activity is confirmed 2 km to the east of the port. Up until now, there has been no trouble between the port activity and local residents. There are currently about 170 port employees. Passengers from Soyo and workers from the offshore oil fields of Malongo commute to Cabinda Port by ferry. The number of passengers per day reaches 3,000 to 4,000, while there are 2,000 citizens in Malongo.

An accident occurred when a loading machine turn over on the corroded wooden jetty during handling works. The case of the accident is the luck of maintenance which had not been conducted since 1974. Maintenance work has been conducted however.

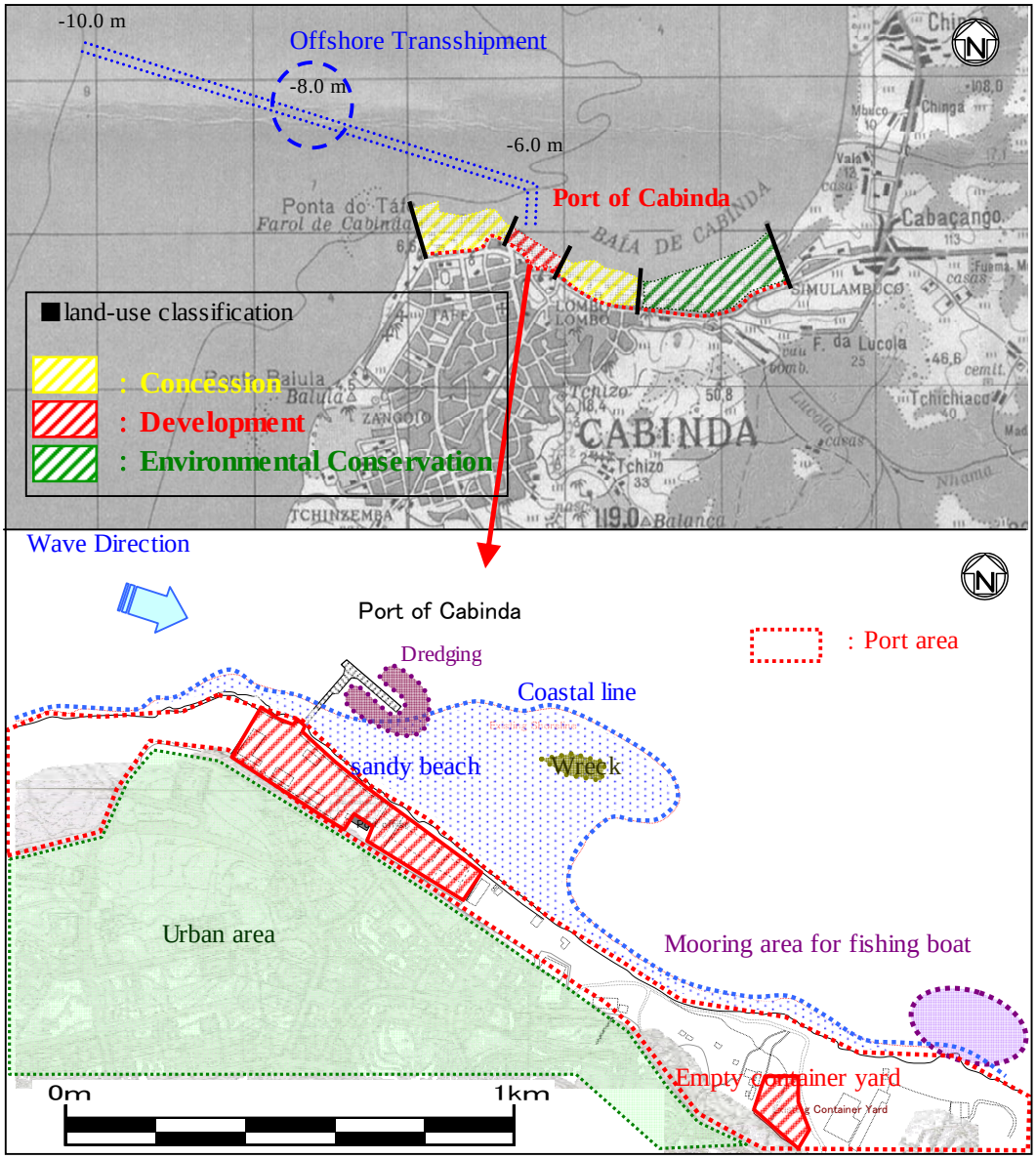

Figure 7-7 Environmental Characteristics around Cabinda Port

Photo 7-20 Panoramic view of Port of Cabinda

Photo 7-21 Beach around the jetty

Photo 7-22 Dredging work of the basin and the jetty repair work

3) Current environmental issues

Table 7-9 Desirable environmental consideration

Environmental Issue	Desirable environmental consideration
Securing the safety of navigation	Removal of sunken ships
	Improvement of charts
	Installation of navigation aids

