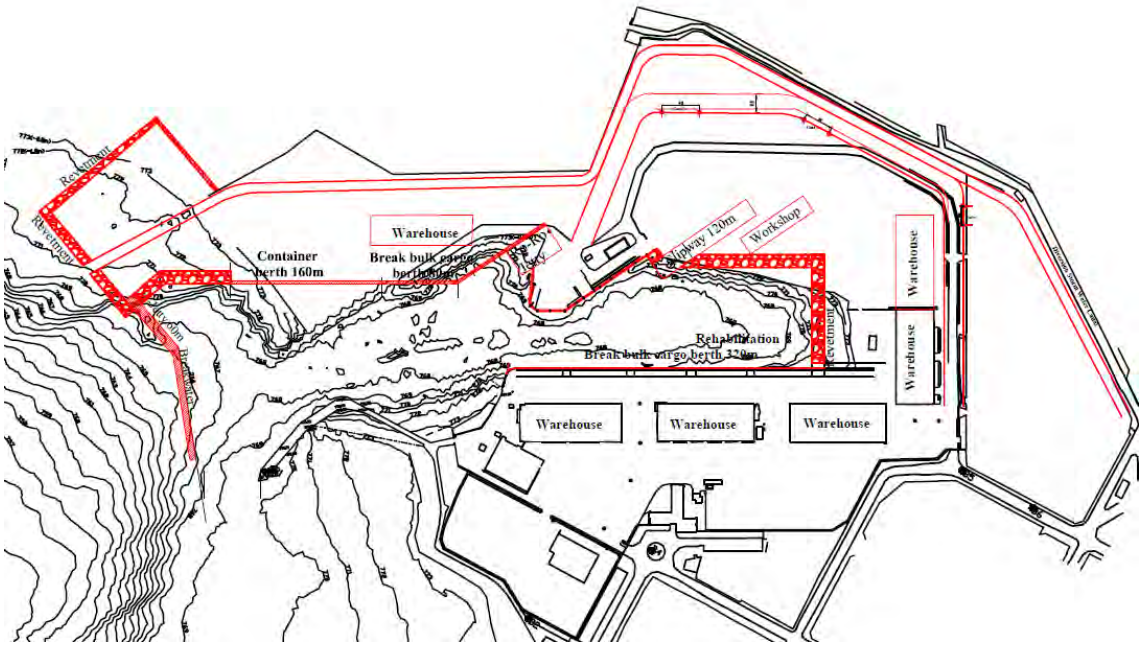


Figure 6.3: Master Plan Layout Alternative (B)

6.2.3 Conclusions and Recommendations

Based on the container transport by railway from Dar es Salaam Port to Kigoma Port envisaged by Tanzania Ports Authority as well as based on the results of physical survey and investigation, the conclusions with respect to the development of Bujumbura Port are summarized below:

1) New container berths have to be built to meet the container cargo.
2) A new break bulk berth is not necessary to be built as the length of the existing general cargo berth is sufficiently long.
3) Master Plan Layout of Alternative (A) is better to meet the short-term and long-term demand of cargo.
4) A slipway can be built at the inner part of the port basin.

The recommendations are as follows:

1) The existing storm water cannel should be diverted to prevent the port basin from getting shallow.
2) Container berths and container stacking yard should be built to meet the TRL railway revitalization.
3) Ship repair facilities consisting of a slipway and workshop and other ancillary facilities should be built to inspect and repair the fleet of Burundian ships.

6.3 Development of Rumonge Port

6.3.1 Facilities Requirements

Based on the previous discussions about the role of Rumonge Port for the local coastal shipping by small wooden cargo ships, the facilities requirements are examined.

(1) Jetty

The dimensions of the wooden cargo ships are considered to be 24 m long, 4.0 m wide and 1.5 m deep in draft when full-loaded. Photo 6.1 shows two (2) wooden cargo ships from DRC beaching at the shore of Rumonge Port site.

Photo 6.1: Wooden Cargo Ships from DRC at Rumonge

As the cargo will be manually handled, the height difference between the berth top and ship's deck should not be too large. According to the record of the water elevation, the difference between the highest and lowest waters is 4.24 m (777.07 m in 1964 minus 772.83 in 1950). In order to provide easier access from the berth to the deck of the ships, the jetty has to be of a floating type, a pontoon. For the stability of the pontoon against the waves, the minimum horizontal dimensions should be 30 m × 20 m. As the small ships can be horse-hitched to the pontoon, its perimeters for the ships to berth in total should be sufficient for 10 ships at the same time. The required length of the perimeter of the pontoon is estimated to be 60 m (4. 0 m (beam) + 2.0 m (1 m clearance each)) × 10 ships), which the pontoon perimeter can suffice. To provide about 50 cm clearance to the ships even when the water elevation is ever lowest, the lake bed elevation where the pontoon is anchored is calculated to be 770 m (772.83 m – 3.00 m =769.83 m) or deeper.

The pontoon may be connected by a removable ramp to the rock causeway with the surface pavement, which is extended from the shore. As it will be difficult to penetrate anchor piles into the lake bed subsoil, the pontoon may be anchored with forged steel chains to the lake bed.

(2) Other Facilities

An open air cargo stocking yard should be provided for the agricultural produce imported mainly from the opposite shore of DRC and cargo which can be wet when it rains. The elevation of the stocking yard should be 777 m so that it can be higher most of the time than the water elevation of the lake. Slope protection will be provided to make the yard flat at about 770 m.

For the cargo which may stay at the port for some time for customs inspection and should not be wet when it rains, a warehouse has to be provided. The floor area should be about 30 m × 70 m. An open air storage yard should also be provided for the cargo which should not be wet when it rains but will not stay for a long time at the port. The floor area is the same with the warehouse.

An administration building is to be built to provide offices for the port management/operation, customs, immigration control, quarantine, bank, forwarders and shipping agents. The building is

of 2 stories and 10 m × 40 m. A building for waiting passengers is to be provided out of the port premises.

6.3.2 Master Plan Layout

According to the requirements discussed above, the port layout is worked out as shown in Figure 6.4. MTTPE had the contract with a local contractor in Rumonge for construction of the gate, fence and guard house which was completed in February 2012.

The southerly winds frequently blow in the afternoon on Lake Tanganyika. Consequently the southerly waves are frequently generated by winds in the afternoon, as the fetch from south to north is very long on the lake, approx. 650 km. However, there exists a delta protruding to the lake at the south of the project site of Rumonge Port. Because of this protruding delta to the lake, southerly waves cannot directory intrude to the project site but intrude diffracting around the cape of the delta. It is considered that the diffracting waves are not strong to hamper berthing and mooring of small cargo ships to the pontoon. In addition, as wave length intruding to the project water area longitudinally to the jetty is considered about 30 m and the longitudinal length of the pontoon is set as 30 m, the ship's pitching will be minimal. It is recommendable, however, numerical wave simulation is to be carried out before the project is implemented to ensure stability of the berthing pontoon by confirming the sufficient calmness of the project water area, ss wave analysis is not conducted for this Study,

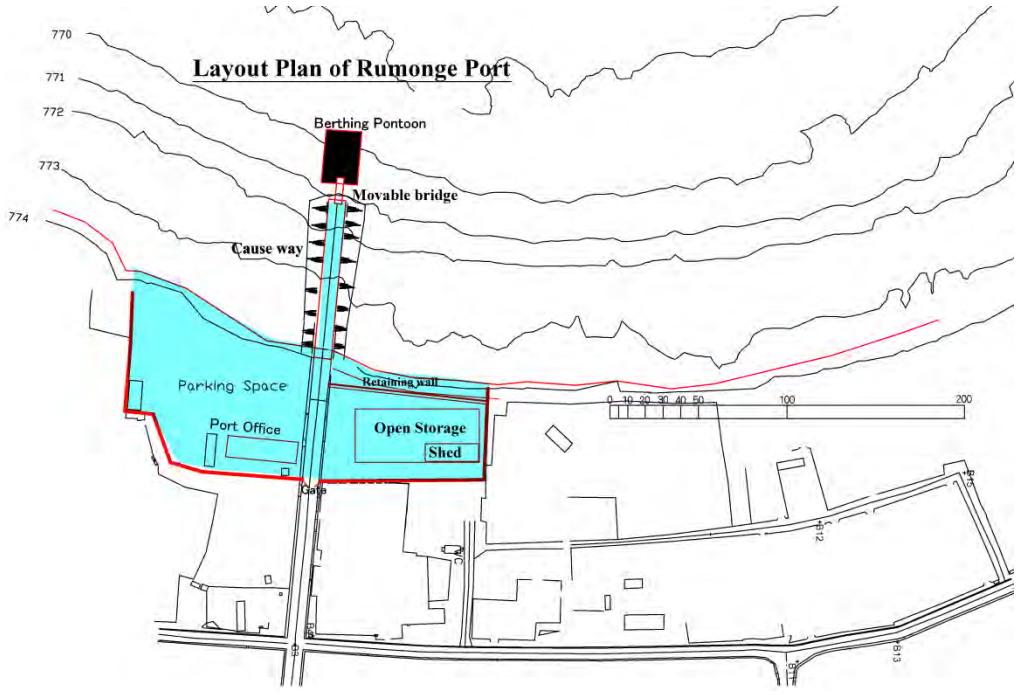


Figure 6.4: Master Plan Layout of Rumonge Port

6.3.3 Conclusions and Recommendations

Conclusions on the development of Rumonge Port are summarized as follows:

1) The port is required to accommodate the small wooden cargo ships plying Lake Tanganyika, particularly between Rumonge and its opposite shore of DRC.

2) The change of the elevation of the water surface is too large for the small wooden cargo ships to berth if the quay wall is made solid. A berthing facility of a floating type is preferable.

The recommendations are as follows:

1) To provide a pontoon of horizontal dimensions of 20 m × 30 m with freeboard of about 1.5 m to accommodate small wooden ships.
2) To provide a movable ramp to connect the pontoon to the causeway.
3) To provide an open storage at the elevation of 777 m.
4) To build the warehouse, open shed and administration building
5) To provide offices in the administration building for international travel and trade

Chapter 7 Environmental Considerations

7.1 Baseline Environmental Condition

7.1.1 Description of Baseline Regional Environment

(1) Geography

Bujumbura is located on a strip of land along the Rusizi River in the northern part of Lake Tanganyika Basin, part of the Albertine Rift, in the western extension of the Great East African Rift Valley. Elevation of most of this area is below 1,000 m. No environmental reserve exists in the adjacent area of the town. Rusizi Natural Reserve (A = 5,932 ha) is located 8 km west of Bujumbura.

Bujumbura used to be a small village. In 1889, it became a military post in German East Africa, and later became the administrative center of the Belgian League of Nations mandate of Ruanda-Urundi after World War I. The town started its expansion across a relatively flat hill strip region, located between the lake waterfront and the backyard mountainous region, mainly along the north-south direction due to the local topographic features.

Bujumbura features a tropical savanna climate with distinct wet (November–April) and dry (May–October) seasons. Average temperatures are almost constant throughout the year with the high temperature at around 29°C and the low temperature at around 19°C.

(2) Lake Tanganyika

Lake Tanganyika is one of the most prominent geographic features surrounding the areas of concern. The lake itself is classified as geologically old; its present basins have been water-filled for at least ten million years and some sediments date back to a period twice as long. With a surface area of 33,000 km^2 and mean depth of 600 m, it is also very large. Maximum depth is almost 1,500 m and the total volume of water is about 19,000 km^3 – almost one sixth of the world's free freshwater. The lake has a unique environment with more than 1,500 different species of plants and animals found within this lake, half of which are found nowhere else in the world.

There are seasonal upwelling events across this lake. During the windy season (May–September), strong winds from the south cause seiche activity (observed wave period is approximately 270 minutes), resulting in a tilting of the thermocline, and periodic upwelling events. More localized and patchy upwellings caused by Poincare internal waves occur in some areas of the lake. These upwelling events introduce nutrients into the epilimnion of the pelagic zone of the lake from the anoxic hypolimnion, which is a sink for fixed forms of nitrogen and phosphorus. These upwelling events are thus important for returning nutrients above the oxycline and making them available to the pelagic food chain.

(3) Environmental Concerns

Current regional environmental concerns cover a range of issues from the drought and desertification in peripheral regions, to the progressive water quality degradation of Lake Tanganyika due to the rapid increase of the demographic pressure without proper regional sewage systems. The deforestation and the resultant soil erosion are other major environmental concerns. Most of the tributaries, upon reaching Lake Tanganyika, discharge turbid water containing silts, and sometimes cause rapid local sedimentation at the downstream side (e.g., the river mouth regions around Bujumbura City) during every rainy season. Several reforestation-related activities and/or pilot projects were initiated by local environmental NGOs such as ACVE recently.

As mentioned earlier, the management of the water quality of Lake Tanganyika is also one of the important environmental issues for Bujumbura since most of the tap water across the city (i.e. the urban water supply) is supplied from purifying this lake water [REGIDESO, personal communication, 2011]. Its water intake point is located at an off-shore region and conveyed to the main water supply station by a pipeline (Q = 600 L/sec, pipeline length is of approximately 3 km). Periodic water quality test for the collected lake water are conducted twice a day for drinking safety.

The main threats to the biological richness as well as the sustainable use of this lake's resources are caused by the intensification of human activities. The accelerating rate of environmental change caused by human activities is now much faster than the fauna's adaptive capabilities and the absorptive capacity of the environment.

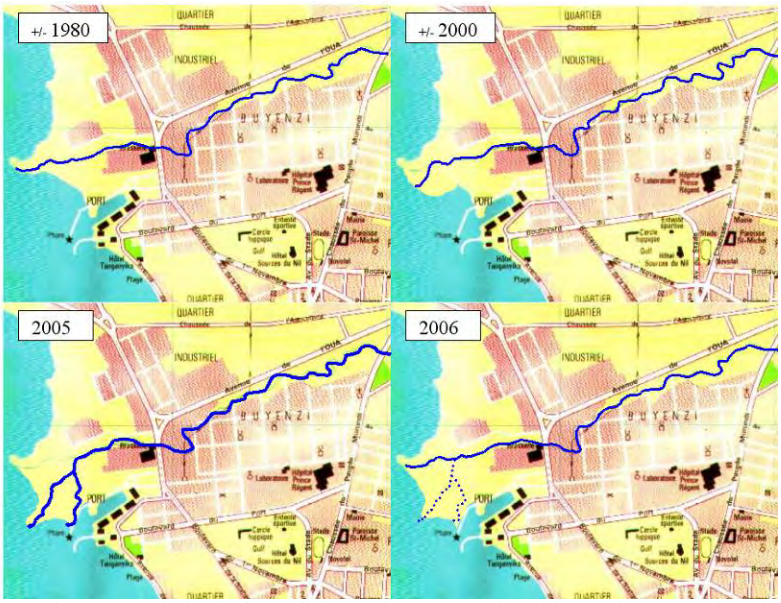
(4) Hydrology and Water Quality of Tributaries

Rapid run-off of the rainfall waters into tributaries tend to occur due to the deforestation in every rainy season, and sometimes lead to local floods and/or inundation at the downstream side. Therefore, the development and the implementation of a comprehensive basin management program covering river improvement, flood protection, reforestation, land use planning and others, is one of urgent tasks to be tackled.

