Ministry of Transport, Public Works
and Equipment
The Republic of Burundi

Preparatory Survey for the Project for the Improvement of the Port of Bujumbura in the Republic of Burundi

Final Report

June 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

PADECO Co., Ltd.
ECOH CORPORATION

Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the Consortium of PADECO Co., Ltd. and ECOH CORPORATION.

The survey team held a series of discussions with the officials concerned of the Government of the Republic of Burundi, and conducted a field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Burundi for their close cooperation extended to the survey team.

June, 2014

Akira Nakamura
Director General,
Economic Infrastructure Department
Japan International Cooperation Agency

Summary

(1) Country Brief

The Republic of Burundi has a population of about 8,700,000 (2012) and occupies an area of 27,800 km^2 which ,includes Lake Tanganyika. Burundi is a land-locked country in East Africa, and sharesborders with the Republic of Congo (hereafter referred to as DRC), the Republic of Rwanda (hereinafter referred to as Rwanda), and the United Republic of Tanzania (hereinafter called as Tanzania). It's land falls along the West Great Rift Valley and mostly consists of plateaus with an altitude of approximately 1,700m to 2,000m, with the exception of the Rusizi Plane located on the northern end of Lake Tanganyika, where the altitude is around 800 m. Even though located near the equator, the weather is moderately warm due to the high altitude and humidity, i.e. the mean temperature is about 23 degree centigrade and the mean annual rain fall is about 1,300mm to 1,600mm.

The GDP of Burundi is about 2.5 billion US Dollars and the GNI per capita is 240 US Dollars (From:Ministry of Foreign Affairs of Japan Website). In recent years, the economy of Burundi has been growing atat a rate of approximately 4% per annum and the population in 2012 is estimated to have increased by 3.1%.

The GDP in 2011 shared by the primary, secondary and tertiaryterciary sectors of industry was 36.4%, 22.6%, and 41.0% respectively. More than 90% of the labor population was employed by the primary sector and until 1993, Burundi had been a food self-sufficient country. However, since the conflict between the Hutu majority and Tutsi minority broke out and civil war ensued ensuedbetween 1993 and 1998, the food has been insufficient and the food supply has been dependent on assistance from the international community. The major export items of the country are coffee and tea, which occupy about 61% and 17% of the total exports respectively.

The government of Burundi has continued structural and financial reform to strengthen the industrial base and improve the business environment. According to the action plan of the long-term strategy called PRGSF/CSLP2 approved in February 2012, the government places spending priorities on poverty-reduction and growth strategy frameworks. Furthermore, Burundi became a member of the East African Community (EAC) in 2007. Since then, the country has been strengthening the relations with other member countries of the EAC.

(2) Background of the project

In "Vision 2025" formulated in 2011, one of the objectives is to realize an increase in GDP per capita from $137 in 2008 to US$ 720 in 2020. In order to achieve this objective, it is considered that the development of infrastructures is necessary for sustainable economic growth. In addition, African Development Bank (hereinafter called as AfDB) formulated "An Infrastructure Action Plan for Burundi – Accelerating Regional Integration" in 2009 to resolve the insufficient infrastructures for transport, power supply and telecommunications within 20 years, including the improvement of Port of Bujumbura which is identified as one of the actions to be undertaken.

Currently the export and import cargo of Burundi is transported by trucks. The transport cost of the export and import goods occupies about 45% in the case of exports and 35% in the case of imports. Such high costs are a burden for economic growth.

From the background described hereinabove, the issues of the port sector in Burundi are summarized as follows:

1. The transport cost remains high, as the thru-transport from Dar es Salaam Port to Bujumbura by use of railway and lake is currently unavailable,

2. Inefficient cargo transport remains inevitable, as containerization of the lake ports is not materialized.
3. Precious hard currency has been spent to maintain the largest fleets of vessels on Lake Tanganyika, as no ship repairing facilities are available in Burundi.

Based on the current situation described hereinbefore, JICA conducted "The Study of Master Plan for Port Sector in the Republic of Burundi" in 2011 (hereinafter MP Study). As a result, Burundi requested a grant aid to the Japanese Government for the construction of a container terminal, ship repairing facilities, dredging of the port basin, diversion of the storm water canal, and technical assistance & office equipment support. The requested facilities and cost of implementation are as follows:

- Amount：¥2.4 billions
- Components：
  1) Construction of Container Terminal (Container Berth (L=80m×2=160m), Berth Apron (W-30m), Container Yard & Drainage (44,000 m^2 (, Inner Port Road (W=20m))
  2) Ship Repairing Facilities (Slipway: L=60m)
  3) Dredging of Port Basin (V=20,400m^3)
  4) Diversion of Storm Water Canal (1,245m)
  5) Technical Assistance & Office Equipment Support to BMPRA

(3) The Survey Schedule

In response to the above request, the Japanese Government decided to conduct a preparatory survey and dispatched a survey team during the periods below:

- Site Survey: From 2nd August to 22nd September, 2013
- Survey Results Explanation: From 22nd February to 1st March, 2014

The provision of the container handling equipment, which was recommended in the MP Study, was not included in the request for the grant aid. The container handling equipment was considered necessary to make the project effective, and the necessity of the equipment was confirmed during the site survey. Meanwhile, dredging of the port basin was originally one independent component in the request, but since it was considered to be one item under the construction of the container terminal, the requested components were altered and prioritized to the order as shown below:

1) Construction of Container Terminal including Dredging of Port Basin
2) Construction of Ship Repairing Facilities
3) Diversion of Storm Water Canal
4) Procurement of container handling equipment

Regarding the request for technical assistance and office equipment support to BMPRA, it was concluded that minimum technical assistance will be provided for the initial operation of the facilities and equipment which will be built or installed for the project.

During the site survey, the survey team investigated the facilities and equipment of the Bujumbura Port, as well as the port operation and business plan undertaken or programmed by the concessionaire. The team also investigated the operation of the ships that are registered in Burundi and operated by the Burundian ship operators. In addition, the team conducted a natural conditions survey and an environmental survey. The investigations resulted in the conclusion that the container terminal will reduce the transport cost of the export/import commodities of Burundi, the ship repairing facilities will improve the safety of the ships registered in Burundi, and the facilities are indispensable to realize the objectives of "Vision 2025." It was also concluded that the diversion of the storm water canal is required to maintain the water depth for both the container terminal and ship repairing facilities. The environmental surveys concluded

that the project site was not contaminated with harmful heavy metals or PCBs and consequently an Environmental Report about the project implementation was submitted from BMPRA to the Ministry of Water, Environment, Land and Urban Planning (hereinafter called as MOE). It is reported that MOE approved the environmental report of the project in April 2014.

Based on the survey results, as well as a contemporary study, which consists of: reviews of project components, dimensions and specifications of the facilities to be built, their outline design and workability, estimates of approximate project costs, etc., was conducted. The results of the study were conveyed to the Burundian side, discussed and concluded during "Survey Results Explanation" in Burundi. As a result, Minutes of Discussion was agreed and signed. At the same time, the Burundian side committed in writing to procure the container handling equipment themselves. Thus, the procurement of such equipment was excluded from the grant aid.

The container terminal will have a 160m long quay wall to simultaneously accommodate two container vessels and a 30m wide apron for mobile container cranes for loading and unloading of containers. The container stacking yard will be planned for reach stackers to work for stacking and unstacking of containers. It should be noted that the container handling equipment, such as the mobile container cranes and reach stackers, will be procured by the Burundian side until the container terminal is completed. Meanwhile, the ship repairing facilities will consist of the slipway capable of pulling-up and -down of a 1,000 DWT cargo vessel, workshop equipped with several machineries, and worker's house and office building.

Planned Facilities

Works/Facilities	Items/Dimensions
Construction of Container Terminal - Dredging - Quay wall - Apron	Quay wall L = 175m Container yard pavement= 34,660 m^2 Storm water drainage L = 865m Inner port road L = 733m Port basin Depth = -4.5m Dredging V= 47,100m^3
Ship Repairing Facilities	Slipway L = 132m, W = 20m Cradles L = 44.9m, W = 6.35m Buildings (Office, Workers' House, Electrical works, etc.)
Relocation of Storm Water Canal	L = 1,200m (Canal bed covered with cobbles for distillation of polluted water)

Major Equipment/Machineries to be Procured

Equipment/Machinery	Item/Number/Specifications	Purpose
Workshop Machineries	Overhead Crane : 2 Lathe : 1 Milling Machine : 1 Upright Drilling Machine : 1	Ttransporting, assembling, processing, manufacturing of materials and/or parts
Screw Air Compressor	Discharge Air : 6.5㎥/min	Distributing compressed air to workshop and slipway
Jib Crane	Working Load and Outreach : 3ton x 20mR	Lifting and setting ship parts and members at slipway.
Rough Terrain Crane	Maximum Rated Lifting Capacity : 30ton x 3mR	Lifting and setting ship parts and members at slipway where jib crane is not reachable. (Also loading and unloading cargos for port operation when available)
Portable Generator	Continuous Service Output : 125KVA Rated Voltage : 200 - 220V Rated Current : 350 - 370A	Supplying electricity to slipway to pull up or launch ship during power failure from outside. (Also supplying electricity to other facilities when needed.)

(4) The project Cost and Schedule

The project cost born by the Burundi side is estimated to be approximately 9.15 million yen in the case of implementation of Grant Aid Cooperation by the Japanese Government. The implementation period takes 28 months in total, of which 9 months are allocated to detailed design and tender, and 19 months for construction and procurement.

(5) Project Evaluation

Relevance

The transport cost respectively occupies 35% and 45% in the import and export commodity prices in Burundi. As almost all the everyday goods are imported and export of coffee and tea occupies a considerable large share in the export income, reduction of the transport cost is the urgent issue to foster the economic growth. In this regard, the construction of the container terminal is indispensable to achieve the US$720 GDP per capita in 2025 from US$137 in 2008 as targeted in "Vision 2025" by promoting the lake transport and reducing the transport cost. As, the project implementation will result in lower prices of the everyday commodities, all the people of Burundi will be the beneficiaries.

Meanwhile, the ship repairing facilities will result in the reduction of outgoing currency from Burundi by repairing the largest fleet on Lake Tanganyika in Burundi instead of repairing them in Tanzania or DRC. Consequently, they will create job opportunities and improve the technology in Burundi. Thus, they will contribute to the self-dependency of the Burundi economy.

Effectiveness

Quantitative Effectiveness

The quantitative effectiveness is evaluated with respect to the increase of the cargo handling capacity of Bujumbura Port, reduction of the container transport cost from/to Dar es Salaam Port by railway and lake via Kigoma Port instead by road all the way from/to Dar es Salaam Port, and increase of the inbound containers from Mpulungu Port. The targets of the effectiveness are summarized in the table below:

Quantitative Effectiveness

Indicators	Originals (2012)	Targets (2020[1]) (4 years after project completion)
Cargo throughput (1,000ton per year)	122.8	296.1
Transport cost of 40 ft container (US$/box)	5,300 (Road)	4,497 (Railway and lake via Kigoma)
Containers from Mpulungu Port (TEU)	0	9,325
Annual number of ships repaired in Burundi	None	Large scale repairing : 5 Small scale repairing : 18

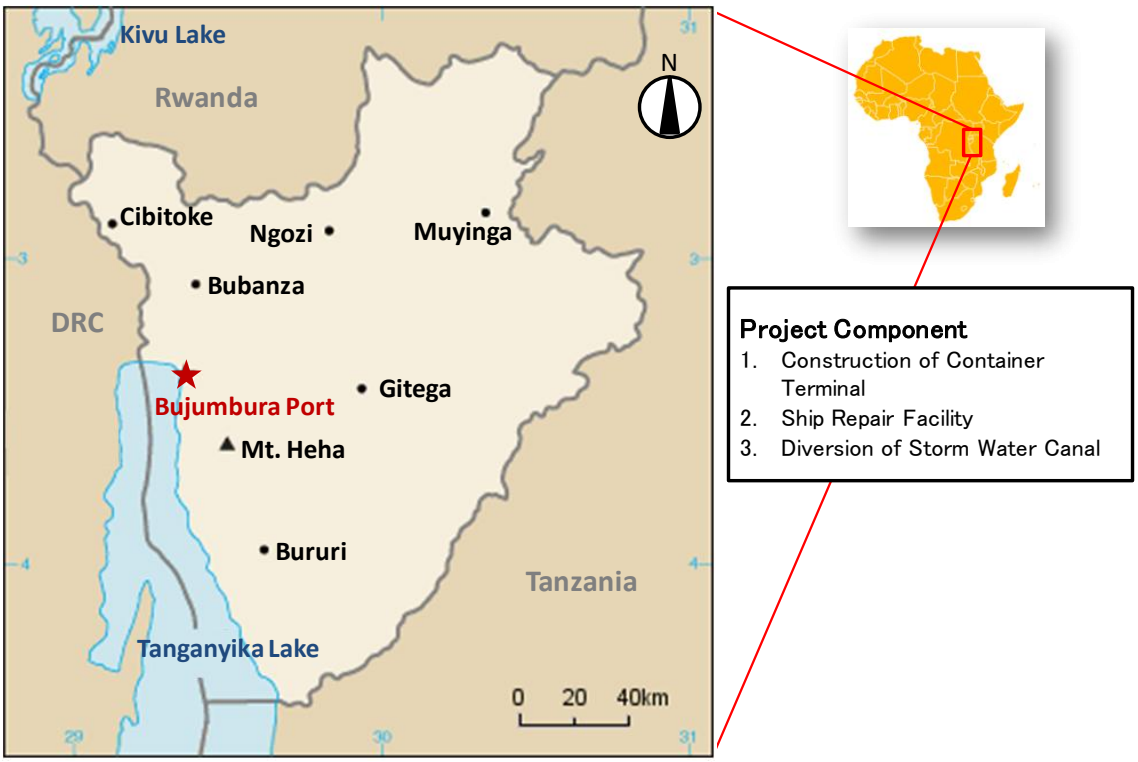
The qualitative effectiveness of the project is described as follows:

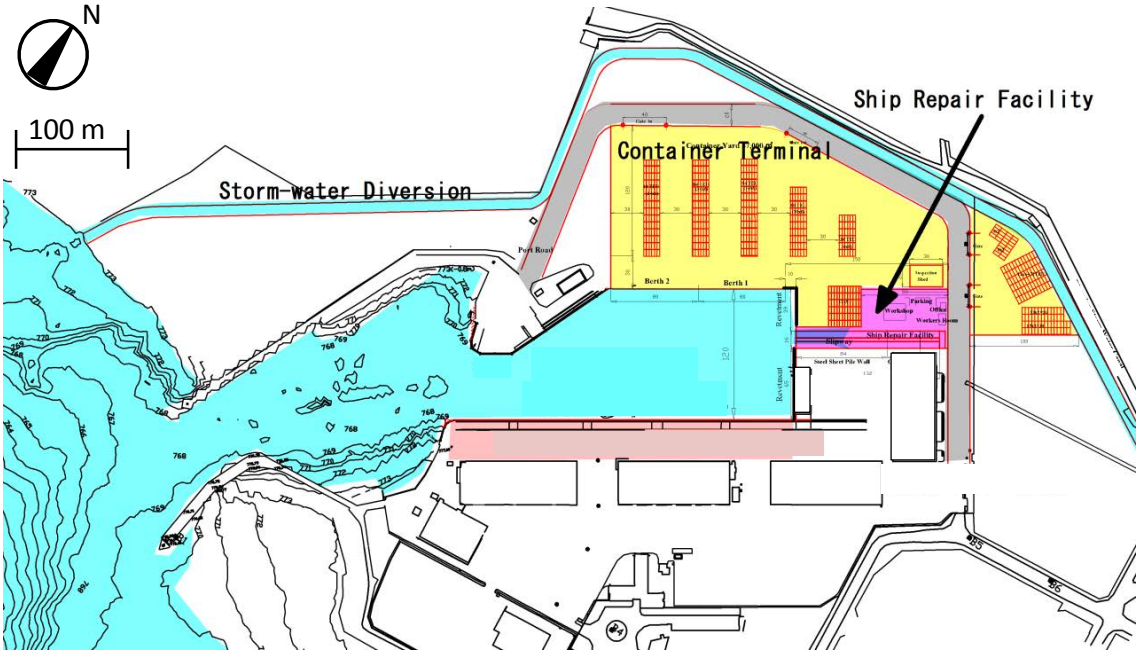
1) The efficiency of cargo handling in Bujumbura Port will improve due to the containerization of the majority of cargo;
2) Safety of the lake transport will improve, due to the fact that ships of Burundi will be periodically inspected and repaired on the completed slipway;
3) The port basin can be deep, as the existing storm water canal will be relocated and the sediments from the city will no longer flow into the basin; and
4) The job opportunities will be created owing to the ship repair facilities, as they can repair not only the ships of Burundi but also those of Tanzania, DRC and Zambia.

[1] As the development of Mpulungu Port in Zambia is planned to start with AfDB's assistance in 2020, the target year is also set 2020, which is 4 years after the project completion, in order to evaluate the container handling at Bujumbura Port as one of the indicators.

Contents

Location Map/Perspective





Location Map and overall plan

Perspective

List of Figures

List of Tables

Abbreviations

AfDB	African Development Bank
BIF	Burundi Franc
BMPRA	Burundi Maritime, Port and Railway Authority
BQ	Bill of Quantities
COD	Chemical Oxygen Demand
D/D	Detailed Design
DIN	Deutsche Industrie Normen
DRC	Democratic Republic of the Congo
EAC	East African Community
EIA	Environmental Impact Assessment
EOI	Expression of Interest
EPA	Environmental Protection Agency
GDP	Gross Domestic Product
GNI	Gross National Income
GPSB	Global Port Services Burundi
IGEBU	The Geographical institute of Burundi,
INECN	National Institute of the Environment and Nature Conservation
ISTEEBU	Institut de Statistiques et d'Etudes Economiques du Burundi
JICA	Japan International Cooperation Agency
MP	The Study of Master Plan for Port Sector in the Republic of Burundi
MOE	Ministry of Water, Environment, Land and Urban Planning
MTTPE	Ministry of Transport and Public Works
M/D	Minutes of Discussion
NEPAD	The New Partnership of Africa's Development
OJT	On-the-Job Training
O&M	Operation and Maintenance
PCB	Polychlorinated biphenyl
SADC	Southern African Development Community

SETEMU	Services Techniques Municipaux
TEU	Twenty-foot Equivalent Unit
TOR	Terms of Reference
TPA	Tanzania Ports Authority
TRL	Tanzania Railway Limited
UNDP	United Nations Development Programme
WHO	World Health Organization

Chapter 1 Background of the Project

1-1 Higher Goal, Roles of the Project, Goal of the Project

The higher goal for Burundi, which is declared in the "Burundi Vision 2025", is to achieve GDP per capita of 720 US dollars by 2025.
The project, and in particular the construction of the container terminal, is implemented to significantly reduce transport costs for Burundi's imports and exports. In addition, the rehabilitation of railway between Kigoma and Dar es Salaam, aims to increase the purchasing power of the people by reducing the import price and strengthen export competitiveness and thereby increasing exports and trade income. Further, the ship repair facilities will enable Burundi to repair the Burundian fleet of vessels, reducing the outflow of foreign currency from Burundi and in general, promoting safe navigation.
Therefore, the goal of this project is set forth as follows.

1) To materialize container cargo throughput by 2025 as projected
2) Tomaintain and repair works of all the Burundian vessels locally in Burundi, and to eliminate accidents at the lake due to inadequate repair works

1-2 Outline of the Project

In order to accommodate for import/export containers of Burundi, which are transported between Kigoma port and Bujumbura port, and those of Burundi and her neighboring countries such as Rwanda, northeast of the Republic of the Congo (hereinafter DRC), etc., which are transported between Mpulungu port and Bujumbura port, a container terminal having 2 berths and stacking yard will be constructed. In addition, ship repair facilities consisting of a slipway which can repair the maximum Burundian vessels, workshops equipped with machine tools, and office building and worker's house will be built. Further, the storm water canal flowing in the port basin will be relocated in order to minimize the maintenance dredging in front of the container terminal, and the ship repair facilities by preventing water depth from becoming shallow.
Procurement of cargo handling equipment is excluded from this project. Coordination with other donors such as AfDB is envisaged when the handling units are to be procured.

1-3 Natural Conditions

1-3-1-1 Climate Condition

Burundi belongs to a tropical zone in the climate classification. However, the majority of the land forms a plateau at an approximately 2,000 m altitude and Lake Tanganyika occupies the western part of its territory. The ambient air is relatively cool, the weather is moderate. The rainy season generally starts in November and continues until April while the dry season is from May to October.

The maximum, minimum and average temperatures at the capital city of Bujumbura (S. Lat. 3º16', E. Long. 29º18') are 35.5 degree centigrade, 11.2 degree centigrade and 24.5 degree centigrade respectively. The climate is moderate. The annual peak rainfall may take place from November to April. Meanwhile, minimal rainfall happens during a relatively short period from May to August. The maximum monthly rainfall is 248.7 mm per month.

According to the weather statistics collected from 2008 to 2012 by the meteorological station of the Geographical Institute of Burundi (IGEBU) at the Bujumbura Airport located at approximately 5km to the north east of the city, the average atmospheric pressure is 923hPa which is due to the high latitude. During the rainy season, the monthly average humidity has reached a maximum of 79%. On the other hand, during the dry season it has gone down to

54%. It is hot and humid during the rainy seasons and it is comfortable during the dry seasons. According to the observation of sunlight, every year there months with more than 300 hours of sunlight, and in such months, there are no cloudy days. There are also months with less than 150 hours of sunlight, and in such months, on average there is no sunlight for half of the day .

According to the wind observation conducted from 2004 to 2009 at the tip of the north breakwater of the Bujumbura Port, the maximum monthly average wind velocity was 2.76m/sec. During the site survey, it was observed that the wind direction ceaselessly varied from ENE to ESE in the morning and from SSE to SSW in the afternoon. At the existing oil berth and the navy jetty, the wind direction gradually changed from the land to the lake. Generally it can be said that the wind blows from the north to the south i.e. to Lake Tanganyika in the morning and it blows from the south to the north in the afternoon. The wind observation has not been conducted since the equipment was broken in 2010.

There are no available wave and current observations. However, the wave condition is considered as follows: In Lake Tanganyika wind waves are generated by winds blowing from the lake. Owing to the geography of the Bujumbura Port and the lake, the relatively high wind-generated waves intrude into the port basin, as the fetch of the lake is significantly long from the north to the south along which direction the winds continue to blow in the afternoon. In addition, as it opens to the south, the waves at the port entrance were often observed around 1m high when strong winds blow in the afternoon from the south. There are no significant currents of the lake to be taken into consideration for the port improvement.

1-3-1-2 Water level of Lake Tanganyika

The highest and lowest water levels of Lake Tanganyika that were observed during the 84 years between 1929 to 2912 are 777.07m (1964) and 772.83m (1950) respectively. In the last 20 years, the highest recorded water level was 775.60m, which is 1.50m lower than the highest water level recorded to date. Water levels change between rainy and dry seasons but no significant change takes place from day to day. The water level observed during the MP survey was 77.380m.

1-3-1-3 Sedimentation

The major rivers flowing into Lake Tanganyika are shown in Figure 1.1, which shows their geographical relation to Bujumbura Port.

Rusizi River, located about 8km northwest of Bujumbura Port and flowing along the border with DRC, has a considerable discharge and sediments which forms a delta at the river mouth on Lake Tanganyika. Ntahangwa River, located about 1km north of the port, has been changing it's channel everytime there is a large-scale flood caused by heavy rainfall. Mutimbuzi River, located about 3km from the port and flowing between Rusizi River and Ntahangwa River, has a medium discharge and, when it floods, debouches many plastic bottles and other wastes which are accumulated along the shoreline.
Figure 1.2 shows the geographical changes of Ntahangwa River at its river mouth. Sediments and other discharged matters have accumulated behind the existing oil berth.

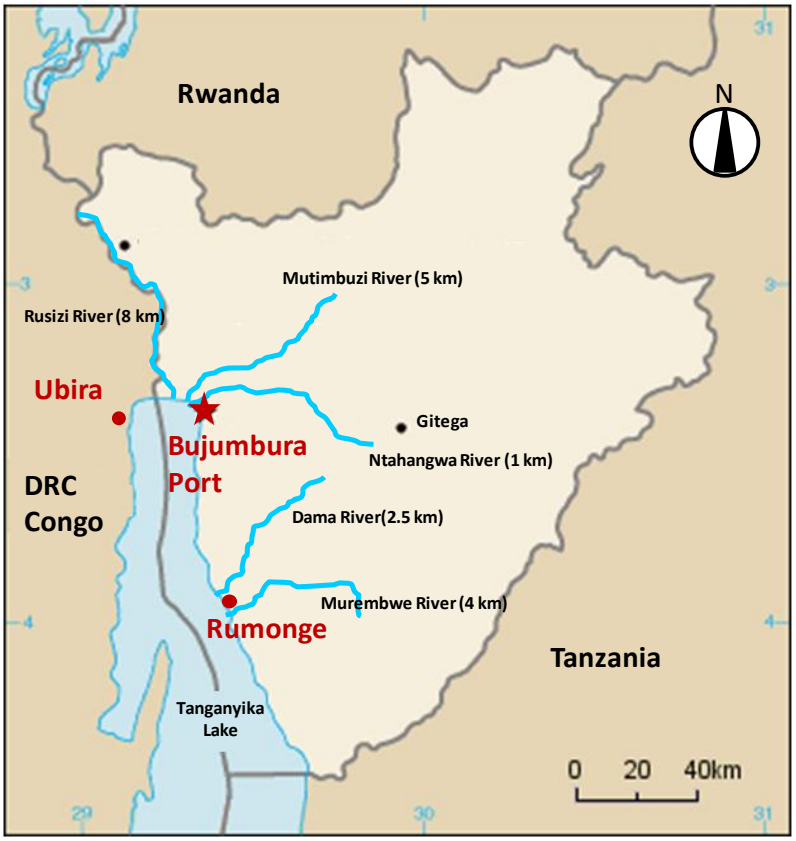


Figure 1.1 Major Rivers of Burundi

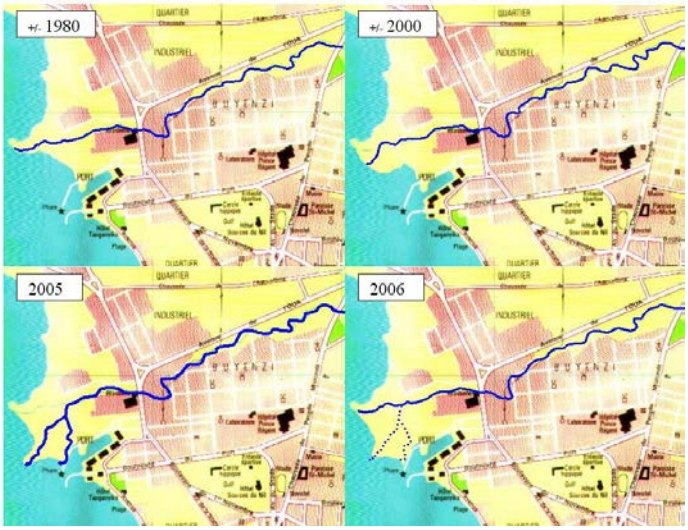
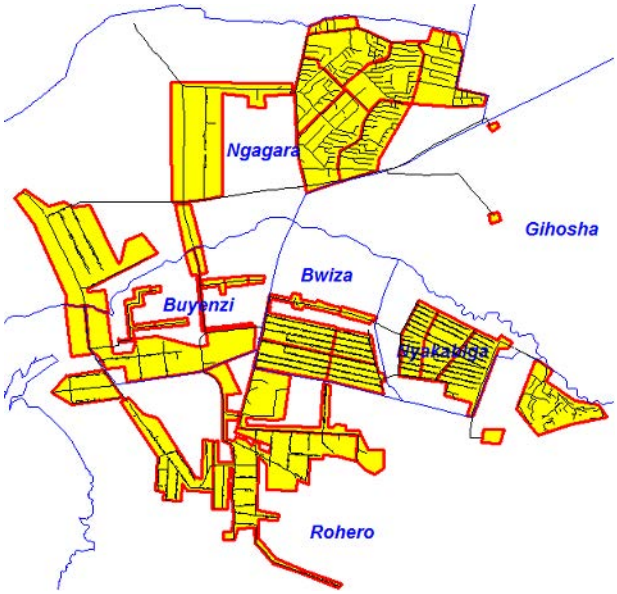


Figure 1.2 Change of Channel of River Ntahangwa

1-3-1-4 The storm water canal in Bujumbura Port

The sewage system of the city around Bujumbura Port is shown in the Figure below. In principle, the sewage system should be independent from the drainage system. Actually, however, the habitants reportedly do not recognize the differences when they discharge their wastes.



Source: CTB Plan Directeur d'Assainissement de Bujumbura Analyse de la situation actuelle – Rapport CTB / SETEMU Groupement FWT-SHER-GEOSCI - Mars 2013

Figure 1.3 Sewage System and Sewers Loacaiton around Bujumbura Port

From the figure, it could be noted that a storm water canal called Buyenzi Canal is flowing into the port basin of Bujumbura Port. The canal discharges both storm and waste water. Buenzi Canal, which passes through the Buyenzi District of Bujumbura City located at the hinterland of the port, is carrying the waste from the ground but also domestic and industrial wastes into the port basin. Particularly at heavy rainfall, a considerable volume of wastes from the ground flows into the basin and accumulate atthe bottom causing the port basin to become shallower.

1-3-1-5 The maintenance dredging of Bujumbura port

The maintenance dredging of the port basin was carried out in 2009 and about 95,000m^3 was excavated. Meanwhile, the capital dredging was carried out in 1960 by a Dutch contractor. Before 2009, a local contractor, Amsar, tried to dredge the port basin but it was not technically viable for Amsar. The maintenance dredging in 2009 was carried out with a cutter suction dredger and the excavation was confirmed incomplete alongside the quay wall of the general cargo berth. The incompletion is considered due to the cargo loading and ship mooring taking place alongside the quay at that time.

1-3-1-6 Topographic and Bathymetric Surveys of Bujumbura Port

In order to complement the topo- and hydrographic map drawn for the MP survey, an additional topographic survey (approx. 91,000m^2) and bathymetric survey (approx. 32,000m^2) were conducted for the preparatory survey. The newly produced map is shown in the next page.
Generally speaking, the project site is flat. The ground on the city side is higher than EL+778m and it is gradually is becoming lower to the west. The average ground elevation of the project site is EL+777m to EL+778m, while the elevation of the casaba field located in the west but within the port territory is EL+775m to EL+776m.
The result of the additional bathymetric survey show that, the lowest bottom of the inner port basin is found existing in front of the general cargo berth, and its elevation is lower than EL+768m. Around the center of the inner port basin, the altitude is mostly lower than EL+770m and port basin is gradually getting shallower to the east end of the port basin. Alongside the quay wall of the general cargo berth, the bottom altitude is higher than EL+777m, which is higher than the design elevation of the quay wall oE EL+769m

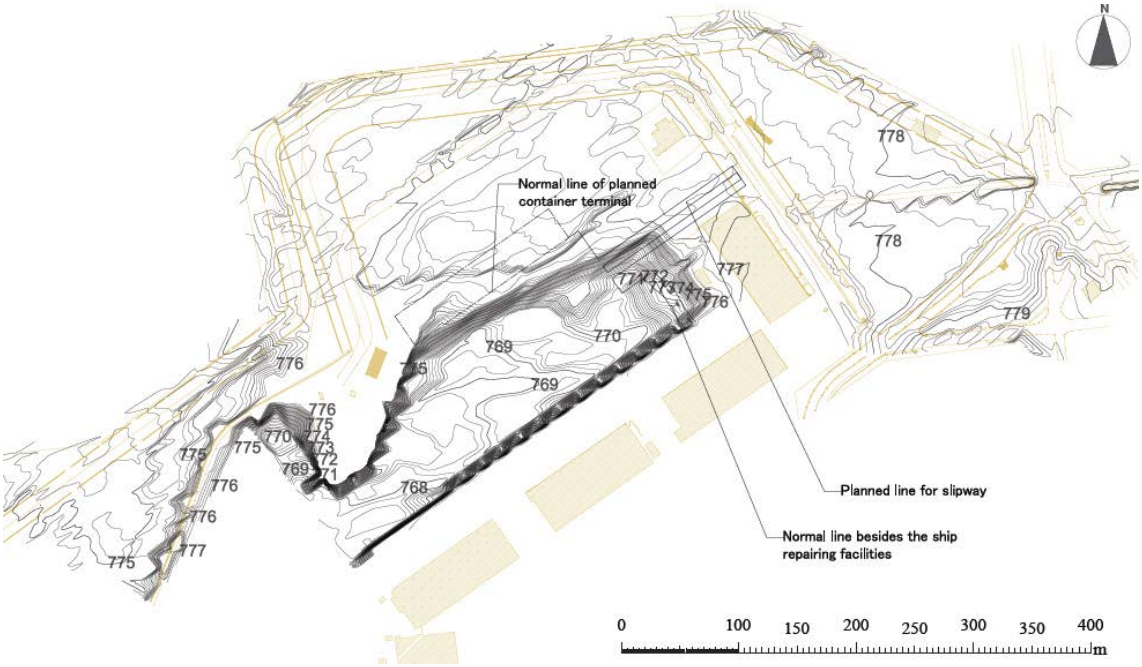


Figure 1.4 Topo- & Hydrographic Map of Bujumbura Port

1-3-1-7 Geography of Project Site

Borehole exploration was conducted for geotechnical investigation at the planned container terminal and ship repairing project site. SPT's were carried out to identify the subsurface distribution and bearing capacity of the soil. Laboratory tests were conducted to identify the physical and mechanical properties. The boring logs are attached to this report as an appendix.

Table 1.1 Geotechnical Borehole Exploration

Facilities	Location	Depth and Number of Boring	Borehole
Container Terminal	Along face line Along the anchor piles	30m : 2 20m: 1	No.3, No.4 No.5
Ship Repairing Facilities	Launching point Center of slipway	30m: 1 30m: 1	No.1 No.2
Relocation of Storm Water Canal	Connection point with city drainage Crossing at oil pipelines	5m: 1 5m: 1	No.6 No.7

Regarding the storm water canal, the subsoil is confirmed to be sandy beside the silty layer of about 2m beneath the ground surface at the connection point with the city drainage and at the crossing point with the pipelines. There will be no significant settlement of the canal after completion.

Along the face line of the planned container quay wall, a very stiff sandy layer has been confirmed beneath the surface layer of about 1m to 6m of silty sand. The stiff sandy layer continues to the end of the boreholes and N-value becomes more than 30 from 6m to 13m beneath the ground surface.

At the planned slipway location, a stiff sandy layer has also been confirmed beneath the surface layer of the silt with cobbles or clayey silt which is about 4m to 8m depth. It is considered that the foundation can easily be constructed to support the slipway, cradles, and ships under repair. However, a clayey silt exists at the end of the slipway, and careful attention should be invited to design and construct the retaining wall, particularly concerning the back-fill and its workmanship.

1-4 Environmental Considerations

The following environmental considerations will be required for this project implementation.

1) Approval for this Project by the Ministry of Environment
BMPRA submitted "Environmental and Social Impact Study" for the approval of this project by the Ministry of Environment. The approval is necessary to implement the project.

2) Pollution Prevention of Lake Tanganyika from Storm-Water Canal
Rain water discharged from the city, which is currently flowing into the port basin, will directly flow into Lake Tanganyika after the relocation of the storm-water canal. Therefore, measures have to be undertaken to prevent the city's waste and polluted water from directly flowing into Lake Tanganyika through the relocated canal.
After the hand-over of the relocated canal, the Burundi side is required to periodically remove waste from the screen and clean the bed of the relocated canal.

3) Measures for PCB in the Transformer Shed
The ground in the transformer shed near the existing container quay is contaminated by PCB due to leakages of insulation material from the transformer. This shed is located outside of the site for this project. Because decontamination of PCB is difficult, the transformer and contaminated soil should be kept in a closed container until the legislation for treatment of hazardous materials in Burundi is fully organized. If this measure cannot be finished before the start of the construction, the area including the transformer shed should be fenced and a signboard of caution should be properly set up to prevent access of workers. These measures are to be taken by BMPRA.

4) Treatment for Large Mammals Inhabiting the Project Site
There are hippopotamuses living in this project site. They may enter the construction site by climbing up the shore slope till the construction works of quay wall or reclamation wall are completed. Sometimes during the day, hippopotamus stay underwater exposing only the eyes and nose. Therefore, it should be assured they are not near the site every morning in order to protect workers from them, and if necessary, construction workers should be alarmed if hippopotamuses are present.

5) Prevention of Water Pollution by Construction Works
Typically, dredging work leads to water pollution, and so, it should be prevented beforehand. In order to do so, the dredging area will be enclosed by setting a proper canvas in water, such as a "silt curtain," and at the same time, water turbidity or transparency in and out of the enclosure will be checked to maintain the quality of lake water. These measures should be mentioned in the construction specifications and its cost should be included in the total construction cost.

6) Environment Management Organization during Construction

Presumably, BMPRA has not acquired the certificate as an implementation organization of the international environment management system, ISO 14001.

Organizing and implementing a full-scale environment management system is costly and many staff members need to be assigned. Therefore, a simple but practical Environmental Monitoring Organization should be set up which should be active 3 months before the start of the construction works.

In order to establish the Environmental Monitoring Organization, one person should be put in charge.This person can hold other positions, and should be assigned by the management of BMPRA to monitor the environment (watching for abnormal conditions and monitoring ambient conditions) at both the construction site and surrounding area of the port before and during the construction works. As necessary, he or she will also deal with complaints to the construction works from business operators and residents in and/or around the port area.

Further, one more person in charge (who could hold other positions) should be assigned by BMPRA to the concessionaire, Global Port Services Burundi (hereinafter, GPSB), . This person could ask GPSB to cooperate in the environmental monitoring by BMPRA for the construction site, water area, and land area near the site. BMPRA could also ask GPSB to cooperate in the sharing of information and records obtained from the monitoring at all times.

The Environmental Monitoring Organization should also include the top project management member from the contractor side.

Environment management during the construction should be carried out as follows:

1. Period and objects of environmental monitoring
   Observation of the inner port water area during the construction

2. Establishing a monitoring organization with members from all three parties
   Responsible individuals (who can hold other positions) will be selected for monitoring from the three organizations, i.e. BMPRA, GPSB and the Contractor, in order to establish a management system.
   Regular meetings will be held once a month during the construction. The Chairperson will belong to BMPRA and minutes will be recorded.

3. Recording measurements and regular reporting to higher level authority and JICA
   Water quality measurement (turbidity or concentration of suspended solids) should be conducted once a month in the 3 months prior to the start of construction, as well as once a week during the construction. The records of measurement will be filed.
   Further, complaints for noise, vibration, bad odor, etc. by the business operators or residents adjacent to the port area will be recorded and proper measures will be undertaken, even though these are not aspects which need to be monitored regularly. The results of the monitoring will be reported to JICA periodically.

4. Environmental monitoring items and measuring points to be noted with care
   Item 1 mentioned above should be conducted at the construction site and in and around the port area. It should be verified that the new measurements are not significantly worse than the measurements obtained during the baseline survey.
   Monitoring points and objects to be observed regularly in the water area of the port area are as follows.

Table 1.2 Water sampling during Construction

Point of Sampling	Water depth	Frequency	Item to be analyzed
(1) Inside of "silt curtain" (during dredging) (2) 10 m west of "silt curtain" edge (3) 150m west (4) Entrance of port basin	-1 m from lake surface	Once a week, 3 times for the day	Concentration of suspended solids (mg/l) or turbidity (NTU)

Table 1.3 Water sampling after Handover of Facilities

Point of Sampling	Water depth	Frequency	Item to be analyzed
(1) Container terminal berth (2) 100 m west from the point (1) above (3) 250m west (4) Entrance of port basin	-1 m from lake surface	Once a week, 3 times for the day	Concentration of suspended solids (mg/l) or turbidity (NTU)

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

① Objectives

In accordance with "Vision 2025" formulated in 2011, the Burundian government is pursuing the goal to increase the GDP per capita to US$ 720 by 2020, a drastic rise from US$137 in 2008. In order to achieve this objective, the development of infrastructure is necessary for sustainable economic growth. In addition, African Development Bank (hereinafter called as AfDB) formulated "An Infrastructure Action Plan for Burundi – Accelerating Regional Integration" in 2009 to resolve the insufficient infrastructure for transport, power supply and telecommunications within 20 years and the improvement of Port of Bujumbura is identified one of the key actions to be undertaken.

Lake transport has been considered and propagated as a moremore efficient transportation means than road because of its economy as well as its bulk mass capabilities and safetyty. It is considered in Burundi as the key issue to sustain economic growth. Therefore, Burundi requested "The Study of Master Plan for Port Sector in the Republic of Burundi" (hereinafter called as MP Study) be carried out with the technical assistance of the Japanese Government. MP Study aims at strengthening the functions of the ports of Burundi to materialize safe navigation and vitalize the economy. Overall, it aims to formulate both the master plan of the port sector whichmainly consists of Bujumbura Port and Rumonge Port and the short-term development plans of both ports. In response to this request, the Japanese Government dispatched a study team to Burundi in October to November 2009 and confirmed that the Burundian Government was ultimately planning for the port sector developments. As a result, MP Study was conducted from 2011 to 2012 and, besidess the Rumonge Port master plan, both the master plan of Bujumbura Port in the target year of 2030 and its short-term development plan in the target year of 2015 are formulated.

In MP Study, the master plan for the development of Bujumbura Port is concluded on the following principles:

1) To ensure sufficient port premises capacity 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 consisting of 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 a sufficient port basin for Ro/Ro berth and oil-tanker berth which will be required in future

Based on the principles above, two alternative development layouts were studied and the alternative to develop the container terminal and ship repairing facilities at the inner port basin was selected. The following facilities were concluded to be built under the short-term development:

1. Relocation of the storm water canal
2. Construction of container terminal
3. Construction of ship repairing facilities
4. Rehabilitation of existing general cargo berth

Construction of the container terminal, ship repairing facilities, dredging of the port basin, diversion of the storm water canal and technical assistance & office equipment support to Japanese Government. The requested facilities and amount for their implementation are as follows:

- Amount：¥ 2.4 billion
- Components：
  1) Construction of Container Terminal (Container Berth (L=80m×2=160m), Berth Apron (W-30m), Container Yard & Drainage (44,000 m^2 (, Inner Port Road (W=20m))
  2) Ship Repairing Facilities (Slipway: L=60m)
  3) Dredging of Port Basin (V=20,400m^3)
  4) Diversion of Storm Water Canal (1,245m)
  5) Technical Assistance & Office Equipment Support to BMPRA

From the preceding discussions, the priority objective over the improvement of Bujumbura Port project is to materialize the steady lake transport in order to sustain the economic growth outlined in "Vision 2025." In line with the priority objective, this project intends to develop the container terminal and ship repairing facilities in order to reduce the transport cost by enhancing container transport and ensure the safety of lake navigation by repairing the ships registered in Burundi within the Burundian territory. As containerization of Mpulungu Port will start in 2020 with the assistance of AfDB, the effectiveness of the project will be evaluated by the indicators in the same year, i.e. 4 years after the project completion. The indicators are set out as follows:

- Cargo throughput t in 2020: 296,100 ton based on the cargo demand forecast
- Transport cost of 40ft container from Dar es Salaam Port in 2020: US$4,497 per box (via rail and lake) from US$5,300 per box (via road) estimated by applying the tariff which is levied at Kigoma Port
- Container cargo from Mpulungu Port in 2020: 9,325 TEUs based on the cargo demand forecast
- Ship repairing in 2020: 5 ships (large scale repair) and 13 ships (small scale repair) based on the estimated number of the ships to be employed to transport the forecast demand of cargo

② Outline of the Project

In response to the request of the Burundian Government, the Japanese Government decided to conduct a preparatory survey, which was conducted from August to September in 2013. As a result, the survey confirmed that the container handling equipment, which procurement had been recommended in MP Study, was necessary for appropriate operation of the container terminal upon its completion in order to ensure the effectiveness of the project. It was also confirmed that the dredging of the port basin was to be included in the construction of the container terminal

Regarding the request for the technical assistance and office equipment support to BMPRA, it is concluded that the minimum technical assistance will be provided for the initial operation of the facilities and equipment which will be built or installed for the project. More in detail, it is concluded that the contactor will provide skilled workers to the project site to train counterpart workers for pulling-up and –down of a ship by moving the cradles on the slipway, as this slipway operation would be the first experience in Burundi according to BMPRA. As a result, the requested components are formulated and prioritized in the order as shown below:

① Construction of Container Terminal including Dredging of Port Basin
② Construction of Ship Repairing Facilities
③ Diversion of Storm Water Canal
④ Procurement of container handling equipment

Based on the survey results, a contemporary study was conducted in Japan. The results of the

study were conveyed to the Burundian side during "Survey Results Explanation" in Burundi in February 2014. During the discussion, the Burundian side committed themselves in writing to procure the container handling equipment by themselves. Thus, the procurement of such equipment was excluded from the grant aid.