7.4 Stakeholders Meeting

7.4.1 Purpose of Stakeholders Meeting

Due to the civil war, Angola has not conducted any surveys for water quality, fauna and flora, air, noise and vibration. Therefore, Ministry of Environment now aims for the effectuation of EIA enforced last year before commencing any port-related project. The purpose of the stakeholders meeting in this study is as follows.

Identifying current environmental issues

Public disclosure of the project outline

Selection of impacts of EIA and the mitigation measures for proposed project

Before holding the meeting, the opinions of port-related people, neighboring residents and academic experts were gathered. The following 3 stakeholders meetings have been held.

First Stakeholders Meeting : June 14, 2005 in Luanda

Second Stakeholders Meeting : November 17, 2005 in Lobito

Third Stakeholders Meeting : November 25, 2005 in Luanda

7.4.2 Stakeholders

The study team requested that representatives from the Port Authority, Private Companies, Railroad Company, Fishery People and the State Government attend the meeting. In addition, representatives from the Ministry of Environment and University Professors who are knowledgeable of environmental circumstances and can be impartial were also asked to attend.

Project Proponent
- MINTRANS: Dr. Filomeno H.C.M. da Silva (National Director of DNMMP)
  Mr. Diur Kassul Angelo (Chief of Port Department)
  Mr. Victor Alexandre Carvalho (Superior Technician/Advisor)

Environmental Representative
- MINUA: Ms.Julieta Posoley (Chief of Environmental Department)
- AGOSTINHO NETO UNIVERSITY:
  Ms. Anabela da Graça Alexandre Leitão
  (Full Professor of Advanced Studies and Research Center on Chemical and Environmental Engineering)

Port Authority
- Port of Luanda: Mr. Sansão Pitra (Technical Director)
  Ms. Maria Cândida Gaspar Cohen (Chief of Study Cabinet)
  Mr. Natalino Mateus (Superior Technician of Port Environment)
- Port of Lobito: Dr. José Carlos Gomes (Director General)
  Mr. Vicente Francisco Albano (Chief of Environment and Security)
  Mr. Cacesto Simão (Chief of Human Resources Department)
  Mr. Manuel da Cruz do Rosário (Chief of Maintenance Department)
  Mr. José André (Vice-Chief of Operation Department)
  Mr. Faustino Venâncio (Vice-Chief of Cargo Handling)
  Mr. Jeremias Estêvão (Chief of Department)
- Port of Namibe: Mr. Pedro Kahamba (GRPN Director)
  Mr. Pompeu António (Environment Director)
- Port of Cabinda: Mr. Fernando Lobo (Chief of Luanda office)
  Mr. Joaquim L. Mecuyda (Chief of Finance)

Railroad Company
- C.F.B: Mr. Beweenle Zsao da Htia
- C.F.M: Mr. Júlio Joaquim (Director General)
  Mr. Simão António

Delegate of Fishery Party
- Instituto Marinho de Investigação de Pesca Regional Centro: Mr. Antonio Buco (Biological Technician)

Provincial Government
- Lobito Province: Mr. José Duklario Vaponço (Provincial Director of Transports)
  Mr. Mario José Ponta (Chief of Environmental Department)
  Mr. Joaquim Pedro Teixeira (General Secretary)

Marine Safety
- Capitania: Mr. Henrique Pedro (Captain)

7.4.3 Minutes of Stakeholders Meeting

1) The first Stakeholders Meeting

Presentation: Outline of the study and the schedule, Outline of the plan, Purpose of environmental social consideration, Purpose of stakeholders meeting, and Environmental check list (scoping) by preliminary study team

Attendants: MINTRANS, Port of Luanda, Port of Lobito, Port of Namibe, Port of Cabinda, C.F.M, JICA Study Team