In particular, the local geo-morphological condition of the Ntahagwa River, one of the major tributaries running through Bujumbura, is unstable (see Figure 7.1), at the downstream side. In particular, the mainstream around the river mouth region frequently changes its course, and sometimes this river has flooded the nearby port facilities in the past [Clay Disposal, personal communication, 2011].

Due to the lack of a proper city-wide sewerage treatment system, most of the effluents and wastewater generated inside of Bujumbura are discharged into nearby tributaries and/or channels such as the Ntahangwa River and Buyenzi Channel without any proper treatment. The Buyenzi Channel is one of the city drainage channels and its outlets, the Port Bujumbura as well as the river mouth of the Ntahangwa River, are located in the adjacent area of this port (approximately 1 km north of the port).

Also, the bacterial pollution of nearby tributaries (those which reach Lake Tanganyika) due to both the direct discharge of the untreated sewage and the disorganized waste treatment system has become one of the most urgent environmental issues to be solved in order to secure safe water resources of Bujumbura.



Local geo-morphological conditions of river mouth of the Ntahangwa River is unstable and frequently changed its courses in the last 30 years.
Source: CTB, 2007

Figure 7.1: Morphological Instability of the Ntahangwa River's River Mouth

(5) Biological Environment

Basically, the current floral conditions around Port Bujumbura and Rumonge consists of following three components, i.e., (i) aquatic vegetation with floating plants (e.g., *Eiccholnia crassipes*), (ii) semi-aquatic vegetation (e.g., *Typha domingensis* and *Cyperus papyrus*), and (iii) vegetation on dry land (e.g., *Solanum campylacanthum*), and no rare floral species occurs therein.

Within this study, totally 19 and 32 fish species are identified around Ports Bujumbura and Rumonge, respectively. Some of them such as Ndagara are important for local inland fisheries business. The most dominant mammal species is the hippopotamus (*Hippopotamus amphibious*) around both ports. Occurrence of several hippopotamus is observed at the local aquatic vegetation, located near the naval base [JICA Study Team, 2012]. At Port Bujumbura, some traces of those foot prints, vegetation grazing and droppings are frequently observed. More detailed descriptions of local flora/fauna are summarized within the separate report, entitled as "Baseline Environmental and Social Study for Selected Short-Term Development Project in the Republic of Burundi (JICA, 2012)"

7.1.2 Local Traffic Conditions around Bujumbura Port

Local land use around the Port Bujumbura is mainly classified as mixed commercial/industrial zone. Neither major residential areas nor schools are located therein, but a small beach resort exists. Due to the recent increase of the amount of the cargo handling volume at the Port Bujumbura, local traffic jams frequently occur along roads connecting to the port. Also, it became common to see many cargo trailers making a long queue for entry into the port (there is only one entrance gate; see Photo 7.1).

Currently, all traffic including general passenger cars and long-distance heavy vehicles use the same road infrastructure throughout Bujumbura City, and major national roads connecting large surrounding cities such as Rumonge and Gitega run through its CBD. Existing city road

infrastructure is still in chaotic condition. Due to the rapid recovery of regional socio-economic activities after the civil war and resultant increase of the traffic volume, more vehicles are expected to circulate around Bujumbura. Therefore, the traffic jams inside of the city will be much more severe in the near future without any improvements of the road network, which is currently prone to heavy traffic jams. Similarly, the roadside environment such as air quality, noise and vibration would worsen further without the implementation of any urban environmental management.

Tanker Lorries circulating around the Port

Long Queue of Trailer Trucks around Port
(Photo taken in September 2011)

Photo 7.1: Local Traffic Conditions around Port Bujumbura

7.1.3 Bujumbura Port

(1) Soil and Sediment Contamination

During the last dredging work of Port Bujumbura, it was found that several portions of the port sediment contained toxic heavy metal components such as arsenic, PCB, cadmium and others therein. Some of those concentrations exceeded the relevant environmental standards of EU, so a preliminary sediment analysis was conducted in 2007 prior to the dredging work. Within this preliminary survey, sediment samples were taken at 14 points across the port (i.e., Area A drawn in Figure 7.2) while 97 parameters were of concern within the laboratory analysis [CTB, 2008]. It is noted that exact locations of those 14 sampling points were unknown. It is reported that there were the following three possibilities on where those toxic substances originated; i.e., (i) substances from the main body of Lake Tanganyika by the coastal current, (ii) wastes discharged at the upstream side of Buyenzi Channel accidentally contained those substances and reached the port, and (iii) some of the port facilities although there is no record of the shipyard in the past, but MV Teza was built on a temporary slipway made on the bank of the port basin opposite to the general cargo berths. The exact origin of those hazardous substances found therein is still unknown.

Based on those findings, the following two measures were taken in order to treat the removed sediments; i.e., (1) convey “safe” sediment to the discharge point, located within Lake Tanganyika, 300 meters away from the lake shoreline, and (2) store “harmful” sediment in the open-space land area, adjacent to Port Bujumbura (i.e., Area B drawn in Figure 7.2), located within the port property. Water contained within those removed sludge was naturally drained and discharged through nearby channels back to the Port Bujumbura without any treatment. Photo 7.2 shows the photo records of this toxic sludge disposal site, its sludge disposal activity and the discharge point of Buyenzi Channel that collected drained water.

Note: It is highly likely that some parts of sediment inside of Port (Area A) contain toxic heavy metal components. Some sediments containing heavy metal were removed to Area B during the last dredging work conducted in 2008. No treatment such as the stabilization was taken so far (Clay Disposal, personal communication, 2011). UXO such as hand grenades and bullets were found around Area C.

Figure 7.2: High Risk Area of Heavy Metal Contamination around Port Bujumbura

Dyke of Sludge Disposal Site (Its height is about 1 m). No cover or measure to protect the dust dispersion is taken.

Actual Sludge Disposal Activity (courtesy of Clay Disposal, 2011)

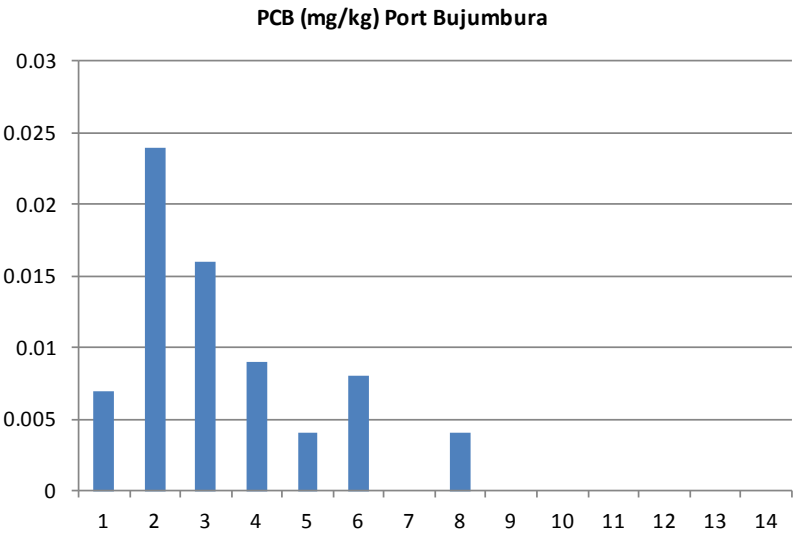
Drained water from removed sludge run down to a nearby channel without any treatment, then eventually back to port.

Discharge Point of Buyenzi Channel to Port Bujumbura

(Photos taken in September 2011)

Photo 7.2: Photo Record of Disposal Site of Removed Sludge from Port Bujumbura

Figure 7.3 shows the measured concentration values of sediment samples, obtained at 14 points across the Port Bujumbura, Burundi (CTB, 2008). Relevant environmental standards do not exist in Burundi yet. Instead, reputable international environmental standards such as ones of EU are used for the decision making process within the environmental administration (MoE, personal communication, 2013). In Japan, environmental standards for the PCB contamination within the benthos and the soil are of 10 ppm and ND (should not be detected)/or 0.0005 mg/L, respectively.



Courtesy of Clay Disposal, 2011

Figure 7.3: Analytical Results (PCB of Port Sediment)

During the discussion with the engineer in charge of this dredging work, it was noted that the survey was regarded as preliminary and did not cover potentially contaminated areas. Therefore, it is highly likely that some sediment portions of Port Bujumbura still contain toxic chemicals. Thus, a more comprehensive sediment analysis should be conducted if any short-term development projects including the port dredging work are to be chosen within this study.

Also, neither stabilization nor neutralization measures have been taken yet for removed sludge, stored in the open land (i.e., Area B of Figure 7.2) adjacent to the Port Bujumbura yet. Similarly, a more comprehensive soil analysis should be conducted if any short-term development projects including the earth work therein are chosen within this study.

(2) UXO

It is also reported that certain amounts of UXO such as hand grenades, bullets (lengths varied between 10cm and 30 c m) and their spent cartridges were retrieved from the bottom of Port Bujumbura, and in particular, around the jetty of the Burundian naval base (i.e., Area C drawn in Figure 7.2) during the dredging work of Year 2008 [Clay Disposal, personal communication, 2011]. Photo 7.3 shows records of UXOs dredged from the port bottom. Accurate coordinate information for dredging points is not available. During the 2008 dredging work, full-scale mine clearance activities such as reconnaissance and hazard assessment using electromagnetic metal detector was not conducted prior to the dredging work. Therefore, it can be said that some parts of Port Bujumbura are still contaminated with UXOs.

Hand Grenade

Bullet (1)

Spent Cartridge

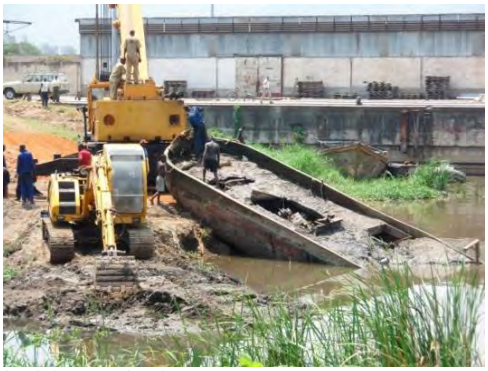
Bullets and spent cartridges

Note that those remnants were retrieved during the dredging work of Year 2008.
Courtesy of Clay Disposal, personal communication, 2011.

Photo 7.3: UXOs and Relevant Remnants Retrieved from Port Bujumbura

(3) Wrecked Ships

Several wrecked ships were salvaged during the last dredging work of 2008. Photo 7.4 shows the records of the salvage activities. Several ships are still wrecked inside of Port Bujumbura and exact coordinates of such wrecked ships are unknown [Clay Disposal, personal communication, 2011].



Note that several wrecked ships were salvaged during the dredging work of Year 2008.
Courtesy of Clay Disposal, personal communication, 2011.

Photo 7.4: Ship Salvage at Port Bujumbura

7.1.4 Rumonge Port

Rumonge is one of the major shoreline towns in Burundi (population of almost 200,000 people), connecting Bujumbura (approximately 75 km south of Bujumbura) and the Tanzanian Border and is located along the shoreline of Lake Tanganyika. After the recent civil war, many refugees who left Burundi temporarily are coming back to Rumonge, and its population is increasing.

CBD of this town exists in highland shoreline areas along the National Road No. 3 and its port is also one of the international ports in Burundi, and cargo to and from Tanzania and/or Congo are delivered therein irregularly.

The entire Port Rumonge consists of the following two regions: (i) commercial port that handles cargo, mainly coming from Kigoma, Tanzania, and (ii) fishery port adjacent to the commercial port, mentioned earlier (see Photo 7.5). About 1,000 fishermen with almost 200 small fishing boats conduct small-scale fishing activities. Due to this spatial closeness of fishery and commercial ports, ship collisions occur occasionally. No detailed information or statistics of past local vessel accidents are available. Local fishery zone extends to 20 km offshore and most of the fishing activities are conducted during the nighttime [JICA, 2011].

The coastal zone of Port Rumonge is classified as a shallow sandy shoreline. Therefore, large vessels up to 150–200 t are usually anchored at off-shore, deeper regions, and small vessels are circulated for both boarding and cargo handling between large vessels and the nearest land as no jetty exists. Current port facilities therein are not in good condition, and many small-scale fishery boats. No environmental reserve exists in the adjacent area of this port. Rumonge Natural Forest Reserve (A = 500 ha) exists 13 km east of Rumonge Town.

Port Rumonge (commercial part)

Current Port Facilities of Rumonge

Inland Fishery Activity: Fish driyng process

Inland Fishery Part of Port Rumonge

(Photo taken in September 2011)

Photo 7.5: Photo Records of Port Rumonge

7.2 Environmental Legal Framework and Administration

7.2.1 Environmental Administration

(1) Central Government

The supreme organization of environmental administration in Burundi is the Ministry for Water, Environment, Land Management and Urban Development. Within this ministry, there is the General Direction of Environment and Forest, and the Department of Environment (DoE) belongs to this General Direction. DoE is in charge of undertaking enforcement, compliance, review and monitoring of environmental impact assessment (EIA), and, in that regard, shall facilitate public participation in environmental decision making, exercise general supervision and coordination over all environmental issues.

Other key bodies involved in EIA evaluation are i) National Institute for Environment and Nature Protection (INECN), and (ii) Burundi Association for Environmental Impact Assessment (ABEIE).

(2) National Institute for Environment and Nature Protection (INECN)

In Burundi, the National Institute for Environment and Nature Protection (Institut National pour l'Environnement et la Conservation de la Nature, INECN, in French) is in charge of establishing and managing protected areas, under the supervision of the Ministry of Environment. The Institute is a public administrative establishment, the directorate-general of which has a secretariat and two departments: (i) a technical department in charge of planning national parks, reserves and natural monuments, also managing the protected areas that have not yet been legally recognized; and (ii) the department of environment, research and environmental education composed of three sections (research, education, monitoring - environmental impact study).

7.2.2 Other Relevant Organization

(1) Burundi Association for Environmental Impact Assessment (ABEIE)

ABEIE is one of the key environmental NGOs founded in Burundi, and sometimes is involved within EIA studies as observers and/or consultants.

(2) Lake Tanganyika Authority (LTA)

The Lake Tanganyika Authority (LTA) was established in December 2008 as a regional management institute for the entire Lake Tanganyika Basin. The overall objective of this organization is to ensure the protection and conservation of the biological diversity and sustainable use of the natural resources of Lake Tanganyika and its basin. The process of establishing a cooperative and collaborative approach to the sustainable development and management of the natural resources of Lake Tanganyika and its Basin have been initiated in the early 1990s by the four Lake Tanganyika riparian countries of Burundi, DRC, Tanzania and Zambia .

(3) Congo Forest Basin Partnership (CFBP)

The Congo Basin Forest Partnership (CFBP) was launched at the 2002 W orld Summit on Sustainable Development in Johannesburg as a non-binding partnership registered with the United Nations Commission on Sustainable Development. As a "Type II" partnership, it represents a voluntary multi-stakeholder initiative contributing to the implementation of an intergovernmental commitment, i.e. the Yaoundé Declaration, and brings together the 10 member states of the Central African Forests Commission (COMIFAC), which are Burundi,

Cameroon, Central African Republic, Chad, DRC, Gabon, Equatorial Guinea, Rwanda, Republic of Congo, Sao Tomé and Principe, donor agencies, international organizations, NGOs, scientific institutions and representatives from the private sector.