As a result, the project facilities to be constructed or procured are summarized in the following tables:

Table 2.1 Planned Facilities

Construction of Container Terminal Dredging Quay wall Apron	Quay wall L = 175m Container yard pavement= 34,660 m^2 Storm water drainage L = 865m Inner port road L = 733m Port basin Depth = -4.5m Dredging V= 47,100m^3
Ship Repairing Facilities	Slipway L = 132m, W = 20m Cradles L = 44.9m, W = 6.35m Buildings (Office, Workers' House, Electrical works, etc.)
Relocation of Storm Water Canal	L = 1,200m (Canal bed covered with cobbles for distillation of polluted water)

Table 2.2 Major Equipment/Machineries to be Procured

Equipment/Machinery	Item/Number/Specifications	Purpose
Workshop Machineries	Overhead Crane : 2 Lathe : 1 Milling Machine : 1 Upright Drilling Machine : 1	Ttransporting, assembling, processing, manufacturing of materials and/or parts
Screw Air Compressor	Discharge Air : 6.5 m^3/min	Distributing compressed air to workshop and slipway
Jib Crane	Working Load and Outreach : 3ton x 20mR	Lifting and setting ship parts and members at slipway.
Rough Terrain Crane	Maximum Rated Lifting Capacity : 30ton x 3mR	Lifting and setting ship parts and members at slipway where jib crane is not reachable. (Also loading and unloading cargos for port operation when available)
Portable Generator	Continuous Service Output : 125KVA Rated Voltage : 200 - 220V Rated Current : 350 - 370A	Supplying electricity to slipway to pull up or launch ship during power failure from outside. (Also supplying electricity to other facilities when needed.)

2-2 Outline Design of the Japanese Assistance

2-2-1 Design policy

2-2-1-1 Basic Policy

The priority order of the required components is as follows. It should be noted that dredging was included in the container terminal construction phase and not treated as a separate individual component.

1) Construction of Container Terminal (including dredging)
2) Ship Repair Facility
3) Diversion of Storm Water Canal
4) Container handling Equipment

When this preparatory survey started, the Burundi side requested technical assistance for operation/maintenance management and strengthening of the organization after completion of the project. Therefore, essential technical assistance will be provided during the implementation of this project, such as training required for operation of the completed facilities and procured tools/materials. More specifically, the training of landing/launching ships on the slipway will be conducted using actual vessels as requested by BMPRA because this is the first experience for Burundi to operate such facilities. Therefore, skilled workers will be dispatched for the training and the incurred training cost will be included in the construction cost of the slipway.

Moreover, the procurement of the container handling equipment that the Burundi side requested is excluded from the grant aid for project implementation at this stage in consideration of the matters below:

1. If the procurement cost is included, the project cost will significantly exceed the grant aid budget that the Japanese side had envisaged in the project cost estimation,
2. Procurement of the container handling equipment is the forth priority, and
3. The other donor will potentially provide financial assistance for the procurement or the concessionaire (GPSB) may acquire the equipment by themselves.

During "Survey Results Explanation" in Burundi in February 2014, the above-mentioned matters were explained to the Burundian side for their decisions. As a result, the Ministry of Transport, Public Works and Equipment submitted a letter dated March 20, 2014 to JICA agreeing that the following equipment would be procured by their responsibility until the project is completed:

- Mobile container STS crane 35 ton at 19m radius: 1
- Reach stackers 35 ton: 2 (1 for 3 tiers for loaded, 1 for 4-tiers for empty)
- Tractor heads: 2
- Terminal chasis: 3

Thus, the procurement of such equipment was excluded from the grant aid.

2-2-1-2 Policy with respect to Natural and Environment Conditions

Bujumbura has a temperate climate, as the maximum and minimum temperatures are 35.5 ^{o}C and 11.2^{o}C respectively and annual average temperature is 23.3^{o}C from 1996 to 2009. There are two rainy seasons, around March and December, and the maximum and minimum monthly rainfalls of these periods are 248.7 mm and 0 mm respectively. Further, no strong wind has been observed, so no special climate condition will be applied to the design.

The design standard does not require earthquakes to be taken into consideration. However, Bujumbura is located at the West Grate Rift Valley and there have been some notable earthquakes. Therefore, the minimum seismic coefficient of Japan, i.e. 0.08, will be applied to the design.

Chronological change of water level of Lake Tanganyika is shown in the following figure, which will be taken into consideration to decide dimensions such as water depth and crown height of the quay wall of the container terminal, top elevation of the protection wall of the ship repair facility, elevation and slope of the slipway, etc.

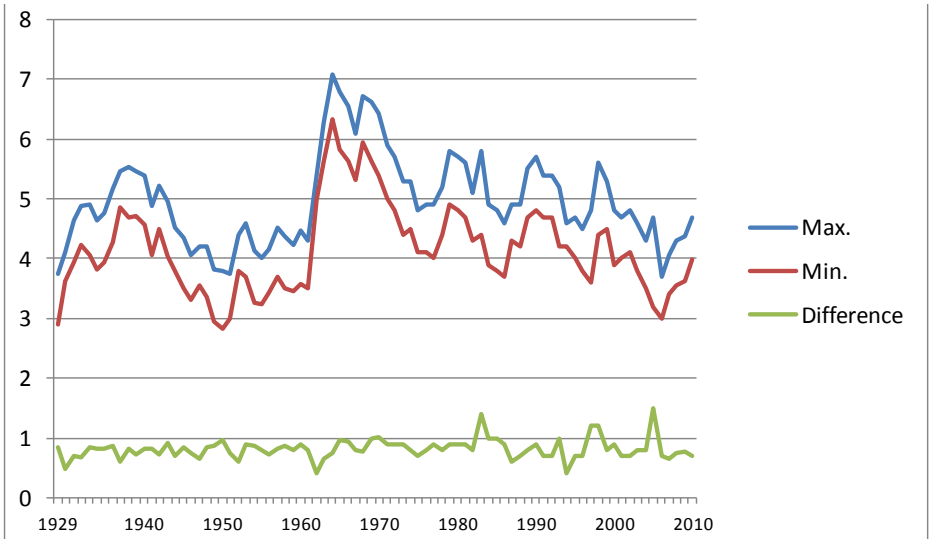


Figure 2.1 Chronological Change of Water Level of Lake Tanganyika

There are some waves around 1 m high entering into the port. However, the quay wall of the container terminal is protected by the existing breakwater and the exiting container quay which acts as an inner breakwater. Therefore, no special consideration is required for wave activity.

Large volumes of waste and polluted water are flowing into the existing storm water canal which is to be relocated in this project. Therefore, it is required that the facilities/structures of the newly constructed canal will decrease waste and polluted water from directly flowing into Lake Tanganyika.

2-2-1-3 Policy with respect to Social and Economical Conditions

Nowadays, Burundi aims to establish a democratic country based on the Arusha Peace Agreement. Therefore, interference in the lifestyles or traditions of some particular ethnic or religious groups should be avoided.

As Burundi is still one of the world's poorest nations, facilities, structures and equipment with minimum maintenance costs should be designed or procured.

2-2-1-4 Demand Forecast

A. Demand Forecast of Cargo between Bujumbura and Mpulungu of Zambia

In "The Study of Master Plan for Port Sector in the Republic of Burundi " (MP), the cargo volume between Bujumbura port and Mpulungu port in Zambia is estimated to be 220,800 ton in 2020, and 397,900 ton in 2030, covering the import/export cargo of southern Africa from Burundi and Rwanda. The volume of each item is shown in the following table.

Table 2.3 Demand Forecast of Cargo of Mpulungu – Bujumbura

Unit : 1000 t

Commodity	2015	2020	2025	2030
Animal & Animal Products	0.3	0.4	0.5	0.6
Vegetable Products	6.3	8.7	11.5	14.8
Foodstuffs	29.2	41.1	54.5	70.5
Mineral Products	79.5	119.2	165.9	222.9
Mineral Fuel and Oil	8.2	11.4	14.9	19.1
Chemicals & Allied Industries	2.7	3.7	4.7	6.0
Plastics / Rubbers	1.1	1.5	1.9	2.5
Raw Hides, Skins, Leather, & Furs	4.2	6.3	8.9	12.0
Wood & Wood Products	2.0	2.7	3.5	4.5
Textiles	0.7	1.0	1.3	1.7
Footwear / Headgear	0.1	0.2	0.2	0.3
Stone / Glass	4.3	6.4	8.9	11.9
Metals	10.2	14.2	18.7	24.2
Machinery / Electrical	2.2	3.1	4.1	5.2
Transportation	0.7	1.0	1.3	1.7
Total	151.6	220.8	300.9	397.9

Source: the MP survey

This demand forecast in the table above is estimated on the assumption that the GDP growth rate of Rwanda and Burundi will be 4.5 % after 2016. This is considered reasonable as the current GDP growth rate of Burundi is estimated to reach around 4.5 %.

In the MP survey, 95 % of the "Mineral Products" in the above table is assumed to be cement which cannot be containerized (because cement sticks to the container and makes it difficult to clean). Under the assumption that containerization of Mpulungu port would start in 2020, the following demand is estimated for 4 cargo types - break bulk, container, dry bulk, and liquid bulk – in consideration of the containerization rates of each commodity.

Table 2.4 Demand Forecast of each Cargo Type of Mpulungu – Bujumbura

Unit : 1000 t

	2015	2020	2025	2030
Breakbulk	141.1	133.4	184.6	246.8
Container	0.0	72.4	96.1	124.6
Dry bulk	4.0	6.0	8.3	11.1
Liquid bulk	6.6	9.1	11.9	15.3

Source: the MP survey

During this preparatory survey, it was found that cargo handling at Bujumbura port decreased significantly in 2013. The main reasons are considered as follows.

1) Cement production in Burundi started in 2011. The production volume has reached 62 - 65 % of the domestic demand for cement.
2) Import volume decreased because of shortage of foreign currency caused by significant deterioration of the current account.
3) Shrinkage of economic activity in Burundi due to the decrease in support by donors as a result of the Euro currency crisis.

The Burundi side added the following incident as one of the reasons.

4) Destruction of the Bujumbura market due to fire

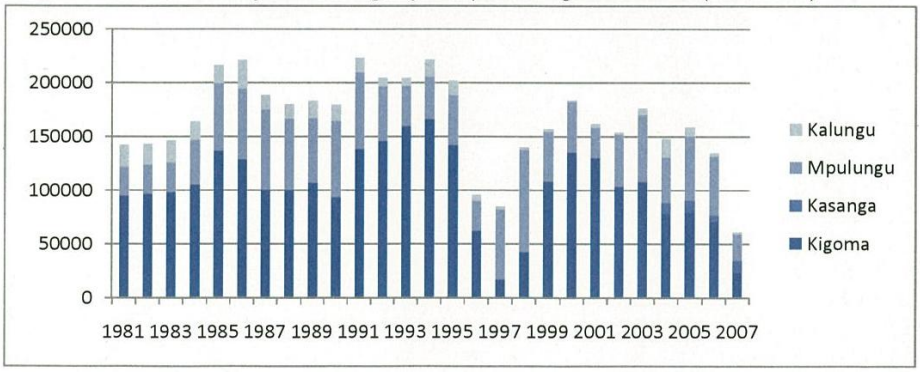
It can be judged that the reduced cargo handling of Mpulungu port is a temporary phenomenon because of the abovementioned reasons, except for the decrease of cement import as a result of domestic production, which is due to economic depression. Furthermore, Burundi has some similar experiences in 1996, 2001, and 2007 as shown in Table 2.5.

Table 2.5 Cargo Handling Volume at Bujumbura port

Table 6.2.1/3: Bujumbura Cargo Throughput (1981-2007)

Year	Port of Origin/Destination												TOTAL
	Kigoma			Kasanga			Mpulungu			Kalundu			
	Import	Export	Total	Import	Export	Total	Import	Export	Total	Import	Export	Total	All Lake Ports
1981	60900	34514	95414	0	0	0	26589	0	26589	19615	347	19962	**141 965**
1982	67575	29003	96578	0	0	0	27600	0	27600	18874	208	19082	**143 260**
1983	68018	30382	98400	0	0	0	27748	0	27748	20227	2	20229	**146 377**
1984	71693	33854	105547	0	0	0	41288	5	41293	17051	21	17072	**163 912**
1985	101142	35979	137121	0	0	0	62616	157	62773	16129	379	16508	**216 402**
1986	91023	37847	128870	0	0	0	65822	2	65824	25007	1346	26353	**221 047**
1987	69879	30859	100738	0	0	0	74063	512	74575	13209	36	13245	**188 558**
1988	63075	37427	100502	0	0	0	65797	713	66510	12863	265	13128	**180 140**
1989	75788	31411	107199	0	0	0	59869	232	60101	14754	1365	16119	**183 419**
1990	63515	30039	93554	0	0	0	70145	845	70990	13226	1637	14863	**179 407**
1991	106101	32405	138506	0	0	0	70422	1055	71477	11896	1669	13565	**223 548**
1992	122394	23351	145745	0	0	0	50241	779	51020	7331	543	7874	**204 639**
1993	146822	12950	159772	0	0	0	36976	386	37362	7664	42	7706	**204 840**
1994	150919	15340	166259	0	0	0	39276	40	39316	16425	2	16427	**222 002**
1995	116695	25231	141926	0	0	0	46592	26	46618	13526	0	13526	**202 070**
1996	49743	13010	62753	0	0	0	27620	0	27620	5553	0	5553	**95 926**
1997	16904	225	17129	0	0	0	46970	18103	65073	1420	1300	2720	**84 922**
1998	42807	0	42807	0	0	0	68049	26859	94908	2280	0	2280	**139 995**
1999	86319	22248	108567	0	0	0	41890	4350	46240	2335	0	2335	**157 142**
2000	107348	27884	135232	432	0	432	47264	0	47264	1000	0	1000	**183 928**
2001	109809	20783	130592	0	0	0	28017	0	28017	3070	0	3070	**161 679**
2002	84261	19361	103622	0	0	0	48500	0	48500	1630	0	1630	**153 752**
2003	83280	24103	107383	1000	0	1000	61914	0	61914	6114	0	6114	**176 411**
2004	66115	12332	78447	10003	0	10003	42409	0	42409	17420	0	17420	**148 279**
2005	69419	10296	79715	11395	0	11395	59491	0	59491	7960	0	7960	**158 561**
2006	65095	5908	71003	6263	0	6263	54325	483	54808	2503	13	2516	**134 590**
2007	18125	5556	23681	11345	0	11345	24407	62	24469	1201	547	1748	**61 243**

Table 6.2.1/4: Charts of Bujumbura Cargo by lake port of origin/destination (1981-2007)



Currently, Burundi imports clinkers to domestically produce cement. Therefore, it can assumed that the domestic cement production will be continued regardless of the existence

or non-existence of lime rock resources in Burundi, and cement import from Mpulungu port will decrease, as domestic production will be enough to replace imports. The demand forecast of the cargo between Bujumbura port and Mpulungu port is shown in the table below; the forecast is based on the assumption that 95 % of the "Mineral Products" is cement and 65 % of it is replaced by domestic cement.

Table 2.6 Demand Forecast of each Cargo Type of Mpulungu – Bujumbura

Unit : 1000 t

		2015	2020	2025	2030
Breakbulk	MP forecast	141.1	133.4	184.6	246.8
	Decreased	49.1	73.6	102.4	137.6
	Forecast of this study	92.0	59.8	82.2	109.2
Container		0.0	72.4	96.1	124.6
Dry bulk		4.0	6.0	8.3	11.1
Liquid bulk		6.6	9.1	11.9	15.3

Source: the MP survey

B. Demand Forecast of Cargo between Bujumbura and Kigoma of Tanzania

The cargo volume between Bujumbura port and Kigoma port in Tanzania is estimated to be 164,100 ton in 2020, and 361,100 ton in 2030 taking into consideration the introduction of a dedicated container block train and the forecast of the Tanzania Ports Authority (TPA). The demand forecast of the container cargo based on TPA's estimation is shown in the following table.

Table 2.7 Demand Forecast of Container Cargo of Kigoma – Bujumbura

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: the MP survey

During this preparatory survey, it was found that TPA is proceeding with the cargo terminal development plan at Kigoma port. For instance, in relation to the consulting service for the renovation plan of the port, including container terminal development, TPA called for an

EOI in August 2012; its RFP is under preparation at this moment. Furthermore, TPA also called for an EOI in June 2013 for the feasibility study for the operation of a block train.

However, it is estimated that the container terminal of this grant aid project will be completed in July 2016. Correspondingly, TPA's operation of the container block train should be started upon project completion. Therefore, it is assumed that lake transportation of containers between Kigoma and Bujumbura will start around July 2016, and accordingly, the target year of the demand forecast prepared during the MP survey will be extended 1.5 years. Based on this demand forecast, the container handling volume of each year is calculated in the following table.

Table 2.8 Demand Forecast of Container Cargo of Kigoma – Bujumbura

Year		2016	2020	2025	2030
Imports	1000 tons	35.4	126.3	195.2	288.6
	TEUs	2,873	10,249	15,840	23,420
	Boxes	2,107	7,518	11,619	17,179
	20 footer	1,334	4,759	7,355	10,874
	40 footer	773	2,759	4,264	6,305
Exports	1000 tons	4.6	16.8	24.0	34.4
	TEUs	310	1,128	1,617	2,317
	Boxes	293	1,067	1,529	2,191
	20 footer	277	1,007	1,443	2,068
	40 footer	16	60	86	123
Empties	TEUs	2,563	9,121	14,223	21,103
	Boxes	1,814	6,451	10,090	14,988
	20 footer	1,057	3,752	5,912	8,806
	40 footer	757	2,699	4,178	6,182
Throughput/ Year	1000 tons	40.0	143.1	219.2	323.0
	TEUs	5,746	20,498	31,680	46,840
	Boxes	4,214	15,036	23,238	34,358
	20 footer	2,668	9,518	14,710	21,748
	40 footer	1,546	5,518	8,528	12,610
Throughput/ Day	TEUs	16	56	87	128
	Boxes	12	41	64	94
	20 footer	7	26	40	60
	40 footer	4	15	23	35

The demand forecast of the MP survey missed the volume of liquid bulk transported from Kigoma port to Bujumbura port. As the MP survey estimated the liquid bulk from Kigoma port to be 5,700 ton in 2020, and 12,600 ton in 2030, the handling volumes of liquid bulk at Bujumbura port in 2015 and 2025 are increased by the figures shown in the table below.

Table 2.9 Liquid Bulk Handling Volume from Kigoma Port

Unit : 1000 t

	2015	2020	2025	2030
Liquid bulk	2.3	5.7	9.2	12.6

C. **Cargo Demand of Bujumbura Port and Container Terminal Development**

The estimations of the cargo volumes of Bujumbura port from/to Mpulungu port in Zambia and those from/to Kigoma port in Tanzania are combined in the following table.

Table 2.10 Forecast of Cargo Volume of Bujumbura Port

Unit: 1,000 ton

		2015	2020	2025	2030
Container	From/to Mpulungu	0.0	72.4	96.1	124.6
	From/to Kigoma	0.0	143.1	219.2	323.0
	Sub-total	0.0	215.5	315.3	447.6
Breakbulk	From Mpulungu	92.0	59.8	82.2	109.2
Dry bulk	Ditto	4.0	6.0	8.3	11.1
Liquid bulk	From Mpulungu	6.6	9.1	11.9	15.3
	Form Kigoma	2.3	5.7	9.2	12.6
		8.9	14.8	21.1	27.9
Total		104.9	296.1	426.8	595.8

The container cargo shown in the above table is converted to TEU as follows.

Table 2.11 Container Throughput of Bujumbura Port

Year	2016	2020	2025	2030
From/to Kigoma Port (1000 ton)	40	143	219	323
Throughput (TEU)	5,746	20,498	31,680	46,840
Throughput (Boxes)	4,214	15,036	23,238	34,358
From/to Mpulungu Port (1000 ton)	0	72	96	125
Throughput (TEU)	0	9,325	12,398	16,081
Throughput (Boxes)	0	8,500	11,310	14,684
Total Throughput in TEU	5,746	29,823	44,078	62,921
Total Throughput in Box	4,214	23,536	34,548	49,042

Table 2.12 Container Throughput per day of Bujumbura Port

Year	2016	2020	2025	2030
From/to Kigoma (TEU/day)	16	56	87	128
From/to Mpulungu (TEU/day)	0	26	34	44

Based on the assumption made in the MP survey that container vessels with a capacity of 60 TEU are in service and 120 TEU can be handled per one ship for loading and discharging, the service frequency of container ships is calculated. Next, the required number of berths is obtained to make it possible for container vessels to operate on a weekly basis. The results are shown in Table 2.13. It is to be noted that the LOA is assumed to be 60 m and the berth length 80 m, including a 10 m margin for the ship to move back and forth.

Table 2.13 Number and Length of Container Berths of Bujumbura Port

	2016		2020		2025		2030	
	From/to Kigoma	From/to Mpulungu	From/to Kigoma	From/to Mpulungu	From/to Kigoma	From/to Mpulungu	From/to Kigoma	From/to Mpulungu
Container (TEU/year)	5,746	0	20,498	9,325	31,680	12,398	46,840	16,081
Container (TEU/day)	16	0	57	26	87	34	129	45
Call of a container ship	every 8days		every 2days	every 5days	every 1day	every 4days	every 1day	every 3days
Required berths (Nos)	1		1		2		2	
Berth length (m)	80		80		160		160	

Accordingly, the quay wall of the container terminal is determined to be 160 m long in total.

Container handling is supposed to be done by mobile cranes and reach stackers. The stacking space (6 containers in one row) is arranged perpendicular to the quay face line. The working space is 30 m for the cargo handling equipment (reach stacker and tractor/chassis). The stacked containers are expected to be approximately 4 times the handling volume per day based on the assumption that import/export containers can be stacked free of charge for 7 days, referring to the example in Tanzanian ports including Kigoma port. 3-tier stacking can be done by reach stacker. Thus, the required ground slots are calculated as follows.

Table 2.14 Required Ground Slots of Container Terminal

Year	Container Throughput (TEU)		Containers to be stored (TEU)	Required Ground Slot
	per year	per day		
2015	5,746	16	128	43
2020	29,823	82	656	219
2025	44,078	121	968	323
2030	62,921	173	1,384	462

The above table shows that around 350 ground slots are appropriate for the target year 2025, and an additional container stacking yard will be necessary outside of the terminal after 2025. In this case, the outside area could be used as a stacking yard for empty containers.

The vessels registered in Burundi are shown Table 2.15.

There are 22 Burundian vessels in total - 5 tugboats, 6 self-propelled cargo vessels, 8 bulk cargo barges, 2 tank barges, 1 tourism/research ship - excuding 2 wrecked vessels (W is noted for the state in the list). These vessels, including the suspended ones (S is noted for the state), would start services when the ship repair facility is completed.

According to the demand forecast of the container trans-shipment, the container cargo will be 20,498 TEU between Kigoma port and Bujumbura port in 2020. In consideration of the fact that the number of inbound and outbound containers is almost the same, the size of the container ships is assumed to be 60 TEU and the round trip, including loading and discharging, is believed to take 2 days; which means one additional container ship will be required in 2020. Likewise, the container cargo be 46,840 TEU between Kigoma port and Bujumbura port in 2030 and three container ships of the same size will be added to the existing fleet. Meanwhile, the container cargo is estimated to be 16,081 TEU between Mpulungu port and Bujumbura port in 2030. Based on similar assumptions, except for the 4 day round trip, two container ships will be in service between these two ports. The results are shown in Table 2.16.

Table 2.15 List of Burundian Vessels

Ship Owner	Name of Vessel	Type of Vessel	Length Overall (m)	Width (m)	Dead Weight (ton)	Draft in Charge (m)	State	In-service Date (year)
1 ARNOLAC	Kizigenza	Tug Line	33.50	7.58	66	3.25	G.E	1955
	Tanganyika	Tug Line	31.20	5.18	37	1.58	G.E	1889
	Krimiro	Tug Line	23.50	4.55	25	–	S	1915
	Moso	Harbour Tug in Kigoma	12.25	3.00	9	–	G.E	1958
	Ruremesha	Mixed Cargo Ship	41.25	9.00	350	2.25	G.E	1981
	Ndaje	Mixed Cargo Ship	54.75	8.70	600	3.20	G	2002
	Cohoha	Tank Barge	42.35	7.00	336	2.71	G.E	1955
	Rweru	Tank Barge	32.71	5.58	115	1.64	G.E	1953
	Sagamba	Bulk Cargo Barge	65.70	10.00	1,397	3.77	S	1955
	Murinzi	Bulk Cargo Barge	59.60	9.02	885	3.26	G.E	1931
	Buragane	Bulk Cargo Barge	54.50	8.50	627	2.61	S	1937
	Mumirwa	Bulk Cargo Barge	52.77	8.82	544	2.75	G.E	1955
	Buyenzi	Bulk Cargo Barge	52.77	8.82	538	2.75	S	1955
	Remera	Bulk Cargo Barge	47.25	8.00	477	2.36	S	1927
	Buyogoma	Bulk Cargo Barge	36.50	6.00	278	2.17	S	1918
	Imbo	Bulk Cargo Barge	37.77	6.50	246	2.08	S	1929
	Baraka	Bulk Cargo Barge	47.25	8.00	–	–	W	1925
	Tanganyika	Tourism and Research Vessel	25.30	6.86	125	–	V.G	1994
2 BATRALAC	Tora	Bulk Cargo Ship	58.00	10.00	1,110	3.50	G	1988
	Rwegura	Bulk Cargo Ship	45.00	8.00	500	2.50	G.E	1984
	Teza	Mixed Cargo Ship	60.00	11.00	1,500	3.60	V.G	1992
3 SOTRALAC	Bwiza	Bulk Cargo Ship	54.70	8.00	508	2.75	W	1913
4 TANGANYIKA TRANSPORT	Mbaza	Bulk Cargo Ship	42.50	7.30	450	2.35	G.E	1988
5 E.P.B	Ngiri	Harbour Tug	15.75	4.30	–	–	G.E	1959

Notes: Mixed Cargo Ship = Container and/or Bulk Cargo Ship
S = Suspended
V.G = Very Good
G = Good
G.E = Good Enough

Source: BMPRA

Table 2.16 Required Number of New Container Ships

Year	2020		2030	
Route	From/To Kigoma	From/To Mpulungu	From/To Kigoma	From/To Mpulungu
Trouhgput per year (TEU)	20,498	0	46,840	16,081
Throughput per ship (TEU)	60			
Once cycle (days)	2	4	2	4
Required container ships (Nos)	1	0	3	1

Therefore, it is estimated that the total number of the Burundian vessels, which can be in service, is 23 in 2020 and 26 in 2030. According to the Burundian law, these vessels must have yearly hull inspections. When the slipway is completed, these vessels will be pulled up onto the slipway and inspected.

Repair works will be required every year for tourism/research ship and every 6 years for cargo vessels. So, it is estimated that ship repair work will be done for 5 vessels in total in 2020 and 6 vessels in 2030.

Thus, it is estimated that small scale repair works on the slipway will be done for 18 vessels and relatively large scale repair works will be done for 5 vessels in 2019. In 2030, small scale repair works will increase to 20 for vessels and 6 for relatively large scale repair works.

Table 2.17 Number of Ships to be repaired on Slipway

	2020	2030
Vessels registered in Burundi	23	26
Tourism/research ship	1	1
Cargo vessels/barges, tankers, tugs, container ships	22	25
Relatively large scale repair (every 6 years)	5	6
Relatively small scale repair (hull inspection)	18	20

2-2-1-5 Policy for Construction Works / Special Conditions on Procurement and Construction Business / Local Business Customs

In terms of land acquisition related to project implementation, there is no special approval which needs to be obtained as the project site is owned by BMPRA and located within the port premises. As to the application for approval from the Environmental Ministry with regards to project implementation, BMPRA is undertaking necessary steps and as of now, there hasn't been any particular problems.

It should be mentioned that there are no standard methods related to the design of port facilities in Burundi; therefore, "TECHNICAL STANDARDS AND COMMENTARIES FOR PORT AND HARBOUR FACILITIES IN JAPAN" is used as this has been applied in other developing countries as an international technical standard.

2-2-1-6 Policy for Employment of Local Contractors (Construction Company, Consultant, etc.)

In general, there are only a few local companies which could be labeled as construction companies. Further, there are no large scale public projects procured by the Burundian government. Therefore, small scale projects or aid projects financed by donor countries are the main source of construction projects currently ongoing in Burundi. As a result of the preparatory survey, two companies have reached an acceptable technical level and have basic capacity of construction technologies. Although they could be labeled as a construction company they lack maritime construction experience. Therefore, Japanese engineers and skilled workers are required to train and supervise the local contractors.

2-2-1-7 Policy for Operation and Maintenance

The concessionaire, which has a certain level of technique and experience, should operate and manage the container terminal and the ship repair facilities after the implementation of this project.

At present, operation and maintenance of the existing port are conducted by GPSB, which is planning to conduct the operation and maintenance of the container terminal constructed in this project. GPSB belongs to the company group which conducts operation and maintenance of large scale ports. Therefore, there should be no problem for the operation and maintenance of the container terminal.

Regarding operation and maintenance of the ship repair facilities, BMPRA is planning to give the concession to the port concessionaire (GPSB) or a local private company. The former has some experience in the maintenance of the existing cargo handling equipment, and the latter has experience in repairing ships. Therefore, there should be no issues or problems for operation and maintenance of ship repair facilities.

2-2-1-8 Policy for Grade Selection of Facilities and Equipment

As the container terminal will handle marine containers which will pass through Dar es Salaam port, the planned apron and yard of the container terminal should have sufficient space for the

cargo handling equipment which can handle marine containers. The yard pavement should be designed to bear the reactions of these container handling units.
The facility pulling vessels up & down should be equipped with a slipway which can pull up the longest Burundian vessel currently in use. Machines for ship repair should be a type commonly used to ensure easy maintenance matching at the local capacity level. Equipment that requires high technology maintenance such as computer control systems should be avoided.

2-2-1-9 Policy for Construction/Procurement Method and Schedule

This is a complex project which consists of civil works such as container terminal, slipway, and relocation of storm water canal and; building works such as the work shop, worker's house and office; and procurement of machines such as equipment to pull vessels up & down and machine tools for the workshop.

For civil works, the quay wall and revetment is made of steel sheet piles, which will be imported from Japan because they are only produced in advanced industrial countries. Other import materials, except cement and re-bars, will also be from Japan because the timing of procurement has to be ensured and if it is imported from neighboring countries, i.e. Tanzania or Kenya, the prices and availability are susceptible to large fluctuations due to current construction boom.
For the other construction materials, re-bars will be purchased at the local level because there is an abundance importable from Zambia. Aggregates, sands, stones, and materials for earth fillings will be procured locally.
As for cement, local material (design strength = 32.5N) will be used for the concrete structures which require relatively low strength such as mortar masonry of the storm water canal, and high quality material (design strength = 42.5N) imported from third party countries will be used for structures which require high strength.
The rail track to be laid on the slipway, main body of cradle, and wheels will be procured and/or pre-assembled in Japan and assembled and/or installed on site.

For building works, the structural members of the workshop should be shaped steel because it needs inner height and width. Because the quality and technique of local welders are unsatisfactory due to lack of experience, the structural steel members of the workshop will be fabricated in Japan, exported to Burundi, and assembled on site in order to reduce work on site as much as possible. The workers' house and office will also be built in the same manner to achieve high work efficiency by reducing differing types of work. Roofing/ siding materials and building facilities will also be procured from Japan and transported to Burundi in a timely manner.

Machines will be procured from Japan for the most part. Ship repairing machine tools, jib crane and rough terrain crane will be loaded at the port in Japan, landed at Dar es Salaam port and transported to Bujumbura by road.

As for the construction schedule, it requires a considerably long period of time for the transportation of materials and equipment due to geographical conditions – notably the project site is located in the landlocked state within the African continent. In addition, at the project site the storm water canal flowing into the port has to be relocated before starting the construction of the quay wall of the container terminal and the protection wall of the ship repair facility.

Therefore, civil works for the relocation of the storm water canal will start before the construction of the quay wall of the container terminal and the protection wall of the ship repair facility. It is not necessary to import equipment and materials for the relocation of the storm water canal, it can be executed by use of local construction equipment and materials.

For the construction schedule of the buildings, materials will be procured from Japan as mentioned above. Especially, steel fabrication works will be done in Japan in order to simplify the work on site and shorten the schedule.

2-2-2 Basic Plan (Construction Plan/Equipment Plan)

Based on the design policy, the following points are carefully considered for the basic plan.

The top elevation of the container terminal quay wall is set higher than the highest lake water level ever recorded to cope with the changing Lake Tanganyika water level.
The container terminal and the ship repair facility will be located as far inside the port basin as possible to steer clear of any waves entering into the port.
The screen for collecting waste will be installed and cobbles will be laid on the bed of the storm water canal to in an effort to reduce the waste and polluted water from the city.
Machine tools are selected from commonly used ones which require no high-tech maintenance to match the technical level of the locals.
Skilled workers will be dispatched for the construction of the quay wall, protection wall, slipway, and the buildings for the ship repair facility to deal with the inadequate capacity of the local workers. Further, for the structures, methods which can shorten the construction period on site and consequently reduce the construction cost, are applied to these facilities and buildings.

For operation and maintenance, the facilities are planned with the assumption that Burundi has sufficient capacity, except for the operation of the equipment used to pull vessels up & down on the slipway. Education and training will be conducted for the vessel pulling equipment by skilled workers from Japan.

2-2-2-1 Overall Plan
(1) Facility Layout

The container terminal is located where there is no strong presence of waves entering into the port, i.e. on the opposite shore parallel to the existing general cargo berths. The distance between the existing and the new quay walls is 120 m in order to ease both ship maneuvering and the up & down vessel pulling on the slipway. The slipway is located deep in the port basin at the north end of the exiting No.1 Warehouse, where the presence of waves is minimal.

The relocated storm water canal is extended to the shore of Lake Tanganyika along the perimeter fence located at the north end of the port premises in order to keep the stacking yard of the container terminal as wide as possible. The inner port road which leads to the existing container quay is between the relocated storm water canal and container terminal. The road is connected to the existing port entrance gate. The new storm water canal is also laid along the north perimeter of the port premises, which is owned by the port and located outside of the fence.

The container terminal quay has an apron 30 m in width for discharging and loading. The container stacking yard is located behind the quay with light poles for security. The stacking yard is planned with the assumption that the containers will be handled by mobile cranes and reach stackers. The stacking space (6 containers in one row) is arranged perpendicular to the quay wall. The working space between the stacking spaces is 30 m from the cargo handling equipment.

Regarding the ship repair facility, the slipway is planned alongside the existing No.1 Warehouse. The workshop is positioned parallel to the slipway and the entrance is located at both ends of

the building. The workers' house is located near the workshop and the office is located beside the inner port road.

Drainage is planned within the container terminal around the perimeter by the ship repair facility and along the inner port road. Rain water is discharged into the relocated storm water canal or the port basin.

External power is supplied from the power distribution board eastside of the existing No.2 Warehouse to the cubicle to be built adjacent to the winch house of the slipway via high voltage power cable. Power will be distributed from the transformer to the ship repair facility and container terminal.

Water supply for the ship repair facility is from the existing feed-water pipe laid under the project site.

(2) Structures

Quay Wall of Container Terminal:
The planned face line of the quay wall of the container terminal crosses the ground above the water level at present and the type of soil along the face line is sand mixed with gravel. Therefore, the fastest way of construction is to; (1) drive steel sheet piles on land, (2) make an anchor system for the steel sheet pile quay wall and (3) excavate in front of the steel sheet pile wall. Thus, as a Japanese contractor is employed for project execution, the steel sheet pile wall with an anchor system is the best structure for the container terminal quay wall, because shortening of the construction period directly leads to the reduction of the construction cost. In consideration of consecutiveness and speed of construction work, the anchors should be steel piles because the pile driver used to drive the steel sheet piles on land can be used to drive them.

Slipway Protection Wall:
The structure is also a steel sheet pile wall, same as the container terminal quay wall, in consideration of consecutiveness and speed of construction work. Steel sheet pile wall with the steel pile anchor is built extending toward the container terminal from the slipway, and the steel sheet pile cofferdam is built extending toward the existing general cargo berths from the slipway.

Slipway:
Slipway will be constructed in dry condition to ensure its quality, because the level of the tip of the slipway is at the same elevation with the bottom of the port basin. Therefore, the cofferdam technique will be applied to the construction. The heads of the foundation steel piles are connected to each other by reinforced concrete transversal and longitudinal girders, and the rails are to be installed on the longitudinal girders. Plain concrete slabs will be placed between the girders.

Workshop, Workers' House, Office:
The workshop will be a steel structure to keep interior space as large as possible and minimize materials needed by reducing their weight, pursue economic efficiency by shortening the construction period, etc. In order to maintain the quality, the steel structural members will be fabricated and assembled provisionally in Japan, transported to Burundi and re-assembled on site. Then, interior finishing will take place. Therefore, roofing and siding materials will also be procured from Japan and transported to the site. In order to reduce work items on site as well, workers' house and office will also be a steel structure, same as the workshop.

Pavement Works:
Concrete pavement will be applied to the quay apron of the container terminal and the container stacking yard in consideration of its durability. For the vehicle marshalling yard in the container terminal and the inner port road, asphalt pavement, which is commonly used in Burundi, is used.

(3) Design Standards

Design of civil work facilities is in accordance with "TECHNICAL STANDARDS AND COMMENTARIES FOR PORT AND HARBOUR FACILITIES IN JAPAN (revised edition in 2007, printed in 2009)". For facilities in which this standard is not applicable, other proper standards of Japan are applied, accordingly.

Design of the building and facilities are in accordance with "STANDARD SPECIFICATION for PUBLIC BUILDING CONSTRUCTION (Building Works, Electrical Works, Machines & Facilities Works) edited by the Public Building Department of Ministry of Land, Infrastructure, Transport and Tourism, published in 2013".

Electrical and mechanical design standards for building structures and facilities are in accordance with the Building Standards Act, the Enforcement Order of the Building Standards Act, and the Notification of Ministry of Land, Infrastructure, Transport and Tourism.
Regarding other standards or specifications not mentioned above, the latest version of "JAPANESE ARCHITECTURAL STANDARD SPECIFICATIONS published by Architectural Institute of Japan" is referred.

The priority of the specifications is as follows.
1st: This Design Document
2nd: Price Quotation
3rd: Particular Specification
4th : "STANDARD SPECIFICATION for PUBLIC BUILDING CONSTRUCTION (Building Works, Electrical Works, Machines & Facilities Works) edited by the Public Building Department of Ministry of Land, Infrastructure, Transport and Tourism, published in 2013"

(4) Equipment Procurement

Machines for the slipway and workshop will be procured from Japan in principle and the machines are selected from the commonly used types for easy maintenance in Burundi.

2-2-2-2 General Facility Plan

(1) Container Terminal

Quay Wall
The quay wall is designed according to "TECHNICAL STANDARDS AND COMMENTARIES FOR PORT AND HARBOUR FACILITIES IN JAPAN (revised edition in 2007, printed in 2009)".

1. Dimensions of Container Berth
The main dimensions of the maximum model ship in Lake Tanganyika are as follows.

Length Over All (LOA):	65.7 m
Length between Perpendiculars (LPP):	60.0 m
Beam:	10.0 m
Full loaded draft:	3.77 m
Empty loaded draft:	1.17 m

The net weight of the target vessel "SAGAMBA" is 1,397 tons. This is very similar to the container vessel of 1,000 DWT (ton) (dead weight), which is envisaged to be in service in future.
The berth length and water depth to accommodate a 1,000DWT cargo vessel are as follows.

Berth Length to be required:	80 m
Water Depth to be required:	- 4.5 m

The scale of the facility shown below is planned according to the overall port plan.

Number of Container Berth:	2 berth (Parallel Berth)
Length of Container Berth:	80 m x 2 berth = 160 m
Water Depth in front of Berth:	- 4.5 m (LWL = under 773.0 m), EL = + 768.5 m
Turning Basin water depth:	- 4.5 m, EL + 768.5 m
Width of Apron:	30 m
Top elevation of Quay Wall:	+777.5 m
Slope/Back side height of Apron:	1%, 777.8 m

The quay is a steel sheet pile wall.

The steel sheet pile wall is designed with reference to "TECHNICAL STANDARDS AND COMMENTARIES FOR PORT AND HARBOUR FACILITIES IN JAPAN (revised edition in 2007, printed in 2009)". Related facilities such as sheet pile type mooring wharf (P981), pile foundation (P584), mooring post (P1172), fender (P1179), car stop (P1199) will also be referred to the page of the standard.

2. Apron Pavement
Pavement is designed according to "Apron (P1225)" of "TECHNICAL STANDARDS AND COMMENTARIES FOR PORT AND HARBOUR FACILITIES IN JAPAN (revised edition in 2007, printed in 2009)". Concrete Pavement is applied.

[Design Condition]
- Design period: 20 years
- Loading condition

Container Crane:	200 ton (Ground pressure: 120 kPa)
Reach Stacker (equivalent to straddle carrier):	Ground pressure: 125 kPa

- Road Bed Thickness
  Road bed thickness is decided to make the support coefficient 200N/m^3.
  The thickness is varied according to the coefficient. However, most of the site planned for the apron is made on cut earth. For the filling part, the support coefficient can be improved around 100N/m^3 by using high quality earth and sand.

Upper Road Bed:	Graded Soil, 20 cm thickness
Lower Road Bed:	Crusher Run, 20 cm thickness

- Concrete Bed Thickness
  It is categorized as CP3 mentioned above, and the equivalent bed thickness is 30cm.

Concrete Bed Thickness:	30 cm
Concrete Bending Stress:	4.5 N/mm^2

<u>Section between Quay Wall and Existing Structure</u>
This is the extension of the quay wall and is of the same structure as the quay wall of the container terminal.

Revetment west side of berth	Length: 5 m, connected existing Pier.
Revetment east side of berth	Length: 10 m, connected to the planned Ship Repair Facility.