Table 7-10 Meeting Minutes of the first Stakeholders Meeting

Discussion Item	Comments and Responses
1.Survey Scope	<Comments>: Will the environmental studies include the provision of any suggestion regarding the improvement of environmental conditions in Luanda Bay? <Responses>: The scope of the Study is limited to the analysis of the existing environmental conditions. However, environment expert in the study team could provide technical advice in response to concerned inquiries. <Comments>: Will the study cover the railway rehabilitation inside the port? <Responses>: The railway rehabilitation inside the port will be taken into consideration in the Study. <Comments>: The rehabilitation project of Cabinda Port has already started. Therefore, instead of Cabinda port, Cacongo port should be developed. <Responses>: Cacongo port should be newly constructed because it has been out of use for a long time and its structural condition is quite bad. Since the main purpose of the Study is to formulate the rehabilitation plan of the Ports, therefore, the case of Cacongo is considered to be out of scope of the Study.
2.Current Status	<Comments>: Sewage from household and vessels are considered to be main reasons to the pollution in the Luanda Bay. How can it be solved? <Responses>: Because it will take time to reduce sewage from households, the sewage treatment system is recommended to be constructed in cooperation with other Ministries, such as MINUA. As for the sewage from vessels, Marpol provides the guidance to solve those environmental issues.
3.Study Content	<Comments>: How will the existing environmental issues in Angolan Ports be treated in the rehabilitation study? <Responses>: The main purpose of this study is not to improve the existing environmental conditions but to analyze the environmental impact due to the rehabilitation work. <Comments>: MINTRANS should establish its own Chemical Laboratory in Luanda, which can analyze the water quality, especially oil spills from the vessels, in the Angolan Ports. Is it possible to include it in the Study? <Responses>: It could be possible to include that matter into a component of the Action Plan for institutional improvement.
4.Others	<Comments>: Cabinda Port has already started its jetty rehabilitation project. What can the Study team do with it? <Responses>: After reviewing the contents of the rehabilitation plan of Cabinda Port, some suggestions will be provided.

2) The second Stakeholders Meeting

Presentation: Purpose of Survey for Environmental Social Consideration and Stakeholders Meeting, Procedure for environment in Angola, Current status of environment, Short term rehabilitation program (Draft) and Urgent rehabilitation program (Draft), and Check list for environmental assessment (Scoping)

Attendants: MINTRANS, Port of Lobito, C.F.B, Lobito Province, Fishery Party, Marine Safety, JICA Study Team

Table 7-11 Meeting Minutes of the 2nd Stakeholders Meeting

Discussion Item	Comments and Responses
1.Comparison between Current Status and the Plan	<Comments>: There are some unpaved sections in container yard and road in the existing port of Lobito. And even paved sections are bumpy due to aging. Also, dust is dispersed when cargo handling chassis and cargo handling machines are operated necessitating that their speed be controlled within the port area. The pavement is the concern for those who are living around the ports as well as port relative people. Protecting the health of the people will lead to the vitalization of the economy. <Comments>: Many people have moved to Lobito follows as the civil war. Therefore the employment chances that can be expected by construction works will be welcomed.
2.Nature Conservation	<Comments>: The land behind the port of Lobito around Salt pan is a very precious amenity for wild birds. The city of Lobito is now preparing to protect water channel between Salt pan and bay of Lobito as well as improving sewage facility for better water quality to conserve the habitat of flamingoes. This sanctuary protects not only flamingo but also other animals and many tourists can be expected to visit here. <Comments>: The surrounding area of the port of Lobito has suffered from deforestation. During the civil war, people looked for safer land and came to Lobito where they have cut down trees for fire wood. In order to recover the greenery, the promotion of forestation is necessary. <Comments>: The groin constructed on sand bar was for the protection of accretion. Fishing has been prohibited in the Bay of Lobito to protect fauna and flora.
3.Waste disposal	<Comments>: Currently, there is no garbage treatment facility in Lobito nor a facility to dispose or industrial waste like construction materials. Therefore, it is necessary to consider how to dispose of the waste that will be generated in the construction. <Responses>: Recycling has been conducted to minimize waste in the port of Lobito. The waste which can not be recycled is buried after incineration in the port. The dumping of industrial waste generated by construction work should be coped with both the port and city of Lobito although it is depended on the volume. Therefore, when the rehabilitation program is going to be implemented proposed by this study it is necessary to apply the approval of city of Lobito for its waste disposal before the construction commencement.
4.Railroad and Port	<Comments>: There is a close relationship between the Port and CFB. Many handling cargoes in the port of Lobito are not suitable for truck transportation and depend on railway. There are many people working for the warehouses called the Lobito Complex near the port of Lobito. The complex functions as a terminal collecting cargoes from the port for transport to each inland destination by railway. It is now possible to transport cargoes from the port up to