7.3 Environmental Laws

7.3.1 Summary of Current Environmental Codes

Basically, the Environmental code of Burundi, entitled "Law No. 1/010 of 30/06/2000", described later, is the core environmental code in Burundi. Beside this code, an additional environmental code entitled "Law No. 100/22 of 07/10/2010," described later, is supplemental to the predecessor code.

7.3.2 Law No. 1/010 of 30/06/2000

This law consists of 7 parts. Outlines of the environmental impact study to be required for infrastructure development projects are described in Chapter 1 of Part II. Chapter 3 of this part summarizes outline of the procedure of the environmental impact study.

7.3.3 Law No. 100/22 of 07/10/2010

This law consists of 5 parts and describes the enforcement of EIA study to be required for any development projects conducted in Burundi. Article 4 of this law categorizes the list of projects that would be subject of EIA/or IEE study.

7.3.4 Environmental License or Approval

In general, all relevant EIA reports shall be written in French, and three (3) copies must be submitted to DoE, the Ministry for Water, Environment, Land Management and Urban Development for examination. According to the current report (JICA, 2011), approximately 80 EIA reports were submitted to DoE. It is noted that most of them are mining-related development projects. Usually, the report examination process takes one (1) – two (2) months before environmental approval is issued.

EIA evaluation for any development projects in Burundi is at the rudimentary stage (as of September 2011), and the detailed explanation and the exact time schedule of EIA process is not specified in relevant legislation. Sometimes relevant environmental and social considerations for any ODA-based development projects are conducted based on each donor's environmental guidelines and/or relevant international laws.

7.3.5 Land Tenure

(1) Backgrounds

The Post-Transition Interim Constitution of the Republic of Burundi, ratified by popular vote in 2005, guarantees every Burundian the right to the property. However, specific legislation and policy with regard to the land do not support this constitutional right. The Constitution grants foreigners equal protections to the person and the property, without restrictions on the foreign ownership of the land (GOB Constitution 1992a; USDOS 2009).

The 1986 Land Code and the customary tenure system provide parallel structures for governing the access to the land. The goal of the Land Code was to encourage the country's development and increase agricultural production, while the customary system provides for local administration of lands. However, the Land Code recognizes customary rights to the land, including fallow land. Under the customary, a community-based system, the land is held by

individual heads of households. The Code, by contrast, requires that the land held customarily be registered in order to be officially recognized. The registration process, however, is extremely complex and infrequently followed. The result is that community-based tenure systems have a quasi-legal status, but are not formally recognized.

At the conclusion of the civil war, the Arusha Agreement on Peace and Reconciliation in Burundi (2000) called for the revision of the 1986 Land Code to resolve unspecified land management problems. Article IV of the Accords promises that returning refugees will be able to access their lands or will receive adequate compensations (GOB Constitution 1992).

After several years of starts and stops, in 2008, the GOB made significant progress on three land-related fronts. Firstly, initiated by an inter-ministerial technical committee, the GOB adopted a National Land Policy Letter, which identifies following four government priorities,

(1) Amendment of land legislation and modernization of the land administration services.
(2) Restructuring and modernization of administrative bodies responsible for the land management.
(3) Decentralization of the land administration
(4) Inventory of state lands

Secondly, in 2008, the GOB held public consultations on land tenure issues and revised the Land Code with assistances from USAID and EU. Issues addressed included: the revocation of governors' authority to allocate state land (only the central Ministry of Environment would hold such authority); the ownership and the management of marshlands; and rights to lands of 1972 refugees (but apparently not to lands of 1993 refugees). The draft Code makes no reference to land rights of women and girls. The GOB sent the draft to Parliament for a vote in spring 2009, but withdrew it in spring 2010, without a vote, just prior to elections.

Thirdly, the GOB adopted a Five-Year Action Plan to Implement the Land Code. The GOB estimates that implementation of the new code will cost USD 17–20 million. The prospects for the adoption of the draft land code and action plan for implementation are uncertain.

(2) Tenure Types

Burundi's formal law recognizes the state and the private land. State land includes lands classified as the public land (e.g., rivers, lakes) and private state lands, which includes all state land not classified as the public, including vacant lands, forests, lands expropriated for the public use, and lands purchased by the state. Under the law, all lands that are not occupied are considered state land. Temporary rights of the occupation are available on lands classified as private state lands (GOB Land Code 1986).

The 1986 Land Code recognizes right for the private ownership of lands. Landowners have the right to exclusive use and possession, the right to transfer land freely, and the right to mortgage their lands. The Land Code permits usufruct rights, leaseholds, and concessions. Under the 1986 Land Code, rights over previously titled lands are recognized as private property rights. The 1986 Land Code expressly recognizes the legitimacy of land rights acquired and held under customary law. However, all asserted rights must be registered; unregistered customary rights do not have the protection of the formal law.

Under customary law, lands in Burundi are generally held individually, rather than by lineage. Families obtained lands through clearing and using the lands or purchasing lands. Wealthier individuals may also own rights to pastureland and forest areas. Access to the forest and grazing land is generally shared with neighbors and relatives, who are permitted to use the land for

grazing and the collection of forest products. Historically, customary law recognized tree tenure separate from land tenure: the person planting trees had the right to benefit from the production, regardless of land ownership. It is unknown whether separate tree and land tenure continues to be recognized.

(3) Land Administration and Institutions

The land administration in Burundi is spread across several ministries competing for authority. The Office of Titles and Registration is within the Ministry of Justice. As of March 2008, the Office of Land Use Planning, Cadastre, and Urban Planning was held within the Ministry of Environment, Management, and Public Works. Whether that Office shifted into the new Ministry of Environment and Territorial Planning in 2008 is unclear. The Ministry of Agriculture is involved in land-use planning, and the Ministry of Home Affairs is responsible for local administration of state, public, and private lands.

The National Commission for Land and Other Properties (CNTB), established in 2006 under the Office of the First Vice President, operates at the national, provincial, and communal levels. The CNTB has the authority to resolve land disputes, assist vulnerable people to reclaim their land or obtain compensation, and update the inventory of state-owned lands. In part due to its limited funds relative to need, the CNTB is facing challenges in fulfilling its mandate.

At least five agencies in Burundi are issuing documentation (titles or certificates) for the formalization of land rights. There is little coordination, however, and there is evidence that competing documentation exists for the same piece of lands. This ambiguity leads to a great deal of confusion over the legitimacy of documents in the event of transactions or disputes, and in the securing of credit.

Some customary institutions in Burundi, such as the village-level system of dispute resolution known as the Bashingantahe, continue to have a significant role in local land issues.

(4) Compulsory Acquisition of Private Property Rights by Government

Burundi's Constitution provides that no person shall be deprived of his property except for reasons of "public utility" or for "exceptional and state-approved reasons." The state is required to pay fair and prior compensations to landholders. Articles 407–433 of the 1986 Land Code provide procedures for the expropriation of lands, including declarations of the public utility and requirements of the public notice. Under the Land Code, the provincial governor must approve of any expropriations of 4 hectares or less of rural lands; expropriations larger than 4 hectares require the approval of the Minister of Agriculture. The Minister of Urbanism must approve of urban land expropriations up to 10 hectares. Larger land expropriations require a decree (GOB Constitution 1992a, Art. 36; GOB Land Code 1986).

Local authorities commonly make decisions about the justification of an expropriation and compensations due based on combinations of statutory and customary laws, and their interpretations of both vary widely across provinces.

Chapter 8 Strategic Environmental Assessment

8.1 Introduction

Strategic Environmental Assessment (SEA) studies are carried out for the developed port-sector master plan studies for Bujumbura and Rumonge, respectively. Basically, those developed master plans (i.e., port improvement plans) consist of a long-term (the target year = 2025) and a short term (the target year = 2015) components. Firstly, the alternative evaluations for the long-term master plan for Ports Bujumbura and Rumonge are conducted, based on both the engineering study results of this study and the current environmental and social conditions surrounding both ports. Then, stakeholder analysis is conducted, and critical factors to be considered for the successful implementation of each plan are summarized. Also, the stakeholder structures for Rumonge and Bujumbura are discussed, respectively. Finally, the institutional analysis is conducted, and several institutional improvement plans for the future comprehensive environmental administration framework is summarized.

8.2 Port Improvement Master Plan

(1) Bujumbura

The entire port improvement plan consists of following ten components (see Chapter 8 of this report for more detailed descriptions),

1) Break Bulk Berth
2) Container Berth
3) Ro/Ro Berth
4) Oil Tanker Berth
5) Warehouse
6) Container Yards
7) Slipway
8) Port Expansion
9) Improvement of Breakwater
10) Diversion of Buyunzi Canal

Then, two alternative layouts (named as “Alternative 1” and ”Alternative 2”, respectively, see Chapter 8 of this report for more detailed descriptions) are developed. The alternative evaluation is conducted for these two options with “Do-Nothing” scenario.Rumonge

(2) Rumonge

The entire port improvement plan consists of following two components (see Chapter 8 of this report for more detailed descriptions),

1) Jetty
2) Relevant port facilities (e.g., Port Office, Opening storage)

Due to this engineering simplicity, compared with the improvement plan of Port Bujumbura, only one alternative layout is developed. So, the alternative evaluation is conducted for this option with “Do-Nothing” scenario.Alternative Evaluation

8.3 Alternative Evaluation

(1) Bujumbura

Table 8.1 summarizes the alternative evaluation for the master plan layout of Port Bujumbura.

Table 8.1: Alternative Evaluation for Port Bujumbura

	Alternative A	**Alternative B**	**Do-Nothing**
Social			
Local Traffic	Heavy traffic jam around the port.	Heavy traffic jam around the port.	Heavy traffic jam around the port.
More Employment Opportunities	High	High	N/A
Urban Planning	Easy to adapt for future growth of entire city (or would be key component for future regional infrastructure).	Easy to adapt for future growth of entire city (or would be key component for future regional infrastructure).	Not easy to adapt for future growth of entire city (or would be obstacle for future development).
Regional Growth	High potential to accelerate the growth of Bujumbura as the hub of regional transport and logistics system (note: need to establish integrated inter-state/or province transport system).	High potential to accelerate the growth of Bujumbura as the hub of regional transport and logistics system (note: need to establish integrated inter-state/or province transport system).	N/A
Regional Stability	High potential to lead regional stability, by improving regional infrastructure.	High potential to lead regional stability, by improving regional infrastructure.	N/A
Regional Economy			
Growth of International Trade	Accept more cargo ships, and then, lead to growth of cargo handling.	Accept more cargo ships, and then, lead to growth of cargo handling.	Existing port is narrow and would not match the growth of cargo handling.
Demolition of existing port facilities	Larger than Alternative B	Smaller than Alternative A	N/A
Possibility of Future Port Expansion	Partially limited.	Limited	N/A
Outside Investment	High potential to attract investment from outside.	High potential to attract investment from outside.	N/A
Environment			
Roadside Noise and Air Quality	Deterioration of roadside noise and air quality environment due to the circulation of future cargo trucks.	Deterioration of roadside noise and air quality environment due to the circulation of future cargo trucks.	Deterioration of roadside noise and air quality environment due to the circulation of future cargo trucks.
Soil Contamination	Risk of physical disturbance on deposits of dredged contaminated sediment due to the construction activity is high.	Risk of physical disturbance on deposits of dredged contaminated sediment due to the construction activities is high.	Risk of unexpected spreading of pollutants is high. Need treatment for dredged contaminated sediment.
Sediment	Risk of physical disturbance on potentially contaminated sediment around the outlet of Buyenzi Canal is high.	Risk of physical disturbance on potentially contaminated sediment around the outlet of Buyenzi Canal is high.	Untreated city effluents is discharged directly to the port from Buyenzi Canal. Sometime, a lot of sediments are loaded into during flood events.
Water Quality	Temporal deterioration of port water quality due to construction.	Temporal deterioration of port water quality due to construction.	N/A
Overall Evaluation	Improvement of Port Bujumbura would be one of driving force to support regional development around Bujumbura. Proper EMP shall be established for the treatment of contaminated soils/sediments.		Existing port facilities will not match future growth of future cargo volume as well as the regional growth.

Source: JICA Study Team, 2012

(2) Rumonge

Table 8.2 summarizes the alternative evaluation for the master plan layout of Port Rumonge.

Table 8.2: Alternative Evaluation for Port Rumonge

	Do Project	**Do-Nothing**
Social		
Local Traffic	Expect minor traffic jam around the port.	N/A
More Employment Opportunities	High	N/A
Regional Planning	Easy to adapt for future growth of entire region (or would be key component for future regional infrastructure).	Not easy to adapt for future growth of entire region (or would be obstacle for future development).
Regional Growth	High potential to accelerate the growth of Rumonge as the hub of regional transport and logistics system (note: need to establish integrated inter-state/or province transport system).	N/A
Regional Stability	High potential to lead regional stability, by improving regional infrastructure.	N/A
Regional Economy		
Growth of International Trade	International trade with Congo, Tanzania and Zambia may be improved.	N/A
Outside Investment	High potential to attract investment from outside.	N/A
Environment		
Roadside Noise and Air Quality	Deterioration of roadside noise and air quality environment due to the circulation of trucks.	N/A
Water Quality	Temporal deterioration of port water quality due to construction.	N/A
Overall Evaluation	Port Rumonge Improvement Project would be one of driving forces to support future development of Rumonge Region.	Existing port condition will not match future growth of future regional growth.

Source: JICA Study Team, 2012

8.4 Stakeholder Analysis

(1) Introduction

Key stakeholders, to be considered within this port sector development MP study, are identified. Special focus will be on the most vulnerable and disadvantaged groups, and those groups who might oppose the reforms proposed within this port sector MP study So, the analysis shall be complemented with a discussion of the interests and incentives underlying key stakeholders' behaviors. The stakeholder analysis shall, therefore, identify potential winners and losers and tensions or conflicts between them as a result of implementation of these MPs. Questionnaire-based opinion surveys are conducted for potential stakeholders for each development master plan of Ports Bujumbura and Rumonge (see Photo 8.1). Relevant discussions are summarized in following sections (see Table 8.3). The opinion-survey sheet used for this analysis, is attached in Appendix 3.

Table 8.3: Outline of Questionnaire-based Stakeholder Analysis Survey

	Survey Date	# of respondents
Bujumbura	April 09, 2012	30
Rumonge	March 18, 2012	54

Source: JICA Study Team, 2012

Stakeholder Meeting at Rumonge

Stakeholder Meeting at Bujumbura

Meeting participants are filling out the survey sheet, regarding the proposed port improvement plans.
Source: JICA Study Team, 2012

Photo 8.1: Questionnaire-based Stakeholder Analysis

(2) Bujumbura

Following is the list of potential stakeholders to get involved within the planning stage of the port improvement plan of Port Bujumbura.