Container Stacking Yard

Container stacking yard is the area between the apron and the inner port road. 5 container ground slot groups of 360 ground slots in total are prepared in the container stacking yard. 1080TEU container can be stacked in the yard, when stacked in 3 tiers.

Container Yard overall area:	37,460 m^2
Marshaling area:	32,760 m^2
Concrete Pavement:	6,010 m^2
Asphalt Pavement:	26,750 m^2
Backup area:	1,900 m^2 (Asphalt Pavement)
Green area:	550 m^2
Existing Building area:	2,250 m^2

The ground slot area is paved with concrete similar to the pavement for the apron. Marshaling area and back up area are paved with asphalt similar to the pavement of the inner port road.

The ground slope of the stacking yard is 0.6%, preventing rain water from gathering, in consideration of balance between cut and fill of the earth. The elevation of the line, which is parallel to and 50 m away from the apron, is set as +778.1 m, and toward the inner port road the slope is designed to be 0.6% to meet its design elevation.

The rain water drainage has 3 rows of ditches crossing the container stacking yard, the first one is along the boundary between the container terminal and ship repair facility, the second one along the edge of the concrete apron including its extension eastward, and the third one along the container yard road. The inverted elevation of the ditches should be adjusted to ensure a proper slope to the discharge of the design precipitation. Grating covers are provided for the ditches where vehicles will move e.g. along the edge of the apron and road crossing.

Light poles will be erected in the container terminal for safety and security. The illumination intensity is designed only for security purpose. The alignment of power cable conduits is to enable additional lighting in the future when night operation is required. For the project, three light poles are arranged 150 m away from each other to keep 20 lx at the midpoint of each pole.

Inner Port Road

Inner port road has two types, Road to Container Terminal and Access Road to Jetty.

- Road to Container Terminal

Length:	643 m
Right of Way (20 m width):	1,286 m^2
Asphalt Pavement width:	12 m in total
Yard side:	5 m (1 lane)
Outside of the yard:	7 m (2 lanes)
Overlay:	2,000 m^2 (Access part: 10 m, Width: 200 m)

- Access Road to Jetty

Length:	90 m
Right of Way (20 m width):	900 m^2
Asphalt Pavement width:	10 m in total
Yard side:	5 m (1 lane)
Outside of the yard:	5 m (1 lane)

The road is paved with asphalt concrete.

The inner port road, which is mainly used as an access to the container terminal, is paved with asphalt. The standard to be applied is "TECHNICAL STANDARDS AND COMMENTARIES FOR PORT AND HARBOUR FACILITIES IN JAPAN (revised edition in 2007, printed in

2009)". The loading condition is AP3, same as the one applied for the quay apron.

[Pavement components of asphalt pavement]
Under the loading condition of AP3 and CBR of the subgrade less than 20, the asphalt pavement is designed as follows:

Dense-graded asphalt concrete (surface course):	50 mm
Coarse-graded asphalt concrete (base course):	150 mm
Graded grain materials (upper roadbed):	150 mm
Crusher-run (lower roadbed)	150 mm

Dredging of port basin

EL+769 m Dredging	Maintenance dredging for existing general cargo berth (20 m width in front)
	Dredging area 20 m x 200 m = 4,000 m^2
EL+768.5 m Dredging	Dredging for the container berth (20m width in front)
	Dredging area 20 m x 175 m= 3,500 m^2
EL+768.5 m Dredging	Dredging of center of the port basin
	Dredging area 8,100 m^2

The dredging volume in front of the existing general cargo berth will increase as it goes deeper into the port basin. Dredging deeper than EL +769m in front of the general cargo berths is impossible, as the elevation of the rubble mound, on which the cast-in-situ concrete quay wall was constructed, is EL +769m. Therefore, the dredging depth in front of the general cargo berth is set as - 4 m (4 m below LWL = + 773.0m).

The maximum draft of the existing Burundian vessels is 3.77 m (set by SAGAMBA, a barge owned by Aronolac), and the draft of 60 TEU container vessels expected to be in service is considered to be around 3.6 m. Therefore, the water depth in front of the container berth is determined to be - 4.5 m including "under keel clearance." Accordingly, the depth of the central part of the port basin, where vessels turn when they are berthing and/or de-berthing, is also - 4.5 m.

Dredging work will be performed by environment-conscious methods, same as in Japan in principle. The dredging work will be carried out in the water area enclosed with proper canvas curtain or similar method so that possible water pollution from the construction site can be prevented.

For the selection of a dredger, the cutter suction dredger owned by a private company and anchored in the port basin will not be used for this project because this type of dredger will discharge the dredged soil together with a considerable volume of water through the pipeline and would require expensive works to prevent the dredged materials from returning to the port basin together with the discharged water. Pollution prevention will also be costly.

As a backhoe dredger or grab dredger is not available in Lake Tanganyika, a clamshell or long-arm backhoe which will be mounted on a flat barge is considered as the optimal tool for dredging to minimize the cost and water pollution. Where the ground is above water level (3500 m^2 - 4000 m^2) and where it is underwater but reachable by the machines from the ground, excavation or dredging will be done by construction machines on land. The excavated soil will be used as filling material.

For maintenance dredging in front of the existing general cargo berths, dredged materials will be discharged by the grab dredger onto dump trucks parked on the pier.

Dredged soil existing underwater in front of the container terminal quay will be excavated and moved to the area where excavation can be carried out by use of an excavator working on the ground above water. Excavated materials will be discharged onto dump trucks directly.

In front of the existing general cargo berths, the lake bed elevation is fixed to be +769 m, same level as the top of the rubble mound under the quay wall. The lake bed elevation in front of the quay wall of the container terminal on the opposite shore is determined to be +768.5 m. Dredging is not necessary at the central part of the port basin, as the lake bed elevation there is lower than +768.5 m.

As per the design, low water level in the port basin is +773 m and the full loaded draft of the maximum existing vessel SAGANBA is 3.77 m; the required water depth is 4.5 m. As the storm water canal will be relocated from the port basin, little maintenance dredging will be required in the future.

(2) Ship Repair Facility

Slipway

The ramp will be designed according to "TECHNICAL STANDARDS AND COMMENTARIES FOR PORT AND HARBOUR FACILITIES IN JAPAN (revised edition in 2007, printed in 2009)." The slope is recommended to be within the range of 1:6 - 1:12 according to the technical standards above. In consideration of the easy pulling up of ships and better workability on the slipway, the slope is to be determined.

General cross section of the slipway is shown in the figure below.

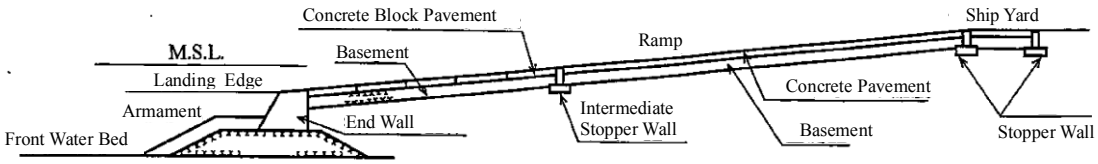


Figure 2.2 General Cross Section of a Slipway

[Outline of the Planned Facility]

Target Vessel (SAGAMBA)	LOA: 65.7 m Empty loaded draft: 1.17 m
Area of ramp	20 m x 132 m = 2,640 m^2
Length of ramp	132.0 m
Width of ramp	20.0 m
Inclination of ramp	1 : 10 (5.7 degrees)
Height of lower end of ramp	EL+768.4 m
Height of upper end of ramp	EL+780.9 m
Design ground elevation	EL+777.5 m

Design of Facilities

All the civil facilities of the slipway is designed according to the section of ship lifting yard, piling foundation, reinforcement concrete, etc. of "TECHNICAL STANDARDS AND

COMMENTARIES FOR PORT AND HARBOUR FACILITIES IN JAPAN (revised edition in 2007, printed in 2009)"

1. Design Water Level

High Water Level:	HWL+775.6 m
Low Water Level:	LWL+773.0 m
Mean Water Level:	MWL+774.3 m
Annual change (Rainy and dry seasons):	0.8m in average

2. Condition for Pulling up

Draft of target vessel (empty load):	1.17 m
Length to be required (Length of cradle):	45 m
Required length above water in normal condition and for repairing :	60 - 66 m (LOA, LPP)
Height of equipment (rail + height of cradle):	1.1 m

The elevations of the ramp both at the landing edge and the upper end are determined with the above conditions taken into account. The gauge of the outer rails on the ramp is set as 6 m to ensure stability, as it should be more than 1/3 of the vessel beam - SANGARA's beam is 10.00 m - according to the technical standards.

Cradle

Height of equipment	1.10 m
Number of cradles	4 sets
Dimension of cradle	6.35 m x 5 m
Length when fully expanded	45 m
Length when positioned deepest	30 m
Number of wheels	32
Row of wheels	4 (8 wheels for each row)
Interval of wheels	2.0 m (width overall: 6.0 m)

Condition of External Force

Target Vessel	LOA	65.7 m
	Draft in case of landing	1.17 m
	Weight in case of landing	1,100 ton

Condition of Loading

HWL		+775.6 m
LWL		+773.0 m
Wheel Load	Axial load	6.95 ton
	Horizontal load	1.05 ton
Earthquake	Design earthquake intensity	0.08

3. Piling Foundation

The soil bearing capacity is sufficient as the sandy soil with N-value of 30 - 50 exists above EL + 760 m, where penetration of piles is to be stopped.

H-shaped steel pile is the most suitable foundation for the geotechnical conditions encountered at this site. Required interval is calculated preliminarily for the three types of the H-shaped steel piles, i.e. 300H, 400H, and 500H. As a result, the H-shaped steel 400H (400 x 400 x 13 x 21)

driven at a 6 meter interval is applied as foundation due to the economic conditions.

4. Girders

The girders of the ramp have a rectangular cross section of reinforced concrete. The longitudinal girders have a rectangular section of 0.8 m width and 1.0 m height, with joints located at an interval of 15 m. Three H-shaped steel piles at a 6 m interval will be placed to support the 15 m long girder.

The transversal girders, which will be placed connecting the pile heads, have a rectangular section of 0.5 m width and 0.5 m height.

5. Concrete Slab

The surface of the base of the ramp is covered by cast-in-situ concrete filling the gap between the girders. Plain concrete will be casted with the thickness of 20 cm on the crushed stone of 30cm thickness.

Ship Repair Yard

Ship repair yard area (excluding slipway)	4,200 m^2
Rails on slipway	4 tracks (132 m)
Cradles	4 sets, total connected length: 30 - 45 m
Jib crane at slipway	1 set, 20 mR, 3 ton
Workshop	1 building, 10m x 30 m
Office	1 building, 8 m x 12 m
Worker's House	1 building, 8 m x 12 m

The Ship Repair Facility is designed to be capable of pulling up and repairing ships having maximum dimensions on Lake Tanganyika. Dimensions of TEZA (owned by BATRALAC) are LOA=59m, B=12m, D=4.5 m, d=3.5 m, DWT=1,500 ton, weight without cargo=800 ton and those of SAGAMBA (owned by Arnolac) are LOA=65.7m, B=10m, d=3.77m, DWT=1,397ton, weight without cargo=694 ton.

As the repair works of engines and vessel body are carried out by the existing local companies, repair works to be done at this ship repair facility consist of the pulling up of vessels, hull washing (water jet type), and removing and re-installing parts/members in and out of vessels. The necessary facilities are the workshop and working place, welding machines, high-pressure washing machine, air compressor, painting spray tools and supply of water, electricity, acetylene, oxygen, etc. This is summarized in the following table.

Table 2.18 Ship Repair Facility

No.	Required Facilities		Specifications	Objectives/Locations
1	Slipway	・ Length	132 m (70 m in water, 62 m on land)	Pulling the maximum model ships, TEZA and SAGAMBA, up & down
		・ Rail	4 tracks, 6 m outer gauge	
		・ Maximum pulling capacity	1000 ton	
2	Facility with Slipway	・ Cradle	B6 .35m x L5 m x D0.8 m (4 sets)	Ship bottom is 1.1 m above ramp (wood block is 0.3 m height) For pulling up of cradle For pulling ship/empty cradle For stabilizing ship
		・ Main winch	Capacity: 45 kW, 17 ton	
		・ Sub winch	Capacity: 7.5 kW, 3 ton	
		・ Capstan	Capacity: 2.2 kW, 1 ton	

No.	Required Facilities		Specifications	Objectives/Locations
3	Equipment on Slipway	・High-pressure washing machine		For washing outer body of the ship
		・Air Compressor	Fixed pipes are laid in ramp	Power source of tools using compressed air
		・Bottle sets of acetylene gas & oxygen	Fixed pipes are laid in ramp	Power source of fusing machine
		・Distribution board & Electric socket	220 V&380V	Power source of welding machine, electric tools, lighting poles, etc.
4	Workshop	Building	B10m x L30m x D10m Under crane: 8 m	6m square steel plate can be turned.
		Overhead Crane	5 ton x 2 sets	Enable to pull up or turn by two cranes
		Work area, Walkway, Entrance for material, Storage for machines/tools/consumables	Center walkway: 1.5 m width Entrance for material: B5 m x H5 m	Facilities required for overhaul work of engine, machining, pipe fabrication, steel fitting & welding, electric work, wood work, etc.
5	Facilities in Workshop	Screw Air Compressor	Amount of Discharge Air: 6.5 m^3 /min Discharge Air Pressure: 0.7Mpa Motor Capacity: 37 kw	Distributing compressed air to workshop and slipway
6	Facilities in Workshop	Portable Generator	Continuous Service Output : 125KVA	Supplying electricity to slipway to pull up or launch ship during power failure from outside. (Also supplying electricity to other facilities when needed.)
7	Facilities for Transportation	Crane in slipway	Post type jib crane 20 mR x 3 ton x 25 m under hook	5 ton lifting capacity at center of vessel
		Rough-terrain Crane	30 ton, 3 mR	Replacement work of steel plates of the vessel's body occasionally together with Jib crane. For lifting works out of reach of the jib crane For cradles setting
8	Office		8 m x 12 m 1F	East end of ship repair facility area
9	Worker's House		8 m x 12 m 1F	Between workshop and office
10	Winch Room		D7 m x B10 m x H4 m	Head of land part of Slipway
11	Cubicle		3 ϕ 6.6KV / 210V 500KVA	Around head of land part of Ramp

Photo 2.1 Site for Ship Repair Facility

Photo 2.2 Maximum model ship SAGAMBA

Protection Wall and Retaining Wall

The protection/retaining walls of the slipway are categorized into three structure types.

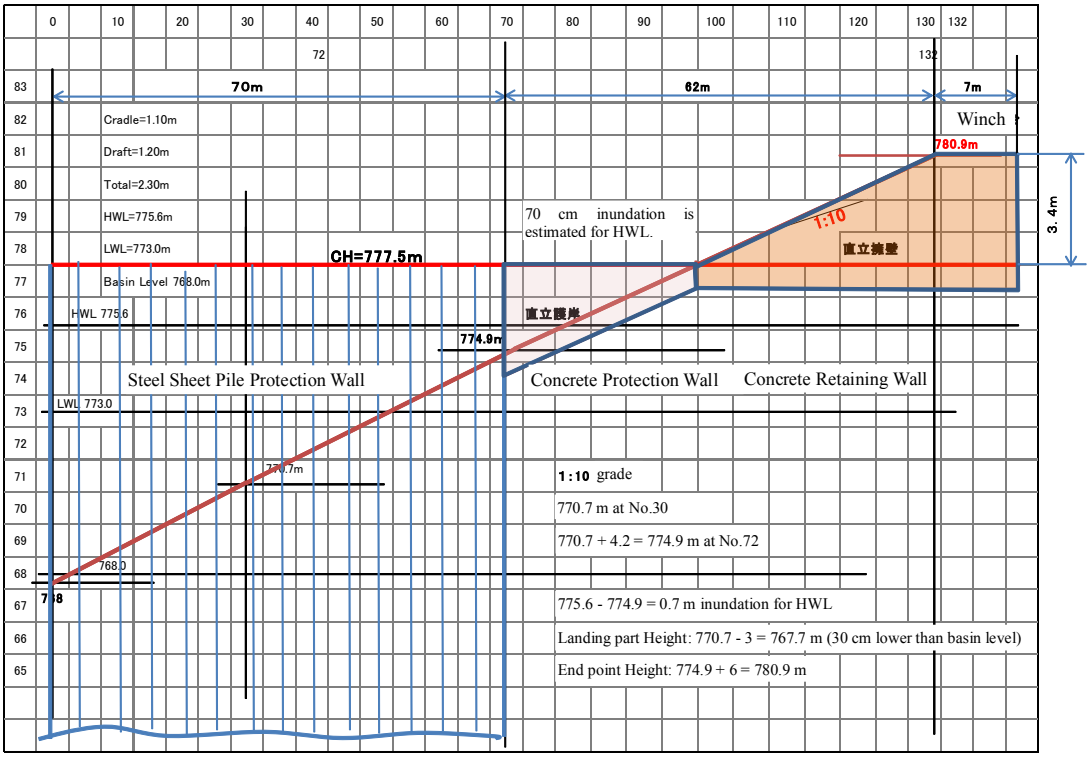


Figure 2.3 Types of Protection/Retaining Walls of Slipway

a) Steel Sheet Pile Protection Wall

The typical section is the same as that of the quay wall of the container terminal.

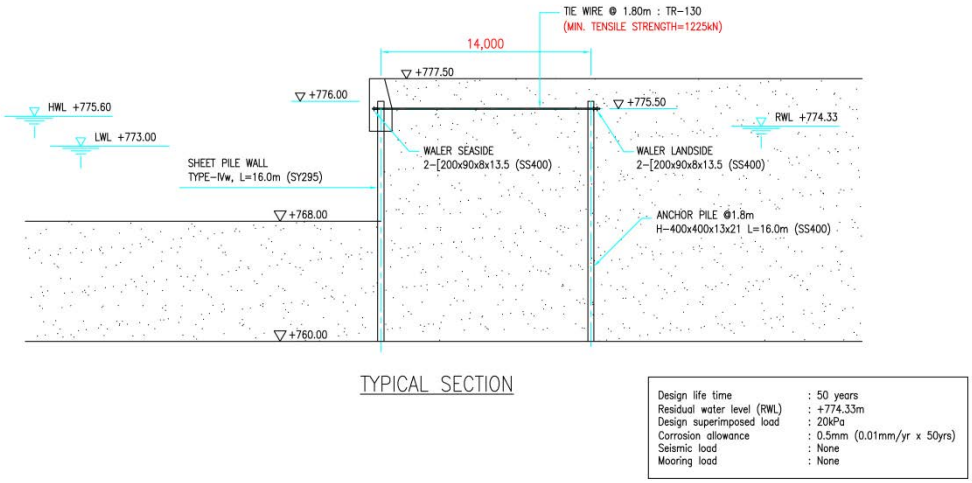


Figure 2.4 Steel Sheet Pile Protection Wall

b) Concrete Protection Wall

This type of structure is applied to the side wall of the slipway lower than the ground level (GL + 777.5 m).

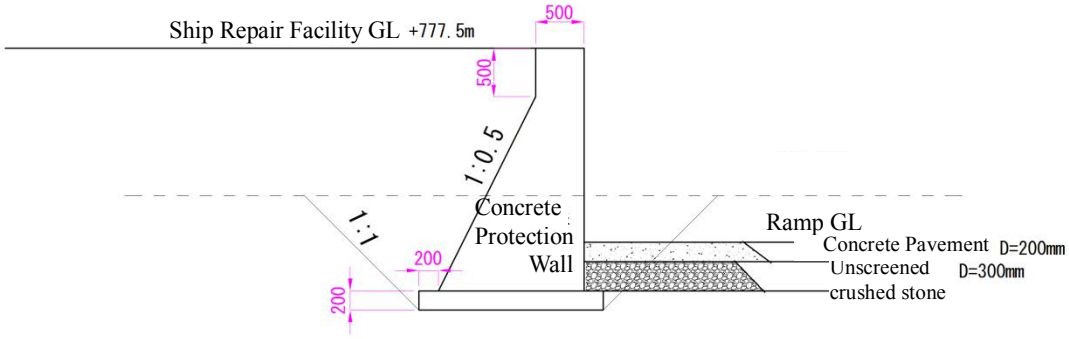


Figure 2.5 Concrete Protection Wall

c) Concrete Retaining Wall

This type of structure is applied to retain the embankment of the slipway higher than the ground level (GL + 777.5 m).

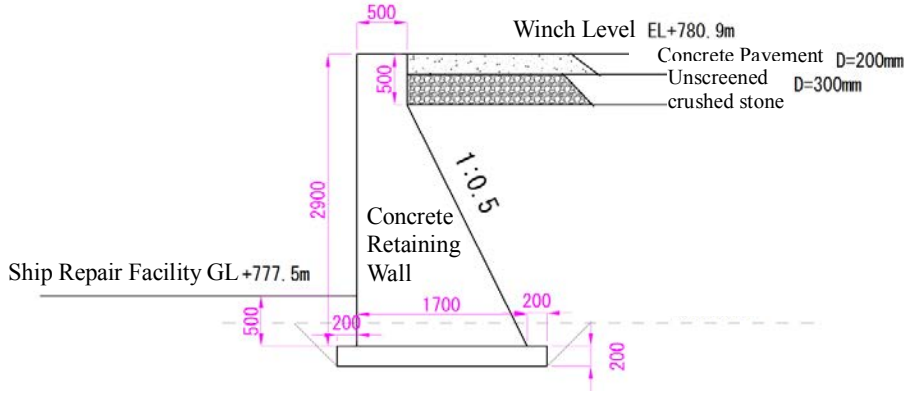


Figure 2.6 Concrete Retaining Wall

The steel sheet pile wall and concrete wall are designed referring to "TECHNICAL STANDARDS AND COMMENTARIES FOR PORT AND HARBOUR FACILITIES IN JAPAN (revised edition in 2007, printed in 2009)".
For the retaining wall, the manual "CIVIL WORKS FOR ROAD - Retaining Wall" or "CIVIL WORKS FOR ROAD - Outline for Road" published by Japan Road Association is referred.

Crown height of protection wall	EL+777.5m
Crown height of concrete retaining wall	EL+777.5m - EL+780.9 m
Face of protection wall	45m (north side: 30 m, south side: 15 m)
Side wall of the slipway	
Steel sheet pile protection wall	70 m x 2 = 140 m
Concrete projection wall	34.5 m x 2 = 69 m
Concrete retaining wall (incl. winch base)	89 m
Steel sheet pile anchor wall (cofferdam)	30 m

(3) Relocation of Storm Water Canal

1. Consideration for Planning and Design

Relocation of the storm water canal was planned along the north end of the port premises. The longitudinal survey along the relocation centerline was conducted in the dry season (August 2013). The shoreline of the lake is 1,200 m from the connection point with the currently existing storm water canal in Bujumbura city. As the ground elevation on the shoreline is EL+774.6m and slightly higher than the MWL, revetment is required to protect the storm water canal from the currents and waves of the lake. If the storm water canal is extended further toward the lake, accretion or erosion of the shoreline is likely to take place - the extension will work like a groyne. The gradient of the invert elevation of the storm water canal is designed to be 0.2 % and the water is estimated to be 1.4 m deep when the design discharge flows through the canal. Manning formula is applied to determine the dimensions of the cross section.

2. Open Canal

Right of way:	10 m
Section of open canal:	Bottom width: 3 m, height: 2 m, crown height width: 5 m, section area: 8 m^2
Length:	1,200 m + 50 m
Design discharge:	11.55 m^3
Invert elevation at connection point:	EL + 777.0 m
Invert elevation at shoreline	EL + 774.6 m (= HWL)
Gradient:	0.2 %

3. Screen to collect floating rubbish

Location:	Around at the connection point with city canal

The width of the canal bed is designed at 3 m. For the section where the screen is installed, the width is 6 m because the flow speed will be reduced by the collected waste.

4. Measures for clean discharge to the lake

The bed of the storm water canal is designed to be covered with cobbles in order to distil the polluted water which is discharged from the city as much as possible. In case of flooding, the flow speed will reach nearly 3m/sec. Concrete beds should be placed every 5 m to prevent the cobbles from flowing away.

Buenzi Canal flows into Lake Tanganyika through the port basin. Not only rain water but also wastewater of the city flows into this canal. This is one of the reasons why maintenance dredging was required for the port basin, where soils and waste are deposited. In addition, this canal exists in the area where the ship repair facility is planned. For these reasons, the storm water canal has to be relocated. It's to be noted that, as the storm water canal cannot be blocked, the relocated one has to be completed in the early stage of this project before starting works for the container terminal or the ship repair facility.

The relocated drainage, which flows polluted water and rainwater from outside of the port, is planned along the perimeter of the port premises, not interfering with the future development of the Bujumbura port.

Further, the existing ground level is lower than the project ground level by around 300 - 500 m near shoreline of Lake Tanganyika. Therefore, earth fill is necessary in this area to maintain the designed dimensions of the cross section of the storm water canal.

The cross sections and slope of the storm water canal are designed to discharge rain water from the city. However, a small amount of wastewater or waste will accumulate in the canal. Therefore, measures to prevent polluted water or waste from excessively flowing into the lake are taken into account in the concept design.

In the MP survey report, the relocated storm water canal was preliminarily designed as an open channel with concrete on both sides and along the bottom. However, in order to mitigate pollution of the lake water, the structure of the storm water canal is designed to have some filtering functions - the bed should be covered by cobbled stone (10 - 50 kg) and rectangular concrete dividers are to be placed every 5 m to prevent cobbles from being washed away.

The dimensions of the cross section of the relocated storm water canal are decided in consideration of the incoming discharge at the inlet, the length and the slope between inlet and outlet on the shoreline of Lake Tanganyika. The length is determined by a longitudinal line survey along the planned centerline of the relocated storm water canal.

The relocated storm water canal will be constructed alongside the perimeter of the port premises. There is a strip of land (the land belongs to BMPRA) between the fence of the neighboring tank yard and the fence of the port. The fence of the tank yard is the limit of the port premises. As the route of the relocated canal is planned along the port premises, the fence of the port has to be moved to the east where the storm water canal enters the port premises.. Further, the storm water canal will cross the fuel pipelines at one point. Therefore, careful attention will be paid in the detailed design.

The relocated storm water canal is designed according to the manual "CIVIL WORKS FOR ROAD - Guide for Drainage Work, 1994, published by Japan Road Association", "CIVIL WORKS FOR ROAD - Guide for Retaining Wall Work, 2012, published by Japan Road Association", and "CIVIL WORKS FOR ROAD - Guide for Culvert Work, 2010, published by Japan Road Association".

Wet masonry retaining walls with rubbles or cobbles are common in Burundi. It is therefore, concluded that local contractors can construct the storm water canal having the side walls made of wet masonry and the invert bed made of dry masonry with cobbles.

2-2-3 Outline Design Drawing

Outline Design Drawings are shown in Figure 2.7 to Figure 2.14.