	Cubal. From now on, cement and petroleum will be transported by railway and each has inland storage facilities. It is important for railway is to provide feeder lines as many as possible. 20km feeder lines are available around the port of Lobito. There will be more demand at the port if railway lines will be rehabilitated up to Huambo and to further inland destinations. Many are calling for quicker rehabilitation of Benguela Railway to connect port of Lobito with neighboring countries and inland countries. Angola has suffered from civil war for more than 30 years therefore Angola did not expect such a strong demand from neighboring countries. In other words, the rehabilitation of railroad is also the urgent issue as well as the port. The rehabilitation of Benguela Railway is to commence from next January with the support of China.
5.Others	<Comments>: It was a very significant meeting. It was our pleasure to know that there is a country to extend a helping hand to Angola.

3) The 3rd Stakeholders Meeting

Presentation: Natural and Social Environment around the port, Sort out current issues, The procedures for environment in Angola, The submission of Short term rehabilitation Program (Draft) and Urgent rehabilitation program (Draft), and Environmental Assessment checklist (Scoping) and the mitigation measures.

Attendants: MINTRANS, Environmental Representative (MINUA, UNIVERSITY), Port of Luanda, Port of Namibe, Port of Cabinda, JICA Study Team

Table 7-12 Minutes of the 3rd Stakeholders Meeting

Discussion Item	Comments and Responses
1.Water Quality Environment	<Comments>: We would like to know how the JICA Study Team measured COD in the water quality survey. <Responses>: Since no tests have been done in the past at ports and no reco4rds have been kept, the study team conducted water pollution test by simple pack test. Environmental standards in Angola related to water quality were not yet established therefore, in order to compare water qualities inside and outside of the bay and at the time of flood tide and ebb tide, samples were taken. Not only COD but tests were conducted as to Transparency, Coliform Count as well. <Comments>: Unfortunately, Angola has no environmental standards, especially no barometer to be the indicator of water quality. There is no problem with the COD test method employed by the study team. The study team has conducted water quality tests in the 4 ports for comparison.
2.Component for environmental consideration	<Comments>: Does this study not include components for sewage, storm drain and garbage disposal? Currently, University (Environmental Institute) is conducting water quality survey in the Luanda bay and it is understood that Chromium and Zinc are stored up in the bay. One of the causes is sunken and abandoned ships which have been lying neglected for a long time. <Responses>: Regarding water quality issues of Luanda bay, untreated effluent of sanitary water is reportedly bring discharged into the bay, therefore, it is necessary to work together with urban areas. The study team does not propose a facility for garbage disposal since this study is for the rehabilitation of existing port facilities. However, the floating oil and garbage problem was discussed in the 1st stakeholders meeting therefore, recovery vessel for oil and garbage has been included in our draft.