Central and Local Governments
1. Presidential Office
2. Ministry of Transport, Publics Works and Equipment
3. Port Authority
4. International Transportation Department
5. Ministry of Environment
6. Fishery Department
7. Ministry of Planning
8. Ministry of Commerce
9. Burundi Revenue Authority (OBR)
10. Marine Police
11. E.P.B.
12. RESIDESO
13. Lake Tanganyika Authority

Private Companies
14. Ship Company (ARNOLAC & BATRALAC)
15. Truck and/or Logistics Company (e.g., forwarder) : SDV, SODETRA
16. AMSTEL BRARUDI

University and Environmental NGOs
17. University of Burundi
18. ABEIE
19. ACVE

Communes
20. ROHERO, NGAGARA and BUYENZI Communes

(3) Rumonge

Following is the list of potential stakeholders to get involved within the planning stage of the port improvement plan of Port Rumonge.

Central and Local Government
1. Presidential Office
2.Ministry of Transport, Publics Works and Equipment
3. Port Authority
4. International Transportation Department
5. Ministry of Environment
6. Ministry of Commerce
7. Fishery organizations
8. Marine Police
9. Fishery Department
10. Ministry of Planning
11. Lake Tanganyika Authority
12. Regional office of Bururi Province

Private Companies
13. Truck and/or Logistics Company (e.g., forwarder)

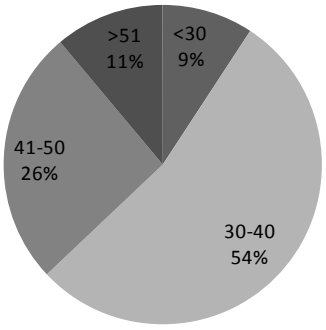
University and Environmental NGOs
14. University of Burundi
15. ABEIE
16. ACVE

Communes
17. Rumonge Town

(4) Opinion Survey Results (Rumonge)

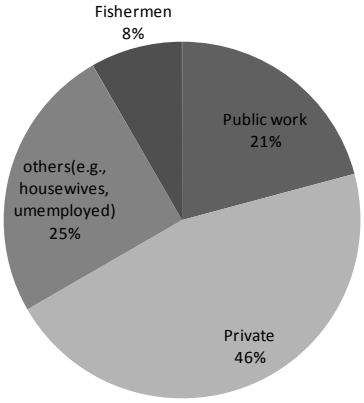
Based on collected 54 returns of questionnaire-based opinion survey (See Table 8.3), the stakeholder analysis for the long-term development strategy for Rumonge Town including the port improvement of Port Rumonge is conducted.

Figure 8.1 shows the age composition of those 54 respondents (male=87% and female = 13%). The generation with age 30s is dominant (54%), and then, age 40s shares 26% within this study. Figure 8.2 shows the profession of those 54 respondents. 46% (22 people) are from private sector while 21% (10 people) from a public sector.



Note: 54 respondents for opinion survey at Rumonge, conducted on March 18, 2012.
Source: JICA Study Team, 2012

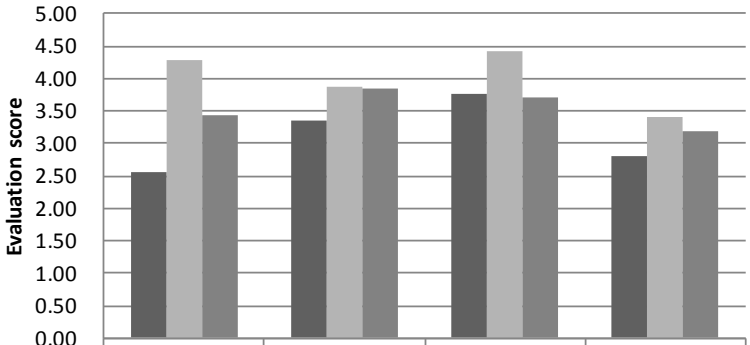
Figure 8.1: Age of Respondents (Rumonge)



Note: 54 respondents for opinion survey at Rumonge, conducted on March 18, 2012.
Source: JICA Study Team, 2012

Figure 8.2: Occupation of Respondents (Rumonge)

Figure 8.3 shows the sector evaluation results for the entire Rumonge town. Here, three sectors such as the social condition, the regional economy and the environment are of concerns. Within this study, 98% of respondents answered the proposed port improvement master plan will contribute to the improvement of their situations. Those who are under age 30 and over age 50 think that the current issues of the regional economy and environmental aspects are at critical condition while ages 30s and 40s think environmental issues are also main critical factors in Rumonge.



Generation	～30	31～40	41～50	51～
a. Social	2.57	3.36	3.77	2.80
b. Economy	4.29	3.88	4.43	3.40
c. Environment	3.43	3.83	3.71	3.20

Note: Evaluation is made with the scale of 1(bad) – 5 (good).
Source: JICA Study Team, 2012

Figure 8.3: Sector Evaluation Results by the Generation (Rumonge)

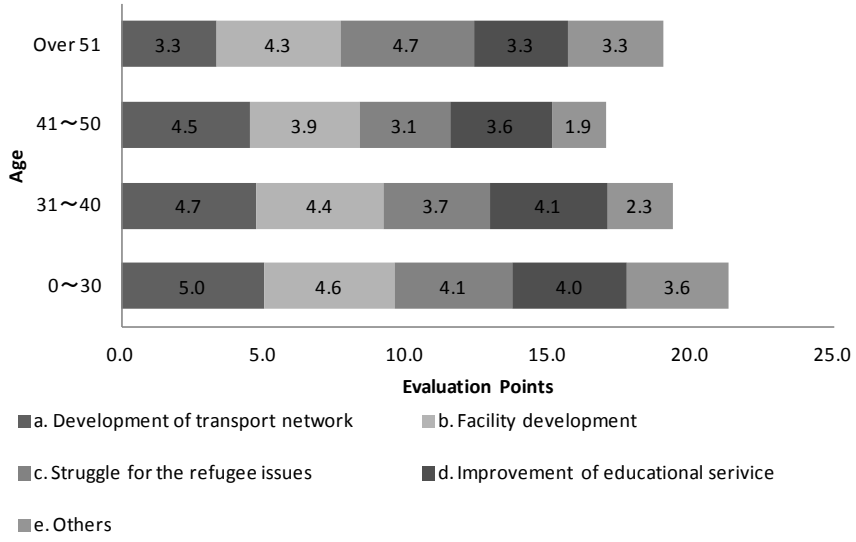
There are many issues to be considered for the long-term development of Rumonge Region. Within this opinion survey, the priority of each regional issue such as the infrastructure improvement is evaluated by all respondents. Figure 8.4 shows the evaluation result of this sector-wide priority issues, obtained from this opinion survey. It is noted that the evaluation is conducted with the scale of 1 (less important) – 5 (very important)). From this figure, it can be said that all generations evaluate that the priority of the development of the regional transportation network including the maritime transport and the improvement of social facilities such as school, hospitals are high. Both ages under 30s and over 50s put more importance on the

refugee-related issue, one of the critical regional issues with the Republic of Congo, compared with other generations.

The younger generation tends to be concerned about the improvement of the education service and put more importance (4.1/5.0 and 4.0/5.0 for ages under 30s and 30s, respectively). Also, from this study result, it can be said that the younger generation under age 30 tends to feel the necessities for comprehensive regional development and/or improvement for Rumonge (the total evaluation score of each issue = 21.3/25.0), then to be followed by the generation of 30s and 50s (each total evaluation score of each issue are 19.2/25.0 and 18.9/25.0, respectively).

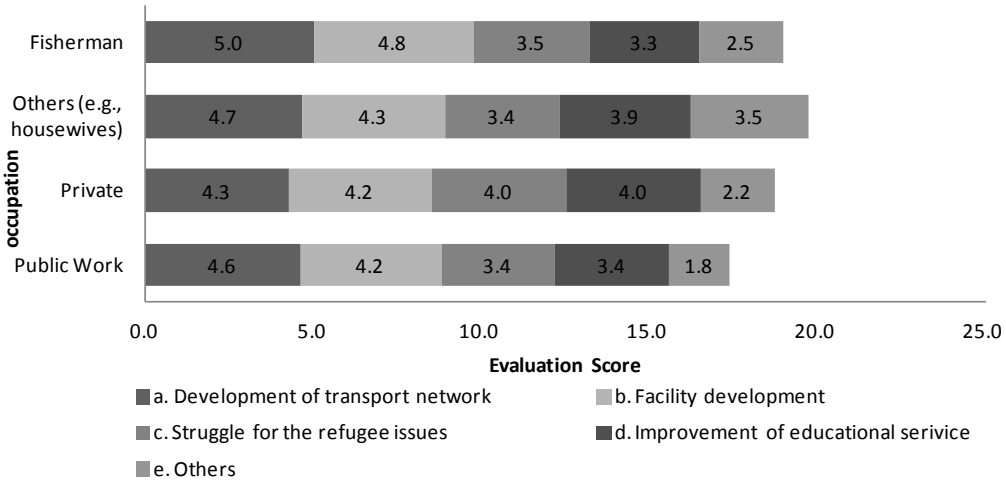
Figure 8.5 shows same evaluation result of this sector-wide priority issues, categorized by the professions. From this figure, it can be said that respondents with non-governmental jobs tend to put more importance on both refugee and education-related issues (4.0/5.0 of each). Respondents categorized as the fishermen and others tend to put more importance on the improvement of the regional transport system issue (5.0/5.0 and 4.7/5.0, respectively). It is noted that the total evaluation score of the others (e.g., housewives, student, unemployed and others) shows the highest score (19.8/25.0), then followed by the fishermen (19.1/25.0) whereas the lowest for the public work (17.4/25.0).

Based on findings derived from this survey, a schematic diagram of the stakeholder composition is summarized (see Figure 8.6). From this figure, the stance of each stakeholder group to the proposed port improvement project can be grasped easily. The younger respondents, a future driving force of the development of the entire town at the proposed target year of 2030, tend to raise awareness for various development issues beside the improvement of the regional infrastructure including the port. It is recommended to carry out a comprehensive regional development master plan that would address not only the development/improvement of the regional transportation network or facilities but also the education, the handling of refugees and employment problems.



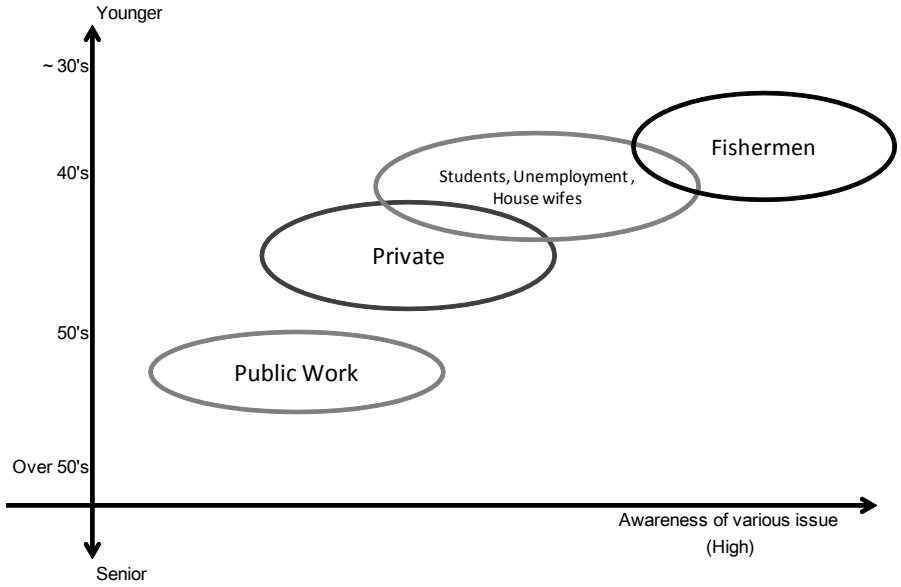
Note: total evaluation score by each generation are as follows, under 30s: 21.3/25.0, 30s: 19.2, 40s: 17.0, over 50s: 18.9/25.0
Source: JICA Study Team, 2012

Figure 8.4: Priority Issue for Regional Improvement by Generation (Rumonge)



Note: total evaluation score by each occupation are as follows, public work: 17.4/25.0, Private: 18.7, Others:19.8, Fishermen: 19.1/25.0
Source: JICA Study Team, 2012

Figure 8.5: Priority Issue to Be Improved in Rumonge (Occupation)



Source: JICA Study Team, 2012

Figure 8.6: Stakeholder Composition of Rumonge, Regarding the Regional Development including Port Improvement

(5) Opinion Survey Results (Bujumbura)

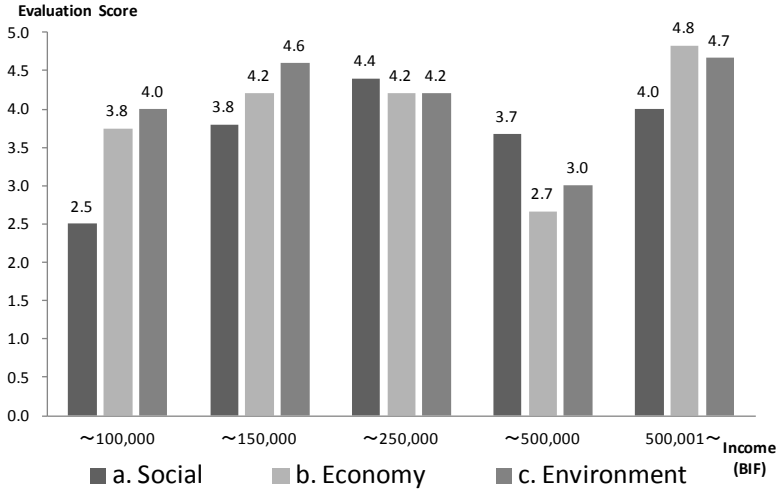
Based on collected 30 returns of questionnaire-based opinion survey (see Table 8.3), the stakeholder analysis for the long-term development strategy for Port Bujumbura was conducted. Table 8.4 summarizes the age composition of those 30 respondents (male = 77 % and female = 23%). From this table, it can be said that the generation of age 30s is dominant (40%), and then, age over 50 shares 30% within this study. Also, the monthly income level of each respondent is varied between less than 100,000 BIF and more than 500,000 BIF (the average monthly income is 508,434 BIF).

Table 8.4: Composition of Respondent by Age and Monthly Income

Age:	~ 100,000	~ 150,000	~ 250,000	~ 500,000	500,001 ~	No reply	Total	Percentage (%)
Under 30	2	1		1		2	6	20
30s	1	3	5	2	1		12	40
40s	1	1				1	3	10
Over 50					5	4	9	30
Total	4	5	5	3	6	7	30	100

Source: JICA Study Team, 2012

Figure 8.7 shows the sector evaluation results for the entire Bujumbura City, classified by the monthly income. Here, three sectors such as the social condition, the regional economy and the environment are of concerns. As shown in this figure, the lowest income group (less than 100,000 BIF) tends to put more importance on the environmental issues (averaged score = 4.0) while the highest income group (more than 500,000 BIF) shows the highest score at the regional economy issue (averaged score = 4.8) although all evaluations by this group are higher than those of the lowest income group.