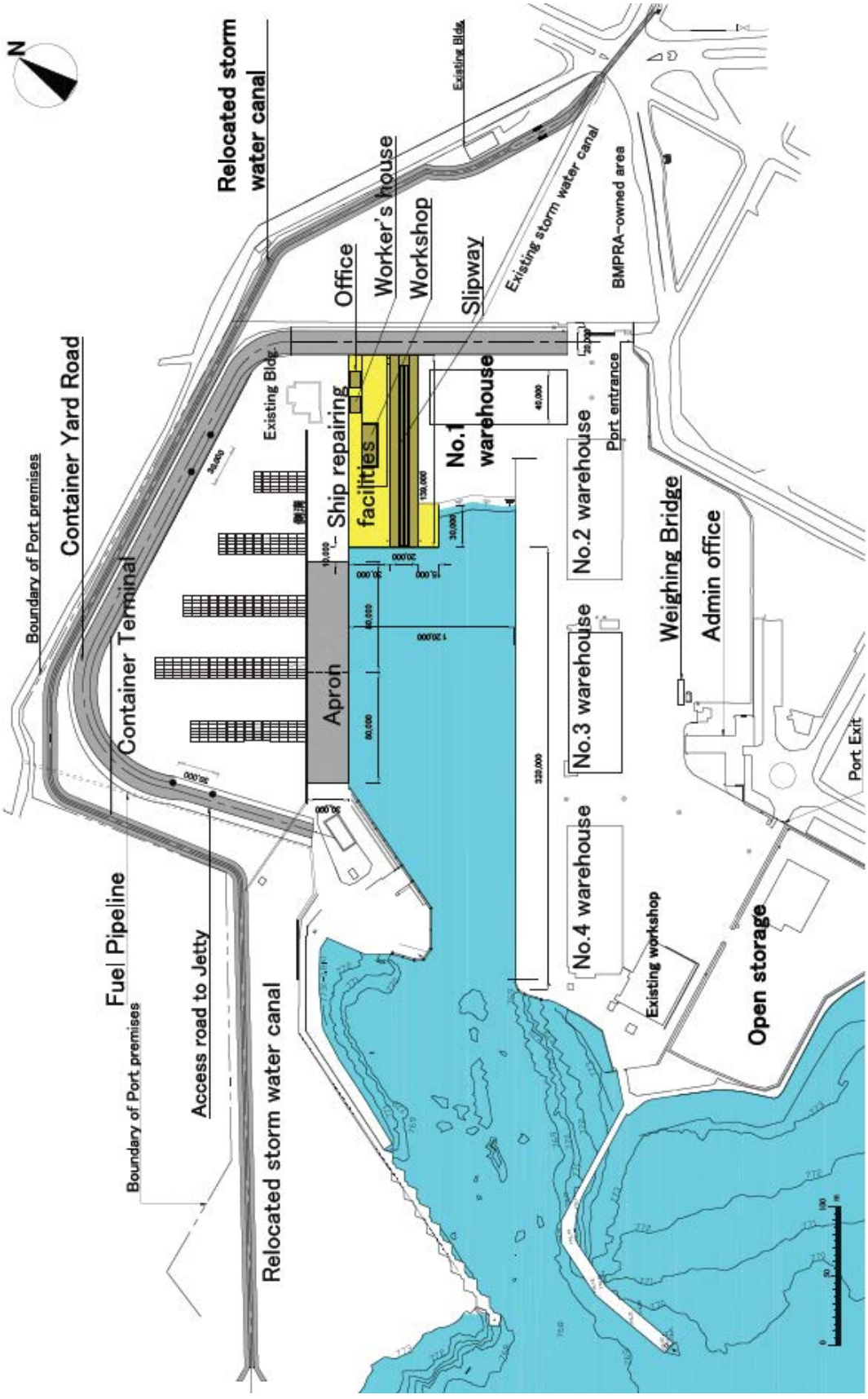


Figure 2.7 General Plan of Project site

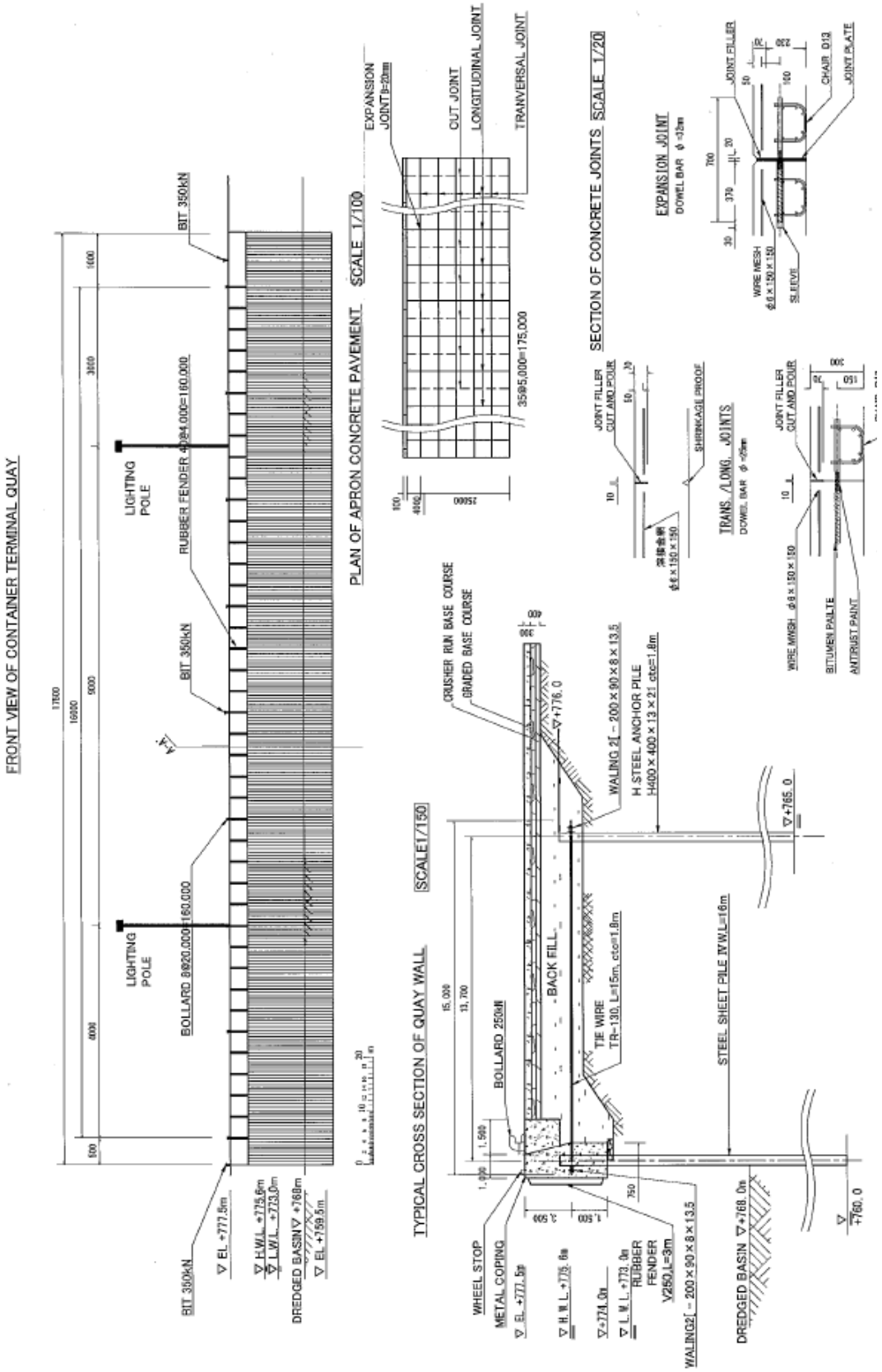


Figure 2.8 Quay of Container terminal

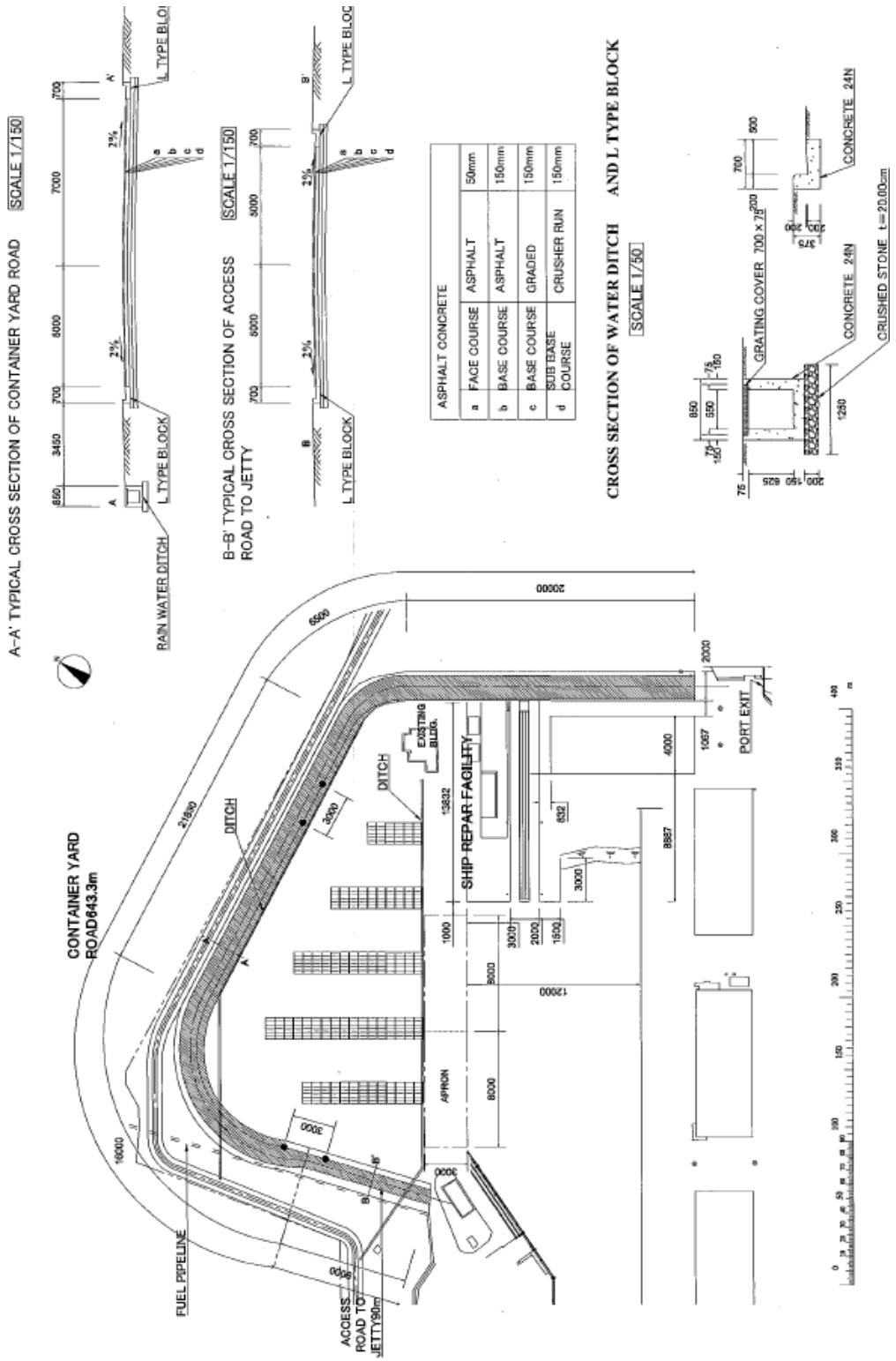


Figure 2.9 Inner port Road

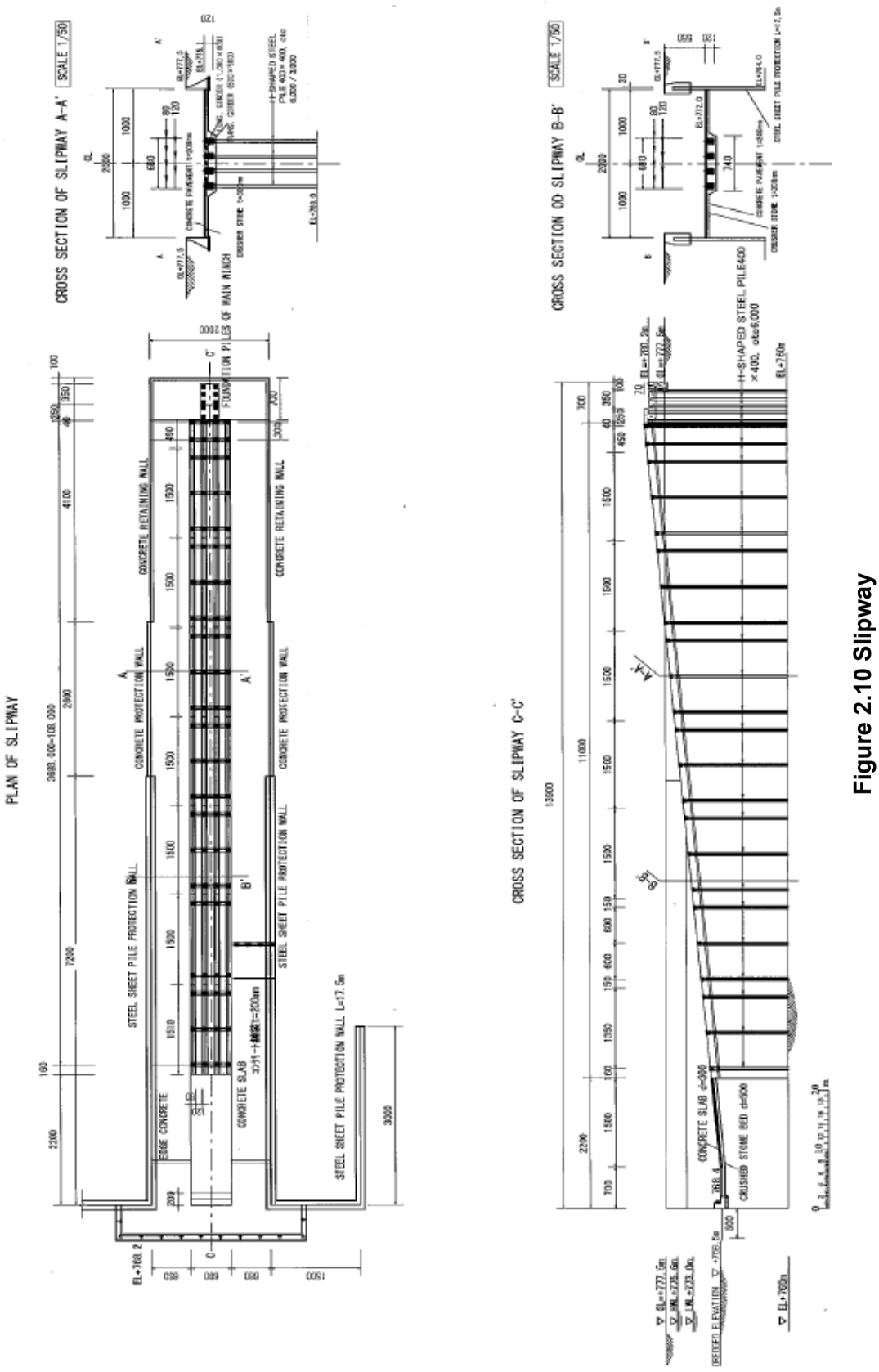


Figure 2.10 Slipway

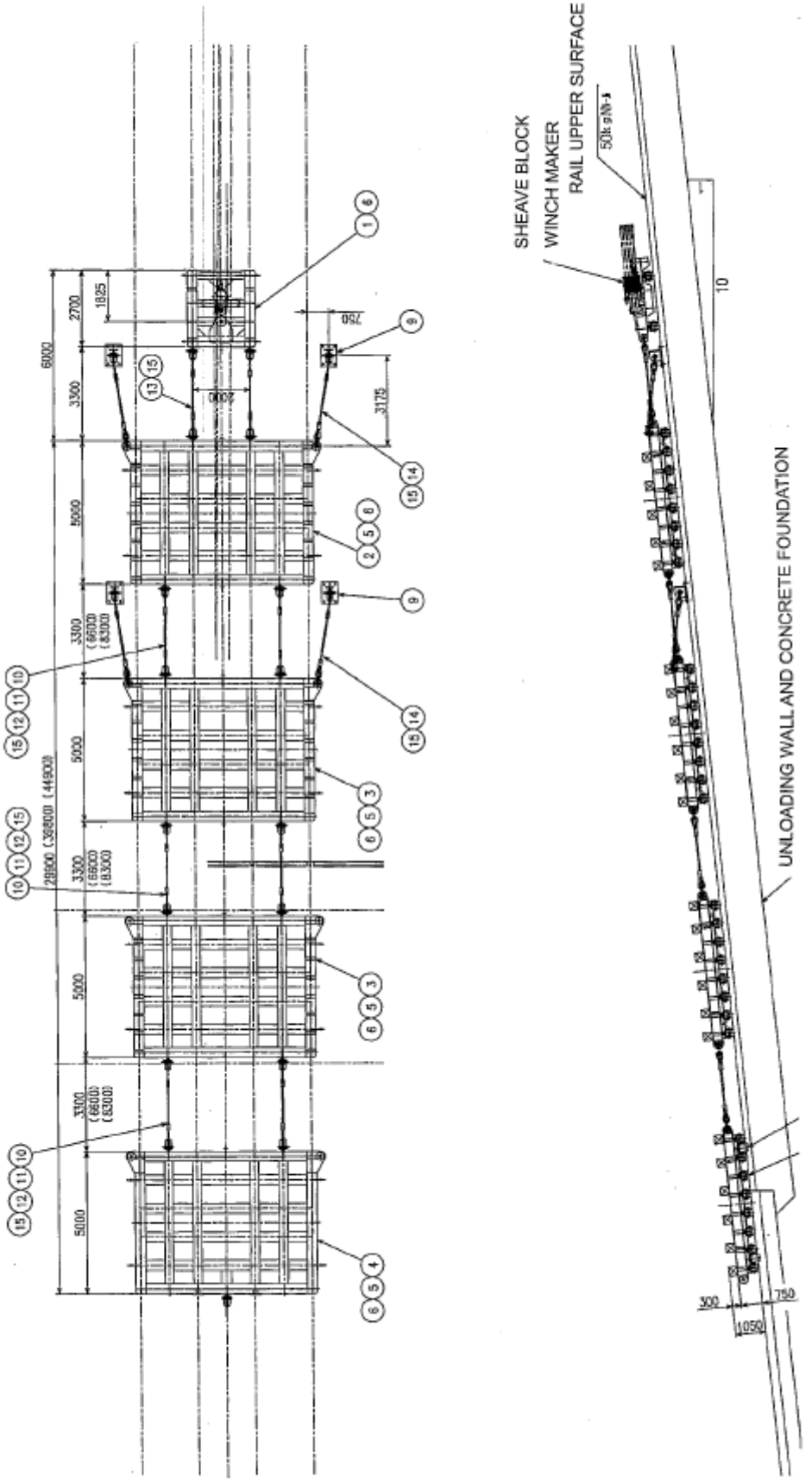


Figure 2.11 Erection drawing of cradle

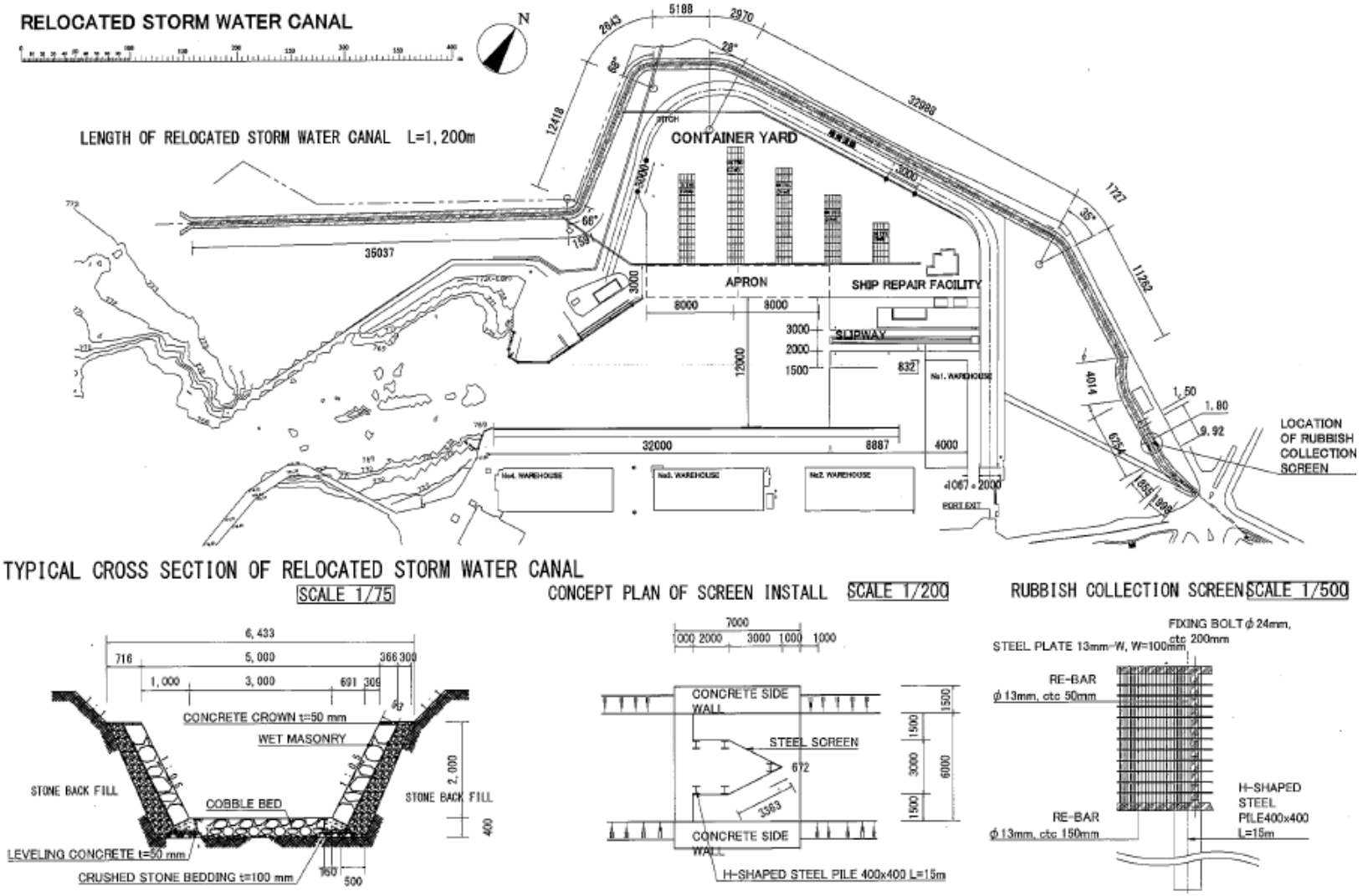


Figure 2.12 Relocated storm water canal

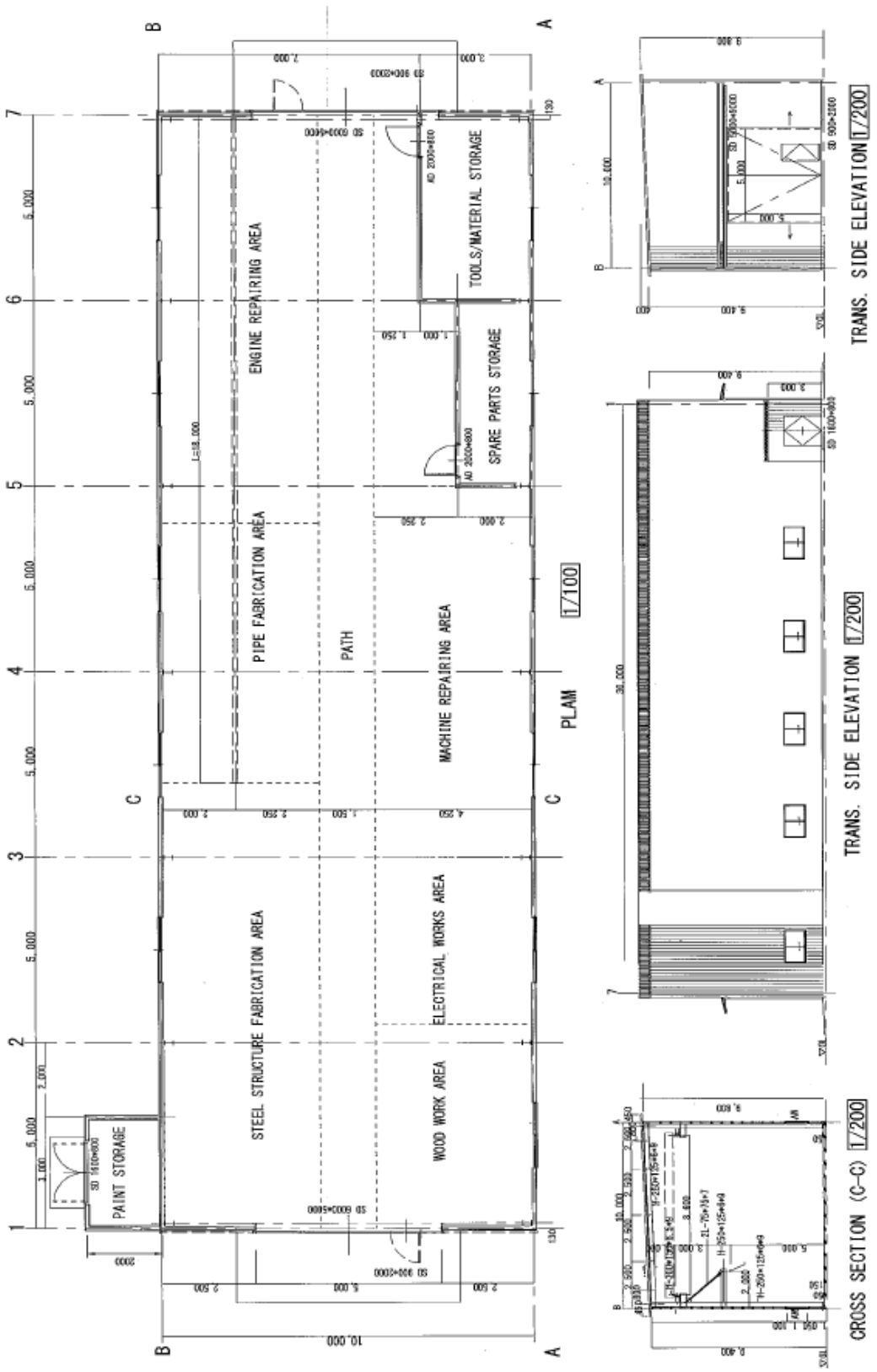


Figure 2.13 General Design of workshop

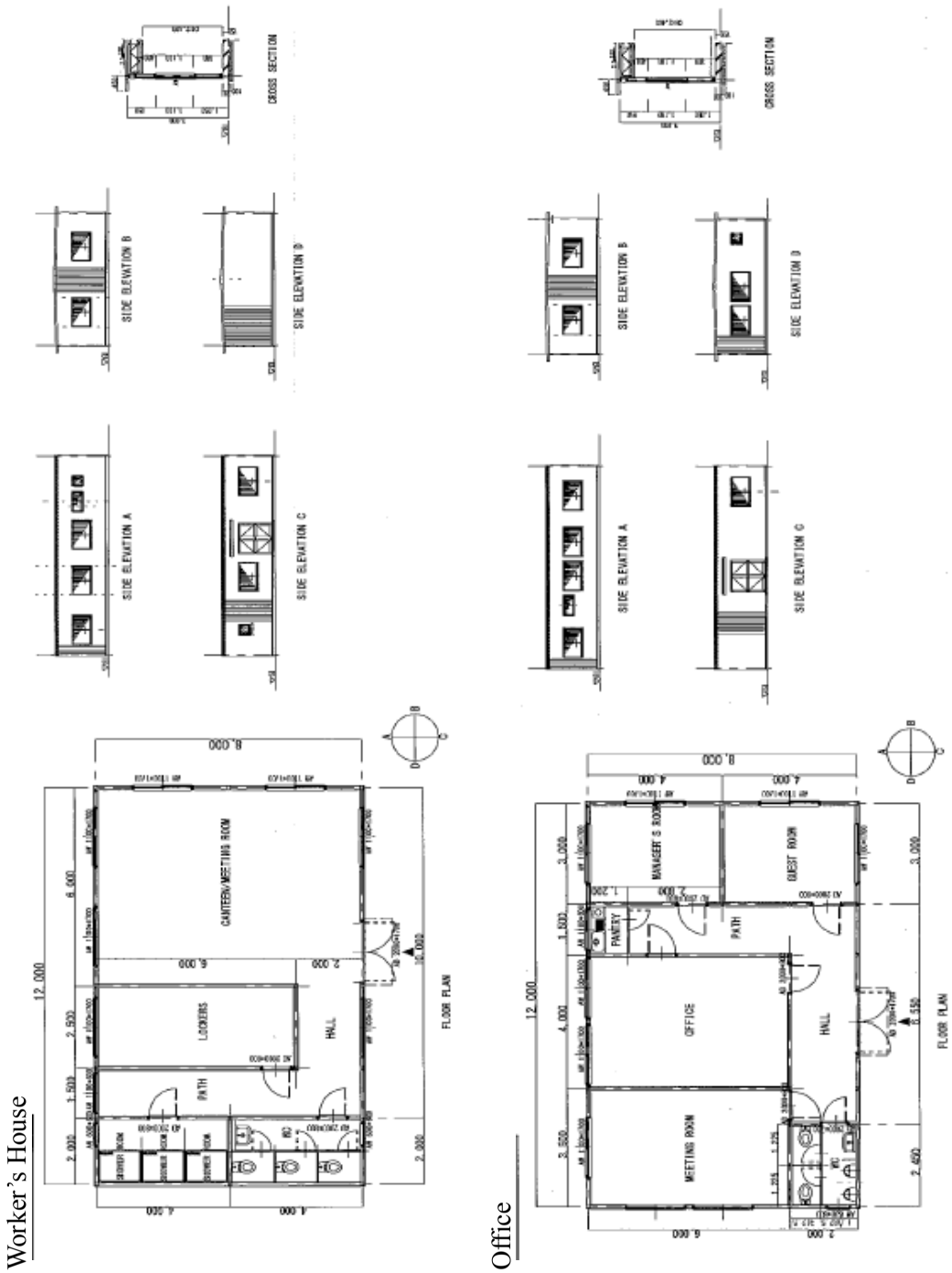


Figure 2.14 General Design of worker's house and office

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Container Terminal (including Inner Port Road and Dredging)

The Container Terminal consists of a steel sheet pile quay wall, apron paved with concrete, marshalling yard paved with asphalt, container stacking yard paved with concrete, port basin dredging, inner port road paved with asphalt, etc.

Local construction companies have some experience of asphalt pavement of the inner port road and concrete works of the coping beam of the quay wall, to mention a few. It is concluded that the local companies can implement these construction works. But other works, like steel sheet pile wall, apron pavement, port basin dredging, etc. are works which have not been implemented in the country, or are works which the locals have limited experience in. Therefore, training and supervision by Japanese engineers or skilled workers is required.

(2) Ship Repair Facility

Special construction works are required for the steel sheet pile wall, foundation piles of the slipway, concrete rail beams (girders), and in addition, rail fastening works requires accuracy, to.

Regarding procurement and installation of machines and equipment, fabrication/installation of the cradles (the main parts will be transported from Japan), installation of machine tools, etc. is necessary. Training and supervision by Japanese engineers or skilled workers is required.

(3) Relocation of Storm Water Canal

All the materials can be procured on site. The side walls are made of mortar masonry, which are seen everywhere in Burundi. It is concluded that skilled workers can be employed in Burundi.

It should be noted that the storm water canal should be relocated before the start of the steel sheet pile wall works for the container terminal and ship repair facility because the existing storm water canal flows into the port basin where these facilities are to be built.

2-2-4-2 Remarks on Construction Works

(1) Remarks for Preparation Works

Main preparatory works include, but not limited to, the following:

1) Concrete plant, storage for cement, aggregate, water, etc.
2) Asphalt plant, storage for asphalt/aggregate
3) Open storage and fabrication yard of steel materials (H-shaped steel/steel sheet piles, etc)
4) Fabrication and storage yard for re-bars
5) Storage of fittings and materials for quay wall /slipway
6) Parking for construction machines
7) Workers' house and guards' cabin
8) Site office/laboratory

Further, low voltage power cable (600V) is embedded passing through the project site to the transformer station located near the existing "Container Berth", which shall be relocated after the project site is set up by the contractor in order to avoid interference with the construction works.

(2) Remarks on Permanent Works

1) Driving of Steel Sheet Piles and H-shaped Steel Piles

Steel sheet piles and H-shaped steel piles are too long to be transported from Japan. According to the cost estimate and construction plans, they will be cut into two pieces, 12 meters maximum, for transportation and welded on site before their driving.
For the H-shaped steel piles to be driven as the foundation of the slipway, the resistance has to be observed and recorded to ensure they have designed bearing capacity.
Steel sheet piles will be driven by a vibratory hammer attached to a crawler pile driver. Flat and steady staging/ground for the pile driver is necessary for safety.

2) Coping Concrete of Steel Sheet Pile Quay Wall
Cement 42.5N is used for the coping concrete. Two-stage concrete placement is necessary because of the height of the coping concrete, i.e. 3.8 m.

3) Relocation of Storm Water Canal
Regarding the relocation of the storm water canal, the construction works will be carried out during the execution of the preparatory works employing local construction methods and workers by use of locally available construction equipment. Even though, proper workmanship has to be ensured by the contractor.

4) Excavation in water/Dredging
Pollution prevention canvas enclosure or the like (silt curtain) has to be installed to prevent excessive turbidity from spreading out of the dredging area. Turbidity or suspended solids have to be measured as part of environmental monitoring.

5) Ship Repair Facility
The construction area for the slipway should be backfilled and enclosed by temporary steel sheet pile wall while the foundation piles are driven. After piling, the area will be excavated for construction of the concrete girders, floor concrete and concrete protection/retaining walls as well as installation of rails and wire ropes in dry condition. After all the work is finished in dry conditions, the temporary steel sheet pile wall will be removed.

For the main equipment, suppliers, along with the necessity of supervisor (SV), are summarized as follows.

Table 2.19 Suppliers and Necessity of Supervisors

No.	Equipment	Suppliers	Necessity of SV
1	Cradles	Burundi / Japan	Necessary
2	Post type jib crane	Japan	Necessary
3	Machine tools (lathe, milling machine, drilling machine)	Japan	Necessary
4	Machine (Welders, grinders, hand-saw, metal-saw, etc	Japan	Unnecessary
5	Screw Air Compressor	Japan	Unnecessary
6	Portable Generator	Japan	Unnecessary
7	Cubicle	Japan	Necessary
8	Rough terrain Crane	Japan	Necessary
9	Pulling up & down system of slipway (winches, rope/wire, pulleys)	Japan	Necessary
10	Overhead Crane	Japan	Necessary
11	Pipe works (water, compressed air, gas/oxygen)	Burundi / Japan	Necessary

Source: Survey Team

As for the cradle, the parts will be fabricated in Japan and then in Bujumbura, most likely, at a local workshop. Skilled workers should be dispatched from Japan in order to maintain the quality of works and stay on schedule.

The cradle fabrication work entails check of materials, fabrication of steel structure, attachment of wheels, and fabrication/installation of wood block. The following works will be executed by dispatched skilled workers.

- Preparation of fabrication manual and supervision of fabrication procedures
- Schedule management
- Quality management (including quality of materials)
- Skill management (skill tests will be carried out as required)

2-2-4-3 Scope of Works

For the implementation of this project, the works executed by Burundi are to place a high tension power cable from an external power source to the cubicle and to relocate the low voltage power cable (600V) which is to be installed with the grant aid.

2-2-4-4 Supervision on Construction Works / Equipment Procurement

Supervision of the civil/building works and procurement of machines tools/equipment for this project will be implemented by the staff as follows.

Team Leader:
Disseminate significance and particulars of this construction works as a JICA grant aid project, monitor/confirm the construction progress and provide instructions to the contractor from time to time.

Construction Supervision on site (civil works/building):
Supervise construction of civil and building works from the beginning till the completion of the works.

Construction Supervision on site (power distribution/supply, water supply, lightings):
Supervise installation works of the ship repair facilities and installation of electric/ machinery/equipment in the buildings.

Ancillary Facilities (vessel pulling up & down equipment, machinery):
Carry out inspection of the tools/materials procured from Japan before shipping and be present for the matching inspection of the tools/materials by a third party before shipping. Also supervise construction works of the vessel pulling equipment including winch installation and installation works of the machinery in the workshop.

Construction Supervision (final inspection):
Carry out final inspection of the construction works.

The supervision organization is as follows.

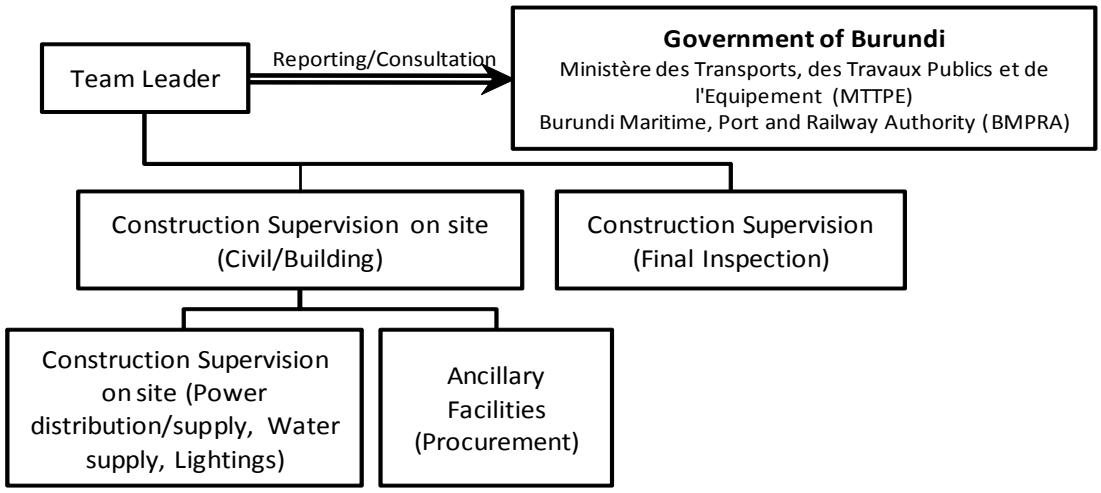


Figure 2.15 Organization Chart for Construction Supervision

2-2-4-5 Quality Control Plan

Table 2.20 Quality Control Plan

Major type of Work	Construction Phase	Tests/Items to be supervised	Remarks
Steel Sheet Piles/ H-shaped steel anchor pile	After driving of steel sheet pile/ H-shaped steel anchor pile	Driving record	Penetration depth/required time, top elevation
H-shaped steel pile	During driving of H-shaped steel pile	Driving record	Penetration depth/required time, top elevation
Tie-Wire	During tensioning the tie wire	Measuring tension	
Concrete	Trial mix	Aggregates, slump, air, temperature, strength after 7 days/28 days	
	During casting	Slump, air, temperature, strength after 7 days/28 days	
Embankment	Each layer	Density test	
Road	Road bed	CBR test	
	Lower base course	CBR test	
	Upper base course	Degree of compaction, particle distribution	
	Asphalt base course	Degree of compaction, particle size distribution, amount of asphalt	
	Asphalt surface course	Degree of compaction, particle size distribution, amount of asphalt	

2-2-4-6 Procurement Plan

As a result of the survey of construction materials/machines in Burundi, it was found that the

number of construction machines is inadequate for the project. Some of them are new and in good condition, although most of them are old. Rental fee is much higher than that of Japan even though the type of machine is considerably old. Special construction machines like pile driver and other machines which are not available in Burundi will be transported from Japan.

As for the construction materials to be procured for the project, stones/sands, aggregates, soils, and cements are produced for civil works within the country. All other materials will be imported from Japan or third world countries. Special construction materials - steel sheet piles, H-shaped steel piles, tie wire and fittings to the quay wall - will be procured from Japan. Other materials will be from neighborhood third world countries, such as Zambia, Uganda, Kenya, and South Africa.

2-2-4-7 Training Plan for Initial Operation/Maintenance

During project implementation, training of workers in Burundi by Japanese skilled workers is required for safe and sustainable use of the provided facilities/machinery.
Training plan required for operation/maintenance during project implementation is shown in the following table.

Table 2.21 Training Plan for Initial Operation/Maintenance

No.	Facility	Training	Time to be Dispatched	Period
1	Cradles	Maintenance procedures such as change of wheels, change of wood blocks, etc.	During fabrication	2 persons x 2 months
2	Pulling up & down system of Slipway (Winches, pulleys capstan, etc.)	Maintenance procedures for the system (Training for the preparation of the pulling up & down manual for operation should be provided by the contractor)	During installation and after completion	3 persons x 1 month
3	Assembling / Installation of post type Jib Crane	Supplier manuals for assembling/ installation, operation and maintenance	During assembling / installation	1 person x 11 days
4	Overhead Crane in Workshop	Supplier manuals for assembling / installation, operation and maintenance	During and after installation	1 person x 5 days
5	Installed Equipment in Workshop	Suppliers manuals for operation and maintenance	When installing equipment	1 person x 11 days
6	Rough-Terrain Crane	Supplier manuals for operation and maintenance	On hand-over	1 person x 5 days

Training for the operation of pulling the cradles up & down will be carried out after the slipway is completed. But this is not sufficient for safe pulling of vessels, which can weigh up to 1,000 ton maximum. Practical training using a vessel on the slipway by experienced specialist is required. Training on the operation of pulling the ship up & down is to be carried out by a team of 6 individuals on average. Therefore, practical training will be finished in a short period of time as training will be provided to 10 workers.

The outline of the practical training is shown below.

Table 2.22 Practical Training for Vessel Pulling up & down System

Work Item	Works and Number of Workers required	Workers to be trained	Number of Specialist to be dispatched	Period to be dispatched
Slipway Pulling up & down	Whole command: 1 person Winch operation: 1 person (pulling up & down, drawing in) Capstan surveillance: 2 person (drawing in) Wood block adjustment for supporting vessel: 2 persons (center wood block, side wood block)	10 persons	Whole command: 1 person Winch operation to control ship body and wood block adjustment: 1 person Total: 3 persons	3 persons x 1 Month

2-2-4-8 Soft Component Plan

No soft component is planned.

2-2-4-9 Implementation Schedule

In case the project is implemented by use of grant aid provided by the Japanese Government, an agreement is signed between the executing agency of Burundi and a Japanese consulting firm(s) for detailed design and construction supervision after the exchange notes and grant agreement have been signed between the Japanese government and Burundian government. Based on the agreement, the detailed design for the project is conducted and bidding documents are prepared. The consultant will assist the executing agency in carrying out the bidding to select a successful Japanese contractor(s), with whom the executing agency will sign the construction contract. The project will be completed upon the completion of the construction works in accordance with the contract terms and conditions. The project implementation schedule is shown in Figure 2.16.

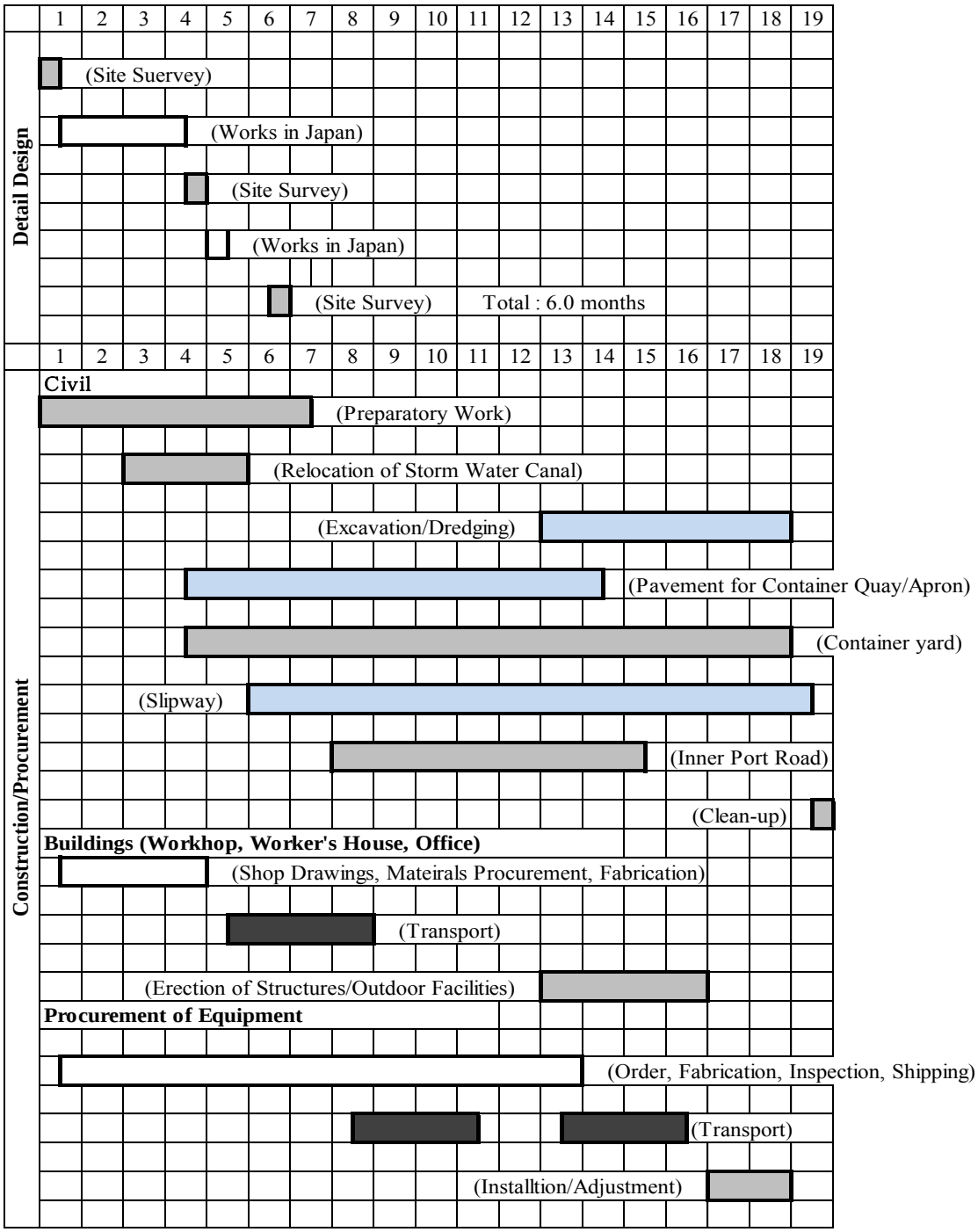


Figure 2.16 Implementation Schedule

2-3 Obligations of Recipient Country

2-3-1 Items to be Implemented by Recipient Country

The following project items have to be carried out by Burundi for implementation of this project.

2. Transformer Shed contaminated by PCB

It was observed that the ground in the transformer shed at the existing container quay, which is outside but near the project site, was contaminated by PCB.

Dispersion of contamination must be prevented and the area, including the transformer shed, should be fenced and a signboard of caution should be put up to keep the workers away .

3. Tax Exemption

Contractors and consultants to be engaged in project execution are exempted from taxation according to the bilateral agreement. For the equipment to be provided under this project, materials/equipment to be imported and incorporated into the project works and temporarily imported construction equipment or the like by the contractors to execute this project, BMPRA should inform the Government-affiliated organizations that they should be tax-exempt. In the same manner, BMPRA should inform the Government-affiliated organizations that individuals who enter and stay in Burundi to execute the services/works of this project or the contractors to execute the works of this project shall be exempted from income tax or corporate tax.

4. Undertakings by Burundian Side

BMPRA will issue certifications for issuing individual visa to enter Burundi for this project and provide pass permit to enter the site of the port premises. BMPRA will also issue certifications which would be required for this project implementation by the contractors, etc.

5. Acquisition of Building Permission

Although all the construction works of this project will be done in the port area, in case permission is required from the Burundi government, BMPRA will provide all the support required to get the permission.

6. Banking Arrangement

It is necessary for the Burundian side to decide a government organization or a bank which will make a banking agreement with the Japanese Bank in order to transfer payments to the contractors and the consultants who will be employed to execute this project. Commission, which is generally proportional to the amount written on the Exchange of Notes (E/N), is required and borne by the Burundi side.

7. Issuing of Authorization to Pay (A/P)

It is necessary for the government organization or the bank of Burundi mentioned above to issue Irrevocable Authorization to Pay (A/P) to the consultants and the contractors after each original contract document is certified by JICA. Commission, which is borne by the Burundi side, is required for issuing the certification according to the original contract documents and for issuing the certification of contract amendments.

8. Hand over the Project site to the Contractor

In addition to the land where the facilities are to be constructed, the land owned by BMPRA between the city road and the fence of the port will be handed over to the contractor to use as a working yard when construction works are commenced.

9. Laying of High Voltage Cable in the Project Site

BMPRA is required to extend high voltage power supply to the cubicle to be installed for this project because the contractor will not be allowed to execute the cable laying works outside of the construction site.

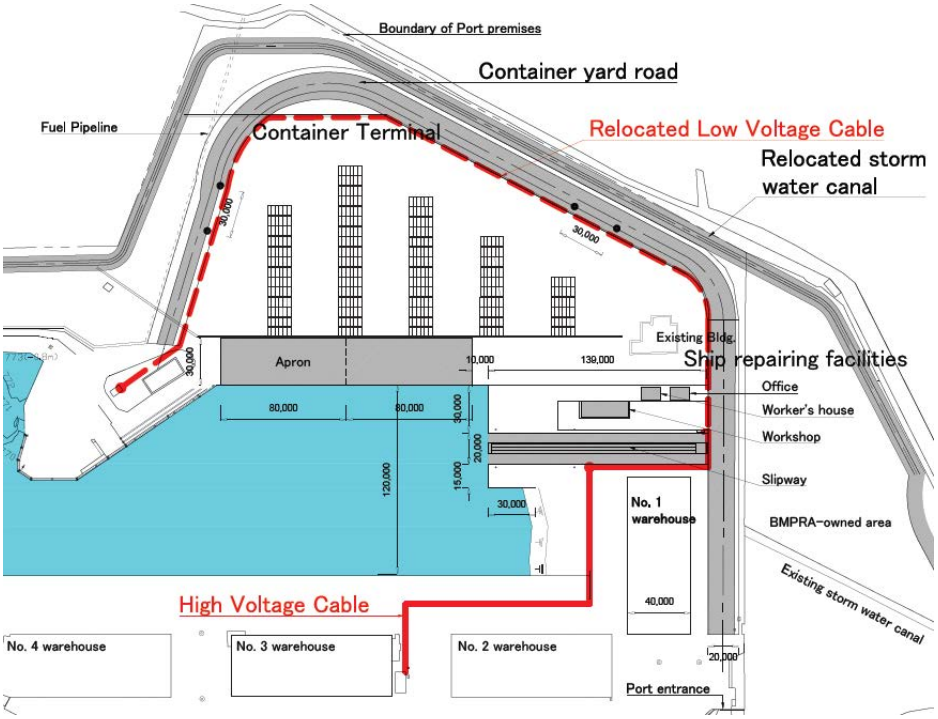


Figure 2.17 Extension of High Voltage Cable to Construction Site

The cost of power supply extension is estimated to be around 6,400,000 JPY, 85% of which accounts for the material costs of high voltage cable.

1. Relocation of the power cable

The 600V power cable embedded passing the project site to the transformer station located near the existing "Container Berth" shall be relocated the project site set up by the contractor in order to avoid interference with the construction works.

10. Regular Cleaning of the Relocated Storm Water Canal

Not only rain water but also waste and wastewater will flow into the lake through the relocated storm water canal. Therefore, the drainage equips rubbish collection screen to remove or reduce waste. And the wastewater flowing into Lake Tanganyika will be aerated by cobbles paved on the canal bed. BMPRA should implement regular cleaning of the relocated storm water canal to maintain rubbish collection and wastewater aeration.

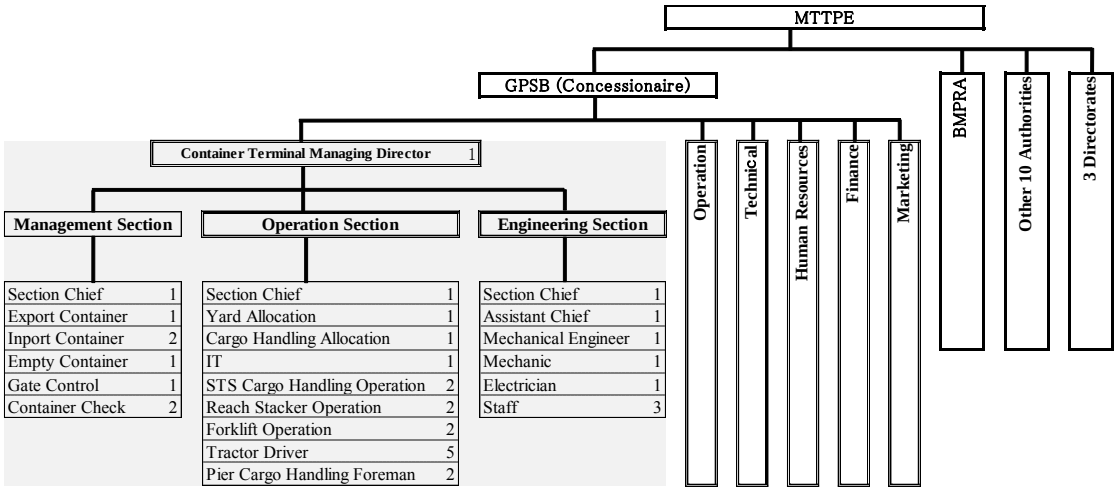
2-4 Project Operation Plan

2-4-1 Operation and Maintenance Plan of Container Terminal

BMPRA is planning to grant the operation/maintenance of the container terminal to the port concessionaire (GPSB), and GPSB has been assuming the operation/maintenance of the container terminal in their business plan. Therefore, the organization of the container terminal operation will not be carried out by an independent operator but by a container terminal department or the likes of GPSB.

In case the port concessionaire operates the container terminal, the appropriate organization for operation/maintenance of the container terminal will be as shown in the following figure. It is worth mentioning that the number of people of the organization is assumed based on the container demand in 2025. Therefore, the workforce shown in Note 1 of the figure will be

appropriate at the initial stage.



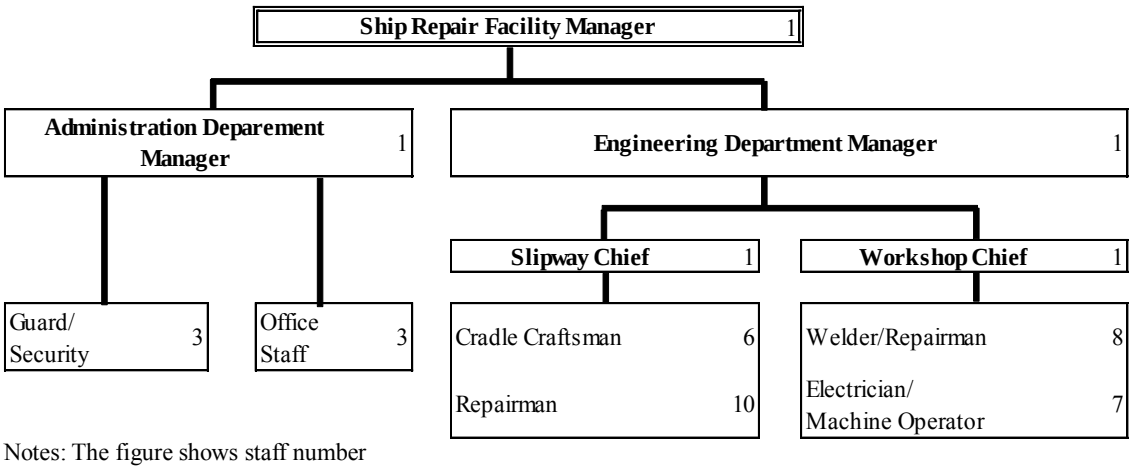
Note 1 : Following staffs will be assigned for start-up of Contanier Terminal operation because of small amount of Container Throughput
a) Management Section chief concurrently to serve as Operation Section chief.
b) 1 staff for each role of Management section, 6 persons in total.
c) Regarding Operation Section, Yard Allocation and Cargo Handling Allocation will be taken care by 1 person.
STS Cargo Handling Operater will be 1 person at the beginning. 11 persons in total without Section Chief.
d) Engineering Section staff is as above from the beginning.
In case GPSB operates the terminal, the existing staff can concurrently serve for this terminal.
Note 2: The figure shows staff number

Figure 2.18 Organization of Operation and Maintenance of Container Terminal

2-4-2 Operation and Maintenance Plan of Ship Repair Facility

BMPRA plans to grant the operation and maintenance of the ship repair facility to the port concessionaire (GPSB) or local private companies. It is considered that both can operate and maintain the ship repair facility because GPSB is operating the existing workshop of Bujumbura port and repairing the cargo handling equipment and the local private companies (Metalusa and Metaluvia) have experience in ship repair.

In the abovementioned case, management will be undertaken by either the GPSB head office or the headquarters of the local companies, so the operation/maintenance organization of the ship repair facility is led by a manager as shown in the following figure.



Notes: The figure shows staff number

Figure 2.19 Organization of Operation and Maintenance of Ship Repair Facility

2-4-3 Management and Cleaning of Relocated Storm Water Canal

It is anticipated that waste and wastewater will flow into the relocated drainage from the city until the completion of the construction of a rain water discharge network in Bujumbura city. In this regard, BMPRA has to maintain and periodically clean the relocated storm water canal until the completion of the rain water discharge network of Bujumbura city in order to reduce the amount of waste and wastewater flowing into Lake Tanganyika. Occasional cleaning will be required on specific occasions such as when the amount of waste is screened after flooding.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

The initial costs to be borne by the grant aid of Japan and the Burundian side are respectively estimated for project implementation in accordance with the conditions set out in 2-5-1-2. The estimated cost to be borne by the grant aid, however, does not mean the ceiling amount which is mentioned in the exchange of notes (E/N) between Japan and Burundi.

Table 2.23 Initial Cost to be borne by Grant Aid

Item			Project Cost (million JPY)
Facilities	Civil Works	Dredging	This Page is closed due to the confidentiality.
		Quay wall	
		Container Yard	
		Inner Port Road	
		Silpway	
		Protection Wall	
		Cradles	
		Storm Water Canal	
	Buildings	Workshop	
		Workers' House	
		Office	
Equipment		Rough Terrain Crane	
		Jib Crane	
		Over Head Cranes	
		Lathe	
		Milling Machine	
		Upright Drilling Machine	
		Screw Air Compressor	
		Tools	
Detailed Design/Construction Supervision			

2-5-1-1 Initial Cost to be borne by Burundian Side

Approximate expenses to be borne by the Burundian side for project implementation are summarized in the following table.

Item	Approx. Cost	
Commission for banking arrangement	42.2 million BIF	2.72 milliion JPY
High-voltage Cable Extension to the project site	66.6 million BIF	4.30 million JPY
Low-voltage Cable Relocation at the project site	33.0 million BIF	2.13 million JPY
Total	141.8 million BIF	9.15 million JPY

2-5-1-2 Conditions for Cost Estimate

The following conditions are set out for cost estimation.

- Time when the cost was estimated: August 2013
- Exchange rates: 1US$=100.47JPY, 1BIF=0.0645JPY
- Construction/procurement: As shown in Figure 2-16 Implementation Schedule
- Others: Cost estimate complies with the JICA guidelines

2-5-2 Operation and Maintenance Cost

2-5-2-1 Operation and Maintenance Cost of Container terminal

Operation Cost

Container terminal operation cost consists of fuel and personnel expenditures required for its operation.

As shown in the following table, the fuel cost is calculated from the operating time of the cargo handling equipment based on the container handling volume in 2025.