	<Comments>: How will the floating oil from the bay be treated after it is recovered? <Responses>: Most commonly, it is done in the port or waste oil disposal facility of a factory nearby. In Japan for example, waste oil disposal facilities used to be in the port but because of the dioxin problem, such facilities are constructed and treated under the complete supervision of a city. <Comments>: Unfortunately there are no waste oil disposal facilities in Angola. Therefore, should each project correspond to this issue? <Responses>: It may be unavoidable to cope with each project for the time being. JICA study team hopes that such projects as soon as possible. The purpose of this study is the rehabilitation of existing port, therefore, no big scale waste will be generated by construction works. <Comments>: Regarding port environment it is definitely necessary to cope with this issue earnestly from now on. The port itself is potentially apt to pollute the environment and the port is expected to contribute to the society. Therefore, the port must take seriously even minor environmental problems.
3.EIA procedure	<Comments>: After the Environmental Impact Assessment came into force last year, EIA became mandatory when a project is implemented. EIA has been requested for all the port related projects. EIA report has to be submitted to MINUA through MINTRANS. The project becomes effective after getting approval by MINUA. <Responses>: Our propose here is to identify the current environmental issues or impacts that can arise from the proposed project. After this meeting, related people will consult each other and frame the project. It is to extract subject for implementation of EIA or to propose the mitigation measures for any environmental impacts. After the project commencement is finalized by the government of Angola, EIA is conducted to cover the items selected at this time in the next stage.
4.Environmental Assessment and mitigation measure	<Comments>: Natural environmental conditions and environmental assessment for planned contents explained by JICA study team has been agreed as a whole. “D” grade was given to soil contamination however, we are anxious about water and soil polluted by rust of containers lying neglected for a long time. In this sense, grades may have to be revised to “C” or “B”. Other assessments mentioned below must be the same as JICA study team explained. ①Port of Lobito: Asbestos drift hazard and its disposal method when existing warehouses will be taken away, Dust impact to vicinity of port during construction work, Noise and vibration made by construction machines and Impact to water area at the time of improvement work of quay ②Port of Namibe: Impact to existing fishing port by increasing of vehicles for port expansion period, Impact to water area at the time of improvement work of quay, Impact for utilization of area where treated of landslide exist. (at backside of the port) <Responses>: Regarding Port of Lobito, removal of existing warehouse is not considered. It is understood that the impact of unpaved area is serious for efficient cargo handling as well as dust. Therefore, the pavement has been proposed in the draft plan. To prevent rain water from running into the port area, the pavement can be sloped in the direction of the sea. <Comments>: It is expected that environmental assessment results for the port of Namibe of the study team will be in their report.

8. Basic Policy on Port Rehabilitation

8.1 Viewpoints for the Formulation of Basic Policy

8.1.1 Government's Post-war Restoration Policy and Port Issues

1) Restoration Policy of the Government and Donor's Activities

Due to the civil war which lasted for nearly thirty years, the Angolan economy, infrastructure and the lives of citizens have been devastated. For restoring these desperate conditions, the Angolan Government has been preparing the highest priority post-war restoration policy, ECP, which is now in final consultation stage with relevant donors. And in this connection, the Government has initiated a rehabilitation program, PPMRRP, which focuses, among other issues, on infrastructure rehabilitation and institutional strengthening. PPMRRP is designed as a one package project which will be integrated with the comprehensive national project, ECP, which incorporates other post-war restoration projects.

The United Nations adopted the Millennium Declaration on September 2000, which defined the goals of international society in the 21st century specifying African Needs as one of the major issues to be considered. Following the direction of the Declaration, international financial institutions have assisted post-war restoration programs. These programs have currently shifted the focus from basic human needs to mid-term economic growth reflecting the lasting peace conditions since 2002.

Currently authorized programs include the first phase project of the World Bank's EMRP ($US 50 million, project period 2005-2007), UNDP Program ($US 38.7 million, project period 2005-2008) and EU's LRRD (117 million EURO, project period 2002-2007). A similar policy direction has been observed in bilateral cooperation. For instance, China has signed a loan agreement in the amount of $US 2.0 billion for the rehabilitation of infrastructures including railways, and India has assisted the rehabilitation of Mocamedes Railway with a $US 40 million loan.

2) Obsolete Facility and Inefficient Management/Operation

i) Obsolete Port Facilities

Angola has four main ports, namely the Ports of Cabinda, Luanda, Lobito and Namibe, which are located at similar intervals along the 1,600km coastline. Each port has its vital functions. The Port of Cabinda plays an essential role as the only trade channel of the enclave Province to other internal provinces and foreign countries. The Port of Luanda is functioning as a nationwide gateway port and both the Port of Lobito and the Port of Namibe are connected closely with their respective hinterlands by railways and have supported economic and social activities in each area.

Most roads and railways have been heavily damaged by civil war and, thus, have long been left unused during the wartime. Compared with these transport sectors, ports were not directly damaged and were able to provide essential services to citizens throughout the period. However, it is a fact that port facilities have not been properly maintained since the 1950's and most of them have been so seriously deteriorated that each port has been currently suffering from desperately insufficient cargo handling capacity.

ii) Inefficient Port Management/Operation

Besides the above-mentioned problem with facilities, Angolan ports have been also faced with institutional problems such as a weak port administration system and insufficient human resources. While substantial legal powers on port administration/operation have been transferred from

the Ministry of Transport to the four Port Corporations reflecting the government's decentralization policy, with the exception of Luanda Port Corporation, these Port Corporations have been heavily dependent on the central government for finances and, thus, new centralization policy has not yet been actually brought into effect.