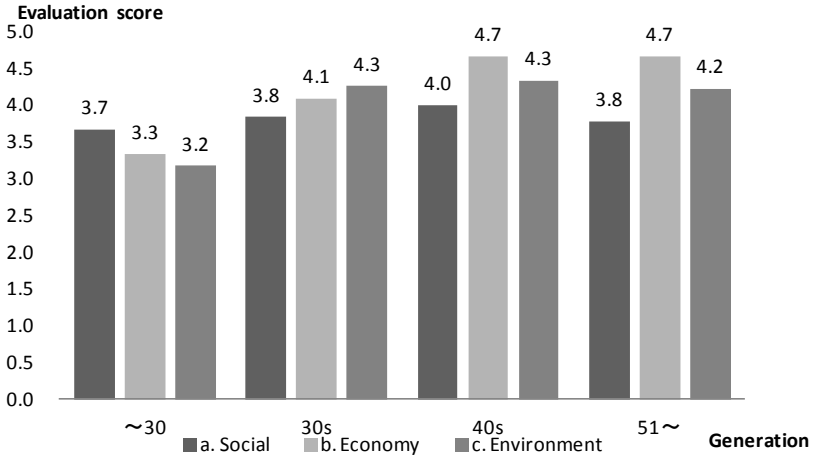


Note: Evaluation is made with the scale of 1(bad) – 5 (good)
Source: JICA Study Team, 2012

Figure 8.7: Sector Evaluation Results by the Monthly Income (Bujumbura)

Figure 8.8 shows the evaluation results by the generation. From this figure, it can be seen that groups of age 40s and over age 51 think the regional economy is the most important (averaged score = 4.7 each) while groups of age 30s puts most importance on the environmental and social issues (averaged score = 4.3).

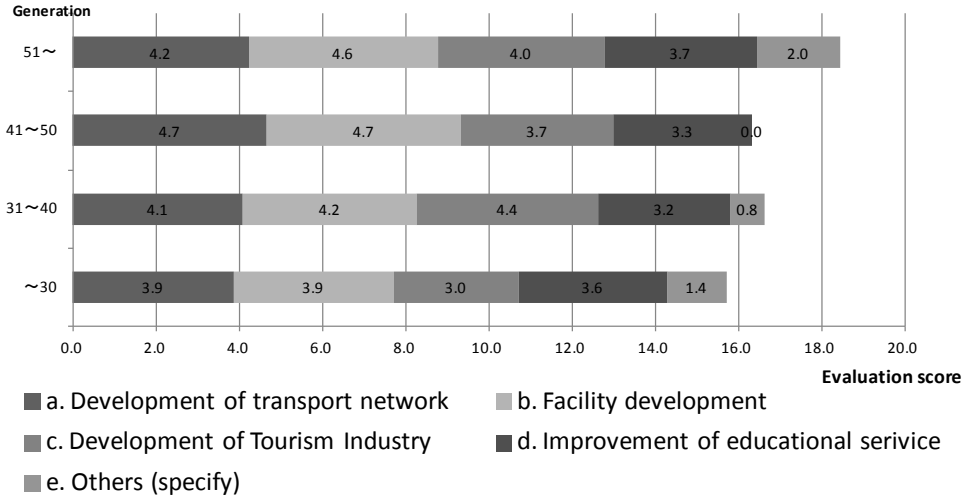
So, it can be said that the senior people with high income tend to have wide concerns for the current issues of Bujumbura City.



Note: Evaluation is made with the scale of 1(bad) – 5 (good)
Source: JICA Study Team, 2012

Figure 8.8: Sector Evaluation Results by the Generation (Bujumbura)

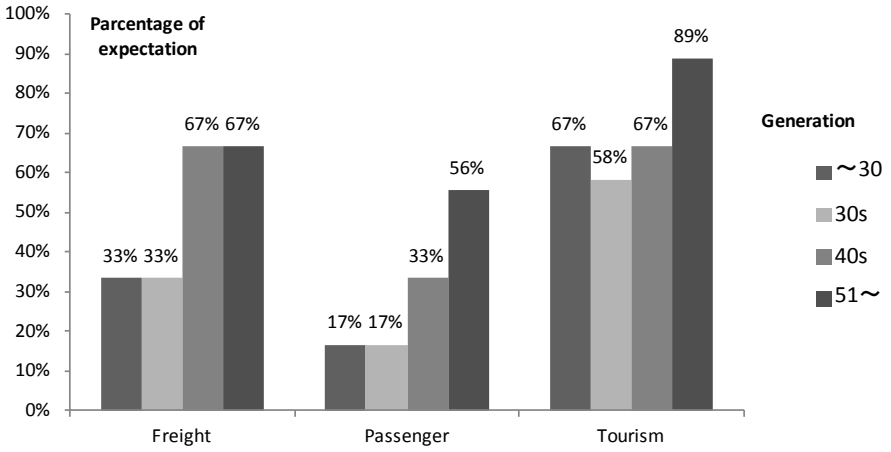
There are many issues to be considered for the long-term development of Bujumbura City. Within this opinion survey, the priority of each regional issue such as the improvement of the infrastructure, education and others is evaluated by a ll respondents. Figure 8.9 shows the evaluation result of this sector-wide priority issues, obtained from this opinion survey. It is noted that the evaluation is conducted with the scale of 1(less important) – 5(very important)). From this figure, it can be seen that senior group (i.e., over 51) tends to show more comprehensive awareness to various issues (total evaluation score = 18.4/30) than the youngest group (total evaluation score = 15.8/30.0). All generations show great concerns to the development of both transport network and public facilities.



Note: total evaluation score by each generation are as follows, Under 30: 15.8/30, 30s: 16.9/30, 40s: 16.3/30, over 50: 18.4/30
Source: JICA Study Team, 2012

Figure 8.9: Priority Issue to Be Improved in Bujumbura

Figure 8.10 shows the role of the future port each respondent expect to see. As shown in this figure, most of respondents expect that the future port would have vital roles to boost the regional tourism industry as well as the cargo handling whereas not for regional commuters, connecting nearest beach towns.

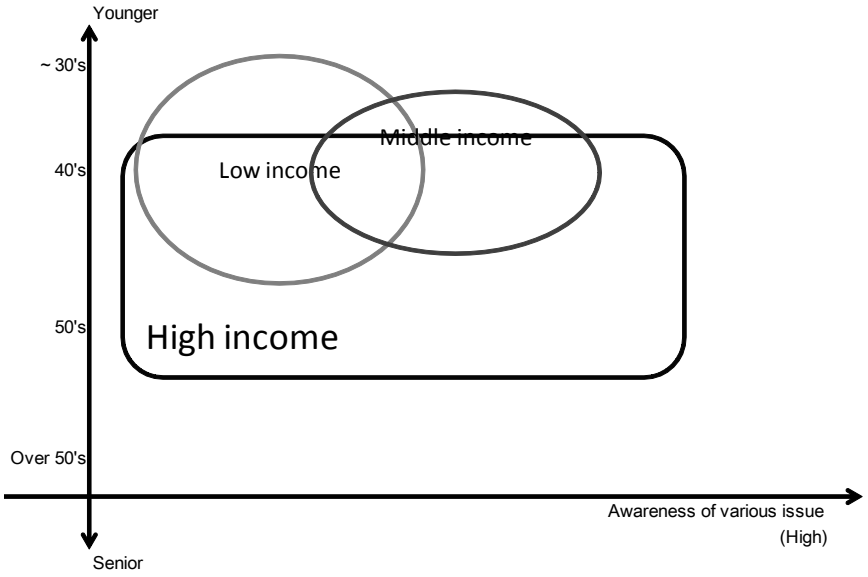


Source: JICA Study Team, 2012

Figure 8.10: Expectation for Future Bujumbura Port (by Generation)

Based on those findings obtained from this survey, a schematic diagram of the stakeholder composition is qualitatively summarized (see Figure 8.11). It is noted that the classification of the stakeholder group by the occupation type, applied for the case of Port Rumonge, is not implemented since most of respondents belong to the private sector within this study. So, the stakeholder categorization is conducted based on the amount of the monthly income.

From this diagram, it can be seen that the senior group tend to raise awareness for various development issues whereas not in the case of Port Rumonge (see Figure 8.4). And those with higher income at each generation tend to show more awareness to various issues.



Source: JICA Study Team, 2012

Figure 8.11: Stakeholder Composition of Bujumbura, Regarding the Regional Development Including Port Improvement

(6) Conclusions

From this stakeholder analysis, it is found that each region has its own unique stakeholder structure, reflecting surrounding social and environmental conditions. Also, it can be said that the study approach developed within this section is useful to analyze the stakeholder characteristics, in particular, the stakeholder categorization for the proposed port-sector improvement study subjectively.

Due to the time constraints of this entire port-sector MP study, only one time questionnaire-based stakeholder analysis was conducted. However, as mentioned earlier, this kind of the stakeholder analysis is beneficial in order to develop a thorough development policy/ strategy/or MP with consensus of all stakeholders. It is recommended to conduct a more comprehensive questionnaire-based stakeholder analysis for the port-sector MP study in order to improve the study accuracy of this analysis.

8.5 Institutional Analysis

As mentioned in Chapter 9, it is found that some portions of Port Bujumbura's sediment is contaminated with heavy metals such as PCB and arsenic (note that origins are unknown), and the removal of those contaminants are not completed, yet. It would be dangerous to implement relevant port improvement activities without a comprehensive environmental management program (EMP).

There are many factors to be considered in order to achieve a successful implementation of proposed port improvement projects that would not cause severe environmental negative impacts such as the spreading of toxic substances.

Among of them, the existence of strong environmental administration is important one. Currently, the Ministry for Water, Environment, Land Management and Urban Development, (hereinafter referred to as "MoE") is the presiding organization for the nation-wide environmental administration. However, the current environmental administrative framework in Burundi is still at the rudimentary stage, and does not have sufficient experiences of the supervising the EMP implementation for any infrastructure development projects, this ministry is still in the process of seeking out ways of more systematic environmental management.

There is no environmental section within the existing Ministry of Transport, Public Works and Equipment (hereinafter referred to as "MoTPWE") that would provide appropriate directions and/or suggestions to any infrastructure development projects while liaisoning with the MoE and relevant agencies and/or organizations for the successful implementation of the environmental management program. So that, the establishment of a good inter-ministerial coordination would be one of critical issues for the successful implementation of any large-scale infrastructure development projects, in particular, for the port improvement projects of Bujumbura and Rumonge.

8.6 Legal Framework

As mentioned earlier, EIA Law of Burundi was enacted in June 2000, and there is no major updating and/or revising of its contents since its introduction. Before implementation of this law, EIA practice used to be conducted within World Bank and/or African Development Bank-funded projects. Specific descriptions for EIA procedures such as the screening process, the indication of sensitive areas, the time schedule, the public participation and other relevant issues are not mentioned. So, there is no systematic EIA supervising system of the actual performance of EIA in practice, yet.

The Constitution does not have specific provisions for the environmental management, and no provisions for environmental rights exist. Also, there are no detailed regulations that deal with EIA implementation or regulations for EIA practitioners. No provisions for Strategic Environmental Assessment (SEA) exist, so that the current overall inter-ministerial coordination for the long-term nation-wide development policies/plans and/or programs is not in good shape.

8.6.1 Organization

(1) Introduction

As mentioned in Chapter 9, it is reported that some portions of Port Bujumbura's sediment is contaminated with heavy metals such as PCB and arsenic, and it would be dangerous to implement relevant construction activities related with the proposed port improvement projects without the establishment of comprehensive environmental management program. There are many factors to be considered in order to achieve a successful implementation of proposed port improvement projects. Among of them, the capacity improvement of the environmental administration, in particular, the Department of Environment (hereinafter referred to as "DoE"), one of key section within current MoE, would be critical to make these port improvement projects environmentally successful.

(2) Restructuring of DoE

Figure 8.12 shows a suggested organization chart of the future DoE. Basically, this department consists of following two sections; i.e., (i) unit responsible for the regional coordination and the public education, and (ii) unit responsible for the environmental monitoring and compliance. Relevant supervising work of EMP for infrastructure development projects will be conducted by the "Environmental Compliance and Monitoring Unit", depicted in this figure. Each unit would need at least two personnel, so that 14 experts (= 2 experts/unit × 7 units) will be required for the operation of this department. Besides, three director-class (or one director and two heads) positions shall be introduced. So, totally, 17 staff will be required for the proper functioning of this re-structured DoE.

(3) Supervision of Project Cycle

Figure 8.13 shows the suggested environmental framework for the successful implementation of the proposed port improvement projects. Main role of the proposed SEA Section (depicted within this figure), belonging to the Presidential Office, is to arrange an inter-ministerial and sectoral coordination of a long-term nationwide development policies/plans and/or program.

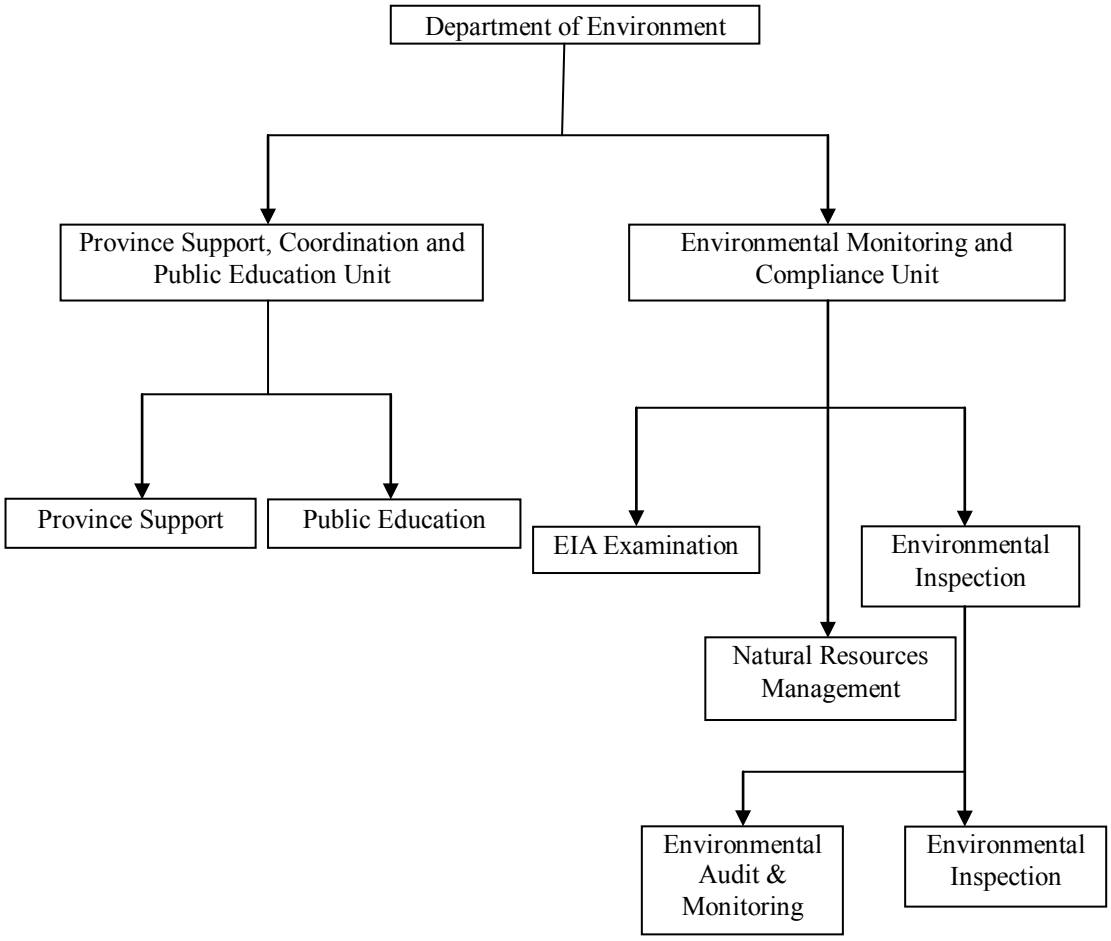
It is preferable that all national master plans shall be developed and examined within this proposed SEA section. So that, more systematic and organized coordination among all mater plans would be possible. Within this framework, competent ministries such as MoTPWE and MoE can work together closely while exchanging relevant information by establishing a good liaison between both ministries.