Table 2.24 Fuel Cost of Container Terminal

Cargo Handling Equipment	Operation hours/day (excluding waiting time)	Fuel price/kl (US$)	Fuel cost/year/set (US$)	At the beginning		Full Operation	
				set	Fuel cost/year (US$)	set	Fuel cost/year (US$)
Mobile Container crane	2.5	1,200	133,200	1	133,200	2	266,400
Reach Stacker	5	1,200	148,800	2	297,600	2	297,600
Forklift	3	1,200	16,800	1	33,600	1	33,600
Tractor Head	5	1,200	210,000	2	420,000	5	1,050,000
Total					884,400		1,647,600

Notes: The fuel price is BIF1,800 same as construction cost estimation.

Staff cost for the container terminal operation is calculated based on the labor unit cost shown in the organization chart and used for estimation. Staff cost for manager, engineer, etc. is assumed to be increased 20% from the MP survey.

50% of the cost of the technical staff of the ship repair shop is included as they will also work for the existing ship repair shop.

The results are as follows.

Table 2.25 Staff Cost for Container Terminal Operation

Personnel	Unit cost/day (BIF)	At the beginning			Full Operation		
		Number	Annual Personnel Cost (1000 BIF)	Annual Personnel Cost (US$)	Number	Annual Personnel Cost (1000 BIF)	Annual Personnel Cost (US$)
1 Container Terminal Department							
Manager	96,000	1	25,344	16,500	1	25,344	16,500
Secretary	36,000	1	9,504	6,200	1	9,504	6,200
2 Management Section							
Section Chief	60,000	1	15,840	10,300	1	15,840	10,300
Export Container	36,000	1	9,504	6,200	1	9,504	6,200
Inport Container	36,000	1	9,504	6,200	2	19,008	12,300
Empty Container	18,000	1	4,752	3,100	1	4,752	3,100
Gate Control	18,000	1	4,752	3,100	1	4,752	3,100
Container Check	12,000	1	3,168	2,100	2	6,336	4,100
3 Operation Section							
Section Chief	60,000	0	0	0	1	15,840	10,300
Yard Allocation	36,000	1	9,504	6,200	1	9,504	6,200
Cargo handling Allocation	36,000	1	9,504	6,200	1	9,504	6,200
IT	18,000	1	4,752	3,100	1	4,752	3,100
STS Cargo Handling Operation	22,000	1	5,808	3,800	2	11,616	7,500
Reach Stacker Operation	22,000	2	11,616	7,500	2	11,616	7,500
Forklift Operation	22,000	2	11,616	7,500	2	11,616	7,500
Tractor Driver	22,000	2	11,616	7,500	5	29,040	18,900
STS Cargo Handling Foreman	16,000	2	8,448	5,500	2	8,448	5,500
4 Engineering Section							
Section Chief	60,000	1	7,920	5,100	1	15,840	10,300
Assistant Chief	36,000	1	4,752	3,100	1	9,504	6,200
Mechanical Engineer	60,000	1	7,920	5,100	1	15,840	10,300
Mechanic	27,000	1	3,564	2,300	1	7,128	4,600
Electrician	26,000	1	3,432	2,200	1	6,864	4,500
Labor Staff	9,000	3	3,564	2,300	3	7,128	4,600
Annual Personnel Cost (US$)				121,100			175,000

Maintenance Cost

The annual maintenance cost of the facilities is estimated as US$128,000. The maintenance cost of the cargo handling equipment shown in the table below is estimated referring to the costs which were provided by the port concessionaire and on the condition that they will be procured by the Burundian side. As they are likely to procure used equipment, the maintenance cost for the cargo handling equipment is assumed to be 4% of the procurement cost.

Table 2.26 Maintenance Cost of Container Handling Equipment

Container Handling Equipment	Procurement Cost (US$)	Annual Maintenance Cost (US$)	Initial Operation		2025	
			Number	Annual Maintenance Cost (US$)	Number	Annual Maintenance Cost (US$)
STS Container Crane	500,000	20,000	1	20,000	2	40,000
Mobil Crane	800,000	32,000	2	64,000	2	64,000
Container Fork Lift	330,000	13,200	2	26,400	2	26,400
Tractor Head	200,000	8,000	2	16,000	5	40,000
Truck	40,000	1,600	3	4,800	7	11,200
Total				131,200		181,600
Note: Annual maintenance cost is assumed to be 4% of the procurement cost.						

Accordingly, the total annual operation and maintenance cost (O&M cost) is estimated as shown

in Table 2.27. The income of the container terminal is estimated to be about US$0.47 million in 2025, as the O&M cost of US$2.13 million in 2025 is about 81% of the revenue of the container terminal operation of about US$260 million. The container terminal can be operated by the concessionaire. However, as the fuel cost occupies about 78% of the O&M cost, fuel price should be carefully watched to undertake appropriate measures if necessary.

Table 2.27 Annual Operation and Maintenance Cost of Container Terminal

Unit : US$

		Initial Operation		2025	
Operation Cost	Fuel	884,400	1,004,400	1,647,600	1,820,900
	Personnel	120,000		173,300	
Maintenance Cost	Facility	128,000	259,200	128,000	309,600
	Cargo Handling Equipment	131,200		181,600	
Operation/Maintenance Cost Total			1,263,600		2,130,500

2-5-2-2 Operation and Maintenance Cost of Ship Repair Facility

The O&M cost for the ship repairing facilities is estimated in reference to the power consumption of a shipbuilding company having similar equipment and capacity and located on the inland sea in Japan. For cost estimation, the rates of power and gas are based on those collected during the site survey and the water supply is considered zero as lake water will be consumed.

Table 2.28 Operation Cost of Ship Repair Facility

Facility Scale, Cost, etc.	Shipyard in Japan	This Project	Remarks
Jib crane 5 ton	1	1	
Rough terrain crane	2	1	
Workshop building	5mx25m=375m²	0mx10m=300m²	
Machinery (Lathe, etc.)	3	3	
Welding machine	6	6	
LOA of vessels	20～60m	12～65.70m	
Annual docking ships	30	25	Number of ships to be repaired in 2025
Electricity cost (JPY/month)	¥1,920,000	¥1,600,000	These costs are proportional to the number of annual docking ships because the function of both ship repair facilities are similar to each other.
Gas/oxygen cost (JPY/year)	¥1,370,000	¥1,142,000	
Water cost (JPY/year, incl. sewerage cost)	¥360,000	¥0	Lake water is used in Bujumbura.
Annual cost total (JPY)	¥3,650,000	¥2,742,000	
Annual cost total (US$)	36,329	27,292	

Staff cost for the ship repairing facilities shown in Table 2.29 is calculated based on the labor unit cost as well as the cost for container terminal. Staff cost for manager, engineer, etc. is assumed to be increased 20% from the MP survey and 50% of the cost of the technical staff of the ship repair shop is included as they will also work for the existing ship repair shop.

As the maintenance cost is estimated to be about US$73,000 when the costs for construction of the facilities and procurement of machineries are taken into account, the annual O&M cost of the ship repairing facilities are as shown in Table 2.30.
In 2025, it is envisaged that 5 ships will need large scale repairing and 20 ships will require small scale repairing. On the assumption that the charge for relatively large scale repairing is US$22,000 (US$6,000 for pulling the ships up and down, US$16,000 for repairs) on average and that for relatively small scale repairing is US$9,000 (US$6,000 for pulling the ships up and

down, US$3,000 for repairs) on average, the annual revenue will be about US$290,000, which will be almost same with the O&M cost. It is therefore recommended that the ship repairing facilities should be utilized for other works like repairing of machineries, etc. In addition, they can be used to repair ships of other countries.

Table 2.29 Staff Cost for Ship Repair Facility

Personnel		Unit Cost/day (BIF)	Number	Annual Personnel Cost (1,000 BIF)	(US$)
1	Ship Repair Facility				
	Manager	96,000	1	25,344	16,300
	Secretary	36,000	1	9,504	6,100
2	Administration Department				
	Manager	60,000	1	15,840	10,200
	Other Staff	36,000	3	28,512	18,300
	Guard/Security	10,000	3	7,920	5,100
3	Engineering Department				
	Manger	60,000	1	15,840	10,200
	Cradle Section Chief	50,000	1	13,200	8,500
	Cradle Craftsman	16,000	6	25,344	16,300
	Repairman	17,000	10	44,880	28,800
	Workshop Chief	50,000	1	13,200	8,500
	Welder/Repairman	17,000	8	35,904	23,100
	Electrician/Machine Operator	26,000	7	48,048	30,800
Annual Personnel Cost (US$)					182,200

Table 2.30 Annual Operation and Maintenance Cost of Ship Repair Facility

	Unit : US $
Annual Operation Cost	27,292
annual Personnel Cost	182,200
Annual Maintenance Cost	73,000
Total	282,492

2-5-3 Maintenance of Storm Water Canal

The storm water canal which will be constructed as a project component should be periodically cleaned to maintain its function to distillate polluted water. For maintenance, 4 workers and 1 truck will be required once a week. The maintenance cost is calculated as shown in Table 2.31.

Table 2.31 Cleaning of Storm Water Canal

	Cost/day（BIF)	Cost/year（BIF)
Damp truck (2 ton)	198,700	10,332,400
Personnel cost (4)	36,000	1,872,000
Total (BIF)		12,204,400
Total (US$)		US$7,835

The maintenance cost is estimated to be about 12.2 million BIF (approx. US$7,835), which will be a very small amount of about 0.3% of the revenue of the container terminal.

Chapter 3 Project Evaluation

3-1 Preconditions

The following terms and conditions have to be met for construction, operation and maintenance of the facilities which will be built or procured for the project.

Acquirement of Building Permit

BMPRA is required to assist the contractor in acquiring a building permit from relevant authorities of the Burundian government if such a permit is necessary for project implementation.

Environmental Management

BMPRA is required to establish an organization in charge of the environmental management for construction and operation of the project facilities. The organization should monitor the environment of the construction site, other port premises and their vicinity before and during construction.

Deployment of Officials to Manage Project Facilities

For appropriate management of the project facilities including the slipway after completion, BMPRA should assign officials in charge of the relevant facilities. The assigned officials should be provided training for the initial operation and management of operations.

Conceding of Container Terminal and Ship Repairing Facilities

To operate and maintain the container terminal and ship repairing facilities which will be completed under the project, their concessionaires have to be decided in advance of their completion.

Procurement of Container Handling Equipment

The following equipment should be procured by the Burundian side before October 2016:
- Mobile container STS crane 35 ton at 19 m radius: 1
- Reach stackers 35 ton: 2 (1 for 3 tiers for loaded, 1 for 4-tiers for empty)
- Tractor heads: 2
- Terminal chasis: 3

Periodical Cleaning of Storm Water Canal

BMPRA should periodically clean the storm water canal in order to maintain its function to screen debris and distillate polluted water.

3-2 Necessary Inputs by Recipient Country

Commission for Banking Arrangement

The Burundian authority which will make payments to the consultant and contractor(s) by use of the grant aid should bear a certain proportion of the amount described in the exchange of notes as commission (E/N). The commission is estimated to be about 42.2 million BIF.

3-2-1 Extension of High-voltage Power Cable to Project Site

BMPRA should extend the high-voltage power cable to the project site at its own expense. The extension will cost about BIF 66.6 million.

3-2-2 Relocation of Low-voltage Power Cable passing Project Site

BMPRA should relocate the low-voltage power cable passing through the project site to the transformer station located near the existing "Container Berth.", which will cost BIF 33 million.

3-3 Important Assumptions

The external conditions with respect to the container terminal development at Bujumbura Port are as follows:

1. Dedicated Container Train Operation between Dar es Salaam Port and Kigoma Port

Around 72% (31,680 TEUs in 2025) of the containers to be handled at Bujumbura Port, including the empty ones, are assumed to be transported via Dar es Salaam Port and Kigoma Port. Therefore, the container throughput of Bujumbura Port highly depends on the operation of the dedicated container train between Dar es Salaam Port and Kigoma Port. In June 2013, in order to promote container transport by railway, TPA called for expression of interest (EOI) for the feasibility study on the TPA's project investment to TRL for the dedicated train operation. However, the project has not been in progress. It should be noted that the transit container cargo of Burundi handled at Dar es Salaam Port was 10,748TEUs in 2012 (17,457TEUs estimated in 2025).

2. Rehabilitation of Container Terminal at Kigoma Port

Rehabilitation of the container terminal at Kigoma Port is one of the conditions to promote container transport on Lake Tanganyika. Owing to the deterioration of the TRL railway between Dar es Salaam and Kigoma, container throughput of Kigoma Port abruptly decreased while the container gantry crane remained unused for a long time because of shortage of spare parts. In August 2012, TPA called for an international bid for rehabilitation of the gantry crane to restore the container handling capacity of Kigoma Port.

3. Container Terminal Development at Mpulungu Port

The development of the container terminal at Mpulungu Port is also one of the external conditions in relation to the improvement project of Bujumbura Port. Currently, Mpulungu Port has one berth for general cargo handling and the berth has only a 20m long quay wall, which is not capable of handling containers. Under the coordination of AfDB, both the governments of Burundi and Zambia exchanged Memorandum of Understanding (MOU) regarding "The Lake Tanganyika Transport Corridor Development Initiative" in September 2013. They agreed to promote lake transport between Bujumbura Port and Mpulungu Port. After the exchange of the MOU and receiving a grant from NEPAD [2] Infrastructure Project Preparation Facility (NEPAD-IPPF) managed by AfDB in December 2013, the Zambian government called for a "Lake Tanganyika Transport Corridor" Project. It is mentioned in the procurement notice of the consultant that the specific physical projects are the rehabilitation and modernization of Mpulungu Port.

There are no external conditions to be taken into consideration with respect to the construction of the ship repairing facilities, as there are private entities who are engaged in ship repairs in Burundi. They use the slipway at Kigoma in Tanzania or the dry dock at Kalemie in DRC for ship repair and there are a sufficient number of ships registered and to be repaired in Burundi.

[2] The New Partnership for Africa's Development

The transport cost respectively occupies 35% and 45% of import and export commodity prices in Burundi. As almost all the everyday goods are imported and the export of coffee and tea occupies a considerable large share in the export income, reduction of the transport cost is an urgent issue to address to foster the economic growth. In this regard, the construction of the container terminal is indispensable to increase the GDP per capita to US$720 in 2025 from US$137 in 2008 as targeted in "Vision 2025" by promoting lake transport and reducing the transport cost.
Meanwhile, the ship repairing facilities will result in the reduction of outgoing currency from Burundi by repairing the largest fleet on Lake Tanganyika in Burundi instead of Tanzania or DRC. Consequently, they will create job opportunities and improve technology in Burundi, leading to economic self-sufficiency.

3-3-1 Effectiveness

3-3-1-1 Quantitative Effectiveness

Quantitative effectiveness is evaluated with respect to the increase in cargo handling capacity of Bujumbura Port, the reduction in container transport cost from/to Dar es Salaam Port by railway and lake via Kigoma Port instead of road (all the way from/to Dar es Salaam Port), and the increase in inbound containers from Mpulungu Port. The targets of effectiveness are summarized in the table below:

Table 3.1 Quantitative Effectiveness

Indicators	Originals (2012)	Targets (2020[3]) (4 years after project completion)
Cargo throughput (1,000ton per year)	122.8	296.1
Transport cost of 40 ft container (US$/box)	5,300 (Road)	4,497 (Railway and lake via Kigoma)
Containers from Mpulungu Port (TEU)	0	9,325
Annual number of ships repaired in Burundi	None	Large scale repairing : 5 Small scale repairing : 18

3-3-1-2 Qualitative Effectiveness

The qualitative effectiveness of the project is described as follows:

1 Cargo handling efficiency of Bujumbura Port will be improved owing to the containerization of a majority of cargo;
2 Safety of lake transport will be improved, as the ships of Burundi will periodically be inspected and repaired on the completed slipway;
3 The port basin can be maintained thoroughly, as the existing storm water canal will be relocated and the sediments from the city will not flow into the basin anymore; and
4 Job opportunities will be created owing to the ship repair facilities, as they can repair not only the ships of Burundi but also those of Tanzania, DRC and Zambia.

[3] As the development of Mpulungu Port in Zambia is planned to start with AfDB's assistance in 2020, the target year is also set 2020, which is 4 years after the project completion, in order to evaluate the container handling at Bujumbura Port as one of the indicators.

Appendices

[Appendices]

1. Member List of the Study Team
2. Study Shcedule
3. List of Parties Concerned in the Reciepient Country
4. Minuites of Discussions
5. Commitment Letter for the Procurement of container handling equipment
6. Meteorological Data and Water Level
7. The Result of Geotechnical Investigation
8. The Result of Environmental Survey

1 Member List of the Study Team

Field Survey

Name	Position	
Yoshimoto Koyanagi	Project Manager	Deputy Director Transportation and ICT Division 1 JICA
Kazuo Ando	Interpreter	Japan International Cooperation Center
Nobuo Endo	Chief Consultant/ Port Planner	PADECO
Masahiro Yokogawa	Port Facility Designer	PADECO (Pen)
Masaru Ikawa	Ancillary Facility/ Container Handling Equipment	ECOH (M.E.S. TOKKI)
Osamu Sase	Natural Condition Survey	ECOH
Hayao Teshima	Environmental & Social Considerations 1	PADECO
Tsutomu Kubo	Construction & Procurement Planner/ Cost Estimation	Padeco (Pen)
Singo Watanabe	Construction & Procurement Planner/ Cost Estimation	Padeco (Pen)
Norifumi Yamamoto	Construction & Procurement Planner/ Cost Estimation	Padeco
Chiemi Osada	Environmental & Social Considerations 2	Padeco

Explanation of the overall plan of the project

Name	Position	
Yoshimoto Koyanagi	Project Manager	Deputy Director Transport and ICT Division 1 JICA
Noboru Okada	Interpreter	Japan International Cooperation Center
Nobuo Endo	Chief Consultant/ Port Planner	PADECO
Masahiro Yokogawa	Port Facility Designer	PADECO (Pen)
Norifumi Yamamoto	Construction & Procurement Planner/ Cost Estimation	PADECO

2 Study Schedule

Field Survey

Date		JICA		Consultant						
		Project Manager	Interpreter	Chief Consultant/ Port	Port Facility Designer	Ancillary Facility/ Container	Natural Condition Survey	Environmental & Social	Construction & Procurement	Environmental & Social
		Mr. KOYANAGI	Mr. Ando	Mr. ENDO	Mr. YOKOGAWA	Mr. IKAWA	Mr. SASE	Mr. TESHIMA	Mr. KUBO	Ms. OSADA
2-Aug	Fri			22:00 Tokyo>Dubai>Nairobi					22:00 Tokyo>Dubai>Nairobi	
3-Aug	Sat			Arr Bujumbura					Arr Bujumbura	
4-Aug	Sun			Internal Meeting					Internal Meeting	
5-Aug	Mon			JICA Field Office/Discussion with MTTPE					JICA Field Office/Discussion with MTTPE	
6-Aug	Tue			Discussion with MTTPE					Discussion with MTTPE	
7-Aug	Wed									
8-Aug	Thu			Visiting Relevant Organization					Rerevant Organization	
9-Aug	Fri			Regular MTG at JICA			Tokyo>Dubai>Nairobi		Regular MTG at JICA	
10-Aug	Sat	22:00 Tokyo>Dubai>Nairobi		Internal Meeting					Internal Meeting	
11-Aug	Sun	Arr Bujumbura		Site Survey			Arr Bujumbura		Site Survey	
12-Aug	Mon	JICA Field Office/Discussion with MTTPE			Site Survey		Collecting relevant data		JICA Field Office/Discussion with MTTPE	
13-Aug	Tue	Discussion on M/D							Discussion on M/D	
14-Aug	Wed	Discussion on M/D, visit to MoE					Natural Condition Survey		Visiting Rerevant Organization	
15-Aug	Thu	Internal Meeting		Visiting Relevant Organization						
16-Aug	Fri					Tokyo>Dubai>Nairobi		Tokyo>Dubai>Nairobi		
17-Aug	Sat	Internal Meeting					Internal MTG			
18-Aug	Sun	Internal Meeting				Arr Bujumbura	Natural Condition Survey	Arr Bujumbura	Internal Meeting	Natural condition Survey
19-Aug	Mon	Sign on M/D						Sign on M/D		
20-Aug	Tue	JICA Kenya office	Arr Tokyo			Site Survey		Visiting Relevant Organization		
21-Aug	Wed			Discussion with MTTPE						
22-Aug	Thu			Site Survey			Natural Condition Survey			
23-Aug	Fri			Regular MTG at JICA				Regular MTG at JICA		Regular MTG at JICA
24-Aug	Sat									
25-Aug	Sun									
26-Aug	Mon			BMPRA regular MTG						
27-Aug	Tue			Site Survey				Site Survey		
28-Aug	Wed			Regular MTG at JICA				Regular MTG at JICA		
29-Aug	Thu			Discussion with MTTPE、BMPRA			Natural Condition Survey	Discussion with MTTPE、BMPRA		
30-Aug	Fri			BMJ> Nairobi > Dubai				BMJ> Nairobi > Dubai		
31-Aug	Sat			Arr Tokyo				Arr Tokyo		
1-Sep	Sun									
2-Sep	Mon									
3-Sep	Tue									
4-Sep	Wed									
5-Sep	Thu						Natural Condition Survey			
6-Sep	Fri									
7-Sep	Sat									
8-Sep	Sun									
9-Sep	Mon									
10-Sep	Tue									
11-Sep	Wed						Natural Condition Survey			
12-Sep	Thu									
13-Sep	Fri									
14-Sep	Sat									
15-Sep	Sun									
16-Sep	Mon						Analysis			
17-Sep	Tue									
18-Sep	Wed					Discission with sub-contractor				
19-Sep	Thu						Regular MTG at JICA			
20-Sep	Fri									
21-Sep	Sat						BMJ> Nairobi > Dubai			
22-Sep	Sun						Arr Tokyo			

Explanation of the overall plan of the project

Date		JICA		Consultant		
		Project Manager	Interpreter	Chief Consultant/ Port Planner	Port Facility Designer	Construction & Procurement Planner/ Cost Estimation
		Mr. KOYANAGI	Mr. Okada	Mr. ENDO	Mr. YOKOGAWA	Mr. Yamamoto
22-Feb	Sat	Lv Tokyo				
23-Feb	Sun					
24-Feb	Mon	Arr Bujumbura				
25-Feb	Tue	Discussion on M/D				
26-Feb	Wed	Discussion on M/D				
27-Feb	Thu	Signing on M/D				
28-Feb	Fri	Lv Bujumbura				
1-Mar	Sat	17:50 Tokyo				

3 List of Parties Concerned in the Recipient Country

Burundi side

Ministry of Transport and Public Works (MTTPE)

Mr. DEOGRTIAS Rurimunzu	Minister
Mr. BAKIRE Nzoyisaba Vincent	Permanent Secretary

Burundi Maritime, Port and Railway Authority(BMPRA)

Mr. Dieudonné DUKUNDANE	Director General
Mr. Nibigira EZECHIEL	Director General
Mr. Pontien BIKEBAKO	Directeur projet Environnement
Mr. Felix NIMBONA	Naval inspectator
Mr. Bahati REVERIEN	Administrative and Financial Director
Mr. MAHIMANA Diomède	Director

Global Port Services Burundi(GPSB)

Mr. Kobus van der Merwe	Director General
Mr. Bonaventure SINZOBAKWIRA	Assistant Director General

Ministere de L'Eau, de l'Environment, de l'Amennagament du Territoire et de l'Urbanisme(MOE)

Ing. Jean Calude NDUWAYO	Minister
Mr. NIMFASHA Joseph	Advisor
Ms. Antoinette MACUMI	Director General of Forestry and Environment
Ms. Bernaditte HAKIZIMANA	In charge of EIA

Japan side

Embassy of Japan in Kenya	Mikio Mori	Minister
Embassy of Japan in Kenya	Yukiko Toyoda	Third Secretary
JICA Kenya Office	Sei Kimura	Representative
JICA Burundi Field Office	Seiko Morita	Program Coordinator

4 Minutes of Discussions

The Minutes of Discussion (M/D) attached as in follows.

During the field Survey (August 19th 2013)

English

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
FOR THE PROJECT FOR THE IMPROVEMENT OF THE PORT OF BUJUMBURA IN THE REPUBLIC OF BURUNDI

In response to a request from the Government of the Republic of Burundi (hereinafter referred to as "Burundi"), the Government of Japan decided to conduct a Preparatory Survey on "The Project for the improvement of the Port of Bujumbura" (hereinafter referred to as "the Project"). In accordance with this decision, Japan International Cooperation Agency (hereinafter referred to as "JICA") decided to commence the survey.

JICA sent the Preparatory Survey Team for the Field Survey (hereinafter referred to as "the Team"), which is headed by Mr. Yoshimoto KOYANAGI, Deputy Director, Transportation and ICT Division 1, Transportation and ICT Group, Economic Infrastructure Department, JICA, and is scheduled to stay in the country from August 3rd to September 21st, 2013.

The Team held discussions with the officials concerned of Burundi side, and conducted a field survey at the Project site.

In the course of discussions and field survey, the both sides confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare a Draft Report of the Preparatory Survey.

Bujumbura, August 19 , 2013

小柳 柱泉

Mr. Yoshimoto Koyanagi
Leader
Preparatory Survey Team
Japan International Cooperation Agency

Captain Dieudonne Dukundane
Director General
Maritime, Port and Railway Authority
The Republic of Burundi

Mr. Deogratias Rurimunzu
Minister,
Ministry of Transports, Public Works and Equipment
The Republic of Burundi

ATTACHMENT

1. Objective of the Project

   The objective of the Project is to contribute to the improvement of Bujumbura Port.

2. Project Site

   The Project site is the Port of Bujumbura as shown in Annex-1.

3. Responsible and Implementing Authority

3-1. The responsible ministry is the Ministry of Transports, Public Works and Equipment (MTTPE).

3-2. The implementing agency is Burundi Maritime, Port and Railway Authority (BMPRA)

3-3. The organization charts are shown in Annex-2-1 and 2-2 respectively.

4. Item requested by the Government of Burundi

4-1. After discussions with the Team, the Government of Burundi requested the items below with following priority. Container Handling Equipment was not included in the original request from the Government of Burundi. Therefore, the both sides agreed to include it as a survey component taking account of its importance for the achievement of the Project objective.

Priority	Item	Specification
1	Construction of Container Terminal	Depth: -5m
	- Dredging of Port Basin	V=20,400m^3
	- Container Berth	L=80m x 2nos
	- Berth Apron	W=30m
	- Container Yard and Drainage	A=44,000m^2
	- Inner Port Road	W=20m
2	Ship Repair Facility	Ship to be repaired (L=60m)
3	Diversion of Storm Water Canal	L=1,245m
4	Container Handling Equipment	
	- Mobile Containers STS	35ton x 2nos
	- Reach Stacker	35ton x 2nos
	- Multi-purpose Forklift	3-5ton x 2nos
	- Tractor Head	5nos
	- Terminal Chassis	7nos

4-2. The Burundi side also requested the technical assistance for the operation and maintenance of the Project. In response to the request aforementioned, the Team

suggested that the technical assistance shall be considered under the Technical Cooperation Scheme.

4-3. JICA will assess the necessity, relevance and degree of urgency of the above requested items through the survey and will report to the Government of Japan.

4-4. The Burundi side understood that some requested items would be excluded from the Project taking account of their priorities caused by current Yen depreciation and cargo handling equipment which was not included in the original request. The Burundi side also understood that JICA and African Development Bank (AfDB) are negotiating the coordination for the Project, of which some components would be covered by AfDB.

5. Japan's Grant Aid Scheme

5-1. The Burundi side understood the Japan's Grant Aid scheme explained by the Team as described in Annex-3 and Annex-4.

5-2. The Burundi side agreed to take the necessary measures, as described in Annex-5 for the smooth implementation of the Project, as a condition for the Japan's Grant Aid to be implemented.

6. Schedule of the Study

6-1. The Team will proceed with further field survey until September 21st, 2013.

6-2. JICA will prepare the draft report and the draft specification and dispatch a mission in order to explain their contents around January, 2014.

6-3. If the contents of the report are accepted in principle by the Government of Burundi, JICA will complete the final report and send it to Burundi around May, 2014.

6-4. The Burundi side took note that the study schedule may be subject to delay by the result of analysis of polychlorinated biphenyl (PCB) and heavy toxic metals which requires more time for the design and cost estimation on the countermeasure such as containment of those objects. In that case, the Burundi side also took note that the commencement of the Project will be postponed one year.

7. Environmental and Social Considerations

7-1. The Burundi side agreed to give due environmental and social considerations during implementation of the Project, and after completion of the Project, in accordance with the JICA Guidelines for Environment and Social Considerations (April, 2010).

7-2. The Burundi side agreed to conduct the necessary procedure concerning the environmental assessment and submit required environmental report of the Project to the Ministry of Water, Environment, Land and Urban Planning (MWELUP)

based on the Draft Report prepared by the Team. The Team explained to the Burundi side that the approval on the environmental report is prerequisite for the Project appraisal in Japan. The Burundi side agreed to obtain the approval from MWELUP and submit it to JICA Burundi Field Office by the end of February, 2014.

8. Others

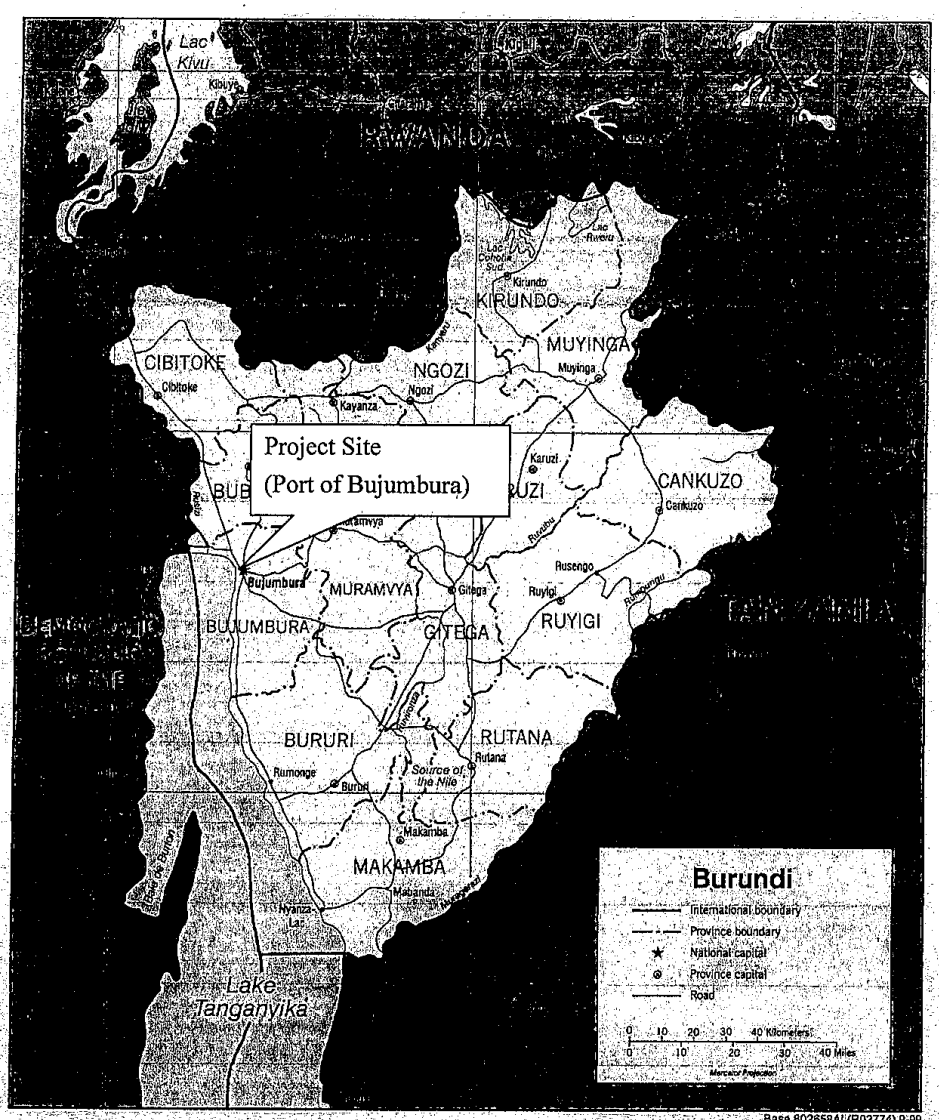
8-1. In case suspicious objects which might be UXOs (Unexploded Objects) are found in the Project site, the Burundi side will investigate and remove them.

8-2. The Burundi side agreed to instruct the concerned shipping company to remove the unused barges currently moored in the Port of Bujumbura before the commencement of the construction work.

8-3. The Minutes of Discussions are made in duplicate in the languages of French and English, both equally authentic. In case of divergence of interpretation, English text shall prevail.

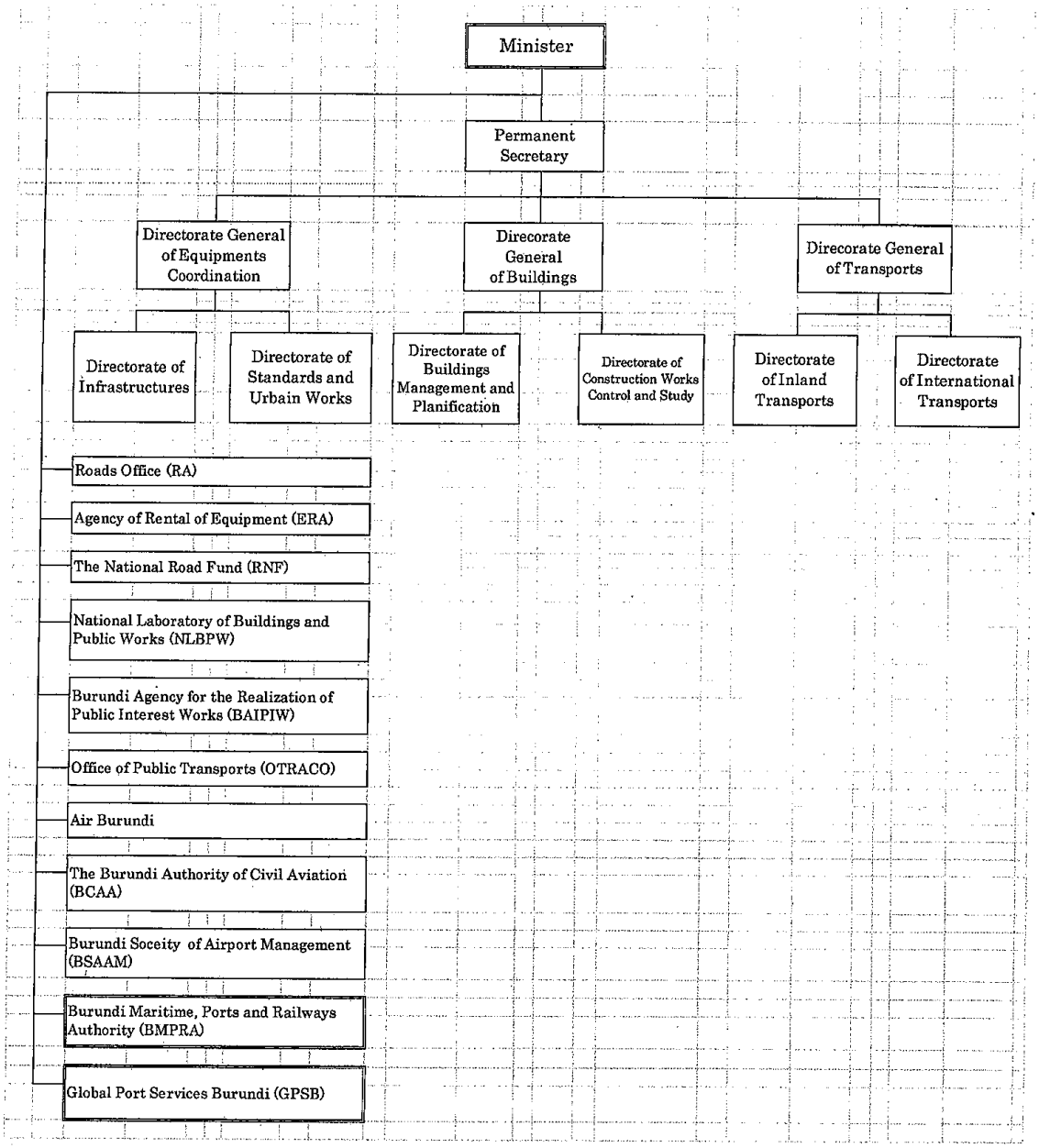
Annex-1	Project Site
Annex-2	Organization Charts
Annex-3	Japan's Grant Aid
Annex-4	Flow Chart of Japan's Grant Aid Procedures
Annex-5	Major Undertakings to be taken by Each Government

Annex-1


Lac Kivu
Kibuye
KIRUNDO
Kirundo
MUYINGA
Muyinga
CIBITOKE
Cibitoke
NGOZI
Ngozi
Kayanza
Project Site
(Port of Bujumbura)
Karuzi
CANKUZO
Cankuzo
Bujumbura
MURAMVYA
Gitega
Ruyigi
BUJUMBURA
GITEGA
RUYIGI
BURURI
RUTANA
Rutana
Rumonge
Burundi
Source of the Nile
Makamba
MAKAMBA
Nyanza Lac
Lake Tanganyika
Burundi
International boundary
Province boundary
National capital
Province capital
Road
0 10 20 30 40 Kilometers
0 10 20 30 40 Miles
Mercator Projection
Base 802658AI (R02774) 9-99

Annex-2-1

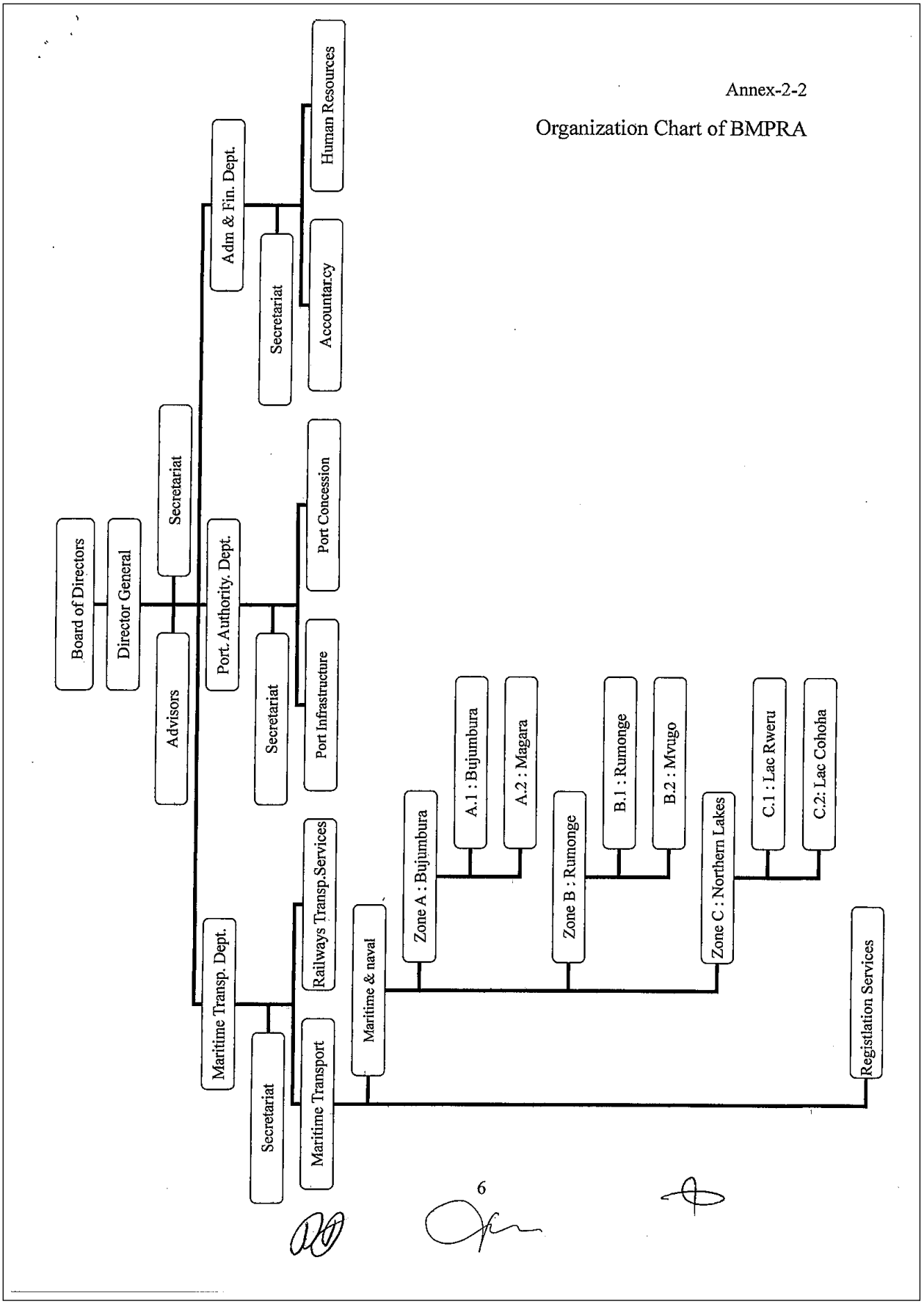
Organization Chart of MTTPE



- 5 -

Annex-2-2

Organization Chart of BMPRA



6

Annex-3

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- ·Preparatory Survey
  - The Survey conducted by JICA
- ·Appraisal &Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- ·Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- ·Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- ·Implementation
  - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline

Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.
JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants
For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey
JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A
After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants
In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country
Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"
The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country
In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"
The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"
The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

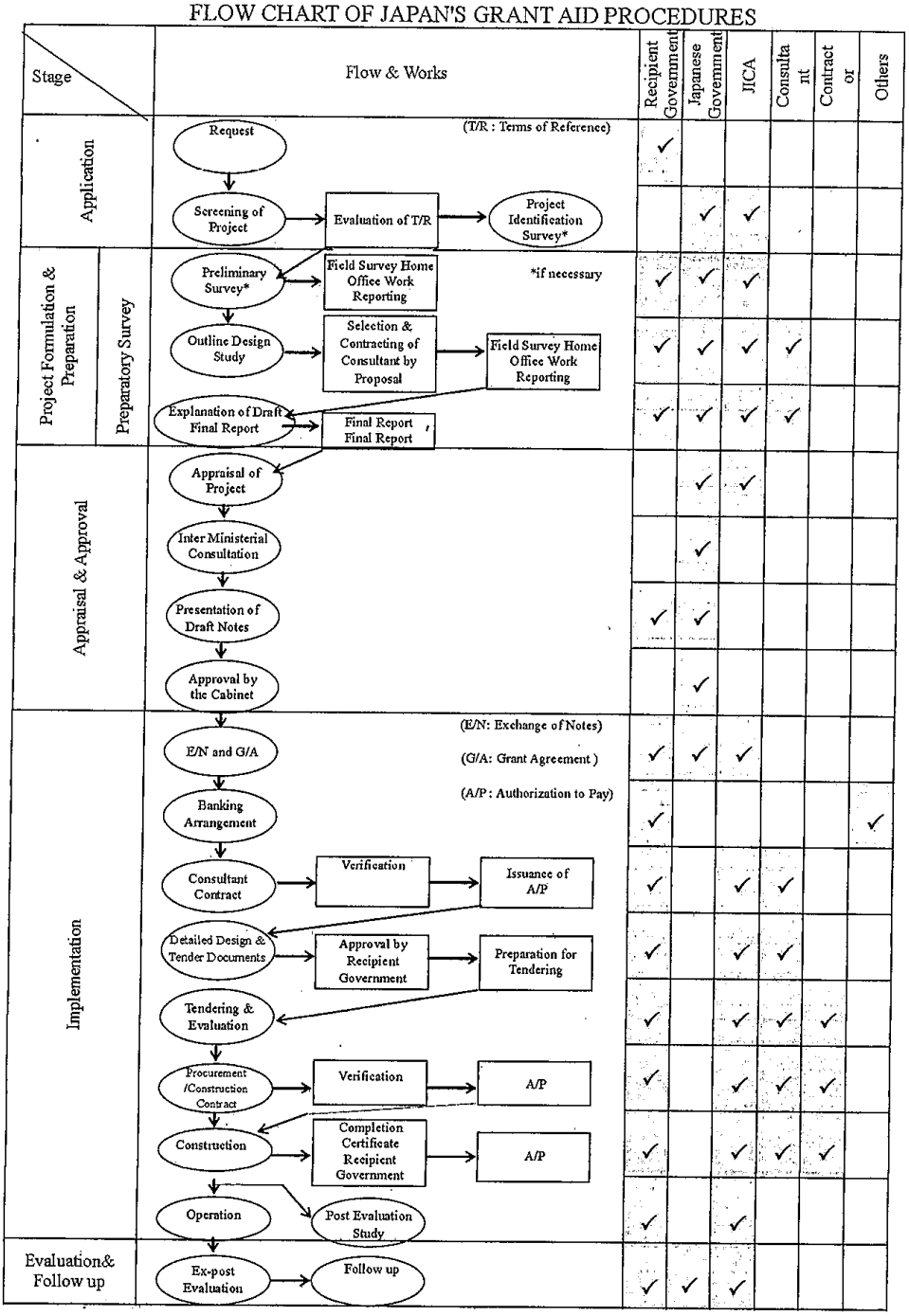
b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations
A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

Annex-4

FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



Annex-5

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land and water area (project site, temporary yard and etc.)		●
2	To clear, level and reclaim the site when needed		●
3	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
4	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted / be borne by the Authority without using the Grant		●
5	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
6	To ensure that the facilities and equipment be maintained and used properly and effectively for the implementation of the Project		●
7	To give due environmental and social consideration in the implementation of the Project		●
8	To bear all the expenses, other than those covered by the Grant, necessary for implementation of the Project		●
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●

(B/A : Banking Arrangement, A/P : Authorization to Pay)

French

Procès-verbal des discussions
sur l'étude préparatoire
pour le Projet pour l'Extension du Port de Bujumbura
en République du Burundi

En réponse à la requête du Gouvernement de la République du Burundi (ci-après désignée "Burundi"), le Gouvernement du Japon a décidé de conduire une étude préparatoire sur "le Projet pour l'Extension du Port de Bujumbura (ci-après désigné "le Projet"). En accord avec cette décision, l'Agence Japonaise de Coopération Internationale (ci-après désignée "la JICA") a décidé de mener ladite étude.