On the other hand, severe constraints on human resources caused by the civil war have resulted in seriously inefficient management/operation systems. In particular, lack of engineers and port operation experts is critical and, thus, capacity development of staff is one of the most urgent and critical issues for each Port Corporation.

iii) Destroyed Transport System in Port Hinterland

Good connection with road/railway networks is vital for port functions. All main Angolan ports except for the port of Cabinda are closely connected to vast hinterlands through railways and have the potential to function as gateways for regions. Being connected to neighboring countries and even to the East Coast, the Benguela Railway, in particular, could make the port of Lobito a representative gateway port along the West Coast of Africa.

However, both road and railway networks have long been damaged and unused due to the civil war. According to a WB Report, 80 % of roads and 90 % of railways in Angola are not functioning at present. Restoration of road/railway functions is urgent if Angolan ports are to reach their full potential.

8.1.2 Port Functions needed in Restoration Period

1) Adequate Port Capacity for Restoration Demand

Angora is a country with the most abundant natural resources in Africa and thus has the potential for great economic growth in the near future. And ports could play strategically essential roles for the take-off of the Angolan Economy in the mid/long term. On the other hand, in the short term, ports are functioning effectively as the only means of transport daily life commodities of citizens where no roads and railways are functioning properly due to the damage caused by the civil war.

While ports are expected to undertake substantial roles both in the short term and long term as mentioned above, this Study focuses on the short-term function during the post war restoration period. Hence, the objectives of port rehabilitation plans are to restore deteriorated port functions in the minimum time period and to develop adequate port capacities which could effectively respond to urgent port demand during restoration period.

2) Effective Coordination with Access Transport Networks and among Main Ports

Ports can generate various kinds of impacts on socio-economic activities in broad hinterlands, which extend to several provinces and even to other countries across the national boundaries. Because of this fact, it is required to clarify functional allocations and coordination among main ports for handling nationwide cargo demand during the restoration period. This point must be reflected for the formulation of the plans.

As repeatedly mentioned, facilities of all transport sectors have been seriously damaged/deteriorated during the civil war, and some of the prioritized facilities have already been under urgent rehabilitation programs by the Angolan Government, international institutions and donor countries. From the cargo distribution point of view, in particular, well-coordinated transport networks are crucially needed between ports and roads/railways. This point is also to be kept in mind for port planning.

3) Effective Use of Existing Facilities / Human Resources

Under the current serious financial conditions, rehabilitation plans of Angolan ports must seek for the maximum short-term/urgent outcome with the minimum cost. For this purpose, effective use of existing facilities and human resources should be a prerequisite for the planning.

The capacities of existing port facilities should be restored to their original design levels at minimum cost. However, minor upgrade of the existing capacity could be included in the rehabilitation plans in case that substantial change, like a drastic containerization movement, would be expected to emerge during the project period.

4) Contribution to Regional Society

Ports have provided citizens of hinterland provinces with various kinds of critical services for supporting their daily lives all through the civil war. For instance, main ports are public enterprises which employ the largest number of people in each province, and thus contribute directly to daily lives of citizens. And further, ports play essential roles for the post war restoration as gateways for transporting foods, water and other daily necessities, and also a tremendous amount of construction materials to develop basic social infrastructures.

While methodologies of quantitative evaluation of social impacts have not yet been established, social impacts by the projects should be taken into considerations in formulating the plans. It is also important to grasp the views of minority groups through stakeholders meetings. Safety and environmental aspects are analyzed and reflected in the contents of the proposed plans.

8.2 Basic Policy

1) To Focus on Short Term Port Rehabilitation

Port rehabilitation plan is proposed as a short-term basis plan with the target year of 2010 (‘Short-term Port Rehabilitation Plan’), which could effectively respond to the urgent demand in the post war restoration period. In addition, if any urgent project components to be implemented in a few years would be identified among the facilities in Short-term Plan, these components would be selected and formulated as the ‘Urgent Port Rehabilitation Plan’. In these Plans, port facilities are basically rehabilitated to restore capacities up to the original design level. However, adequate level of improvement should be considered in the Plans when substantial change would be expected to happen before 2010.