As mentioned earlier, current MoTPWE does not have any environmental sections and/or units which shall establish a good liaison with MoE. It is recommended to set up relevant environmental and social sections that would supervise appropriate environmental and social considerations for any infrastructure development projects including proposed port improvement projects. It would be beneficial to prepare environmental and social guidelines for each sector (e.g., road, port and others). It is noted that MoE shall raise appropriate environmental awareness among relevant agencies and/or organizations (e.g., Bujumbura Municipality and/or Bururi Province) punctually throughout the entire project cycle.

It is noted that several nations such as Tanzania, Zambia and Congo exist within the entire basin of Lake Tanganyika, so it is important to have a comprehensive environmental management program covering trans-boundary issues such as a wide-spreading of the temporal water quality degradations, that maybe caused by the construction activities. In that sense, it is important to establish close relationship with Lake Tanganyika Authority (LTA).

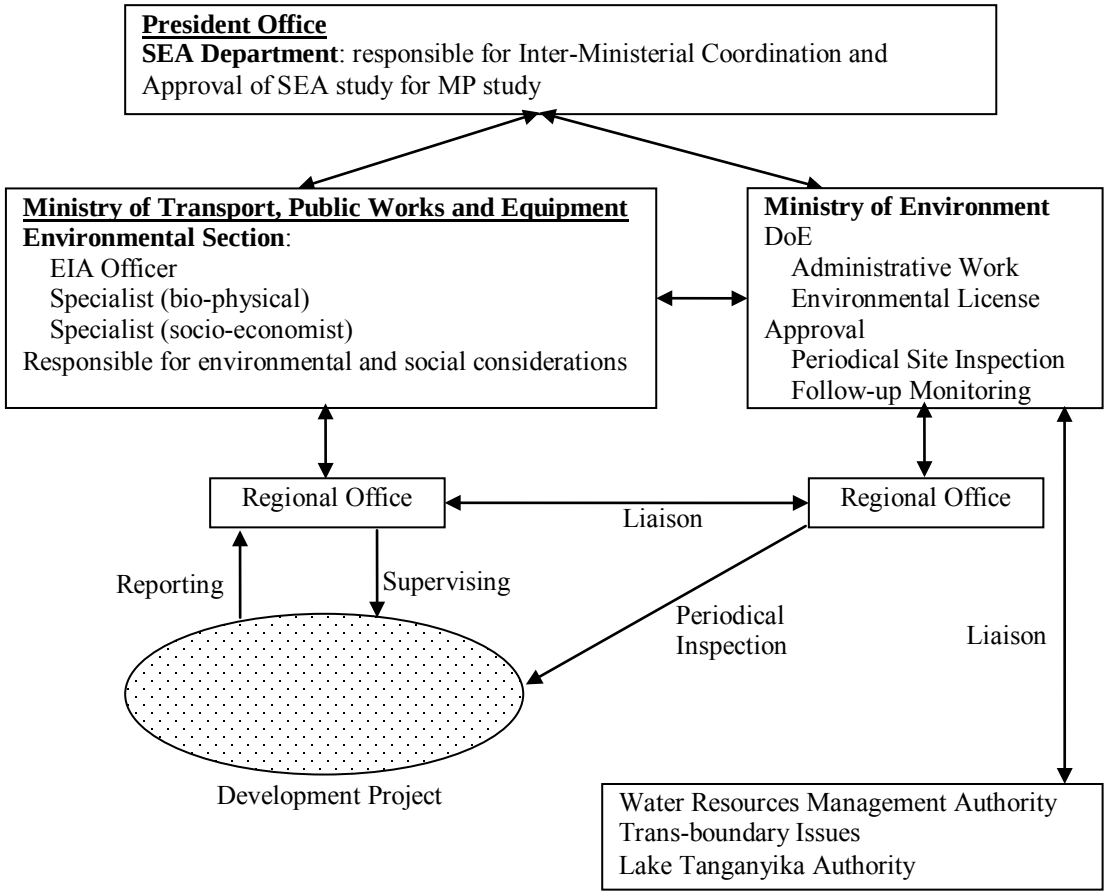
Also, Lake Tanganyika is one of important water reservoirs for lakeside communities, so that it is important to have close communication with the water resources management authority as well as lakeside local communities.

Under the coordination of the President Office, MoE and MoTPWE can work for the supervising the construction of port improvement projects in coordinated manners.



Source: JICA Study Team, 2012

Figure 8.12: Department of Environment (Example)



Source: JICA Study Team, 2012

Figure 8.13: Environmental Monitoring Framework for Development Project (Example)

Chapter 9 Improvements in Maritime Transport on Lake Tanganyika

9.1 Improvement in Marine Transport

9.1.1 Current Capacity of Lake Transport by Burundian Fleet

Lake Tanganyika is long and slimly shaped; being 650 km in length (north-south) and 100 km in width (east-west). Therefore, it is natural that the transportation mode across the lake from east to west has developed due to a strong demand. The short distance routes between Burundi/Tanzania and DRC are serviced by small ships, and the requirement for cargo transportation will increase for both types and lots of cargo in consideration of freight and cargo arrival times.

The ships of the current Burundian fleet are shown in Table 9.1. Among these ships, only the mixed cargo ships, bulk cargo ships and bulk cargo barges are considered to transport the break bulk cargo between Mpulungu Port and Bujumbura Port. The capacity is estimated based on the conditions below:

- The capacity has to be more than 110,140 tons which was the highest amount recorded in 2010.
- The average speed of cargo ships is assumed to be 10 knots (18 km/hour) with a slow speed when entering and departing the port.
- Availability to load cargo onto Burundian fleet at Mpulungu is assumed to be 90% of the time, i.e. 328 days per year.
- Maximum loaded cargo is assumed to be 90% of the dead weight tonnage (DWT) of ships.
- Loading capacity per gang at Mpulungu Port is assumed to be 450 ton/day by use of shoot.
- Unloading capacity per gang at Bujumbura Port is assumed to be 250 ton/day/gang.
- As for cargo to Ndaje, Munizi, Mumirwa, Tora, Teza, 2 loading gangs are assumed at Bujumbura Port.

For efficiency of transport, the capacity is computed in maximizing the use of the larger cargo ships. The results are shown in the table below:

Table 9.1: Current Capacity of Burundian Fleet

Name of Vessel	Type of Vessel	DWT (ton)	Cargo (90 % of DWT) (ton)	Bujumbura to Mpulungu (day)	Loading (day)	Mpulungu to Bujumbura (hours)	Un-loading (day)	Cycle time (day)	Cycle per year	Loading days per year	Cargo (ton/year)
Teza	Mixed Cargo Ship	1,500	1,350	2	4	2	3	11	29.8	119	40,230
Tora	Bulk Cargo Ship	1,110	1,000	2	3	2	3	10	29.8	89	29,800
Murinzi	Bulk Cargo Barge	885	800	2	2	2	2	8	29.8	60	23,840
Ndaje	Mixed Cargo Ship	600	540	2	2	2	2	8	29.8	60	16,092
Mumirwa	Bulk Cargo Barge	544	490	2	2	2	2	8	0.0	0	0
Rwegura	Bulk Cargo Ship	500	450	2	2	2	1	7			
Mbaza	Bulk Cargo Ship	450	410	2	2	2	1	7			
Ruremesha	Mixed Cargo Ship	350	320	2	1	2	1	6			
Total		5,939	5,360						119	328	109,962

Accordingly, the current capacity of the Burundian fleet to transport break bulk cargo between Mpulungu Port and Bujumbura Port is estimated at about 110,000 tons per year. The bottleneck of the transport capacity between the two ports is the limit of the loading capacity of cargo onto the ships at Mpulungu Port, as it has only a 20 m quay and only one gang of workers can work.

As the cargo is expected to continually increase from now on, several actions have to be urgently undertaken by Mpulungu Port to meet the demand as follows:

- To increase working hours as a temporary measure
- To expand the quay wall to 60 m to deploy 3 gangs of worker for MV Teza as an urgent development
- To construct a container berth to expedite containerization of break bulk cargo for effective cargo handling as a short-term development

9.1.2 Transport Capacity of Burundian Fleet When Mpulungu Port Is Improved

It is reasonable to extend the quay of Mpulungu Port to 60 m so that 3 gangs of workers can work at the same time to load cargo onto a relatively large ship like MV Teza, which length is 60 m. Therefore, in case such an extension is materialized, the transport capacity of the Burundian fleet will increase as shown in the table below:

Table 9.2: Capacity of Burundian Fleet in Case of a 60 m Quay at Mpulungu

Name of Vessel	Type of Vessel	DWT (ton)	Cargo (90 % of DWT) (ton)	Bujumbura to Mpulungu (day)	Loading (day)	Mpulungu to Bujumbura (hours)	Un-loading (day)	Cycle time (day)	Cycle per year	Loading days per year	Cargo (ton/year)
Teza	Mixed Cargo Ship	1,500	1,350	2	2	2	3	9	36.5	73	49,275
Tora	Bulk Cargo Ship	1,110	1,000	2	1	2	3	8	36.5	37	36,500
Murinzi	Bulk Cargo Barge	885	800	2	1	2	2	7	36.5	37	29,200
Ndaje	Mixed Cargo Ship	600	540	2	1	2	2	7	36.5	37	19,710
Mumirwa	Bulk Cargo Barge	544	490	2	1	2	2	7	36.5	37	17,885
Rwegura	Bulk Cargo Ship	500	450	2	1	2	1	6	36.5	37	16,425
Mbaza	Bulk Cargo Ship	450	410	2	1	2	1	6	36.5	37	14,965
Ruremesha	Mixed Cargo Ship	350	320	2	1	2	1	6	36.5	37	11,680
Total		5,939	5,360							329	195,640
Notes: 1)	Quay wall of Mpulungu Port is assumed to be expanded to 60 m from 20 m.										
2)	On the 60 m quay, it is assumed that 3 gangs can work at the same time.										
3)	It is assumed that 3 gangas can work for Teza, Tora, Murinzi, and 2 gannngs can work for the other ships.										
4)	The other condisions are assumed the same as those to compute the present capacity.										

From the table above, approximately 195,000 tons of the break bulk cargo per year can be transported by the current Burundian fleet. However, the demand of break bulk cargo will exceed this capacity in 2020 unless part of the break bulk cargo is containerized for loading efficiency. The containerization needs one container berth and container handling equipment, like mobile container STS cranes and reach stackers. As a result, the Burundian fleet should put into service container ships plying between Bujumbura Port and Mpulungu Port. Meanwhile, one break bulk berth and one container berth, each 60 m long, should be built at Mpulungu Port to meet the cargo demand to be transported on Lake Tanganyika.

9.1.3 Requirements of New Container Ships

(1) Bujumbura Port – Kigoma Port

From 2020, 3 container ships of a 60 TEU capacity will be put into services and one of them will call Bujumbura Port every day up to the time when the daily container throughput reaches 120 TEU. In 2030, one additional container ships of a 60 TEU capacity will be required to transport containers once every 5 days.

(2) Bujumbura Port – Mpulungu Port

At the beginning of containerization when containers are not many, a combo-type cargo ship like MV Teza can be put into service. A container ship will need 5 days plying between Mpulungu Port and Bujumbura Port, half day for unloading/loading at each port and 2 day navigation. Therefore, one container ship will be required to transport containers in 2020 and 2

ships and 3 ships will be required in 2025 and 2 030 respectively. In other words, one container ship will call Bujum bura Port every 5 days, 3 da ys and 2 days in 2020, 2025 and 2030 respectively.

9.1.4 Measures to Be Undertaken

(1) Measures to Be Undertaken by Shipping Companies

In order to meet the incr ease of carg o to be transported on the lake, it is necessary for the shipping companies to implement the following:

1. To deploy such cargo vessel or vessels that ar e large enough to t ransport an entire lot of cargo in one trip. As the tonnage of the vessels does not always meet the cargo volum e to be transported as one lot, consigners may not want to use lake transport.
2. To reassess the components of the transport ch arges for the shipping companies to offer a reasonable tariff to the c onsigners. This do es not neces sarily mean to low er transport charges but to offer a reliable manner in wh ich the consigners can esti mate the cost an d make a sustainable transportation business.
3. To advertise the days required for the transport and try not to change them. In addition, it is necessary to minimize the duration of transport and monitor the location of the cargo.

In order to i mplement the above-mentioned busin ess, it is necessary to undertake measures as follows:

- The shipping companies to consult with the consigners and offer them appropriate cargo vessels to meet the ty pe and volume of their cargo. The shipping com panies must implement business promotion and exchange in formation with the consigners so that a vessel of the appropriate type and size can be deployed to match the type and method of loading and handling of the cargo that the c onsigners will send. They should also meet the demand of the consigners by renovating their vessels, dismantling unnecessary idle vessels or building new ships.
- To promote transportation of small lots as a result of de-vanning c ontainerized cargo as it is being done at CFS. As the container tran sport on the lake should be pr omoted first, the small lot cargo services may take a longer time to start.

(2) Measures to Be Undertaken by the Ports

Meanwhile, the ports should im plement facility development and m odernize cargo handling equipment, which will contribute to i mproving the capacity of lake transport. Naturally , the more efficient the cargo handling becomes at the port, the more frequent services of the cargo vessels can take place and transport capacity will increase. As less dwell time of cargo is materialized at the port, the more reliance of the consigners on the lake transport will be created and transit time reduced.
To promote lake transport, the p ort should have the following cargo han dling equipment and facilities:

- To install container STS cranes attached with a spreader and provide a container handling yard. Other ancillary equipment for container handling is to be provided.
- To install slewing wharf cranes on break-bulk berth equipped with several types of buckets so that they can handle bulk cargo when necessary.
- To provide finger-type forklifts to tra nsport break bulk cargo, store them in t he warehouses and load/unload them onto/from trucks.

- To further promote usage of pallets (except for cargo which is long in length or bulky) to augment the handling efficiency and reduce the damage to the cargo.

(3) Measures to Be Undertaken on Transport Network

Considering the transport network as a whole, a modal shift among the lake, road or railway transport has to be smoothly carried out. In particular, a modal shift between the ship and railway requires the operation timetables of both transport means to be adjusted and in accordance with each other to minimize the time loss in shifting the cargo. To implement the harmonized operation, it is recommended to modernize the port facilities and cargo handling equipment for efficiency and introduce a computerized system to monitor the cargo movements. The consigners will rely on such a system to monitor their cargo whereabouts and know their transport means.