La JICA a envoyé une équipe d'étude préparatoire (ci-après désignée "l'Equipe") conduite par M. Yoshimoto KOYANAGI, Directeur de la Division I, Groupe de Transport et TIC, Département des Infrastructures Economiques, JICA, pour la période du 3 août au 21 septembre 2013.

L'Equipe a tenu une série des discussions avec les responsables concernés de la partie burundaise et mené une enquête de terrain dans le site du Projet.

A l'issue de ces discussions et de l'enquête de terrain, les deux parties ont convenu des points essentiels mentionnés dans le document attaché au présent procès-verbal. L'Equipe procédera à des travaux complémentaires et préparera l'avant-projet du rapport sur l'étude préparatoire.

Fait à Bujumbura, le 19 août 2013

小柳 柱泉

M. Yoshimoto Koyanagi
Chef de la Mission d'Etude préparatoire
Agence Japonaise de Coopération Internationale

Capitaine Dieudonné Dukundane
Directeur Général
Autorité Maritime, Portuaire et Ferroviaire
République du Burundi

M. Deogratias Kurimunzu
Ministre
Ministère des Transports, des Travaux Publics et de l'Equipement
République du Burundi

APPENDICE

1. Objectif du Projet

L'objectif du Projet est de contribuer à l'extension du port de Bujumbura.

2. Site du Projet

Le site du Projet est indiqué en Annexe-1.

3. Autorités responsable et d'exécution

3-1. Le ministère responsable est le Ministère des Transports, des Travaux Publics et de l'Equipement (MTTPE).

3-2. L'agence d'exécution est l'Autorité Maritime, Portuaire et Ferroviaire (AMPF).

3-3. Les organigrammes desdites autorités sont indiqués respectivement en Annexe-2-1 et Annexe-2-2.

4. Eléments demandés par le Gouvernement du Burundi

4-1. Après avoir discuté avec l'Equipe, le Gouvernement du Burundi a demandé les éléments ci-dessous, selon la priorité indiquée. L'équipement de manutention de containeurs n'était pas inclus dans la demande originale du Gouvernement du Burundi. C'est pourquoi les deux parties se sont mises d'accord de l'inclure comme un des composants faisant l'objet de l'étude tout en considérant son importance pour la réalisation de l'objectif du Projet.

Priorité	Eléments	Spécifications
1	Construction d'un terminal à containeurs - Dragage du bassin portuaire - Poste à containeurs - Apron de poste - Parc à containeurs et drainage - Voie du port intérieur	Profondeur: -5m V=20.400m^3 L=80m x 2 L=30m Surface=44.000m^2 L=20m
2	Installation de réparation de navires	Navire à réparer (L=60m)
3	Déviation du canal des eaux pluviales	L=1.245m
4	Equipement de manutention de containeurs - Containeurs mobiles STS - Grues d'entassement (reach-stacker) - Chariots élévateurs à multi-buts - Tracteurs à l'avant - Châssis du terminal	 35 tonnes x 2 35 tonnes x 2 3-5 tonnes x 2 5 7

4-2. Egalement, la partie burundaise a demandé une assistance technique pour l'exploitation et la maintenance du Projet. En réponse à la demande susmentionnée, l'Equipe a suggéré que l'assistance technique devrait être envisagée dans le cadre du système de la coopération technique.

4-3. La JICA examinera la nécessité, la pertinence et le degré d'urgence des éléments demandés à travers l'étude et en fera rapport au Gouvernement du Japon.

4-4. La partie burundaise a pris note que quelques éléments demandés pourraient être exclus du Projet en prenant en considération leur degré de priorité et à cause de la dépréciation actuelle du yen japonais et de l'équipement de manutention de cargaisons qui n'était pas inclus dans la demande originale. La partie burundaise a également compris que la JICA et la Banque Africaine de Développement (BAD) sont en cours de négocier une coordination pour le Projet dont le financement de quelques composants serait couvert par la BAD.

5. Système de la coopération financière non-remboursable du Japon

5-1. La partie burundaise a compris le système de la coopération financière non-remboursable du Japon expliqué par l'Equipe et indiqué en Annexe-3 et Annexe-4.

5-2. La partie burundaise a accepté de prendre les mesures nécessaires décrites à l'Annexe-5 pour permettre le bon déroulement du Projet, comme une condition de l'application d'une coopération financière non-remboursable du Japon.

6. Calendrier de l'Etude

6-1. L'Equipe procédera à des enquêtes de terrain complémentaires jusqu'au 21 septembre 2013.

6-2. La JICA préparera l'avant-projet du rapport et celui des spécifications et enverra une mission afin d'expliquer leurs contenus vers le mois de janvier 2014.

6-3. Lorsque le Gouvernement du Burundi accepte en principe le contenu de l'avant-projet du rapport, la JICA complétera le rapport final et l'enverra au Burundi vers le mois de mai 2014.

6-4. La partie burundaise a compris que le calendrier de l'Etude pourra être susceptible d'être retardé par le résultat de l'analyse des polychlorobiphényles (PCB) et des métaux lourds toxiques, car un temps considérable est nécessaire pour le concept et l'estimation du coût des mesures à prendre telles que le confinement des déblais contenant de ces matières dans le sol. Dans ce cas, la partie burundaise a également pris note que le commencement du Projet sera reporté d'une année.

7. Considérations environnementales et sociales

7-1. La partie burundaise a accepté de prendre en compte les considérations environnementales et sociales pendant l'exécution et après l'achèvement du Projet conformément aux lignes directrices de la JICA relatives aux considérations environnementales et sociales (avril 2010).

7-2. La partie burundaise a accepté de conduire la procédure requise concernant l'évaluation environnementale et de soumettre le rapport environnemental requis du Projet au Ministère de l'Eau, de l'Environnement, de l'Aménagement du Territoire et de l'Urbanisme (MEEATU) sur la base de l'avant-projet du rapport préparé par l'Equipe. L'Equipe a expliqué à la partie burundaise que l'approbation du rapport environnemental est une condition préalable à l'évaluation du Projet au Japon. La partie burundaise a donné son accord pour obtenir l'approbation du MEEATU et le soumettre au bureau de la JICA au Burundi avant fin février 2014.

8. Autres

8-1. En cas où les objets suspects tels que les munitions explosives non explosées (UXOs) soient trouvés dans le site du Projet, la partie burundaise devra les ramasser et enlever.

8-2. La partie burundaise s'est engagée de donner des instructions à la compagnie de navires concernée pour enlever les barges inutilisées actuellement amarrées dans le port de Bujumbura avant le commencement des travaux de construction.

8-3. Le procès-verbal des discussions est établi en langues anglaise et française, et ces deux versions sont authentiques. En cas de divergences d'interprétation, la version anglaise prévaudra.

Annexe-1 : Site du Projet

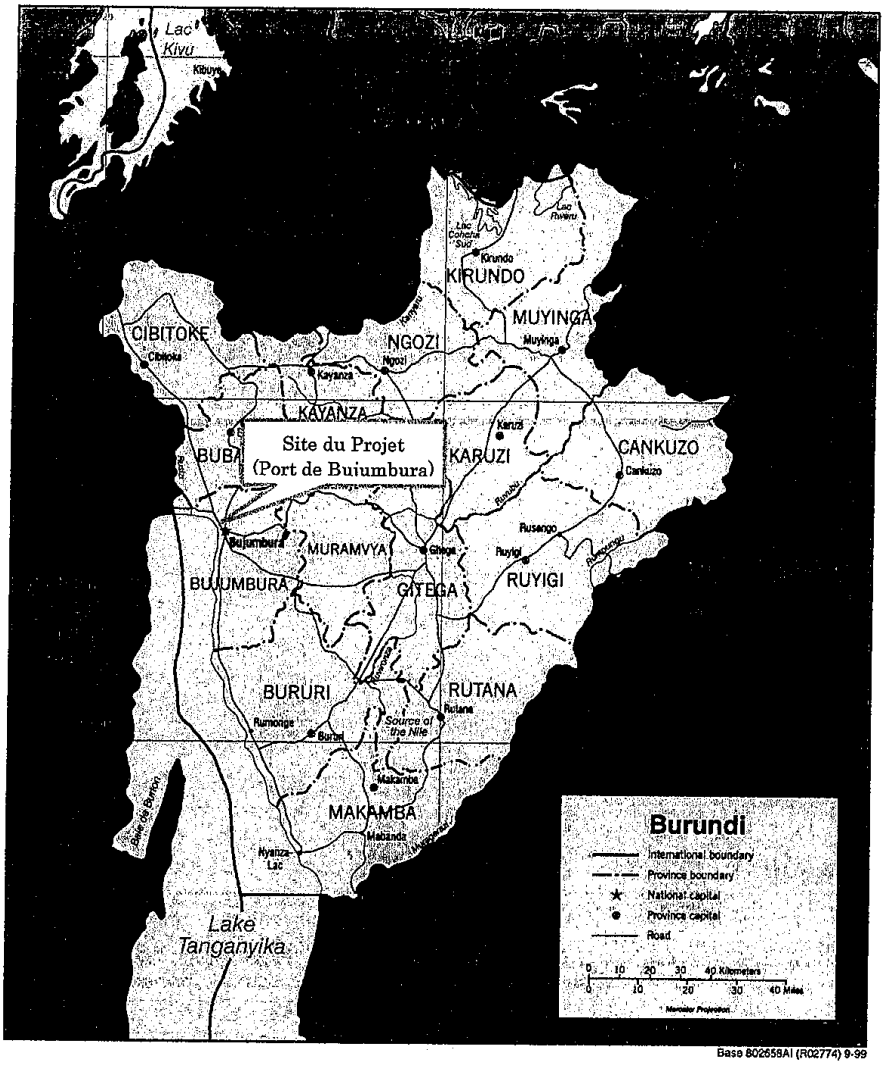
Annexe-2 : Organigrammes

Annexe-3 : Système de la coopération financière non-remboursable du Japon

Annexe-4 : Procédure de la coopération financière non-remboursable

Annexe-5 : Répartition des principaux travaux et prestations entre les deux parties

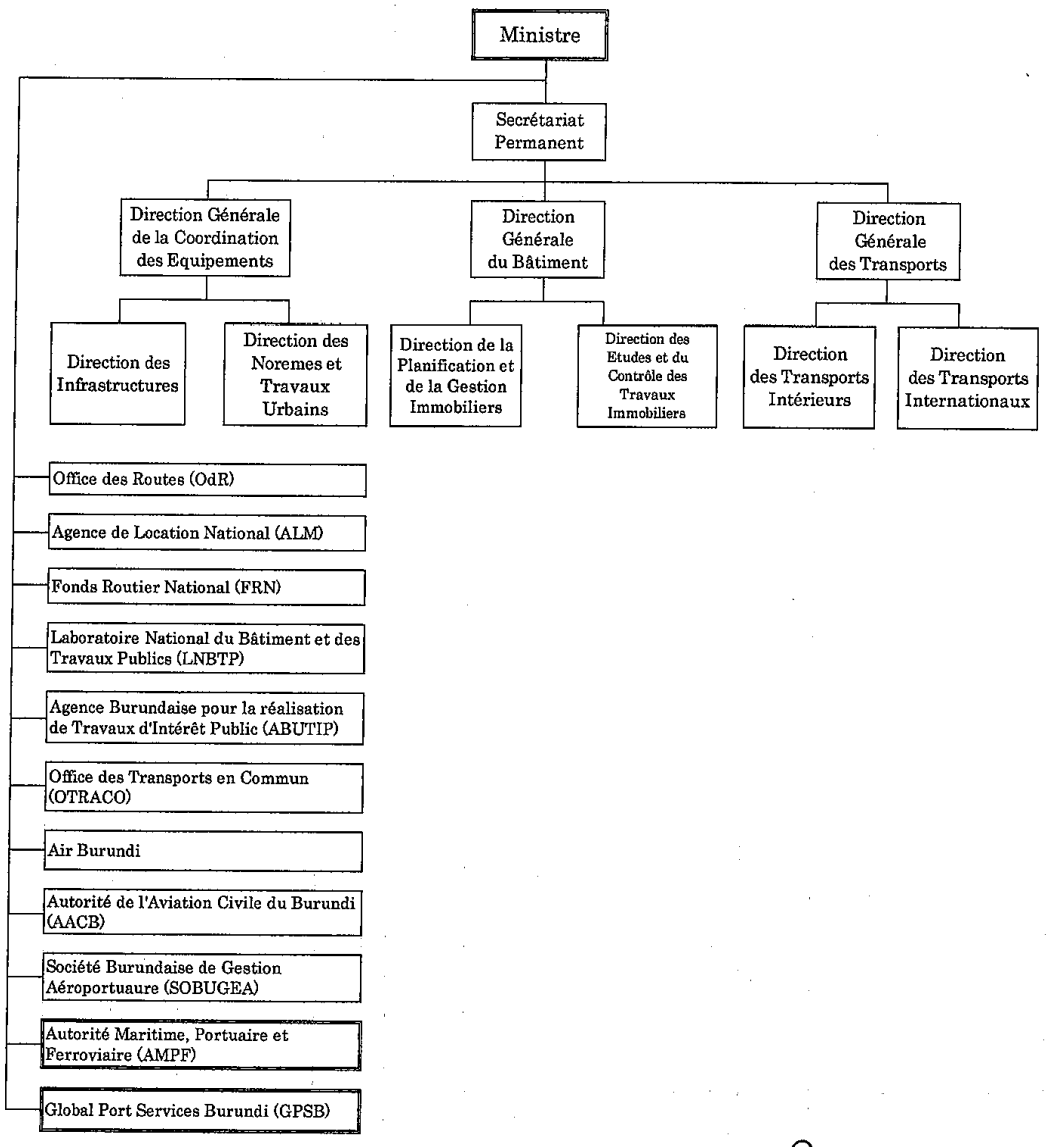
Annexe-1


Lac Kivu
Kibuye
Lac Cohoha Sud
Lac Rwihu
Kirundo
KIRUNDO
MUYINGA
Muyinga
CIBITOKE
Cibitoke
NGOZI
Ngozi
Kayanza
KAYANZA
Site du Projet
(Port de Bujumbura)
BUBA
Karuzi
KARUZI
CANKUZO
Cankuzo
Bujumbura
MURAMVYA
Gitega
Rusengo
Ruyigi
BUJUMBURA
GITEGA
RUYIGI
BURURI
RUTANA
Rutana
Rumonge
Burasi
Source of the Nile
Makamba
MAKAMBA
Matana
Kyntiza-Lac
Lake Tanganyika
Burundi
International boundary
Province boundary
National capital
Province capital
Road
0 10 20 30 40 Kilometers
0 10 20 30 40 Miles
Base 802658AI (R02774) 9-99

Annexe-2-1

Organigramme

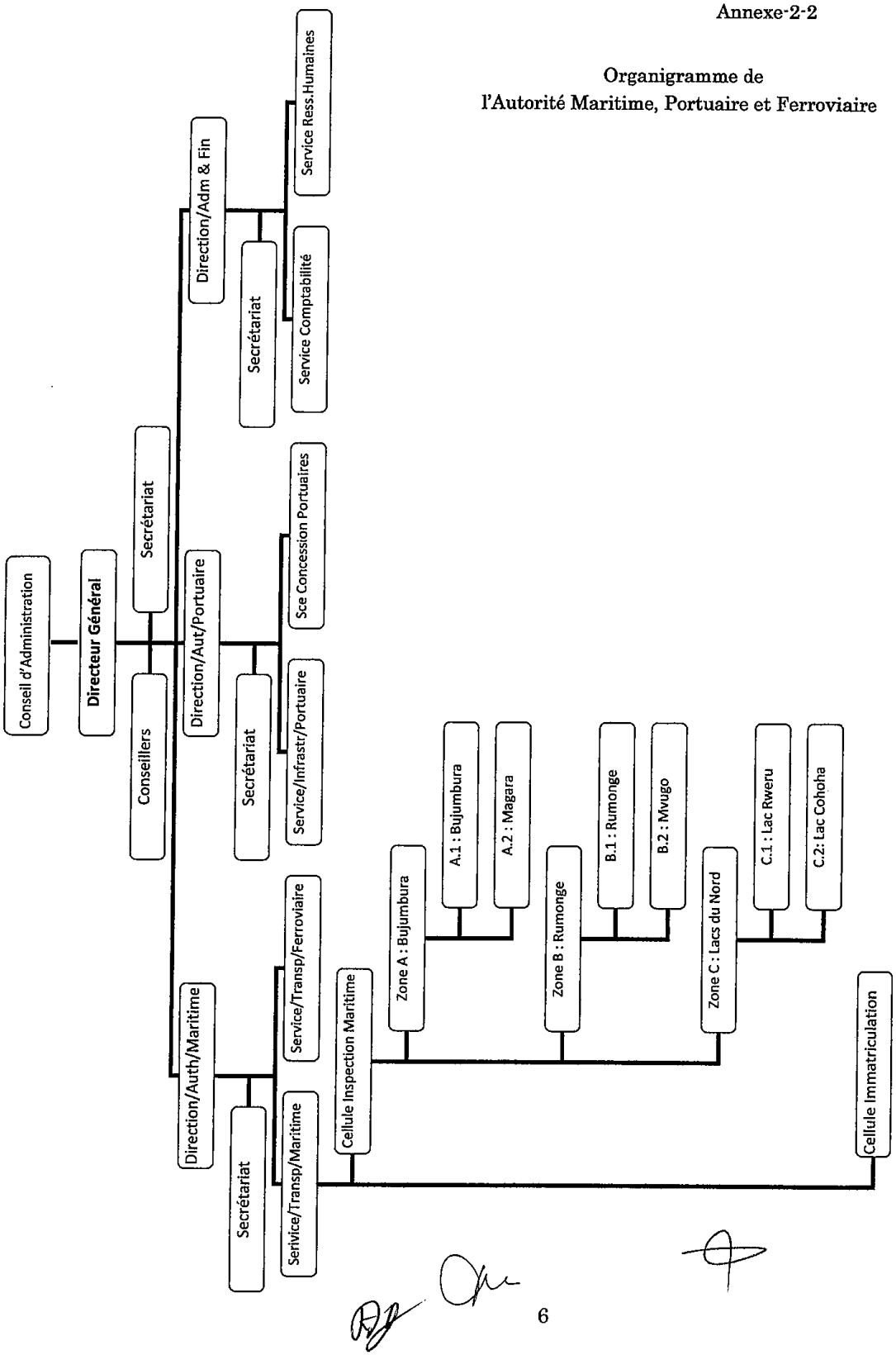
du Ministère des Transports, des Travaux Publics et de l'Equipement



- 5 -

Annexe-2-2

Organigramme de
l'Autorité Maritime, Portuaire et Ferroviaire



Annexe-3

SYSTEME DE LA COOPERATION FINANCIERE NON-REMBOURSABLE DU JAPON

Le Gouvernement du Japon (ci-après dénommé "le Gdj") est au centre de l'exécution des réformes organisationnelles pour améliorer la qualité des opérations de l'Aide publique au développement (l'Apd), et dans le cadre de ce réajustement, une nouvelle loi de la JICA est entrée en vigueur au 1er octobre 2008. En se basant sur la loi et la décision du Gdj, la JICA est devenue l'agence exécutive de la Coopération financière non-remboursable du Japon pour les Projets généraux, pour la Pêche et pour la Coopération Culturelle.

La coopération financière non-remboursable consiste en des fonds non-remboursables pour le pays bénéficiaire qui permettront de fournir les installations, les équipements et les services (services techniques ou transport des produits, etc.) pour le développement socio-économique du pays, selon les principes suivants et conformément aux lois et réglementations y afférentes du Japon. La coopération financière non-remboursable n'est pas effectuée sous forme de don de matériel en nature au pays bénéficiaire.

1. Procédures de la coopération financière non-remboursable du Japon

La coopération financière non-remboursable du Japon est menée comme suit :

Etude préparatoire (ci-après dénommée « "l'Etude" »)
- L'Etude menée par la JICA

Estimation et approbation
- Estimation par le Gdj et la JICA. Approbation par le Conseil des ministres du Japon

Détermination de l'exécution
- L'Echange de Notes entre le Gdj et un pays bénéficiaire

Accord de Don (ci-après dénommé « l'"A/D' »')
- Accord conclu entre la JICA et un pays bénéficiaire

Exécution
- Mise en œuvre du Projet sur la base de l'A/D

2. Etude préparatoire

(1) Contenu de l'Etude

Le but de l'Etude est de fournir un document de base nécessaire pour l'estimation du Projet par la JICA et le Gdj. Le contenu de l'Etude est le suivant:

- confirmer l'arrière-plan de la requête, les objectifs et les effets du Projet ainsi que les capacités de maintenance du pays bénéficiaire nécessaires à l'exécution du Projet.
- évaluer la pertinence de la coopération financière non-remboursable d'un point de vue technologique et socio-économique
- confirmer le concept de base du plan convenu après Concertations entre les deux parties
- préparer un concept de base du Projet ; et
- estimer les coûts du Projet

Le contenu de la requête par le pays bénéficiaire n'est pas obligatoirement approuvé en tant que contenu de la coopération financière non-remboursable. Le concept de base du

projet doit être confirmé par rapport au cadre d'aide financière non-remboursable du Japon.
La JICA demande au gouvernement du pays bénéficiaire de prendre toutes les mesures qui pourraient s'avérer pour assurer son indépendance lors de l'exécution du Projet. Ces mesures doivent être garanties même si elles n'entrent pas dans la juridiction de l'organisme du pays bénéficiaire en charge de l'exécution du Projet. Par conséquent, l'exécution du Projet doit être confirmée par toutes les organisations concernées du pays bénéficiaire par la signature des minutes des Concertations.

(2) Selection des consultants
En vue de la bonne exécution de l'Etude, la JICA utilise un (des) consultant(s) enregistré(s). La JICA effectue une sélection basée sur des propositions soumises par ces derniers.

(3) Résultat de l'Etude
Le rapport de l'Etude est relu par la JICA, et après confirmation de la justesse du Projet, la JICA recommande au Gdj d'effectuer une estimation sur l'exécution du Projet.

3. Plan de la coopération financière non-remboursable du Japon
(1) L'E/N et l'A/D
Après l'approbation par le Conseil des ministres du Japon du Projet proposé par le gouvernement bénéficiaire, l'Echange de Notes (ci-après dénommé "l'E/N") sera signé entre le Gdj et le Gouvernement du pays bénéficiaire pour formuler une demande d'aide, qui sera suivie par la conclusion de l'A/D entre la JICA et le Gouvernement du pays bénéficiaire afin de définir les clauses nécessaires pour l'exécution du Projet, telles que les conditions de paiement, les responsabilités du Gouvernement du pays bénéficiaire, et les conditions d'obtention.

(2) Sélection des Consultants
Le(s) consultant(s) employé(s) pour l'Etude sera (seront) recommandé(s) par la JICA au pays bénéficiaire pour également travailler sur l'exécution du Projet après l'E/N et l'A/D en vue de maintenir l'uniformité technique.

(3) Pays d'origine éligible
La coopération financière non-remboursable du Japon doit être en principe réservée exclusivement à l'achat de produits provenant du Japon ou du pays bénéficiaire, et aux services des ressortissants japonais ou du pays bénéficiaire. Lorsque la JICA et le Gouvernement du pays bénéficiaire ou son autorité désignée le jugent nécessaire, la coopération financière non-remboursable peut être utilisée pour les produits ou les services tels que le transport d'un pays tiers (autre que le Japon ou le pays bénéficiaire). Toutefois, dans le cadre de la coopération financière non-remboursable, les principaux contractants, à savoir les sociétés de construction, la société de commerce nécessaires à l'exécution de la coopération, et le consultant principal doivent être exclusivement des ressortissants japonais. (Le terme "ressortissant japonais" signifie les personnes

physiques japonaises ou les personnes morales japonaises dirigées par des personnes physiques japonaises.)

(4) Nécessité de la vérification

Le gouvernement du pays bénéficiaire ou son représentant autorisé conclura les contrats en Yen japonais avec les ressortissants japonais. Ces contrats seront vérifiés par la JICA. Cette vérification est nécessaire car les fonds de la coopération financière non-remboursable proviennent des taxes des citoyens japonais.

(5) Principales dispositions à prendre par le gouvernement du pays bénéficiaire

Lors de l'exécution de la coopération financière non-remboursable, le pays bénéficiaire devra prendre les dispositions suivantes:

(6) "Usage adequate"

Le Gouvernement du pays bénéficiaire est requis d'entretenir et d'utiliser les installations construites et les équipements achetés dans le cadre de la coopération financière non-remboursable de manière adéquate et efficace et de désigner le personnel nécessaire pour le fonctionnement et la maintenance ainsi que de prendre en charge toutes les dépenses autres que celles couvertes par la coopération financière non-remboursable.

(7) "Exportation et Ré-exportation"

Les produits achetés dans le cadre de la coopération financière non-remboursable ne doivent pas être exportés ou réexportés à partir du pays bénéficiaire.

(8) "Arrangement bancaire (A/B)"

a) Le gouvernement du pays bénéficiaire ou son "représentant autorisé" devra ouvrir un compte à son nom dans une banque au Japon (ci-après dénommée la "Banque"). La JICA exécutera la coopération financière non-remboursable en procédant aux paiements en Yen japonais pour couvrir les obligations du gouvernement du pays bénéficiaire ou de son représentant autorisé conformément aux contrats vérifiés.

b) Les paiements seront effectués lorsque les demandes de paiement seront présentées par la Banque au gouvernement du Japon conformément à l'Autorisation de Paiement émise par le gouvernement du pays bénéficiaire ou de son représentant autorisé.

(9) Autorisation de Paiement (A/P)

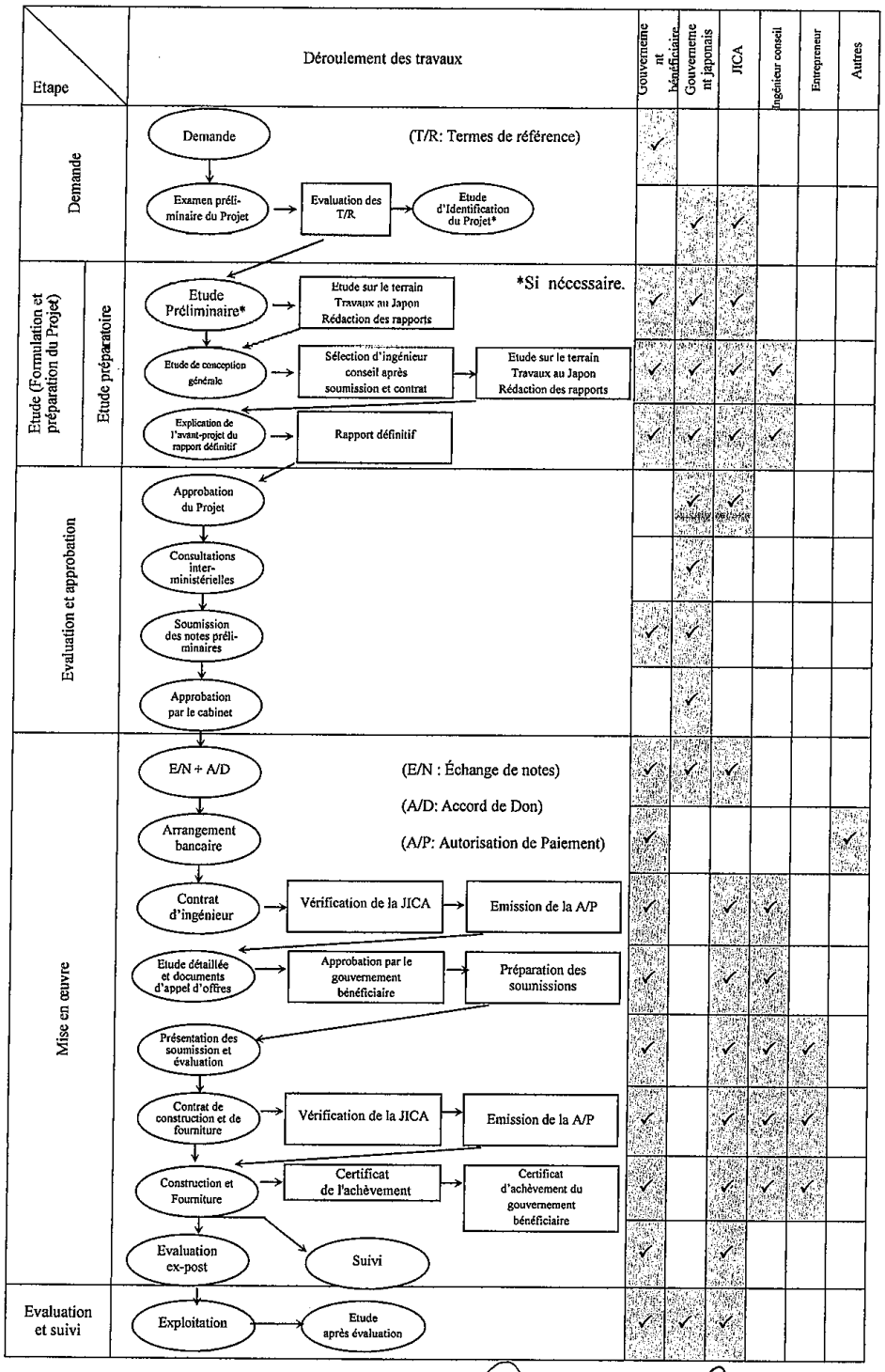
Le Gouvernement du pays bénéficiaire devra régler à la banque la commission de notification de l'autorisation de paiement et la commission de paiement.

(10) Considérations sociales et environnementales

Le pays bénéficiaire doit assurer les considérations sociales et environnementales pour le Projet et doit suivre les règlements environnementaux du pays bénéficiaire et les directives socio-environnementales de la JICA.

Annexe-4

Procédure de la coopération financière non-remboursable



Annexe-5

Répartition des principaux travaux et prestations entre les deux parties

No.	Items	Japon	pays bénéficiaire
1	Acquérir une surface de terre et d'eau nécessaire (Site du projet, terrains pour les travaux temporaires etc.)		●
2	Défrichage et mise à niveau du terrain si nécessaire		●
3	Assurer le déchargement et le dédouanement rapides des produits aux ports de déchargement dans le pays bénéficiaire et assister le transport intérieur desdits produits 1) Transport vers le pays bénéficiaire par mer (air) de produits originaires du Japon 2) Exonération d'impôts et dédouanement des produits au port de débarquement du pays bénéficiaire	●	●
4	Exempter les droits de douane, taxes internes et autres prélèvements fiscaux qui peuvent être imposés aux ressortissants japonais dans le pays bénéficiaire en relation avec la fourniture des produits et services sous le contrat vérifié.		●
5	Accorder aux ressortissants japonais, dont les services peuvent être requis en relation avec la fourniture des produits et services sous le contrat vérifié, les facilités qui peuvent être requises en relation avec leur entrée dans le pays bénéficiaire et leur séjour pour la réalisation.		●
6	Assurer l'exploitation et la maintenance correcte et efficace des équipements et installations pour la mise en œuvre du Projet.		●
7	Assurer la prise en considération des questions environnementales et sociales dans la mise en œuvre du Projet		●
8	Prise en charge de toutes dépenses, autres que celles couvertes par la coopération financière non-remboursable, nécessaire à l'installation des équipements fournis etc.		●
9	Prise en charge des commissions suivantes de la banque japonaise pour les services bancaires basés sur les arrangements bancaires (A/B). 1) Commission de notification de l'autorisation de paiement (A/P) 2) Commission de paiement		● ●

Explanation of the overall plan of the project (February 27th 2014)

English

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
FOR THE PROJECT FOR THE IMPROVEMENT OF THE PORT OF BUJUMBURA IN THE REPUBLIC OF BURUNDI
(EXPLANATION OF THE DRAFT OUTLINE DESIGN REPORT)

On the basis of the discussions and field survey in the Republic of Burundi (hereinafter referred to as "Burundi") in August, 2013, and the subsequent technical examination of the results in Japan, Japan International Cooperation Agency (hereinafter referred to as "JICA") prepared a draft Preparatory Survey Report on the Project for the Improvement of the Port of Bujumbura (hereinafter referred to as "the draft report").

In order to explain and discuss with the Burundi side on the contents of the draft report, JICA sent to Burundi the draft report explanation team (hereinafter referred to as "the Team"), which is headed by Mr. Yoshimoto KOYANAGI, Deputy Director, Transportation and ICT Division 1, Economic Infrastructure Department, JICA, from February 23 to 28, 2014.

As a result of the discussion, both sides confirmed the main items described in the attached sheets.

Bujumbura, February 27, 2014

Mr. Yoshimoto KOYANAGI
Deputy Director
Japan International Cooperation Agency

Hon. Amb. Ezechiél NIBIGIRA
Director General
Maritime, Port and Railway Authority
The Republic of Burundi

Hon. Virginie CIZA
Minister
Ministry of Transports, Public Works and Equipment
The Republic of Burundi

ATTACHMENT

1. Components of the Draft Outline Design Report

   The Burundi side agreed and accepted in principle the contents of the draft report explained by the Team.

2. Japan's Grant Aid Scheme

   The Burundi side reconfirmed the Japan's Grant Aid scheme. The Burundi side reassured to take necessary measurements as described in Annex-4 and Annex-5 of the Minutes of Discussions (M/D) signed by both sides on August 19, 2013.

3. Schedule of the Study

   JICA will complete the Final Outline Design Report of the Preparatory Survey in English and French, in accordance with the confirmed items and send the report to the Burundi side through JICA Burundi Field Office at the latest in June, 2014.

4. Cost Estimation

   The both sides agreed that in order to secure a fair and equitable procurement, the Project Cost Estimation attached in Annex-1 should never be duplicated or released to any third party before the signing of all the Contract(s) for the Project.

5. Container Handling Equipment

5-1. The Team explained to the Burundi side that container handling equipment was excluded from the Project by the reasons of 1) Budget constraint of the Japanese side for the Project, 2) Priority of the Burundi side agreed on the M/D signed by both sides on August 19, 2013 and 3) Possibility of provision/development by African Development Bank (AfDB) or concessionaire.

5-2. The Burundi side understood the necessity of installation of following container handling equipment by completion of the project around October, 2016, and mentioned the possibility of procurement of those equipment by the budget of Government of Burundi.

- 1 mobile container crane
- 2 reach stackers (1 for container berth, 1 for container yard)
- 2 tractor heads
- 3 chassis (2 for ordinary operation, 1 for backup)

The Burundi side agreed to prepare the letter addressed to JICA mentioning the commitment of procurement of the above mentioned container handling equipment by their discretion. Any necessary measure to assure the fund and procurement of

the equipment will be determined by the coordination with relevant ministries/organizations and any international donors by the Burundi sides' discretion.

5-3. The Team explained to the Burundi side that the submission of the above mentioned letter is the prerequisite condition for the Project appraisal by Cabinet meeting of the Government of Japan, and the Burundi side agreed to submit it by the end of March, 2014 preferably, or, at the latest by the end of May, 2014 to JICA Burundi Field Office. If the letter is not submitted by the end of May, 2014, the commencement of the Project will be postponed one year

6. Operation and Maintenance Policy

6-1. The Burundi side explained their basic policy to the Team that the facilities and equipment developed by the Project will be operated and maintained under the full responsibility of Burundi Maritime, Port and Railway Authority (BMPRA).

6-2. The Burundi side explained to the Team that BMPRA is empowered to instruct the concessionaire to take necessary measures along with the enlargement and change of the activities in the port.

7. Environmental and Social Considerations

7-1. The Burundi side explained to the Team that the required environmental report of the Project has not been approved by the Ministry of Water, Environment, Land and Urban Planning (MWELUP). The Burundi side agreed to obtain the approval from MWELUP and submit it to JICA Burundi Field Office by the end of April, 2014 prior to the Project appraisal by Cabinet meeting of the Government of Japan.

7-2. The both sides agreed to the contents of the Environmental Checklist as shown in Annex-2.

7-3. The Burundi side agreed that monitoring for environmental and social considerations will be conducted by the responsibility of BMPRA in accordance with the Monitoring Plan for the Project as described in the above mentioned environmental report. The results of monitoring will be provided to JICA Burundi Field Office by filling in the Monitoring Form attached as Annex-3, during construction phase and after completion of the Project.

7-4. The Burundi side agreed that JICA may disclose the monitoring results and may disclose further information as well on demand from the third parties.

8. Others

8-1. The Burundi side confirmed that the following undertakings to be taken by the

Burundi side with the Burundi side's expenses.

- Installation of high-voltage line to the Project site by around October, 2015. Exact deadline and place will be informed to the Burundi side after completion of the tender document of the Project.
- Relocation of the 600V power cable to the substation at the existing container berth on the completion of the setting out of the Project site, probably in February through April in 2015.
- Regular (once a week or twice) cleaning of the diverted stormwater channel

8-2. The Minutes of Discussions are made in duplicate in the languages of French and English, both equally authentic. In case of divergence of interpretation, English text shall prevail.

Annex-1 Project Cost Estimation
Annex-2 Environmental Checklist
Annex-3 Monitoring Form

CONFIDENTIAL

Annex-1

Project Cost Estimation

This page is closed due to the confidentiality.

Notes:

(1) The cost estimates in the above table are provisional and will be further examined by the Government of Japan for the approval of the Grant.

(2) The total cost of the project JPY 2,768 million is equivalent to USD 27.55 million at the current exchange rate; USD 1.0 = JPY 100.47

Annex -2

Environmental Checklist: . 10.Ports and Harbors (1)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) N (d) N	(a) Need to clarify present status undertaken by BMPRA. (b) Need to clarify present status with BMPRA. (c) Need to clarify present status with BMPRA. (d) Need to clarify present status with BMPRA.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) During the Burundi Port M/P study, project outlines are presented. (b) Stakeholders expressed their opinions. Comments are reflected into project design.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) In the Port M/P, Alternative A and B are presented together with the zero option.
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust emitted from ships, vehicles and project equipments comply with the country's emission standards? Are any mitigating measures taken?	(a) N	(a) In the absence of the Burundian standards, East African Community Standards shall apply. Actual air quality monitoring due to ship emissions yet to be undertaken.
	(2) Water Quality	(a) Do effluents from the project facilities comply with the country's effluent and environmental standards? (b) Do effluents from the ships and other project equipments comply with the country's effluent and environmental standards? (c) Does the project prepare any measures to prevent leakages of oils and toxicants? (d) Does the project cause any alterations in coastal lines and disappearance/appearance of surface water to change water temperature or quality by decrease of water exchange or changes in flow regimes? (e) Does the project prepare any measures to prevent polluting surface, sea or underground water by the penetration from reclaimed lands?	(a) N (b) N (c) Y (d) N (e) -	(a) In the absence of the Burundian standards, East African Community Standards shall apply. Water quality monitoring due to storm-water drainage, which is discharged directly to the port waters, is yet to be undertaken. However, the above drainage is not a part of the port facility. (b) It is not known, as standards applicable to ship effluents are yet to be established in Burundi. Nor measurements are undertaken. (c) BMPRA's emergency unit undertakes such incidents of oil leak and toxicant leaks. (d) The new container terminal construction reduces length of internal shoreline within the port area. However, it will not alter the coastal lines along the Lake. In terms of changes in the water flow regime within the port waters, the municipal drainage, which has been directly draining municipal storm-waters into the port water body, is diverted through newly built canal, to discharge directly to the Lake, which reduces significant waste water pollutant loads in the port waters, thus facilitating less polluted ambient water within the port. (e) The proposed project does not entail any land reclamation due to the new container terminal construction.