2) To Support the on-going National Restoration Projects in the Hinterlands

It is essential for the ports to support smooth implementation of several national restoration projects as gateways of socio-economic activities in its hinterlands. In this regard, port rehabilitation plans should be formulated keeping close coordination with concerned organizations in order to create effective integration among several post-war restoration projects in the hinterlands.

3) To Coordinate Facility Rehabilitation and Institutional Strengthening for Effective Port Rehabilitation

An adequate integration of hardware project components (port facilities) and software project components (institution and human resources) is required to create effective port functions. Port rehabilitation plans should take this point into consideration.

4) Functional Allocations among Main Ports and Connection with Roads and Highways

Nationwide functional allocations among main ports are needed for the formulation of rehabilitation plans because of the fact that hinterlands of ports usually extend to considerable areas and, thus, parts of one port hinterland often overlap with another. Further, ports can function well only when they are efficiently connected with roads and railways in the hinterlands. Therefore, smooth coordination with access roads/railways is crucially needed for the formulation of effective port rehabilitation plans.

5) To Highlight the Capacity Development of Main Ports

The Study prepares concrete measures for the development of human resources of port sectors in order to utilize rehabilitated port facilities efficiently with the capacities of existing port staff. The measures consist of short-term to long-term programs. Among others, short-term measures include technology transfer from the experts of Study Team to staff of main ports in Angola. The technology transfer is carried out through on-the-job training and covers such various fields as planning, operation, facility design, and environmental consideration and contract procedures.

6) To Promote Social/Environmental/Safety Considerations

For the formulation of rehabilitation plans, impacts on daily lives of port hinterland inhabitants should be adequately considered and analyzed. The plans should comply with JICA's Guideline. Further, safety considerations should also be well taken into account in the proposed plans.

7) To promote economic development of inland counties

The rehabilitation of Angolan ports can contribute to the promotion of economic activities in Sub-Saharan Africa through providing land-locked countries with a gateway port to the west. In particular, the Benguela railway connects DRC, Zambia, Zimbabwe, and Botswana with the Port of Lobito and makes up the Lobito Corridor. These inland countries expect the railway to resume its service and secure the west gateway to Europe and North/South America. NEPAD has identified several international corridors to be rehabilitated or developed from the viewpoint of economic development of Africa.

While there are three major international corridors from the Sub-Saharan inland countries to the east coast of Africa, namely Beira, Maputo and Dar es Salaam corridors, the Lobito Corridor is the only corridor to the west coast. Since the Lobito Corridor is a shortcut to Europe and North/South America, the Port of Lobito, together with the Benguela Railway, will play a vital role to improve the transportation from/to land-locked countries in the Sub-Sahara.

8.3 Rehabilitation Policy on Each Port

8.3.1 Rehabilitation Policy on the Port of Luanda

The Port of Luanda is located in the waterfront of the capital of Angola and plays an important role in supporting economic activities in the metropolitan area and its hinterland. The port is mainly used for the import of general goods, vehicles, construction materials, food stuffs, machinery and project cargoes related to oil industries. Cargo throughput has dramatically increased in connection with the economic restoration in the recent couple of years. Ships are always waiting for berthing due to insufficient cargo handling capacity.

Reasons for the long waiting queue are 1) poor port facilities and low productivity of cargo handling; 2) difficulty in handling containers using old-fashioned port equipment; 3) inefficient port operations due to poor information system and untrained port staff and workers.

As a result of the port congestion and low productivity in cargo handling, ocean freight rates to the Port of Luanda are considerably higher than the rates to nearby ports. It is therefore urgent for the Port of Luanda to improve the productivity and reduce ship congestion. In order to improve the productivity, measures should be taken in the revision of port hardware and software.

In addition, the government invited private companies to rehabilitate and operate a terminal in the Port of Luanda. Terminal concessions were granted to Multi Terminal Co., and UNICARGAS for the general cargo terminal and the multi-purpose terminal respectively. However, UNICARGAS is a state owned company so that it is not private participation in a strict sense. A concession of the container terminal may be granted to a consortium consisting of APM Terminal Co., and a local company subject to the approval of the Supreme Court.