(4) Recommendations

The port and shipping companies should implement the above-mentioned measures to service the cargo unnecessarily transported by road at present. The consigners will choose the transport route, road or lake, based on the characteristics and volume of their cargo. The recommendations for the lake transport are summarized below:

- The port should install facilities and equipment to materialize efficient cargo handling.
- The port should provide facilities for efficient modal shifts between ship and road/ railway.
- The shipping companies should reorganize their fleet of cargo vessels to meet the demand of the consigners.

9.2 Improvement of Marine Safety

9.2.1 Actual Situation of Marine Safety

The Burundi Maritime, Port and Railway Authority (BMPRA) was established as the "land lord" of the ports of Burundi according to the Presidential Decree No. 100/252 dated 4 October 2011. BMPRA is the responsible government organization for marine safety. However, the organizational restructuring is underway. In this report, therefore, the present situation about marine safety in Burundi is described.

In Burundi, Ministry of Transport (through BMPRA) is responsible for keeping the navigation and security of the lake coast organized. The organization of BMPRA is not completed yet; as of August 2011 they had just begun to make a plan for marine safety (about navigation safety, security and rescue of the Burundi coast). First, they have to complete their organization and clarify the role of each of their departments. Next, training for the rescue members will be conducted and sufficient equipment for maintaining vessels' safe navigation and conditions of the coast will be provided. However, as of now, they have just started to make the plan.

BMPRA must carry out the control of safety navigation, maintain security of the coast and rescue accident victims, in cooperation with the Navy. However, the BMPRA has so many problems; there is not enough equipment to handle their duties and there is a lack of trained and organized staff. In actuality, the Navy's vessels are mooring to maintain safety at Rumonge and Bujumbura.

9.2.2 Measures to Be Undertaken by Burundian Government

With respect to the activities of Marine Police, the following measures should be undertaken by the government.

(1) Maintain Security on Territorial Water of Lake Tanganyika

Marine Police should be empowered to take roles of the following:

- To crack down maritime crimes and violation of law
- To crack down poaching
- To crack down smuggling and stowaway
- To countermeasure terrorist attack and piracy
- To inspect suspicious ships and spy ships

(2) Rescue and Salvage in Case of Maritime Disaster

The topography and bathymetry of the coast of Burundian territorial water is not complex and the length of the coast is relatively short, i.e. 140 km only. Therefore, two marine police base having a speed boat should be set up at Bujumbura and Rumonge to swiftly cover all the territorial water. Marine Police should be provided sufficient equipment to periodically patrol the assigned water area for security from their bases and, in case of disaster, swiftly take actions for rescue.

At present, Marine Police has not sufficient human resources and equipment to carry out the patrol or rescue. Even all the necessary measures have been realized, however, Marine Police may need cooperation by Navy for rescue operation in case of a large maritime disaster. Particularly, in order to maintain security of the territorial water, it is practical for Marine Police to request Navy's cooperation against armed pirates or criminals.

(3) Environmental Conservation of Lake Tanganyika

Marin Police should be also empowered to carry out the following tasks for environmental conservation of Lake Tanganyika:

- Surveillance and patrol against violation laws for marine environments
- Surveillance of pollution on the lake
- Supervision and enlightenment for environmental conservation

The activities should particularly be exercised on the subjects below in regulating and supervising ships calling the ports:

a) Prevention measures against spillage of oily wastewater
b) Measures for the case of oil spillage i.e. possession of oil absorbing mat, oil fence, etc
c) Enlightenment for importance to conserve the environment of the lake

(4) Safety of Maritime Transport

Laws should be made for Marine Police to exercise the surveillance and patrol on ships calling the ports as follows:

- Legal reinforcement of safety equipment
- Possession of rescue boats, life rings and jackets, fire extinguishers, beacon for night navigation, etc.
  - Prevention of overloading, over-passengers

- Submission of list of crew and passengers
- Surveillance of dangerous cargo
- Prevention of spillage of oily wastewater
- Maintenance of navigation lights

9.2.3 Analysis of Accidents on Lake Tanganyika

In the territorial waters of Burundi, there have not been any serious accidents during the last 10 years. However, upon inspection of the entire area of Lake Tanganyika, there were a significant number of accidents. Only serious accidents are listed and analyzed below:

Table 9.3: Serious Accidents on Lake Tanganyika

Date of Accident or announcement	23 November 2001, announced by the news agency
Place	Near "Uvira Port" of DRC
Vessel	A collision of 2 (two) cargo passenger vessels, one belonging to "Baraka Port" and another to "Ubwari Port"
Destination	No description
Damage	• The number of passengers was not clear (no passenger list). • 28 (twenty-eight) victims were rescued near "Uvira Port", 27 (twenty-seven) dead bodies were found near "Uvira Port" and 9 (nine) dead bodies were found at the shore of "Burundi"
Causes of accident	Based on the comment of local police, • Bad visibility of the lake from "Uvira Port" • Both vessels did not have or did not turn on the navigation lights

Date of Accident or announcement	22 March 2003 (reported by "Burundi Port Authority" staff) 24 March 2003 announced by Reuters
Place	Between "Kalemie" and "Uvira" in DRC
Vessel	Passenger Vessel
Destination	"Kalemie" to "Uvira"
Damage	• The passenger vessel was overturned, and 39 (thirty nine) victims were rescued. It is assumed that more than 150 of the 200 passengers on board died.
Causes of accident	Reported by "Burundi Port Authority" staff According to an information source, the capacity of this vessel was likely to be fewer than 100 (one hundred) passengers. • Overloaded vessel • Strong winds

Date of Accident or announcement	7 June 2006 from "Kinshasa"
Place	Between "Uvira" and "Kalemie"
Vessel	Cargo Passenger Vessel
Destination	"Uvira" to "Kalemie"
Damage	• The vessel sank due to a fire. • Only 18 (eighteen) passengers were rescued. It is assumed that more than 100 (one hundred) passengers died.
Causes of accident	• The vessel was loaded with large quantities of oil and petroleum when the fire broke out from the engine room. • The cause of accident was that the staff of the vessel was careless about fire control or had no knowledge about dangerous cargo handling.

Date of Accident or announcement	• 29 January 2008 (Vice Governor Mr. Yav Tsibal of KATANGA) • 30 January 2008 by "Voice of America"
Place	East side of the lake and 5 (five) km away from "Kalemie"
Vessel	Cargo Passenger Vessel

Destination	"Kalemie" to "Moba"
Damage	• The vessel was stranded and sank at night. • At least 17 passengers (most of the victims were women and children) died and more than 100 (one hundred) passengers were rescued, and some passengers were missing. • The investigator of this accident could not state the number of missing passengers, because the on-board passenger list of this vessel had only 58 (fifty eight) names and no one knew the actual number of passengers. Just before the accident, the operator of vessel was trying to go to shore to board more passengers.
Causes of accident	• Lack of knowledge about navigation routes and safe navigation rules. • Overloading of passengers and cargo. • Dangerous navigation route for overdraft vessel.

There were no marine accidents by large cargo passenger vessels in Burundi. However, to avoid an accident from becoming a serious incident, a rescue system (organization, equipment, etc) should be established. Suggestions are as follows:

a. To build a safety communication system between navigating vessels and BMPRA
b. To enhance awareness of safety consciousness among crew of vessels
c. To enhance awareness of the rescue work of BMPRA among the inhabitants on the Burundian shore
d. To regularly conduct rescue training
e. To possess a set of rescue gear

Appropriate BMPRA bases should be set up at Bujumbura and Rumonge for emergency rescues. Bujumbura is the most important port of Burundi, and Rumonge is located almost at the center of the Burundi shoreline. Rescues shall be organized, reported and implemented as illustrated below:

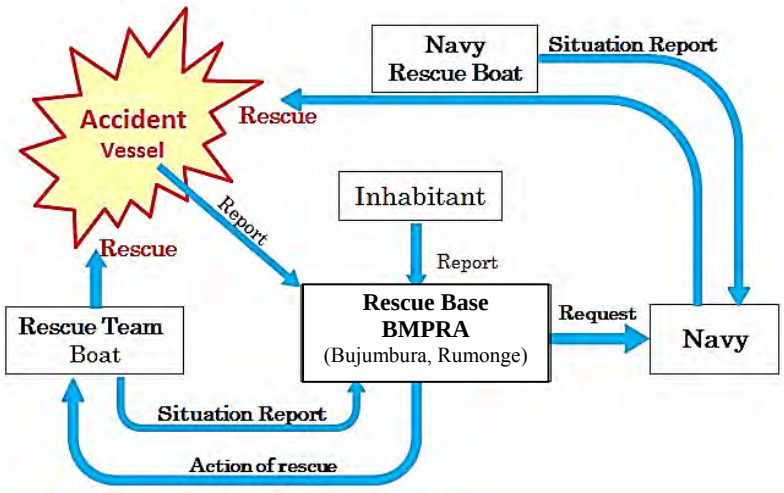


Figure 9.1: Rescue Flow

At present, BMPRA of Burundi has no rescue boats so they should acquire them as soon as possible. The required number of the rescue boats is three (3), one for Bujumbura Port, one for Rumonge Port and the third one as a spare when the others boats are under maintenance or repair. The required specifications must satisfy the following:

a. The boats shall operate with sufficient speed so that they can promptly reach accident sites.
b. Equipment shall be provided for easy night cruising.
c. Good communication equipment has to be equipped.
d. The boat shall have a strong lighting system.
e. The boat shall have sufficient lifesaving equipment.
f. Passenger capacity of the boat shall be more than 10 people.

Boats that can be used for rescue work are shown below:

CRUISING BOAT		
Name		
L*B*H m	7.47 * 2.69 * 1.42 m	8.84 * 2.69 * 1.77 m
Total Weight	2,065kg	2,583kg
Engine	110.3 kW(150 ps) x 2	220.7kW(300ps)
Capacity	Total 10	Total 10
Price	¥11,750,000(US$146,875)	¥11,800,000(US$147,500)

BIG BOAT		
Name		
L*B*H m	11.98 * 3.97 * 2.33 m	10.84 * 3.659 *2.21 m
Total Weight	10,249kg	7,000kg
Engine	243 kW(330 ps) x 2	243kW(330ps) x 2
Capacity	Total 12	Total 12
Price	¥69,000,000(US$862,500)	¥40,000,000(US$500,000)


Photo 9.1: Cruising Boat and Big Boat for Rescue Work

9.2.4 Safe Navigation

The port usually closes at 6:00 PM and vessels are not allowed to depart or enter the port after that time. However, there is some uneasiness about vessels reaching the port before 6:00 PM due to departure delay s or whether the next destina tion of a vessel was far from the port. In either case, a vessel has to carry out night navigation.

Large vessels may be able to navigate safely even at night, because they are likely to have safe navigation equipment and they can choose a safe navigation course far from the coast shoreline. Nonetheless, there are so many small cargo vessels that are normally built of wooden materials (called “BOTI” in the local language, meaning boat).

Normally, smaller vessels have to choose a night navigation route closer to the shoreline than large vessels, because they cannot get information about their own position as they do not have

safe navigation equipment. Also, there are so me dangerous shallow waters near the shoreline (These shallow waters are located very close to the shoreline, maximum distance approximately 500 m). Therefore, night navigation is very dangerous for small wooden cargo vessels.

The most practical ways for small vessels to secu re their safety is to know their own position at night by following the lighthouse light and by their own experiences. As fishing boats alway s have to start work very early in the morning, they need to take the sa me measures for safety a s well.

(1) Existing Navigation Aids

The landform of Lake Tan ganyika's coast shoreline is not so co mplicated and safer than that o f Lake Victoria. Thus, to see if warning signal li ghts for dangerous shallow water s are necessary, an investigation was conducted to check all lighthouses and beacon towers on the coast shoreline. The results are below.

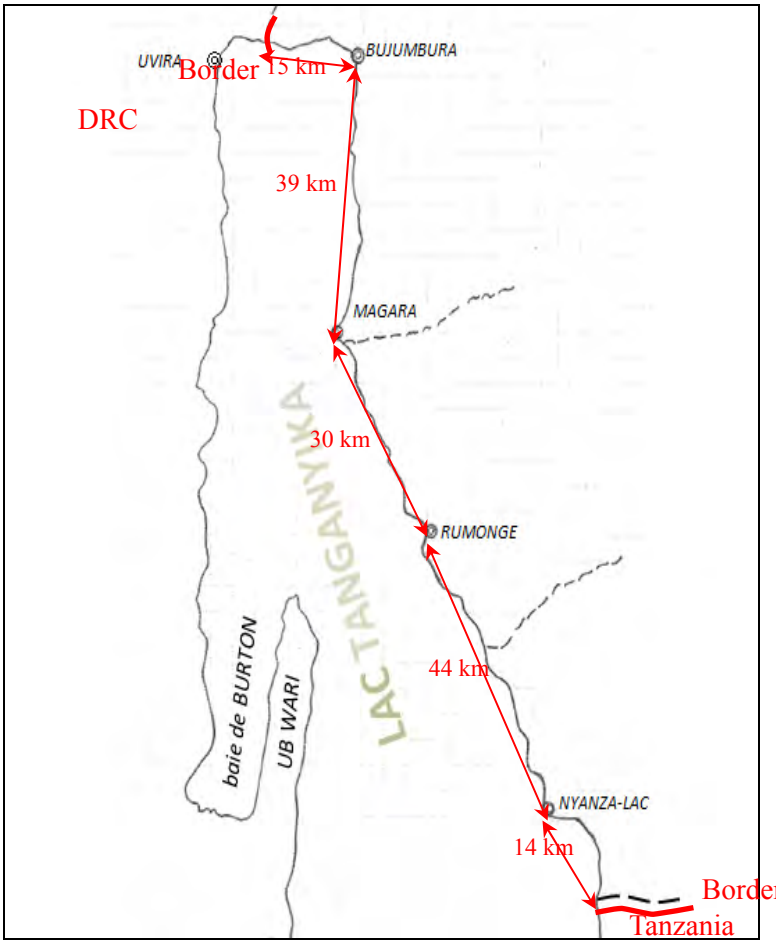


Figure 9.2: Location of Beacons

Bujumbura Port

There are two (2) beacons on both sides (north and south) of the port entrance. The North si de beacon is broken. The South side beacon is still working, but the power of the beacon light is very weak and the reachable distance of the beacon light is short. Sometimes vessels had missed seeing the light and passed through in front of Bu jumbura Port entrance and navigated north at night time. The beacon is protected by the Navy base stationed at the port.

Photo 9.2: Location of Beacon at Bujumbura

Photo 9.3: Beacon at Bujumbura

Magara

The beacon had been stolen. There was only a beacon tower in front of the village building.