Environmental Checklist: . 10.Ports and Harbors (2)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(3) Wastes	(a) Are wastes generated from the ships and other project facilities properly treated and disposed of in accordance with the country's regulations? (b) Is offshore dumping of dredged soil properly disposed in accordance with the country's regulations? (c) Does the project prepare any measures to avoid dumping or discharge toxicants?	(a) N (b) Y (c) Y	(a) The Lake-wide ship wastes are monitored by the member countires of the Tanganyka Lake Authorities. (b) Project generated dredged soil is not to be dumped to the Lake waters, instead it is used as fill volume in earthworks for slipway construction and container terminal construction. (c) During the JICA praparatory survey, potential contaminated areas of lakebottom and former terrestrial dredge soil dump of the existing piers and planned container-terminal are extensively explored and are subjected to chemical toxicant analyses, resulting in non-existence of trace amount of toxicants.
2 Pollution Control	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a) Y	(a) A baseline noise survey conducted along and around the main entrance to the port area resulted in noise levels below the WHO standards daytime and the night.
	(5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) -	(a) the proposed project does not entail pumping a substantial volume of the groundwater.
	(6) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(a) -	(a) There is no potential odor sources due to the project.
	(7) Sediment	(a) Are adequate measures taken to prevent contamination of sediments by discharges or dumping of hazardous materials from the ships and related facilities?	(a) Y	(a) There is no chances of lakebottom sediment contamination due to discharges from ships.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) The project site is outside the boundaries of the designated protected areas such as Ramsar Convention wetland.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic organisms? Are adequate measures taken to reduce negative impacts on aquatic organisms? (e) Is there a possibility that the project will adversely affect vegetation or wildlife of coastal zones? If any negative impacts are anticipated, are adequate measures taken to reduce the impacts on vegetation and wildlife?	(a) N (b) N (c) - (d) N (e) N	(a) It does not encompass ecologically important habitats. (b) It does not encompass habitats of endangered species. (c) Significant impacts are not anticipated. (d) Adverse impacts on aquatic organisms are anticipated. Hippopotamus used to graze and come ashore on the shcrelines and tidal outcrops. (e) Will not adversely affect vegetation and wildlife of coastal zones, though the coastal zone is an part of hippopotamus grazing area.
	(3) Hydrology	(a) Do the project facilities affect adversely flow regimes, waves, tides, currents of rivers and etc if the project facilities are constructed on/by the seas?	(a) N	(a) The construction of piers of the container terminal does not change the flow regimes, tides, and currents within and outside the port area.

6

Environmental Checklist: . 10.Ports and Harbors (3)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(4) Topography and Geology	(a) Does the project require any large scale changes of topographic/geographic features or cause disappearance of the natural seashore?	(a) N	(a) The earthworks needed to construct the new container terminal do not envisage significant topographic/geomorphorogic features. The proposed site and the surrounding environment, in the designated port area, has already undergone intensive and extensive anthropogenic exploitation, leaving almost no natural vegetation nor habitats.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) N (c) N (d) N (e) N (f) N (g) N (h) N (i) N (j) N	No involuntary resettlement is envisaged as the site and its adjacent environment reside within the restricted port area.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that changes in water uses (including fisheries and recreational uses) in the surrounding areas due to project will adversely affect the livelihoods of inhabitants? (c) Is there a possibility that port and harbor facilities will adversely affect the existing water traffic and road traffic in the surrounding areas? (d) Is there a possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are considerations given to public health, if necessary?	(a) N (b) N (c) N (d) N	(a) No inhabitants in the site and its vicinity. (b) No fisheries and recreational uses in the site and its vicinity. By Burundian law, fishing in the port waters is prohibited. (c) Construction of piers and container terminal facilitate water traffic. (d) Prevention measures will be taken by the BMPRA.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There exist no local archaeological, historical and religious heritage, in the vicinties of the port area.

Environmental Checklist: . 10.Ports and Harbors (4)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Moving cranes and high-rise cargo handling facilities will alter the apex profile of the port landscape, distant view, but it does not constitute an unharmony with existing landscape of the port and surroundings.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) - (b) -	(a) There are no ethnic minorities nor indigeneous peoples living in the vicinity of the port and its surroundings. (b) No impacts anticipated.
4 Social Environment	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) N (b) Y (c) Y (d) Y	(a) BMPRA shall comply with Burundi's laws on working conditions. (b) BMPRA shall observe safety considerations such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials. (c) BMPRA shall establish a safety and health program, and conduct safety training (including traffic safety and public health) for workers. (d) BMPRA shall take appropriate measures to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) BMPRA shall take adequate measures to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes). It is realized through establishment of a joint regulat meeting among BMPRA, concessionnaire, and the contractor, dedicated to cope with reducing and nullifying the project-generated adverse impacts. (b) It is done in the same manner as above (a). (c) The envisaged unit will take actions whenever complaints are received by the above scheme as stated in the (a).
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) N	(a) BMPRA, the proponent, shall address and establish an Environmental Monitoring Plan (EMP) to tackle with incidents of potential impacts. (b) Addressed are noise level (in dBA) and increased tubidity and suspended solids (SS) due to deployment of construction machines for earthworks and piling work during construction. (c) By EMP, BMPRA shall conduct a regular monitoring of port water body by measuring SS abd turbidity. Other monitoring items and monitoring frequencies shall be added to the original plan. (d) BMPRA shall confirm and verify its monitoring program with Burundian regulatory authorities.

Environmental Checklist: . 10.Ports and Harbors (5)

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
6 Note	Note on Using Environmental Checklist	(a) Where necessary, impacts on groundwater hydrology (groundwater level drawdown and salinization) that may be caused by alteration of topography, such as land reclamation and canal excavation should be considered, and impacts, such as land subsidence that may be caused by groundwater uses should be considered. If significant impacts are anticipated, adequate mitigation measures should be taken. (b) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) - (b) -	(a) Proposed project's construction works does not entail any significant earthworks, ground boring, nor land reclamation that may interfere with existing confined ground water regime, resulting in ground subsidence. (b) The project does not envisage factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, nor global warming.

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made.
In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

Annex-3

MONITORING FORM

BMPRA, as the executing agency, shall regularly undertake necessary environmental measurements on the quality of port waters. This activity shall constitute an essential part of BMPRA's overall Environmental Management activity. Observed water quality data shall then regularly be reported to JICA using the standard "Monitoring Form" below, as designated by JICA.

DURING CONSTRUCTION

During the construction, BMPRA, will jointly with concessionaire, monitor Port's ambient water quality through Contractor's obligatory environmental measurement activity. The measured results are recorded in a book and are to be reported to JICA, using the following form.

Ambient Water Quality

Water Quality Parameters to be measured: Suspended Solids (mg/liter) or Turbidity (NTU)

Sampling Location	Sampling Depth	Sampling Frequency	Reference Value Observed at the Baseline Survey, August, 2013
a. Inside the Silt Curtain (While the dredging and/or piling is in operation)	-1 meter Depth from the Surface	Daily Three times of sampling for a Day. Turbidity (NTU) or Total Suspended Solids (mg/l) Morning (9:00): Noon (12:00): Afternoon (15:00):	Range of Turbidity 0.1 – 1.0 NTU Range of Total Suspended Solids 8 – 15 mg/l
b. 10 meters away from the Silt Curtain	-1 meter Depth from the Surface	Daily Three times of sampling for a Day Turbidity (NTU) or Total Suspended Solids (mg/l) Morning (9:00): Noon (12:00): Afternoon (15:00):	
c. 150 meters away from the Silt Curtain	-1 meter Depth from the Surface	Daily Three times of sampling for a Day Turbidity (NTU) or Total Suspended Solids (mg/l) Morning (9:00): Noon (12:00): Afternoon (15:00):	

d. Outside the port boundary, but along the navigation channel within the Lake Water, i.e. the port entrance	-1 meter Depth from the Surface	Daily Three times of sampling for a Day Turbidity (NTU) or Total Suspended Solids (mg/l) Morning (9:00): Noon (12:00): Afternoon (15:00):	

AFTER CONSTRUCTION

After construction and the new terminal is operational, BMPRA, through concessionaire, monitor Port's ambient water quality for three (3) years. The measured results are recorded in a book and are to be reported to JICA, using the following form.

Ambient Water Quality

Water Quality Parameters to be measured: Suspended Solids (mg/liter) or Turbidity (NTU)

Sampling Location	Sampling Depth	Sampling Frequency	Reference Value Observed at the Baseline Survey, August, 2013
a. New container terminal berth	-1 meter Depth from the Surface	One Day per Week Three times of sampling for a Day. Turbidity (NTU) or Total Suspended Solids (mg/l) Morning (9:00): Noon (12:00): Afternoon (15:00):	Range of Turbidity 0.1 – 1.0 NTU Range of Total Suspended Solids 8 – 15 mg/l
b. 100 meters West of the new container terminal berth	-1 meter Depth from the Surface	One Day per Week Three times of sampling for a Day Turbidity (NTU) or Total Suspended Solids (mg/l) Morning (9:00): Noon (12:00): Afternoon (15:00):	
c. 250 meters West of the new container terminal berth	-1 meter Depth from the Surface	One Day per Week Three times of sampling for a Day Turbidity (NTU) or Total Suspended Solids (mg/l) Morning (9:00): Noon (12:00): Afternoon (15:00):	
d. Outside the port boundary, but along the	-1 meter Depth from the Surface	One Day per Week Three times of sampling for a Day Turbidity (NTU) or Total Suspended	

navigation channel within the Lake Water, i.e. the port entrance		Solids (mg/l) Morning (9:00): Noon (12:00): Afternoon (15:00):	

French

PROCES-VERBAL DES DISCUSSIONS SUR L'ETUDE PREPARATOIRE DU PROJET D'EXTENSION DU PORT DE BUJUMBURAEN RÉPUBLIQUE DU BURUNDI

(EXPLICATION SUR LE RAPPORT DE L'AVANT-PROJET SOMMAIRE)

Faisant suite aux discussions et à l'étude sur terrain menées en août 2013 en République du Burundi (ci-après désignée « Burundi »), et à l'analyse technique des résultats de cette étude au Japon, l'Agence japonaise de coopération internationale (ci-après désignée « JICA ») a élaboré un avant-projet du rapport de l'étude préparatoire sur le projet d'extension du port de Bujumbura (ci-après désigné « avant-projet du rapport »).

Afin d'expliquer et discuter avec la partie burundaise sur le contenu de l'avant-projet du rapport, la JICA a décidé d'envoyer du 23 au 28 février 2014, une délégation (ci-après désignée « délégation ») dirigée par M. Yoshimoto KOYANAGI, Directeur adjoint de la 1ère Division du Département de l'infrastructure économique (Transportation and ICT Division 1).

Au terme des discussions, les deux parties ont confirmé les principaux points décrits sur les feuilles en annexe.

A Bujumbura, le 27 février 2014

Mr. Yoshimoto Koyanagi
Directeur adjoint
Délégation de l'Etude préparatoire
Agence japonaise de coopération internationale

FIELD OFFICE BUJUMBURA, BURUNDI

Hon. Amb. Nibigira Ezéchiel
Directeur général
Autorité maritime, portuaire et ferroviaire (AMPF)
République du Burundi

RÉPUBLIQUE DU BURUNDI DIRECTION GENERALE B.P. 6716 Bujumbura AUTORITE MARITIME, PORTUAIRE ET FERROVIAIRE

Hon. Ciza Virginie
Ministre
Ministère des Transports, des Travaux publics et de l'Equipement
République du Burundi

RÉPUBLIQUE DU BURUNDI Cabinet du Ministre Transports, des Travaux Publics et de l'Equipement

ANNEXE

1. **Eléments constitutifs du rapport de l'avant-projet sommaire**
   La partie burundaise a approuvé dans son ensemble le contenu du rapport de l'avant-projet expliqué par la délégation.

2. **Plan japonais d'aide publique au développement**
   La partie burundaise a de nouveau approuvé le plan japonais d'aide publique au développement. Elle a garanti que le Burundi prendra les mesures nécessaires décrites dans les annexes IV et V du procès-verbal des discussions (M/D) signé par les deux parties le 19 août 2013.

3. **Calendrier de l'étude**
   La JICA complètera le projet de rapport final de l'avant-projet sommaire de l'étude préparatoire en anglais et en français conformément aux points convenus entre les deux parties et le remettra à la partie burundaise à travers le bureau de représentation de la JICA au Burundi au plus tard en juin 2014.

4. **Estimation du coût**
   Dans le souci de garantir une acquisition juste et équitable, les deux parties ont convenu que le contenu de l'annexe I relative à l'estimation du coût du projet ne pourra en aucun cas être reproduit ou divulgué aux tiers avant la signature de tous les contrat(s) relatifs au projet.

5. **Equipements de manutention des conteneurs**

5-1. La délégation a expliqué à la partie burundaise que les équipements de manutention de conteneurs ont été exclus du projet en raison 1) des contraintes budgétaires du projet, 2) des priorités exprimées par la partie burundaise et convenues entre les deux parties dans le procès-verbal du 19 août 2013, et 3) de la possibilité d'acquisition de ces équipement auprès de la Banque africaine de développement (BAD) ou du concessionnaire.

5-2. La partie burundaise a compris la nécessité d'installer, avant la fin du projet prévue au mois d'octobre 2016, les équipements de manutention de conteneurs ci-après et a évoqué la possibilité de leur fourniture à travers le budget du gouvernement du Burundi. Il s'agit de :

- 1 grue mobile,
- 2 gerbeurs (1 pour le poste de mouillage, 1 pour l'aire de stockage de conteneurs),

- 2 camions tracteurs (1 pour le poste de mouillage, 1 pour l'aire de stockage de conteneurs),
- 3 plateaux porte-conteneurs (2 pour une opération ordinaire, 1 pour le secours).

La partie burundaise a promis de délivrer une lettre d'engagement de la fourniture des équipements de manutention des conteneurs mentionnés ci-dessus, en prenant toute la responsabilité de les acquérir.

5-3. La délégation a expliqué à la partie burundaise que la transmission de la lettre mentionnée ci-dessus constitue une condition préalable pour l'approbation du projet par le Conseil des Ministres du gouvernement du Japon. La partie burundaise s'engage à transmettre ladite lettre de préférence avant la fin du mois de mars 2014 et au plus tard avant la fin du mois de mai 2014 au bureau de représentation de la JICA au Burundi.

6. Système d'exploitation et de maintenance

6-1. La partie burundaise a expliqué à la délégation le principe de base que les installations et les équipements installés par le projet seront opérés et entretenus sous l'entière responsabilité de l'Autorité maritime, portuaire et ferroviaire du Burundi (AMPFB).

6-2. La partie burundaise a expliqué à la délégation que l'Autorité maritime, portuaire et ferroviaire du Burundi (AMPFB) est investie du pouvoir d'instruire le concessionnaire de prendre les mesures nécessaires en rapport avec le développement et le changement des activités du port.

7. Considérations environnementales et sociales

7-1. La partie burundaise a expliqué à la délégation que le rapport sur l'environnement (EIE) requis pour le Projet n'est pas encore approuvé par le ministère de l'Eau, Environnement, de l'Aménagement du territoire et de l'Urbanisme (MEEATU). La partie burundaise s'est engagée à obtenir l'approbation du MEEATU et de la transmettre au bureau de représentation de la JICA au Burundi le plus tôt possible, et ce au plus tard à la fin du mois d'avril 2014 avant la tenue de la réunion du Conseil des ministres du gouvernement japonais.

7-2. Les deux parties se sont mis d'accord sur le contenu de la fiche de vérification environnementale objet de l'annexe II.

7-3. La partie burundaise a accepté que le suivi des aspects environnementaux et sociaux sera assuré sous la responsabilité de l'Autorité maritime, portuaire et ferroviaire du Burundi (AMPFB) conformément au plan de suivi du projet tel que défini dans le rapport de l'étude préparatoire et au rapport sur l'environnement mentionné ci-dessus. Pendant les travaux de construction et après l'achèvement du

projet, les résultats de suivi seront transmis au bureau de représentation de la JICA au Burundi en remplissant la fiche de suivi objet de l'annexe III.

7-4. La partie burundaise accepte que la JICA pourra fournir les résultats du suivi ainsi que d'autres informations à toute tierce personne qui le désire.

8. Autres

8-1. La partie burundaise a affirmé qu'elle prendra à sa charge les dépenses relatives :

- à l'installation d'une ligne à haute tension sur le chantier du projet avant le mois d'octobre 2015. La date limite exacte et l'emplacement de cette installation seront précisés par la partie japonaise à la partie burundaise après l'achèvement de la préparation du dossier d'appel d'offres du projet,
- au déménagement de la ligne électrique de 600V alimentant la cabine du quai à conteneurs actuel à la fin de la délimitation du site du projet, probablement entre février et avril 2015,
- au nettoyage périodique (chaque semaine ou tous les quinze jours) du nouveau collecteur d'eaux dévié.

8-2. Le procès-verbal des discussions sera produit en français et en anglais, qui toutes font foi. En cas de divergence d'interprétation, la version anglaise prévaudra.

Annexe-1 Estimation du coût du projet
Annexe-2 Liste des points de vérification sur l'environnement
Annexe-3 Fiche de suivi

CONFIDENTIAL

Annexe-1

This page is closed due to the confidentiality.

Notes:

(1) L'estimation de coût du tableau ci-dessus est provisoire et elle sera examinée plus en détail par le gouvernement japonais pour l'approbation de cette aide.

(2) Le coût total du Projet, à savoir, 2 769 millions de JPY est équivalent de 27,56 millions de dollars US. Le taux de change utilisé pour cette conversion est le taux actuel : 1,0 USD =100,47 JPY.

Annexe - 2

Environmental Checklist: . 10.Ports and Harbors (1)

Categorie	Element	Points de Contrôle Principaux	Oui: Y Non: N	Observations sur des Questions Environnementales (Raisons, Mesures de mitigation)
Autorisation et Explication	(1) EIE et Autorisation sur les questions environnementales	(a) Le processus de la préparation du Rapport EIE, a-t-il été déjà officialisé? (b) Le Rapport EIE, a-t-il été approuvé par des autorités gouvernementales? (c) Cette approbation, a-t-elle été inconditionnelle? Si des conditions, il y en a, ont-elles été satisfaites? (d) En dehors de l'approbation suscitée, d'autres autorisations nécessaires (s'il y en a) ont été données par une autorité appropriée?	(a) Y (b) N (c) N (d) N	(a) La clarification de l'état actuel d'avancement doit être faite par AMPFB. (b) La clarification de l'état actuel d'avancement doit être faite par AMPFB. (c) La clarification de l'état actuel d'avancement doit être faite par AMPFB. (d) La clarification de l'état actuel d'avancement doit être faite par AMPFB.
	(2) Explication aux parties prenantes locales	(a) Les parties-prenantes locales ont reçu une bonne explication sur des impactes probables du projet et l'ont consentie suivant une procédure approprié. (b) Les observations des parties-prenantes (population locale, etc), ont-elles été reflétées sur la conception du projet?	(a) Y (b) Y	(a) Par la mission de l'étude du P/D du Port de Burundi, le présentation sommaire du projet a été faite. (b) La conception du projet tient compte des opinions expérimées par les parties prenantes.
	(3) Examination d'Alternatives	(a) Les mesures alternatives, ont-t-elles été réfléchies sur la base des considérations sociales et environmentales?	(a) Y	(a) Les options A et B du Plan Directeur ont été présentées avec zéro option.
2 Contrôle de pollution	(1) Qualité d'Air	(a) La pollution d'air comme Sox, NOx, suie et poussières dégagés par les bateaux, les véhicules et les équipement du Projet; est conforme au norme natioanl? Vous avez déjà pris les mesures de mitigation de cette pollution?	(a) N	(a) Comme il n'y a pas de normes burundaises, les normes de la Communauté de l'Afrique de l'Est seront appliqués. Le monitoring de l'impactes des emissions de bateau sur la qualité de l'eau n'est pas encore commencé.
	(2) Qualité d'Eaux	(a) Les eaux usées des installations du projet sont conformes au norme environnemental de ce pays? (b) Vous avez déjà considéré les mesures préventives contre la fuite d'huiles et desproduits toxiques? (c) Est-ce que le Projet prévoit des mesures contre la fuite d'huile et de produits toxiques? (d) Est-ce que le Projet peut provoquer un changement de la ligne côtière et une disparition/aparition d'une surface de la terre? Est-ce que le Projet peut provoque le changement de la température, de la qualité et du débit des eaux? (e) Est-ce que le Projet prévoit des mesures préventives contre la pollution du sol, des eaux ou de la nappe phréatique à cause de la contamination qui provient du projet?	(a) N (b) N (c) Y (d) N (e) -	(a) Comme il n'y a pas de normes burundaises, les normes de la Communauté de l'Afrique de l'Est seront appliqués. Le monitoring de l'effet de l'évacuation des eaux des fortes pluies, déversées directement dans le bassin portier, sur la qualité de l'eau n'est pas encore commencé. (b) Sans réponse. Il n'y a pas de normes concernant les eaux usées de bateaux au Burundi actuellement. Il n'y a non plus des mesures prises en cette matière. (c) L'unité d'urgence d'AMPFB prend charge des accidents de fuite d'huile et de produits toxiques. (d) La construction du terminal à conteneurs réduit la longueur de la plage à l'intérieur de la zone portière. Cependant, elle ne change pas la ligne cotière du lac. Concernant le changement du débit du déversement dans la zone portière, le canal de drainage qui déverse directement les eaux de pluie dans la zone portière, sera dévié par la construtiion du nouveau canal qui va directement vers le lac. Par conséquent les charges polluantes à cause des eaux usées dans la zone portière diminueront considé rablement. ce qui va améliorerconsidérablement la qualité d'eau dans la zone portière. (e) Le projet ne nécessite aucune récupération de terre pour la construction du terminal à conteneurs.

Environmental Checklist: . 10.Ports and Harbors (2)

Categorie	Element	Points de Contrôle Principaux	Oui: Y Non: N	Observations sur des Questions Environnementales (Raisons, Mesures de mitigation)
	(3) Dechets	(a) Es-ce que les déchets produits par les bateaux et d'autres équipements du projet sont traités et jetés conformément à la réglementation du pays? (b) Le rejet de la terre de dragage au large est fait conformément à la ré glementations du Burundi? (c) Est-ce que le projet prévoit des mesures préventives contre le rejet des d échets toxiques?	(a) N (b) Y (c) Y	(a) La quantité totale des déchets du lac est contrôlée par les pays membre des Autorit és du Lac Tanganyka. (b) La terre de dragage ne sera pas jeté dans le lac. Elle va être utilisée pour les travaux de remblayage pour la construction du cale et du terminal à conteneurs. (c) Dans le cadre de l'étude préliminaire de la JICA, les zones probablement contamin ées, les zones avec le fond probablement contaminé, et le lieu où la terre de dragage a été jeté au niveau de la jetée existante et du terminal à conteneurs du plan ont été examinées et ont fait l'objet de l'analyse des produits chimiques toxiques, ce qui ont donné le résultat de non-existence de trace de produits toxiques.
Pollution	(4) Bruits et vibrations	(a) Les bruits et les vibrations générés par le projet sont conformes au norme de votre pays?	(a) Y	(a) Une mesure du niveau sonore de base au niveau de l'entrée principale à la zone portière a donné le résultat qui indique le niveau du bruit, inférieur au standard défini par OMS (journalier et nocturne).
	(5) Affaissement	(a) Est-ce que l'utilisation de l'eau souterraine peut causer l'affaissement du sol?	(a) -	(a) Le projet proposé ne nécessite pas le pompage de l'eau souterraine.
	(6) Mauvais odeurs	(a) Est-ce qu'il y a une source de mauvais odeurs? Si c'est le cas, des mesures appropriées sont prévues?	(a) -	(a) Il n'y a pas de source potentielle d'odeur qui provient du projet.
	(7) Sedimentation	(a) Est-ce que des mesures appropriées sont prévues pour prévenir la contamination de sédiments à cause du rejet des matières dangereuses par les bateaux ou des installations connexes?	(a) Y	(a) Il n'y a pas de possibilité de la contamination de sédiments au fond du lac par les rejets de bateaux.
Nature	(1) Zone protégée	(a) Est-ce que le site du projet se trouve dans la zone protégée, désignée suivant la loi nationale ou les traités ou conventions internationales? Est-ce quele projet peut cause un impact négatif à ces zones?	(a) N	(a) Le site du projet se trouve à l'extérieur de la zone protégée comme celle définie par la convention de Ramsar.
	(2) Ecosystem	(a) Est-ce que le site du projet touche des forêts primitives, tropiques ou des habitats écologiques précieuses comme des récifs de corail, mangrove, ou lagunes? (b) Est-ce que le site du projet touche des habitats protégés des espèces rares, désignées par la loi ou les traités et les conventions intrnationales? (c) Si des impactes écologiques importants sont prévus, des mesures pour en atténuer sont prévues? (d) Est-ce qu'il y a une possibilité que le projet cause un effet négatif aux organismes aquatiques? Si c'est le cas, est-ce que des mesures pour en attenuer sont prévues? (e) Est-ce qu'il y a une possibilité que le projet cause un effet negatif aux vé gétations et aux animaux sauvages? Si c'est le cas, est-ce que des messures pour en atténuer sont prévues?	(a) N (b) N (c) - (d) N (e) N	(a) Le site du projet ne touche aucun habitat ecologiquement important. (b) Le site du projet ne touche aucun habitat des espèces rares. (c) Aucun impacte n'est prévu. (d) Aucun impact négative sur des organismes aquatiques n'est prévu. Hippopotames venait brouter les herbes sur la côte et l'affleurement des rochers au moment de la mar ée basse dans le passé. (e) Il n'y a pas d'impacte negative sur les végétation et les animaux souvages de la zone cotière, même s'il y a des hyppopotames qui vivent dans cette zone cotière.
	(3) Hydrologie	(a) Est-ce que les installations du projet ont un effet négatif au débit d'é coulement, aux vagues, aux marrais, à l'écoulement de rivière, etc. si ces installations sont construites au bord de l'eau?	(a) N	(a) La construction du poste à conteneurs ne change pas l'écoulement, les marée, le courant maritime à l'intérieur et à l'extérieur du port.

6

Environmental Checklist: . 10.Ports and Harbors (3)

Categorie	Element	Points de Contrôle Principaux	Oui: Y Non: N	Observations sur des Questions Environnementales (Raisons, Mesures de mitigation)
	(4) Topographie et Geologie	(a) Est-ce que le projet peut provoquer un changement important, topographique/géographique ou une disparition de plages?	(a) N	(a) Les travaux de terrassement pour construire le terminal à conteneurs ne causera pas le changement important en matière de la topographie et la géomorphorogie. Le site proposé et l'environnement aux alentours dans le port a déjà subi beaucoup d'exploitation par les hommes, par conséquent il n'y a ni végétation ni habitats.
Environnement Social	(1) Relogement	(a) Est-ce que l'exécution du projet peut nécessiter le relogement d'une partie de la population malgré eux? Si c'est le cas, est-ce que des mesures pour diminuer l'impact dû au relogement sont prévues? (b) Est-ce qu'une bonne explication sur la compensation et l'aide au relogement donné à la population concernée? (c) Est-ce que le plan de relogement incluant des aspects comme la compensation de la totalité du coût du relogement, la restauration de la condition de vie et du standard de vie a été développé sur la base d'une étude socioéconomique de relogement? (d) Est-ce que la compensation est payée avant le relogement? (e) La politique du relogement est proposée dans le document? (f) Est-ce que le plan de relogement inclut des considération particulière à des personnes vulnérables, y compris les femmes, les enfants, les personnes agées, les personnes qui vivent sous le seuil de pauvreté, les mynorité ethnique, et peuple indigène? (g) Est-ce que les personnes relogées ont accepté le relogement avant le relogement? (h) Est-ce que le cadre orgaisationnel a été établi pour le bon déroulement du relogement? (i) Est-ce qu'un plan pour le monitoring de l'impact du relogement a été développé? (j) Est-ce que le méchanisme d'écouter les plaintes a été établi?	(a) N (b) N (c) N (d) N (e) N (f) N (g) N (h) N (i) N (j) N	Aucun relogement involontaire n'est envisagé au site et aux alentours du site.
	(2) Condition de vie	(a) Est-ce qu'il y a une possibilité d'affecter les conditions de vie des habitants d'une manière négative? Est-ce que des mesures pour diminuer ces impacts ont été prévues? (b) Est-ce qu'il y a une possibilité que le projet cause le changemet pour l'utilisation de l'eau(y compris la pêche et dans le but recréationel dans les zones environnantes à cause des effets négatifs? (c) Est-ce qu'il y a une possibilité que le port et les installation portières cause un effet négatif au transport maritime et routier dans les zones environnantes?. (d) Est-ce qu'il y a une possibilité que les maladies infectieuse comme VIH peuvent -elles être introduites dans la zone du projet à cause des travailleurs immigrants pour le projet? Est-ce qu'une attention particulière a été payé à la santé publique?	(a) N (b) N (c) N (d) N	(a) Il n'y a personne qui habite, ni au site ni aux alentours. (b) Il n'y a ni la zone de pêche ni la zone de recréation au site et aux alentours. La loi burundaise interdit la pêche à l'intérieur du port. (c) La construction de la poste à conteneurs et du terminal à conteneurs facilite le transport maritime. (d) Des mesures préventives seront prises par AMPFB.

7

Environmental Checklist: . 10.Ports and Harbors (4)

Categorie	Element	Points de Contrôle Principaux	Oui: Y Non: N	Observations sur des Questions Environnementales (Raisons, Mesures de mitigation)
	(3) Heritage	(a) Est-ce qu'il y a une possibilité que le projet endommage des héritages archeologique, historique, culturel, et religioux? Est-ce que des mesure sont prévues pour protéger ces sites conformément à la loi de votre pays?	(a) N	(a) Il n'y a ni site archéologique, ni site historique, ni site religioux aux environs du port.
	(4) Paysage	(a) Est-ce qu'il y a une possibilité que le projet peut affecter le paysage du site? Est-ce que des mesures sont envisagées pour ce problem?Is there a possibility that the project will adversely affect the local landscape?	(a) N	(a) Des grues et des conteneurs entassés à une hauteur assez elevée modifiera le paysage du port. mais cela ne va pas entamer l'harmonie avec le paysage qui existe déjà.
	(5) Minorités ethnique et peuple indigénes	(a) Est-ce que des considérations ont été donné pour réduire des impactes sur la culture et le style de vie de minorités ethniques et de peuple indigène? (b) Est-ce que les droits de minorités ethniques et de peuple indigène sont	(a) - (b) -	(a) Il n'y a ni minorité ethnique ni peuple indigène aux environs. (b) Aucun impact n'est prévu.
Environment Social	(6) Conditions de Travail	(a) Est-ce que le développer du projet n'enfreign pas la loi et des ordonnances en matière des conditions de travail que le développer du projet doit respecter? (b) Est-ce que des considérations concrètes en matière de la sécurité des personnes concernées au projet comme l'installation d'équipement de la sécurité pour prévenir des accidents de travail, et la gestion des matériels dangeroux? (c) Est-ce que des mesures immatérieles seront prévues pour les personnes concernées au projet comme un établissement du programme de la sécurité et de la santé, et la formation de sécurité (incluant la sécurité du transport et la santé publique) pour les travailleurs, etc? (d) Est-ce que des mesures appropriées seront prises pour assurer que les gardients de la sécurité affectés au site du projet ne porte atteinte à la sécurité des autres personnes ou des résidents locals?	(a) N (b) Y (c) Y (d) Y	(a) AMPFB se conformera avec la loi burundaise concernant les conditions du travail. (b) AMPFB appliquera les mesures de sécurité comme par exemple, la mise en place des équipements de sécurité pour prévenir les accidents du travail et pour traiter les matières dangereuses. (c) AMPFB elaborera le programe de sécurité et de la santé publique, et BMPRA shall establish a safety and health program, and conduct safety training (including traffic safety and public health) for workers. (d) BMPRA shall take appropriate measures to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents.
	(1) Effets des travaux de construction	(a) Est-ce que des mesures seront prises pour atténuer la pollution comme le bruit, la vibration, les eaux troubles, les poussières, le gaz d'echappement, et les ordures? (b) Si les travaux de construction produisent un effet négatif à l'environnement naturel (écosystème), des mesures pour attenuer cet effet seront considérés? (c) Si les travaux de construction produisent un effet négatif à l'environnement social , des mesures pour attenuer cet effet seront considérés?	(a) Y (b) Y (c) Y	(a) AMPFB prendra des mesures nécessaire pour diminuer des impacts pendant la période de construction (bruits, vibrations, turbidité de l'eau, poussières, gas d'échappement, et déchets). Elles qui seront décidées par la réunion d'AMPFB,concessionnaires, et le contractant sont pour diminuer et supprimer les impacts négatifs dus au projet. (b) Ce problème sera traité de la même manière que (a). (c) Le service contentieux sera crée pour répondre aux plaintes et les problèmes seront traités d'une manière indiquée à (a)

Environmental Checklist: . 10.Ports and Harbors (5)

Categorie	Element	Points de Contrôle Principaux	Oui: Y Non: N	Observations sur des Questions Environnementales (Raisons, Mesures de mitigation)
Autres	(2) Monitoring	(a) Est-ce que le programme du monotoring de développement et d'exé cution concernant les questions environnementales qui est en cours d'étude peut avoir un impact? (b) Quel sont les paramètres, méthodes et fréquences du programme du monitoring? (c) Est-ce que le cadre du monitoring (organisation, personnel, matériel, et budget approprié pour appuyer le cadre du monitoring) est déjà prévu? (d) Est-ce que des régles concernant le système du rapport de monitoring comme le formulaire, et la fréquence de la présentation de rapports aux autorités, ont été déjà établis?	(a) Y (b) Y (c) Y (d) N	(a) AMPFB et la personne principale qui propose le projet établira le Plan du Monitoring Environnemental pour diminuer des impacts. (b) Ce sont le niveau du bruit (dBA) et la turbidité augmentée et solides en suspension à cause de l'utilisation d'engins de construction et des travaux d'installation de piliers. (c) Par le plan de monitoring, AMPFB conduira le monitoring régulièrement en analysant la qualité de l'eau (solides en suspension et turbideté). D'autres paramètres et la fréquence du monitoring sera ajoutés par rapport au plan initial. (d) AMPFB confirmera son programme du monitoring avec les autorités burundais des réglementations.

Environmental Checklist: . 10.Ports and Harbors (6)

Categorie	Element	Points de Contrôle Principaux	Oui: Y Non: N	Observations sur des Questions Environnementales (Raisons, Mesures de mitigation)
6 Note	Observation sur cette liste	(a) Si des impacts comme abaissement du niveau de l'eau souterraine ou salinisation (impacts sur l'hydrologie de l'eau souterrain dû au changement de topologie comme récupération du sol, excavation du canal), ou affaissement de la terre dû à l'utilisation de l'eau souterraine sont prévues, des mesures de mitigation des impacts doivent être prévues. (b)Des impacts globals qui touchent la vaste zone audelà de la frontière comme les eaux usées qui passent les différentes zones, ou la pluie acide, la destruction de la couche d'ozone, ou le rechauffement de la terre, qui peuvent être provoqués par le projet, doivent être étudiés.	(a) - (b) -	(a) Les travaux de construction ne comprennent ni les importants travaux de terrassement, ni le forage, ni la récupération de la terre, qui peuvent causer le changement de l'état de l'eau souterraine et l'affaissement de terrain. (b) Le projet ne prend pas en considération des facteurs qui peuvent provoquer des problèmes comme le traitement des déchets qui proviennent de la zone hors frontière, la pluie acide, la destruction de la couche d'ozone, le réchauffement de la terre.

1) Le terme, "normes nationales" qui est utilisé dans le tableau, comme les normes nationales environnementales, doivent se conformer aux normes internationales. Au cas où il y a trop d'ecart entre ces deux normes, il faut reconsidérer sur la question environnementale d'une manière appropriée. Au cas où des réglementations sur certains points, manquant, sont à élaborer à partir du maintenant, l'élaboration doit être faite en se référant sur des réglementations d'autres pays (y compris les expériences japonaises).

2) La list des points de vérification environnementale est une liste basée sur les considérations générales. Par conséquent, il faut la modifier en ajoutant ou éliminant des points de vérification en tenant compte du contexte locale.

Annexe - 3

FORMULAIRE DU MONITORING

AMPFB, en tant que l'organisation d'exécution, exécutera régulièrement l'analyse de la qualité d'eau. Cette activité constituera la partie essentiale des activités de la Gestion Environnementale d'AMPFB. Les données d'analyse de l'eau, ainsi obtenues, sera présentées à la JICA sous forme du Formulaire du Monitoring comme ci-dessous.

PENDANT LA CONSTRUCTION

Pendant la construction, AMPFB exécutera le monitoring de la qualité d'eau de la zone portière en collaboration avec le concessionnaire dans le cadre des activités obligatoires. Les données ainsi obtenues seront enregistrées dans un registre et présentées à la JICA.

Qualité de l'Eau dans la Zone Portière

Les paramètres suivants sur la qualité de l'eau sera analysée : Solides en Suspention (mg/litre) ou Turbidité (NTU)

Position d'Echantillonnage	Profondeur d'Echantillonnage	Fréquence d'Echantillonnage	Valeur de Référence Observées lors de l'étude en août 2013
a. A l'intérieur du barrage flottant (Pendant le dragage et/ou les travaux d'installation des piliers)	-à 1 mètre de la surface d'eau	Tous les jours Trois fois par jour. Turbidité (NTU) ou Solides en Suspension Totals (mg/l) Matin (9:00): Midi (12:00): Après-midi (15:00):	Gamme de Turbidité 0.1 – 1.0 NTU Gamme de Solides En Suspension Total 8 – 15 mg/l
b. A 10 meters du Barrage Flottant	- A 1 mètre de la Surface d'eau	One Day per Week Three times of sampling for a Day Turbidity (NTU) or Total Suspended Solids (mg/l) Morning (9:00): Noon (12:00): Afternoon (15:00):	
c. A 150 meters du Barrage Flottant	-A 1 meter de la Surface d'eau	Tous les jours Trois fois par jour. Turbidité (NTU) ou Solides en Suspension Totals (mg/l) Matin (9:00): Midi (12:00): Après-midi (15:00):	
d. A l'extérieur du la	-1 meter Depth	Tous les jours Trois fois par jour	

limite du port, mais toute la longueur de la voie de navigation dans le lac, c'est-à-dire, à l'entrée du port	from the Surface	Turbidité (NTU) ou Solides en Suspension Total (mg/l) Matin (9:00): Midi (12:00): Après-midi (15:00):	

APRES LA CONSTRUCTION

Après la construction et la mise en service du terminal à conteneurs, AMPFB fera le monitoring de la qualité d'eau de la zone portière en collaboration avec le concessionnaire pendant trois (3) ans. Le résultat d'analyse sera enregistré et présenté à la JICA sous forme du formulaire suivant.

Qualité de l'Eau de la Zone Portière

Les paramètres suivants sur la qualité de l'eau sera analysée : Solides en Suspention (mg/litre) ou Turbidité (NTU)

Position d'Echantillonnage	Profondeur d'Echantillonnage	Fréquence d'Echantillonnage	Valeur de Référence Observées lors de l'étude en août 2013
a. Poste de mouillage du nouveau terminal à conteneurs	- A 1 mètre de la Surface d'Eau	Un jour par semaine Trois fois par jour d'échantillonnage Turbidité (NTU) ou Solides en Suspension Total (mg/l) Matin (9:00): Midi (12:00): Après-midi (15:00):	Gamme de Turbidité 0.1 – 1.0 NTU Gamme de Solides En Suspension Total 8 – 15 mg/l
b. A 100 meters oust du poste de mouillage du nouveau terminal à conteneurs	- A 1 mètre de la Surface d'Eau	Un jour par semaine Trois fois par jour d'échantillonnage Turbidité (NTU) ou Solides en Suspension Total (mg/l) Matin (9:00): Midi (12:00): Après-midi (15:00):	
c. A 250 meters oust du poste de mouillage du nouveau terminal à conteneurs	- A 1 mètre de la Surface d'Eau	Un jour par semaine Trois fois par jour d'échantillonnage Turbidité (NTU) ou Solides en Suspension Total (mg/l) Matin (9:00): Midi (12:00): Après-midi (15:00):	
d. A l'extérieur du la limite du port, mais toute la longueur de la voie de navigation dans le lac,	- A 1 mètre de la Surface d'Eau	Un jour par semaine Trois fois par jour d'échantillonnage Turbidité (NTU) ou Solides en Suspension Total (mg/l)Morning Matin(9:00): Midi (12:00):	

c'est-à-dire, à l'entrée du port		Après-midi (15:00):	

13

5 Commitment Letter for the Procurement of container handling equipment

English

REPUBLIC OF BURUNDI

Bujumbura, March 20, 2014

MINISTRY FOR TRANSPORT, PUBLIC WORKS AND EQUIPMENT

MINISTRY CABINET

Ref. N°: 720/CAB/0396/2014

Commitment on the Procurement of container handling equipment for the Project for the Improvement of the Port of Bujumbura

To: Mr. Yoshimoto KOYANAGI,
Deputy Director
Transportation and ICT Division 1
Economic Infrastructuer Departement
Japan Internation Cooperation Agnecy

Dear Mr Koyanagi,

Referring to the Articles 5-2 and 5-3 of the Minutes of the Discussions on the Preparatory Survey for the Project signed by JICA and Ministry of Transports, Public Works and Equipment of the Republic of Burundi (hereafter defined as "MTPWE") on February 27, 2014, I, Minister of MTPWE inform you that the Government of Burundi shall take full responsibility of procurement of the following container handling equipment as indispensable component for the Project by the time of completion of the Project, October, 2016 as planned:

- 1 mobile container STS crane 35 ton at 19 m radius
- 2 reach stackers 35 ton, 3 tiers for loaded and 4 tiers for empty
- 2 tractor heads
- 3 terminal chassis.

Any necessary measure to assure the fund and procurement of the equipment will be determined by the coordination with relevant ministries/organizations and any international donors by the Burundi sides' discretion and the status of the procurement will be informed JICA by any necessary manner and timing.

Yours sincerely,

Hon. Virginie CIZA
Minister
Ministry of Transports, Public Works and Equipment

Po Box : 1860 Bujumbura – Tél. : (+257) 22 22 77 72, (+257) 22 22 68 41 – Fax : (+257) 22 22 68 40 – E-mail : mttpe@cbint.com

French

REPUBLIQUE DU BURUNDI

Unité • Travail • Progrès

MINISTERE DES TRANSPORTS, DES TRAVAUX PUBLICS ET DE L'EQUIPEMENT

CABINET DU MINISTRE

N° réf. : 720/CAB/0396/2014

Bujumbura, le 20/03/2014

A Monsieur Yoshimoto KOYANAGI, Directeur adjoint de la 1ère division du Département de l'infrastructure économique à l'Agence japonaise de coopération internationale (JICA)

Objet : Engagement pour la fourniture des équipements de manutention de conteneurs pour le projet d'extension du port de Bujumbura

Monsieur le Directeur adjoint,

Faisant référence aux articles 5-2 et 5-3 du procès-verbal des discussions sur l'étude préparatoire du projet signé entre l'Agence japonaise de coopération internationale (JICA) et le ministère des Transports, des Travaux publics et de l'Equipement, nous avons l'honneur de vous informer que le gouvernement du Burundi s'engage à assumer l'entière responsabilité de l'acquisition des équipements de manutention de conteneurs suivants comme composante indispensable pour le projet avant la fin du projet prévue au mois d'octobre 2016.

Il s'agit des équipements ci-après :

- une grue mobile STS pour conteneurs de 35 tonnes et de 19 mètres de portée,
- deux gerbeurs de 35 tonnes, de 3 plans en hauteur chargé et 4 de plans en hauteur vide,
- deux camions tracteurs, et
- trois plateaux porte-conteneurs.

Toute mesure nécessaire pour se procurer les fonds et les équipements sera déterminée en collaboration avec les ministères et/ou organismes compétents, et tous les bailleurs de fonds internationaux quelconques à être déterminés à notre discrétion ainsi que l'état d'avancement de passation des marchés seront portés à la connaissance de la JICA de manière adéquate et en temps utile.

Veuillez croire, Monsieur le Directeur adjoint, en l'assurance de ma considération distinguée.