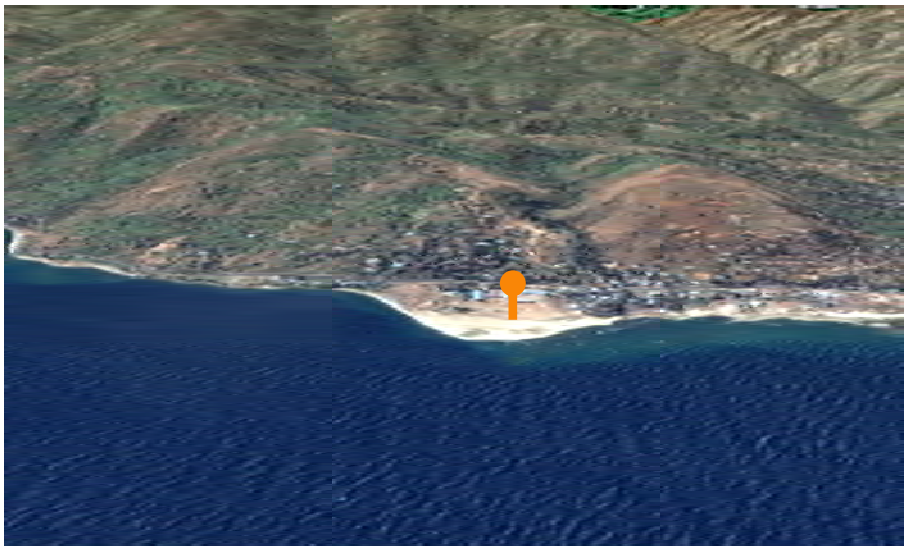


Photo 9.4: Location of the Beacon at Magara

Photo 9.5: Beacon at Magara

Rumonge

The beacon is working, but the power of the beacon light is very weak and the reacha ble distance of the beacon light is too short. Th e position of the b eacon should be reconsid ered because the beacon is hardly distinguishable from so many other lights in the Rumonge town.

Photo 9.6: Location of Beacon at Rumonge

Photo 9.7: Beacon at Rumonge

Nyanza

The shoreline of Nyanza is all cliffs or shore reef. There is no port along the shoreline of Nyanza. The beacon is working, but the power of the beacon light is very weak and the reachable distance of the beacon light is too short. This beacon is set on a slightly elevated cape on uninhabited private ground.

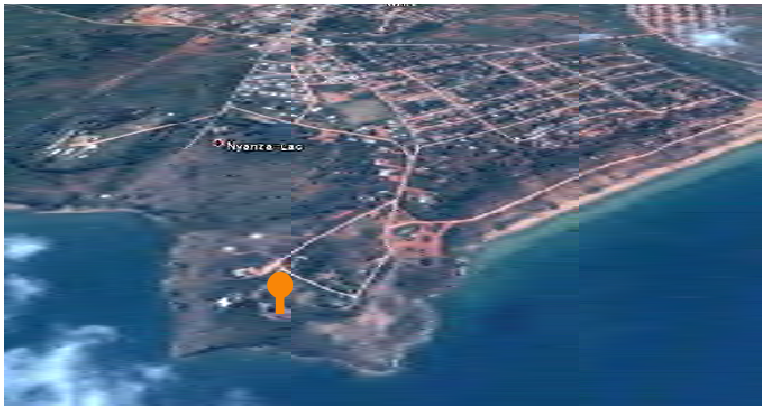


Photo 9.8: Location of Beacon at Nyanza

Photo 9.9: Beacon at Nyanza

(2) Investigation Results

The results of investigation are as follows:

Table 9.4: Investigation Results

Location of Beacon		Description
Bujumbura	(Green) (Red)	• Green Beacon was broken and did not work. • Red Beacon is still working but the illumination lux is very low and very hard to see at night.
Magara	(White)	• There is no beacon on top of the tower. It was stolen.
Rumonge	(White)	• The beacon is working but the illumination lux is very low. • The beacon is positioned behind Rumonge Bay and not so high. Need to reconsider the positioning and elevation of the beacon light.
Nyanza-Lac	(White)	• The beacon is still working but the illumination lux is very low. • The beacon is positioned on a cape but on private land. It should be built on government land. • High trees are blocking the beam of beacon's light.

(3) Recommended Beacons to Be Installed

Existing beacons have become too old. The light is emitted by a non-LED bulb and the illumination "lux" has become dim. The existing beacons should be replaced by LED-lit higher towers. The required specifications should satisfy the below:

a. Enough light intensity
b. Enough luminous range
c. Good positioning (place and elevation) for navigating vessels
d. Suitable structure to protect them from being stolen
e. Enough power source during periods with no electric power or no sunshine
f. Free of maintenance needs as much as possible

The examples of towers and beacons satisfying the above specifications can be seen in the following figures:

Photo 9.10: A Beacon Tower

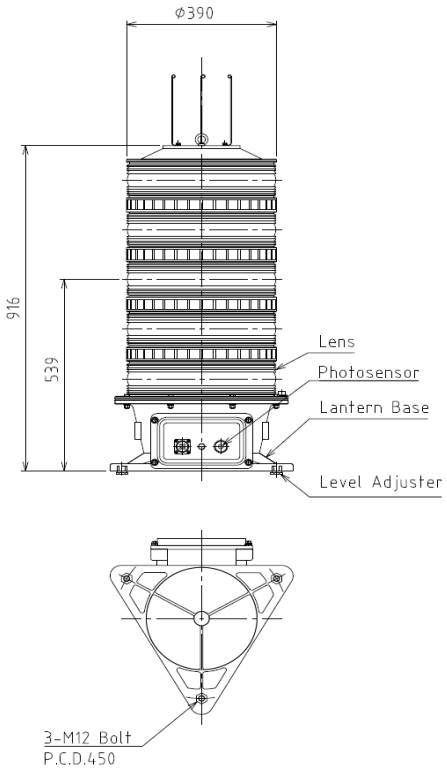


Figure 9.3: Green and Red Color Beacons (Bujumbura Port)

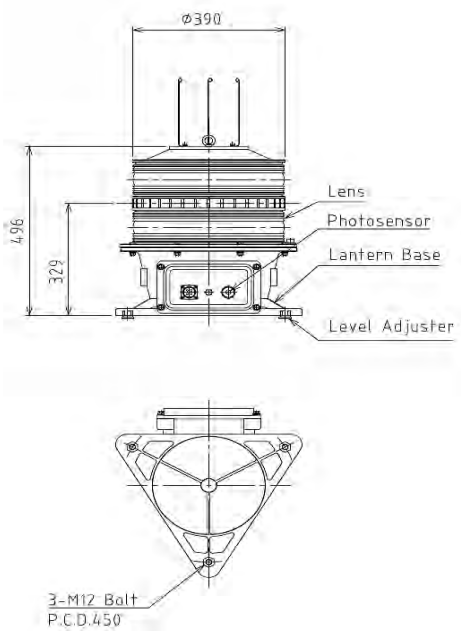


Figure 9.4: White Color Beacons (Magara, Rumonge, Nyanza)

Chapter 10 Improvement of Cargo Handling

10.1 Bujumbura Port

In order to handle the container cargo which will be transported by a container block train between Dar es Salaam and Kigoma and between Kigoma Port and Bujumbura Port by ship, the port has to be equipped with specialized equipment, like mobile container STS cranes, reach stackers. Operators of the equipment have to be selected and trained among the current operators. To meet the increasing volume of break bulk cargo, it is necessary to gradually replace the current cargo handling equipment with new equipment when their repair becomes too expensive. Also necessary are: development of computerized cargo inventory in the warehouses and container terminal, training for storekeepers to learn how to store efficiently in the warehouse, laborers to learn about safety, and IT workers on use of soft infrastructure. Specific measures are as follows:

10.1.1 Replacement of Aged Handling Equipment

(1) Improvement of Cargo Handling at General Cargo Berths

- In general, the cargo handling equipment are well maintained and carefully operated even though they are aged and outdated.
- However, when their repair becomes too expensive or takes too long, four shore cranes working at the general cargo berths should be gradually replaced with new cranes equipped with a shorter cargo boom and lower driver seat for easier unloading operation. Because the current cranes' boom is too long for picking up cargo from the ship and also the driver's seat is too high to unload cargo from a small ship which has a lower freeboard. The new cranes should preferably be multipurpose ones for the convenience of the port operation as a whole.
- Five old 4.5 ton capacity forklifts which are built in 1994 and 1995 should be replaced, when its repair becomes too expensive.
- Shore crane for heavy cargo and containers, which is ineffective and built in 1959, should be also replaced.

The major cargo handling equipment is as shown in the table below:

Table 10.1: Current Cargo Handling Equipment

Item	Number	Remarks
4.5 ton forklift	12 units	5 old ones built in1995 and 1994
20.0 ton forklift for heavy cargo & container	2 units	built in1975 and1986
50.0 ton mobile crane for heavy cargo	1 unit	built in 1987
50.0 ton fixed crane for heavy cargo	1 unit	built in1959
5.0 ton rail mounted shore crane	4 units	built in 1959

Source: EPB

(2) Relocation of Working Area

It is necessary to rearrange the working area depending on the type of work. The dedicated area should be clearly marked by paint for appropriate management of the port area.

- Parking lot for trailers and trucks which are waiting for customs clearance should be provided.
- Working area for stuffing and un-stuffing work to/from containers should be provided around the warehouse and separated from other areas.

- Parking lot for a large passenger bus for immigration control should be provided apart from the cargo handling area. The parking area may be located at the eastern part of the port premises.

(3) Waterproofing of Roof and Repair of Doors

Some parts of the warehouse should be repaired for safe cargo storage. Especially the roofs should be waterproofed and the doors should be repaired so they can be opened and closed smoothly.

(4) Storage Management in Warehouse

A professional expert to manage the cargo storage in the warehouse should be trained so that he can arrange efficient cargo storage by conducting routine checks of the storage conditions of the warehouse. The trained expert can make stowage more efficient also and store more volume of cargo than currently stored.

(5) Safety Training of Laborers

Forklift drivers are wearing the uniform of the EBP, but it was observed that laborers on the pier and in the ship's hold were wearing slippers. Further safety training is required for the safety of the laborers.

(6) Computerized Inventory Control

Computerized inventory control for cargo stored in the warehouse and containers stored at the storage yard is recommended to yield higher productivity in storage and save manpower costs.

10.1.2 Cargo Handling at New Container Terminal

(1) Cargo Handling System

It is recommendable to operate the new container terminal with the handling system described below:

Container Unloading

A mobile container STS crane should be employed to unload containers from ship to shore. Unloaded containers will be picked up by a reach stacker and placed onto chassis which is pulled by a tractor head and moved to the designated slot of the stacking yard. Another reach stacker will off-load and stack containers at the stacking yard as planned beforehand.

A tally man will check the number of containers, intactness of their seal and conditions of their exterior.

Container Loading

As planned beforehand, containers to be loaded to ship should be picked up by a reach stacker and placed onto a chassis pulled by a tractor head and moved to quay side. Containers will be picked up by another reach stacker and placed near a mobile container STS crane, which will load containers onto ship.

One Working Group to Handle Containers

One gang consists of the following equipment for one container ship:

- 1-mobile container STS crane

- 2-reach stackers
- 1-tractor and chassis

Operators of the above equipment should be trained before operation of the container terminal is commenced. For efficient and systematic operation, procedures how to handle containers should be documented in detail. After commencement, the documents should be updated to cope with new happenings.

(2) Documentation

Documents to be Computerized

To carry out proper stacking control and materialize accurate and agile response to consignee's tracing order of his containers, all the relevant information ranging from their unloading, loading, to their gate-in and gate-out should be computerized. To acquire common information and data between the documentation team and operation team, LAN NET should be built.

Stuffed Containers

- Import containers
  To control dwell time of import containers is important. If an import container dwells longer than the period of time of "free storage," the consignee should be advised of an early gate-out so that the container stacking yard can efficiently be used.

- Export containers
  Most of export containers will be empty at Bujumbura Port in view of the trade of Burundi. The principle of their handling should be "first-come first-go."

Empty Containers

Empty containers may be used for coffee beans to be exported. To select proper empty containers for coffee beans, their conditions should be monitored and they should be cleaned if necessary.

Capacity Building

As discussed above, computerized storage control of containers is required at the container stacking yard, an operation system and data control should be computerized. Capacity building of the employees is also necessary. To this end, system establishment and training of employees to operate the new container terminal have to be carried out before the terminal operation is commenced.

10.2 Rumonge Port

(1) Advantages of Port Development

Opening of the new port having the fenced port premises with berthing facilities will have the advantages below:

1) To enhance security of cargo and prevent them from being wet
2) To ensure safety of passengers during embarkation and disembarkation
3) To expedite the customs clearance and immigration control
4) To enable shippers to deliver their outbound cargo to the port in advance of ship arrival

(2) Preparation of Port Operation

In order to consolidate a proper port operation, cooperation of the concerned agencies like local government, police, customs office, immigration control office and quarantine office, etc is indispensable. Prior to opening the port, it is important to coordinate the procedures to investigate import and export cargo and control passengers to and from abroad with concerned agencies for smooth port operation.

(3) Organization of Port Operation

As discussed at Rumonge among the concerned officials, the cargo demand of Rumonge Port is considered as shown in Table 10.2 below:

Table 10.2: Estimated Ship Calls and Cargo Demand at Rumonge in 2010

Ship Calls per year	Cargo to Handle per year (ton)
250	25,000

Source: JICA Study Team

To meet the ship calls and cargo to handle, the port organization will consist of the following personnel:

Port master:	1
Document team:	2
Operation team:	1
Security man:	4
Total:	8

As arrival time and type and volume of cargo may not be obtained by use of telephone or internet, 4 security guards will ensure the security of cargo and ships of the port day and night by 2 shifts. Working hours are limited from 08:00 to 17:00.

Assignments of each person or team are described below:

- Port master
  He will manage the port as a whole. He is going to control and inspect the port operation in order to maximize efficiency and productivity to increase financial benefits of the port. He should avoid any hindrance to the cargo handling and ship calling. He will assist the documentation team or operation team when necessary.

- Document team
  - To manage and control stored cargo within the port premises. The team will keep a book to exactly record daily inventory.
  - To manage inbound and outbound cargo. The team will confirm and record the quantities and conditions of cargo in the presence of a tally man.
  - To witness customs clearance. The team will confirm the export and import cargo for the customs.
  - To collect wharfage and other port charges and conduct book keeping. The team will issue invoice to the users, collect the payments and conduct accounting works.

- Operation team
  - To accommodate ships to arrive. After receiving information from security man, the team will inform customs, immigration and quarantine offices of the arrival of ships. These offices will be ready for documentation in advance.

  - To arrange tally man and workers when cargo handling from ship to shore or vice versa is necessary.
  - To control cargo handling from ship to shore or vice versa.
  - To record cargo handling. The team will record (1) name of ship, (2) arrival date and time, (3) departure date and time of ship, (4) name of passengers with the places to come from and depart for and (5) kind and volume of cargo. The record will be the basis for invoice for the document team to issue.

- Security man
  - To ensure security of the entire port premises.
  - To collect information of ships to arrive and enhance communication with relevant offices on shore. The security man will inform the operation team of ship arrival and the security team will inform relevant offices of ship arrival for their preparation.

(4) Port Tariff

The following charges can be considered as port tariff:

- Harbor dues
- Stevedoring charges
- Open storage charges
- Warehouse charges
- Handling charges