LE MINISTRE DES TRANSPORTS, DES TRAVAUX PUBLICS ET DE L'EQUIPEMENT

Hon. Virginie CIZA

B.P. 1860 Bujumbura – Tél. : (+257) 22 22 77 72, (+257) 22 22 68 41 – Fax : (+257) 22 22 68 40 – E-mail : mttpe@cbint.com

6 Meteorological Data and Water Level

Temperature of Bujumbura

Unit: degree centigrade

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Max. TEMP	33.6	29.4	33.3	35.0	30.5	34.5	35.5	34.5	34.5	35.2	35.3	33.2	33.6
Min. TEMP	11.2	19.1	15.0	14.1	18.7	14.0	14.4	14.5	13.1	14.1	15.0	15.4	14.9
Average TEMP	22.4	24.2	24.7	24.9	24.6	25.1	24.9	25.0	24.8	25.1	25.2	24.3	24.3

Source: Annuaire Statistique du Burundi 2011, 1996–2009

Average Monthly Temperature of Bujumbura

Unit: degree centigrade

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average TEMP	23.2	23.1	23.0	23.0	23.2	22.9	22.5	23.4	24.0	23.8	22.9	22.9	23.2

Source：Newest Every Country in the World Directory, the 11th Version

Average Monthly Rainfall of Bujumbura

Unit: mm

Year / Month	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Monthly Average
January	103.1	113.1	135.4	46.5	104.2	195.2	87.0	143.0	99.1	125.0	210.4	76.6	62.1	115.4
February	37.0	77.2	121.6	60.9	19.9	61.0	121.0	81.7	166.7	148.0	124.0	88.4	96.2	92.6
March	149.4	99.9	124.4	100.8	162.8	145.9	124.0	86.5	71.0	188.4	155.8	173.3	43.6	125.1
April	42.1	97.9	79.5	68.1	93.7	70.2	111.0	150.0	69.2	133.3	63.7	116.9	104.1	92.3
May	–	93.0	34.0	25.0	0.7	130.6	88.9	22.2	23.2	86.8	33.8	62.5	54.4	54.6
June	–	4.8	–	1.9	–	1.1	2.5	10.7	89.2	1.6	4.4	33.3	46.8	19.6
July	–	76.0	–	0.5	1.5	–	0.9	52.3	15.1	–	3.7	23.6	–	17.4
August	–	–	–	2.5	1.7	4.8	38.1	6.9	3.6	3.5	–	4.6	29.5	9.5
September	2.5	62.3	5.6	54.0	73.6	4.2	32.3	29.9	31.9	5.1	41.2	87.0	33.8	35.7
October	40.2	67.6	74.9	77.0	37.1	32.9	63.0	113.0	69.7	67.6	50.9	67.5	172.7	71.9
November	203.8	91.4	57.1	68.0	45.4	116.1	157.0	63.4	65.1	248.7	90.8	108.9	56.7	105.6
December		88.0	134.2	38.3	181.5	55.0	215.0	94.6	37.0	225.8	78.0	202.9	246.0	134.4
Yearly Average	728.8	871.2	766.7	543.5	722.1	817.0	1040.7	854.2	740.8	1233.8	856.7	1045.5	945.9	

Source：IGEBU Bujumbura Airport

Average Atmospheric Pressure by Month

Unit: hPa

Year / Month	2008	2009	2010	2011	2012	Average
January	922.7	922.5	921.3	923.3	922.5	922.5
February	923.5	923.2	922.2	922.8	921.7	922.7
March	923.3	922.3	922.1	922.1	922.1	922.4
April	922.9	922.7	922.5	922.7	923.0	922.8
May	923.2	923.5	923.7	921.8	924.3	923.3
June	923.6	924.0	923.4	920.9	925.5	923.5
July	922.6	925.1	924.5	921.7	924.8	923.7
August	921.4	924.4	923.2	922.2	923.6	923.0
September	920.9	922.2	923.1	922.3	923.4	922.4
October	921.2	922.2	922.2	922.2	923.6	922.3
November	922.0	921.0	922.3	921.1	921.9	921.7
December	920.8	922.5	923.0	921.6	922.6	922.1

Source： IGEBU Bujumbura Airport

Average Humidity by Month

Unit: %

Year / Month	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average
January	79	78	69	73	79	74	77	75	73	75	75	77	75.3
February	77	76	68	75	76	74	69	77	76	76	74	74	74.3
March	78	75	71	76	76	73	72	76	75	75	75	74	74.7
April	75	78	72	78	74	75	74	76	76	75	73	77	75.3
May	74	73	69	76	75	74	72	69	75	73	74	77	73.4
June	72	66	65	64	72	68	70	68	69	68	69	71	68.5
July	69	65	61	63	64	65	68	67	64	65	69	70	65.8
August	61	55	54	60	63	64	66	65	62	61	67	65	61.9
September	70	56	59	68	61	60	66	62	60	65	68	69	63.7
October	73	68	57	68	67	65	69	70	67	67	75	73	68.3
November	69	74	68	76	73	79	76	73	75	73	79	77	74.3
December	75	75	70	78	73	77	75	74	76	74	79	78	75.3

Source： IGEBU Bujumbura Airport

Average Sunshine Hours by Month

Unit: hours

Year / Month	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Average
January	181.8	165.5	146.7	167.7	146.6	232.4	203.5	179.3	172.9	108.1	170.5
February	100.9	170.8	175.5	202.7	155.0	140.4	198.4	160.7	154.3	93.1	155.2
March	184.3	180.4	203.8	167.7	175.5	152.5	204.2	196.4	205.2	185.2	185.5
April	184.7	153.4	229.9	164.3	196.2	211.1	210.8	194.2	215.6	234.2	199.4
May	248.6	211.9	213.4	252.1	234.4	257.7	187.5	239.6	251.0	232.1	232.8
June	245.1	283.6	226.9	300.0	266.8	309.7	264.2	217.5	241.2	308.3	266.3
July	321.8	287.0	315.2	232.4	264.3	318.2	166.3	300.9	325.1	280.6	281.2
August	280.4	296.5	282.5	225.8	259.4	271.2	−	290.5	238.8	186.2	259.0
September	180.0	212.7	205.4	224.1	220.1	205.3	209.1	230.4	259.2	142.8	208.9
October	187.0	211.0	228.0	187.0	190.2	223.3	146.1	202.1	162.5	171.8	190.9
November	191.7	145.5	149.2	190.9	176.4	175.7	163.5	189.8	−	−	172.8
December	177.3	152.0	247.0	169.5	174.2	168.0	129.9	183.4	131.3	−	170.3

Monthly Average Wind Velocity

Unit: m/sec

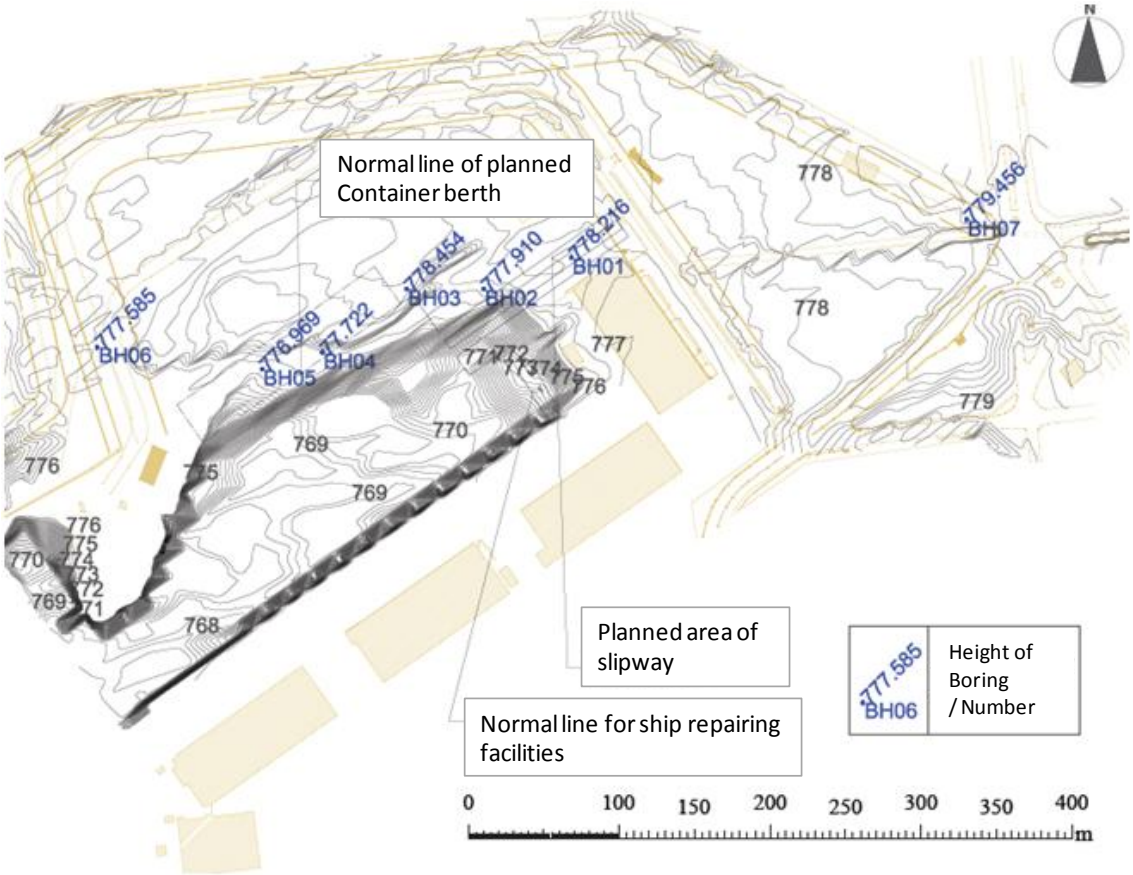
Year / Month	2004	2005	2006	2007	2008	2009	Average
January	−	0.34	1.51	0.19	1.11	0.95	0.82
February	−	0.46	−	0.75	0.31	0.66	0.55
March	0.86	0.49	1.24	1.37	0.11	0.72	0.80
April	0.49	0.89	0.88	0.82	1.00	0.35	0.74
May	0.53	0.70	0.63	1.78	2.15	1.01	1.13
June	0.00	1.05	2.15	1.84	1.90	−	1.39
July	−	−	2.25	−	1.68	−	1.97
August	−	2.54	2.09	−	2.37	2.76	2.44
September	−	2.69	2.40	−	1.81	−	2.30
October	1.91	2.33	2.06	2.03	1.51	−	1.97
November	1.17	−	0.67	1.57	1.68	−	1.27
December	0.72	−	−	−	1.68	−	1.20

Note: the observation point is about 5 km north east of Bujumbura Port.

Water Level at Lake Tanganyika

Year	Max. Water Level	Min. Water Level	Amplitude	Year	Max. Water Level	Min. Water Level	Amplitude
1929	773.75	772.90	0.85	1971	775.90	775.00	0.90
1930	774.11	773.62	0.49	1972	775.70	774.80	0.90
1931	774.65	773.95	0.70	1973	775.30	774.40	0.90
1932	774.89	774.22	0.67	1974	775.30	774.50	0.80
1933	774.91	774.07	0.84	1975	774.80	774.10	0.70
1934	774.63	773.82	0.81	1976	774.90	774.10	0.80
1935	774.76	773.93	0.83	1977	774.90	774.00	0.90
1936	775.16	774.28	0.88	1978	775.20	774.40	0.80
1937	775.45	774.85	0.60	1979	775.80	774.90	0.90
1938	775.53	774.70	0.83	1980	775.70	774.80	0.90
1939	775.45	774.72	0.73	1981	775.60	774.70	0.90
1940	775.40	774.57	0.83	1982	775.10	774.30	0.80
1941	774.88	774.05	0.83	1983	775.80	774.40	1.40
1942	775.22	774.50	0.72	1984	774.90	773.90	1.00
1943	774.95	774.03	0.92	1985	774.80	773.80	1.00
1944	774.51	773.80	0.71	1986	774.60	773.70	0.90
1945	774.35	773.51	0.84	1987	774.90	774.30	0.60
1946	774.07	773.32	0.75	1988	774.90	774.20	0.70
1947	774.21	773.55	0.66	1989	775.50	774.70	0.80
1948	774.20	773.35	0.85	1990	775.70	774.80	0.90
1949	773.82	772.95	0.87	1991	775.40	774.70	0.70
1950	773.79	772.83	0.96	1992	775.40	774.70	0.70
1951	773.75	773.00	0.75	1993	775.20	774.20	1.00
1952	774.41	773.80	0.61	1994	774.60	774.20	0.40
1953	774.60	773.70	0.90	1995	774.70	774.00	0.70
1954	774.13	773.25	0.88	1996	774.50	773.80	0.70
1955	774.02	773.23	0.79	1997	774.80	773.60	1.20
1956	774.15	773.42	0.73	1998	775.60	774.40	1.20
1957	774.52	773.70	0.82	1999	775.30	774.50	0.80
1958	774.38	773.50	0.88	2000	774.80	773.90	0.90
1959	774.24	773.45	0.79	2001	774.70	774.00	0.70
1960	774.46	773.57	0.89	2002	774.80	774.10	0.70
1961	774.31	773.51	0.80	2003	774.60	773.80	0.80
1962	775.39	774.98	0.41	2004	774.30	773.50	0.80
1963	776.29	775.64	0.65	2005	774.70	773.20	1.50
1964	777.07	776.32	0.75	2006	773.70	773.00	0.70
1965	776.80	775.83	0.97	2007	774.05	773.40	0.65
1966	776.56	775.63	0.93	2008	774.30	773.55	0.75
1967	776.10	775.31	0.79	2009	774.38	773.62	0.76
1968	776.72	775.95	0.77	2010	774.68	773.98	0.70
1969	776.62	775.64	0.98	2011	774.35	773.35	1.00
1970	776.42	775.40	1.02	2012	774.73	773.83	0.90
				1929～2012	Average Max.Water Level	Average Min.Water Level	Average Amplitude
				84 Years	774.96	774.14	0.82

7 The Result of Geotechnical Investigation



Location of Borehole Exploration

Bujumbura Port hole No.1
E; 760808.000-N; 9626767.000 EL; 778.216
N – Value

Depth (m)	Blow No.	Moisture Content (%)	Specific Gravity (t/m3)	Note (Soil Aspect)
1				Silt & midiumsize Boulders
2	8	17.4	2.86	Silt & small size Boulders
3				Sand
4	18	39.6	2.79	Silty Sand
5				Sand
6	30			Sand
7				Sand
8	38	19.4	2.78	Sand
9				Sand
10	20			Sand
11	16			Sand
12	47	5.0	2.77	Sand
13	23			Sand
14	27			Sand
15	37			Sand
16	50/30			Sand
17	50/50			Sand
18	50/59			Sand
19	50/57			Sand
20	64			Sand
21				Sand
22	66			Sand
23				Sand
24	44			Sand
25				Silty sand with stiff clay
26	50/55			Sand
27				Sand
28	50/50			Sand
29				Sand
30	72			Sand

Bujumbura Port hole No.2
E; 760747.000-N; 9626746.000 EL; 777.910
N – Value

Moisture Content (%)	Specific Gravity (t/m3)	Note (Soil Aspect)
		Silt
25.6	2.67	Clayey silt
		Clayey silt
12.5	2.73	Sand
		Sand
		Clayey silt
		Clayey silt
10.3	2.78	Silty sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand

Bujumbura Port hole No.3
E; 760696.000-N; 9626746.000 EL; 778.454
N – Value

Depth (m)	Blow No.	Moisture Content (%)	Specific Gravity (t/m3)	Note (Soil Aspect)
1				Silty sand
2	18	25.1	2.74	Sand
3				Sand
4	7	17.4	2.77	Sand
5				Sand
6	20			Sand
7				Sand
8	40	23.0	2.77	Sand
9				Sand
10	42			Sand
11	42			Sand
12	37			Sand
13	42			Sand
14	48			Sand
15	44			Sand
16	49			Sand
17	41			Sand
18	39			Sand
19	51			Sand
20	66			Sand
21				Sand
22	50/50			Sand
23				Sand
24	66			Sand
25				Sand
26	48			Sand
27				Sand
28	54			Sand
29				Sand
30	55			Sand

Bujumbura Port hole No.4
E; 760640.000-N; 9626704.000 EL; 777.722
N – Value

Moisture Content (%)	Specific Gravity (t/m3)	Note (Soil Aspect)
		Silty clay
31.5	2.75	Silty clay
		Silty clay
8.8	2.78	Silty
		Silty sand
		Silty sand
		Sand
		Sand
		Sand
		Sand
		Sand
22.9	2.67	Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand
		Sand

Standard Penetration Test

Bujumbura Port hole No.5
E; 760600.000-N; 9626693.000 EL; 776.969
N – Value

Depth (m)	Blow No.	Moisture Content (%)	Specific Gravity (t/m3)	Note (Soil Aspect)
1				Sand with cobbles
2	8	14.8	2.89	Sand with cobbles
3				Silty sand
4	5	31.0	2.87	Silty sand
5				Silty sand
6	50			Silty sand
7				Silty sand
8	38			Sand
9				Sand
10	48			Sand
11	41			Sand
12	44	20.8	2.78	Sand
13	60			Sand
14	54			Sand
15	69			Sand
16	50/57			Sand
17	50			Sand
18	74			Sand
19	50			Sand
20	50/50			Sand

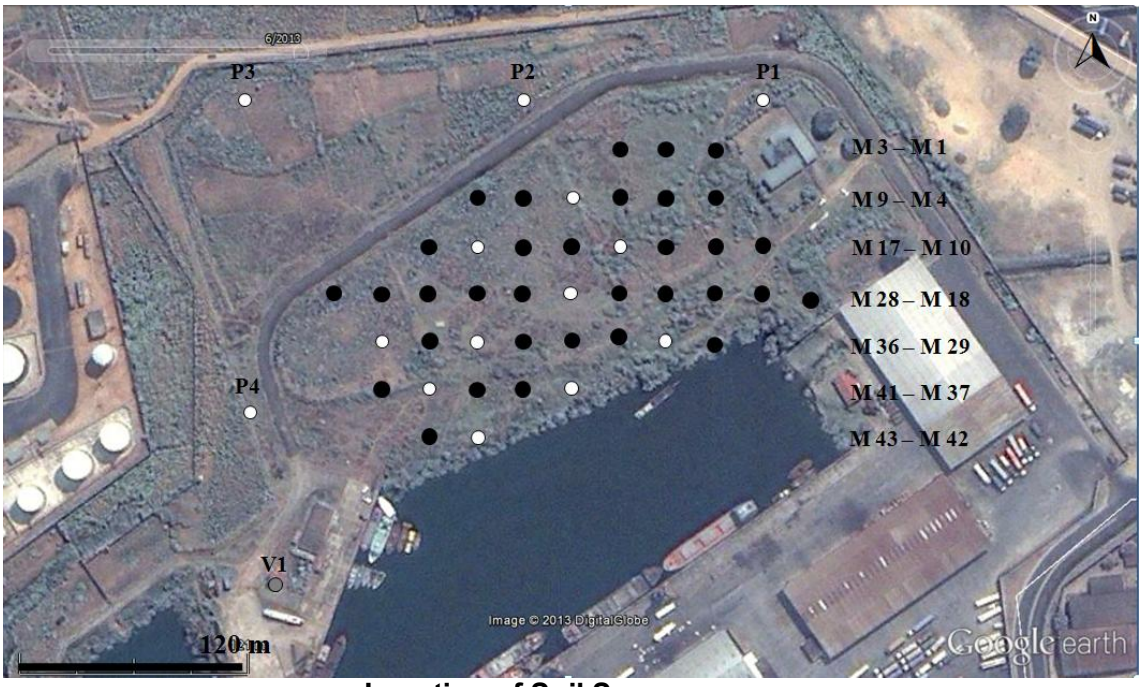
Boring Logs No.1 to No.5

Depth (m)	Blow No.	Bujumbura Port hole No.6 E; 760491.000-N; 9626708.000 EL; 777.585 N – Value 0 10 20 30 40 50	Moisture Content (%)	Specific Gravity (t/m3)	Note (Soil Aspect)	Bujumbura Port hole No.7 E; 761067.000-N; 9626792.000 EL; 779.456 N – Value 0 10 20 30 40 50	Moisture Content (%)	Specific Gravity (t/m3)	Note (Soil Aspect)
1	9				Silt				Silt & gravel
2	18		9.2	2.91	Silt		30.8	2.91	Silty clay & gravel
3	13				Sand				Sand
4	4				Sand				Sand & gravel
5	4		16.7	2.79	Silty sand		18.0	2.86	Silty sand & gravel
6									
7									
8									
9									
10									

Boring Logs No.6 – No.7

8 The Result of Environmental Survey

8-1 Soil Survey



Location of Soil Survey

Physical analysis results (water contents, specific gravity & grain size) and chemical analysis results (hazardous metals & lipophilic substances)

Sampling location code			M1		M2		M3		M4		M5		M6		M7		M8		M9		M10	
Sampling depth (cm)			10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60
Soil type			Medium Sand	Fine Sand	Silt	Fine Sand	Silt	Medium Sand	Medium Sand	Medium Sand	Silt	Silt	Silt	Fine Sand	Silt	Silt	Silt	Silt	Silt	Silt	Medium Sand	Medium Sand
Color			Brown	Light brown	Brown	Brown	Brown	Brown	Brown	Brown	Dark brown	Dark brown	Brown	Light brown	Brown	Brown	Brown	Light brown	Brown	Red brown	Light brown	Light brown
Odor			No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor
Parameter	LOQ	Unit																				
Water content	-	mass-%	7.9	2.2	18.5	7.7	3.7	7.7	15.4	22.6	24.2	26.8	26.1	6.3	21.2	21.7	25.4	23.9	25.7	27	9	1.2
Specific gravity	0.1	g/cm³	2.1	1.8	2	2	1.9	2	1.9	2	1.8	2.1	1.6	2.1	1.9	1.8	1.6	1.8	2	1.9	2.7	2.8
Grain size	-	mm	0.19	0.17	0.0074	0.17	0.009	0.19	0.25	0.23	0.015	0.005	0.012	0.18	0.005	0.0083	0.016	0.012	0.01	0.01	0.25	0.3
Lipophilic substances	5	mg/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Arsenic (As)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium (Cd)	0.001	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Copper (Cu)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Tin (Sn)	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mercury (Hg)	0.0002	mg/l	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Nickel (Ni)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc (Zn)	0.01	mg/l	0.01	< 0.01	0.01	0.01	< 0.01	< 0.01	0.01	< 0.01	0.02	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Sampling location code			M11		M12		M13		M14		M15		M16		M17		M18		M19		M20	
Sampling depth (cm)			10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60
Soil type			Medium Sand	Medium Sand	Silt	Medium Sand	Silt	Medium Sand	Silt	Silt	Silt	Silt	Silt	Silt	Silt	Medium Sand	Medium Sand	Silt	Medium Sand	Silt	Medium Sand	Medium Sand
Color			Brown	Brown	Dark brown	Brown	Brown	Light brown	Brown	Brown	Brown	Light brown	Dark brown	Dark brown	Dark brown	Dark brown	Brown	Brown	Brown	Brown	Dark brown	Dark brown
Odor			No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor
Parameter	LOQ	Unit																				
Water content	-	mass-%	12.4	8.9	22.6	10.9	23.8	8.3	20.2	19.3	21.1	17.3	28.2	24.7	23.5	10.8	12.1	4.8	10.1	6.2	9.6	4.4
Specific gravity	0.1	g/cm³	2	2	1.7	2	1.7	2.1	2	1.9	1.9	1.5	1.9	1.9	1.7	1.9	1.9	1.8	1.7	1.9	2.1	2.7
Grain size	-	mm	0.22	0.25	0.012	0.24	0.006	0.19	0.009	0.01	0.028	0.014	0.006	0.0095	0.005	0.17	0.17	0.17	0.19	0.15	0.22	0.26
Lipophilic substances	5	mg/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	37	< 5
Arsenic (As)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium (Cd)	0.001	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.009	< 0.005
Copper (Cu)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	0.007	< 0.005
Tin (Sn)	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mercury (Hg)	0.0002	mg/l	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Nickel (Ni)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc (Zn)	0.01	mg/l	0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.01	0.03	< 0.01

Note: LOQ stands for "Limit of Quantitation"

Sampling location code			M21		M22		M23		M24		M25		M26		M27		M28		M29		M30	
Sampling depth (cm)			10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60
Soil type			Silt	Medium Sand	Fine Sand	Silt	Silt	Silt	Fine Sand	Silt	Medium Sand	Silt	Medium Sand	Silt	Silt	Medium Sand	Silt	Medium Sand	Medium Sand	Medium Sand	Medium Sand	Fine Sand
Color			Dark brown	Dark brown	Brown	Brown	Dark brown	Brown	Dark brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Odor			No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor
Parameter	LOQ	Unit																				
Water content	-	mass-%	22.9	8.3	6.7	19.5	24	19.7	14.1	17.1	6.4	14.6	0.3	13	19.7	6.4	23	7.8	10.8	4.6	5.5	9.9
Specific gravity	0.1	g/cm³	1.6	2.2	2.7	1.6	2	1.6	2.1	1.8	2.2	1.8	1.4	2	1.8	1.9	1.8	2.1	1.9	2.2	2.3	2.2
Grain size	-	mm	0.0073	0.2	0.14	0.014	0.013	0.012	0.17	0.13	0.4	0.03	0.23	0.017	0.016	0.17	0.014	0.21	0.21	0.33	0.45	0.1
Lipophilic substances	5	mg/l	< 5	< 5	< 5	< 5	< 5	20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Arsenic (As)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium (Cd)	0.001	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.006
Copper (Cu)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Tin (Sn)	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mercury (Hg)	0.0002	mg/l	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Nickel (Ni)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc (Zn)	0.01	mg/l	0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.02

Sampling location code			M31		M32		M33		M34		M35		M36		M37		M38		M39		M40	
Sampling depth (cm)			10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60
Soil type			Silt	Silt	Fine Sand	Silt	Medium Sand	Fine Sand	Medium Sand	Medium Sand	Fine Sand	Medium Sand	Medium Sand	Silt	Silt	Silt	Medium Sand	Medium Sand	Medium Sand	Medium Sand	Medium Sand	Medium Sand
Color			Brown	Brown	White brown	White brown	Brown	White	White brown	White brown	White	White	Brown	Brown	Brown	Brown	Brown	Organic brown	Brown	Brown	Red brown	Light brown
Odor			No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor
Parameter	LOQ	Unit																				
Water content	-	mass-%	27.9	22	3.3	10.8	8.3	3.9	6.8	1.1	3.9	1.3	7.1	12.2	14.2	7.2	11.1	4.3	9	3.5	6.1	2
Specific gravity	0.1	g/cm³	1.8	1.6	1.9	1.6	2.5	1.7	2.8	2.1	2.5	2	2.2	1.8	1.9	2.8	1.7	1.4	1.6	1.3	2	2.5
Grain size	-	mm	0.02	0.01	0.2	0.04	0.24	0.12	0.25	0.37	0.2	0.24	0.2	0.024	0.11	0.086	0.19	0.23	0.2	0.19	0.34	0.24
Lipophilic substances	5	mg/l	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Arsenic (As)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium (Cd)	0.001	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.007	< 0.005
Copper (Cu)	0.005	mg/l	0.006	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Tin (Sn)	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mercury (Hg)	0.0002	mg/l	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Nickel (Ni)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc (Zn)	0.01	mg/l	0.02	0.01	< 0.01	0.02	0.01	< 0.01	0.02	< 0.01	0.01	< 0.01	0.04	0.03	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01

Note: LOQ stands for “Limit of Quantitation”

Sampling location code			M41		M42		M43		P1		P2		P3		P4	
Sampling depth (cm)			10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	50	150	50	150	50	150
Soil type			Medium Sand	Fine Sand	Silt	Silt	Silt	Medium Sand	Fine Sand	Fine Sand	Fine Sand	Medium Sand	Silt	Medium Sand	Medium Sand	Fine Sand
Color			Brown	Light brown	Brown	Light brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Light brown
Odor			No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor	No odor
Parameter	LOQ	Unit														
Water content	-	mass-%	9.2	13.9	13.7	9.5	12.5	15.1	18.9	10.3	8.9	8.9	24.8	4.7	8.3	4.8
Specific gravity	0.1	g/cm³	2.9	2.6	2.8	2.5	2.7	2.8	2.7	2.8	2.7	2.7	1.8	2.3	2.4	2.2
Grain size	-	mm	0.24	0.081	0.14	0.08	0.15	0.15	0.17	0.18	0.17	0.16	0.006	0.21	0.2	0.009
Lipophilic substances	5	mg/l	< 5	< 5	< 5	< 5	< 5	10	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Arsenic (As)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium (Cd)	0.001	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chromium (Cr)	0.005	mg/l	0.005	0.006	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Copper (Cu)	0.005	mg/l	0.005	0.006	0.006	< 0.005	< 0.005	0.006	< 0.005	< 0.005	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005
Tin (Sn)	0.01	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mercury (Hg)	0.0002	mg/l	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Nickel (Ni)	0.005	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc (Zn)	0.01	mg/l	0.02	0.05	0.04	0.01	0.04	0.04	< 0.01	0.07	< 0.01	0.02	0.07	< 0.01	0.01	< 0.01

Note: LOQ stands for “Limit of Quantitation”.

Upon ETA’s request to analyze oil and grease (n-hexane extractable materials), lipophilic substances were analyzed in the laboratory through gravimetric determination of low volatile lipophilic substances. Petrol ether (a mixture of hydrocarbons with boiling point between 40-60 °C) was used as solvent for the extraction. Examples of lipophilic substances are mono-, di- or triglycerides, phosphor- or glycolipides or sterol ester.

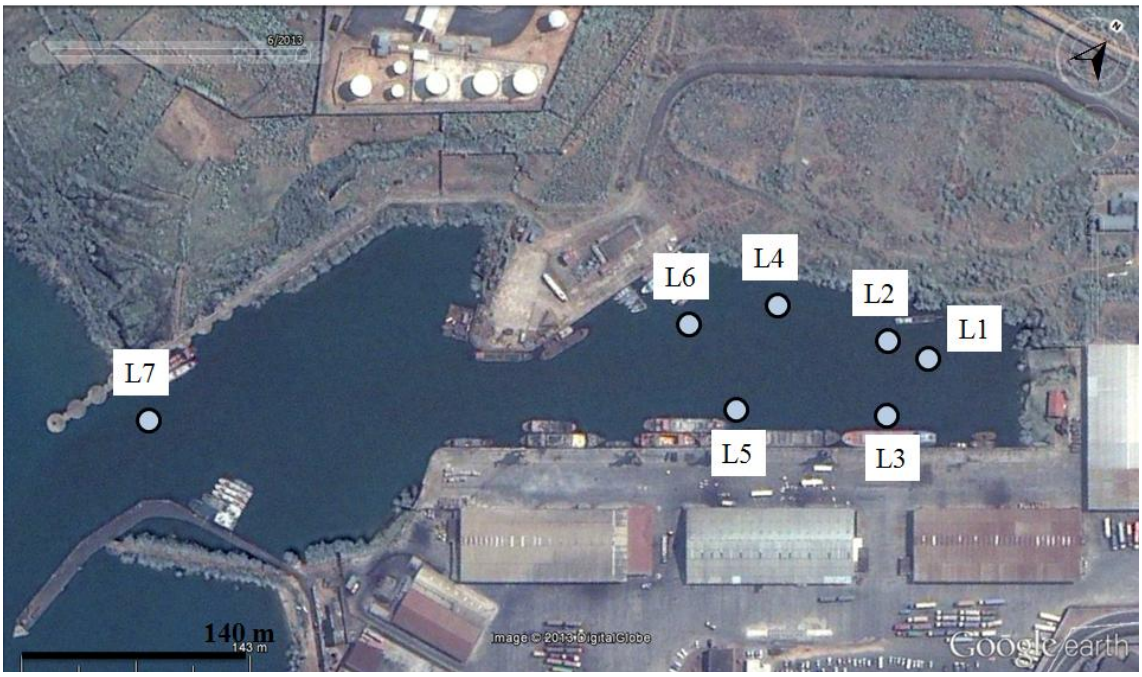
PCB analysis results of Soil Survey

Sampling location code			M7		M13		M16		M23		M30		M34		M37		M40		M42	
Sampling depth (cm)			10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60
Parameter	LOQ	Unit																		
PCB 18	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 28	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 31	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 44	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 52	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 101	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 105	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 118	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 138	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 149	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 153	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 156	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 170	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 180	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 194	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Total 6 PCB		mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sampling location code			P1		P2		P3		P4		V1
Sampling depth (cm)			10-15	50-60	10-15	50-60	10-15	50-60	10-15	50-60	0-10
Parameter	LOQ	Unit									
PCB 18	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 28	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 31	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 44	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 52	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 101	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.049
PCB 105	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 118	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 138	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.4
PCB 149	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.35
PCB 153	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.53
PCB 156	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.027
PCB 170	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.19
PCB 180	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.67
PCB 194	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.13
Total 6 PCB		mg/kg	-	-	-	-	-	-	-	-	1.649

Note: LOQ stands for “Limit of Quantitation”

8-2 Lake Bottom Sediment Survey



Location of Sediment Survey

On-site findings and physical analysis results (water contents, specific gravity and grain size)

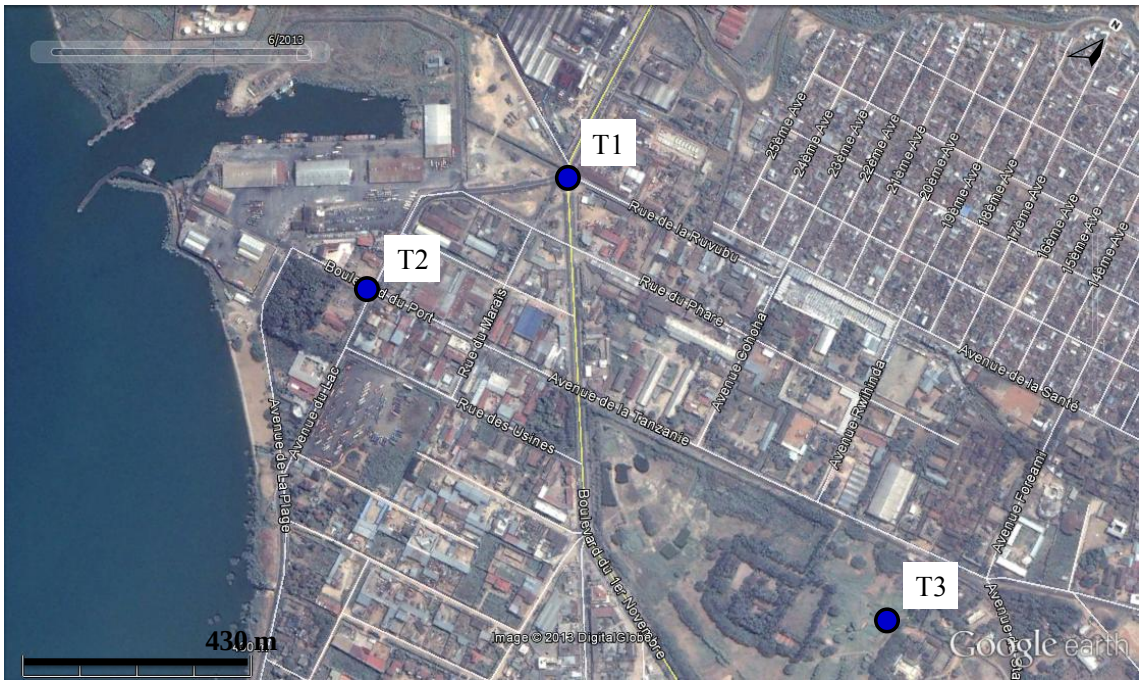
Sample ID			L1	L2	L3	L4	L5	L6	L7
Sampling depth (m)			2.4	4.3	4.6	4.9	5.8	5.8	6.4
Sediment type			Silt	Silt	Silt	Medium Sand	Silt	Silt	Silt
Color			Blackish brown	Blackish brown	Blackish brown	Blackish brown	Blackish brown	Blackish brown	Blackish brown
Odor			Strongly sulfurous	Strongly sulfurous	Sulfurous	Sulfurous	Strongly sulfurous	Strongly sulfurous	Sulfurous
Parameter	Analysis method	Unit							
Water content	DIN EN 14346	mass-%	67	65.8	47.3	31.7	63.4	49.1	67
Specific gravity	SOP 806	g/cm³	1.2	1.2	1.5	1.5	1.2	1.3	1.3
Grain size	DIN 18123	mm	0.026	0.023	0.032	0.23	0.0075	0.025	0.0074

Chemical analysis results (Polychlorinated biphenyl (PCB)) of Lake Sediment Survey

Parameter	Analysis method	LOQ	Unit	Sample ID						
				L1	L2	L3	L4	L5	L6	L7
PCB 18	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 20	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 28	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 31	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 44	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 52	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 101	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 105	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 118	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 138	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 149	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 153	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 156	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 170	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 180	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
PCB 194	DIN 38414-20	0.003	mg/kg	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003

Note: LOQ stands for “Limit of Quantitation”

8-3 Ambient Air and Atmospheric Survey



Location of Ambient and Noise Survey

In-situ monitoring results (CO and noise)

Parameter	Monitoring date		T1	T2	T3	Unit	Remark
CO	2013/08/29 - 30	Weekday	0.58	0.59	0.59	µg/Nm3	Average value in 24 hours
	2013/08/31 -	Weekend	1.28	1.29	1.17		Average value in 24 hours
Noise	2013/08/29 - 30	Weekday	52.3	55.3	44.1	dBA	Average value in daytime (7:00 - 22:00)
			42.5	44.2	43.1		Average value in nighttime (22:00 - 7:00)
	2013/08/31 - 09/01	Weekend	52.6	52.2	44.8		Average value in daytime (7:00 - 22:00)
			43.8	43.9	43.0		Average value in nighttime (22:00 - 7:00)

Ex-situ monitoring results (SO2, NO2, O3, PM2.5 and PM10)

Parameter	Monitoring date		T1	T2	T3	Unit
SO2	2013/08/29 - 30	Weekday	92	169	49	µg/m3
	2013/08/31 -	Weekend	74	83	94	
NO2	2013/08/29 - 30	Weekday	415	175	31	µg/m3
	2013/08/31 -	Weekend	207	103	18	
O3	2013/08/29 - 30	Weekday	94	86	79	µg/m3
	2013/08/31 -	Weekend	64	94	88	
PM2.5	2013/08/29 - 30	Weekday	25	22	14	µg/m3
	2013/08/31 -	Weekend	21	19	14	
PM10	2013/08/29 - 30	Weekday	45	40	21	µg/m3
	2013/08/31 -	Weekend	38	36	19	

8-4 Water Survey

Location of Water Quality Survey

Water investigation results

Date	Sample ID	Depth (m)	Temperature (℃)	pH	DO (mg/l)	Salinity (‰)	Turbidity (NTU)	TSS (mg/l)	COD (mg/l)	T-N (mg/l)	T-P (mg/l)	Oil & Grease
2013/8/18	W1-1	0.5	27.6	7.42	10.44	0.34	1.76	8	15	0.31	<0.01	nil
	W1-2	2.3	26.2	7.4	4.8	0.34	0.88	6	42	0.36	<0.01	nil
	W2-1	0.5	27.3	7.36	11.62	0.34	0.51	9	87	0.45	<0.01	nil
	W2-2	2.5	26.1	7.32	5.81	0.34	0.83	8	33	0.5	<0.01	nil
	W2-3	4.5	25.8	7.3	4.81	0.33	0.47	11	85	0.56	<0.01	nil
	W3-1	0.5	28	7.4	15.35	0.33	0.84	10	134	0.48	<0.01	nil
	W3-2	2.5	26.2	7.35	6.76	0.34	0.39	12	156	0.39	<0.01	nil
	W3-3	5	25.8	7.27	6.14	0.33	0.5	14	202	0.36	<0.01	nil
2013/8/24	W1-1	0.5	26.5	8.03	7.25	0.34	0.33	6	30	0.5	<0.01	nil
	W1-2	2.3	26.6	8.05	5.19	0.34	0.61	8	72	0.64	<0.01	nil
	W2-1	0.5	26.5	8.01	7.75	0.34	0.43	11	80	0.59	0.03	nil
	W2-2	2.5	26.4	8	5.03	0.34	0.41	9	48	0.53	0.06	nil
	W2-3	4.5	26.5	8.14	5.21	0.34	0.47	12	67	0.56	<0.01	nil
	W3-1	0.5	26.9	8.11	8.94	0.34	0.57	15	38	0.39	<0.01	nil
	W3-2	2.5	26.6	8.05	5.62	0.34	0.56	12	98	0.62	<0.01	nil
	W3-3	5	26.4	8.02	5.36	0.34	0.34	13	56	0.42	<0.01	nil

Note1: DO = Dissolved Oxygen, TSS = Total Suspended Solids, COD = Chemical Oxygen Demand, T-N = Total Nitrogen, T-P = Total Phosphorus and NTU = Nephelometric Turbidity Units.

Note2: It should be noted that the project site experience a strong rain for several hours on the day before the first water sampling (18 August 2013) while there was no precipitation observed on that site the entire week before the second water sampling day (24 August 2013).

Date	Sample ID	Depth (m)	Temperature (℃)	pH	DO (mg/l)	Salinity (‰)	Turbidity (NTU)	TSS (mg/l)	COD (mg/l)	T-N (mg/l)	T-P (mg/l)	Oil & Grease (mg/l)
2013/8/18	W4-1	0.5	26.5	7.22	8.88	0.34	0.24	9	108	0.5	<0.01	nil
	W4-2	1.5	26.2	7.2	6.47	0.34	0.36	13	46	0.53	<0.01	nil
	W4-3	3	25.9	7.26	6.78	0.34	0.14	7	57	0.48	<0.01	nil
	W5-1	0.5	27.4	7.17	12.3	0.34	0.65	6	70	0.31	<0.01	nil
	W5-2	2.5	26.2	7.1	7.36	0.34	0.31	15	97	0.39	<0.01	nil
	W5-3	4.5	26	7.11	6.77	0.34	0.44	8	20	0.42	<0.01	nil
	W6-1	0.5	26.3	6.64	8.22	0.34	0.78	8	32	0.42	<0.01	nil
	W6-2	6	26.2	6.93	6.79	0.34	0.16	6	51	0.42	<0.01	nil
	W6-3	12	26	6.86	6.94	0.34	0.55	9	44	0.42	0.02	nil
2013/8/24	W4-1	0.5	27	7.3	7.64	0.34	0.32	8	50	0.64	<0.01	nil
	W4-2	1.5	26	7.91	6.75	0.34	0.32	9	90	0.56	<0.01	nil
	W4-3	3	25.8	7.96	6.14	0.34	0.59	6	96	0.62	<0.01	nil
	W5-1	0.5	26.4	7.97	7.81	0.34	0.44	10	185	0.56	0.02	nil
	W5-2	2.5	26.3	8.02	5.56	0.34	0.44	11	93	0.73	<0.01	nil
	W5-3	4.5	26.2	8.04	7.6	0.34	0.54	8	45	0.67	<0.01	nil
	W6-1	0.5	26.4	8.11	7.87	0.34	0.46	14	50	0.62	0.12	nil
	W6-2	6	26.4	8.05	6.26	0.34	0.69	9	70	0.42	<0.01	nil
	W6-3	12	26.4	8.02	5.91	0.34	0.37	8	155	0.7	<0.01	nil

Note1: DO = Dissolved Oxygen, TSS = Total Suspended Solids, COD = Chemical Oxygen Demand, T-N = Total Nitrogen, T-P = Total Phosphorus and NTU = Nephelometric Turbidity Units.
Note2: It should be noted that the project site experience a strong rain for several hours on the day before the first water sampling (18 August 2013) while there was no precipitation observed on that site the entire week before the second water sampling day (24 August 2013).