In this regard, the rehabilitation of the Port of Luanda is left to concessionaires and the port authority is only responsible for navigational aspects. If concessionaires are slow to move forward with the rehabilitation or are unable to due to financial constraints, the port authority should take necessary action immediately and find a way to restore the port facilities by themselves. Delay in the port rehabilitation will become a bottleneck of Angolan economic restoration.

Urgent requirements for the Port of Luanda are 1) to rehabilitate and improve the port facilities as soon as possible with the participation of the private sector; 2) to expand the container yard and to enhance the capacity of container handling; 3) to improve the access road/railroad to the port and to develop a bypass route on the outskirts of the downtown; and 4) to develop inland container depots to increase the capacity of container storage. Furthermore, it will be necessary for the port authority to make a plan of new container terminal and a program to develop a new terminal with proper participation of the private sector.

8.3.2 Rehabilitation Policy on the Port of Lobito

The Port of Lobito, located in the middle of the Angolan coast, is at the west end of the Benguela Railroad and forms an interchange of maritime and surface transportation. Reopening of the Benguela Railroad will bring a considerable increase in imports and exports through the Port of Lobito.

Presently the port is used for the import of general goods, vehicles, construction materials and petroleum products to be distributed to the central area of Angola. Port facilities are however in very poor condition; namely, the yard pavement is severely damaged, and railroads in the port area are uneven and out of order. Since the port was designed for the export of agricultural and mineral products, the layout of port facilities is not suitable for container handling. Warehouses were built near the quay wall, which was suitable for handing break bulk cargoes but not adequate for handling container. Quay cranes were installed on the front line, however the lifting capacity is so poor that they cannot handle loaded containers and rest on the quay wall.

In the restoration of the Port of Lobito, it is crucial for safe and efficient cargo handling to repair the pavement on the surface as well as the quay walls and fenders. Regarding the repair of railroads in the port, the track on the quay head will not be necessary due to changes in cargo handling measures and the tracks in the middle and the back of the yard shall be repaired in accordance with the re-pavement in the yard. Bulk cargo will be once stored in a yard or silo and loaded onto a ship with belt conveyors or pneumatic transport system. Break bulk cargo will be once stored in a shed and loaded onto a ship. Therefore, railroad tracks on the quay front are not required any more and can be removed in the near future. Since the rail transportation is beneficial to containers, break bulk cargoes and bulk cargoes, the railroad shall be connected to the backyard in the port.

While quay cranes are well maintained and used for handling break bulk cargoes, those in container terminals shall be removed in the near future and the others shall be removed in accordance with the change in cargo handling equipment. Needs for warehouses will also be reduced in the near

future; these shall be changed into a refrigerator warehouse or into another use.

Containerization dominates maritime general cargo transportation, so that efforts should be made to expand container yard, improve container handling equipment, install more reefer plugs and improve the capacity of container terminal. A modern container terminal has rail mounted gantry cranes (RMGC) and achieves high performance in container handling. Since the installation of gantry cranes requires the consolidation of foundations, it may be necessary to handle more than 50,000 - 100,000 TEU annually in order to redeem the initial investment on the foundations and gantry cranes.

Presently, the Port of Lobito handles about 40,000 TEU. It will be appropriate to install gantry cranes at the new container terminal to be developed next to the berth No.8, which shall have a berth length of 300 meters and an area of 10 ha or more.

8.3.3 Rehabilitation Policy on the Port of Namibe

The Port of Namibe is a gateway to the southern region of Angola and the west terminal of the Mocamedes Railroad. Presently the port is used for the import of general goods, food stuff, construction materials and petroleum products, and for the export of granite. Port facilities are in very poor condition; namely, yards are not paved, railroad tracks are uneven and not serviceable, all quay cranes are out of order, all fenders are broken, and the road in the port is very rough.

Urgent rehabilitation of port facilities is firstly necessary for safe and efficient cargo handling. As container cargoes will dramatically increase together with economic restoration in the near future, it will be important to pave the container yard, procure container handling equipment, and install reefer plugs and power generator. While a modern container terminal is equipped with gantry cranes, the container throughput of the Port of Namibe is about 6,000 TEU in 2004, which is too small to install gantry cranes. Gantry cranes will not be necessary for the time being.

Presently, all container ships calling at the ports of Namibe, Lobito and Luanda have ship gears to handle containers, so that container loading and unloading operations are possible without gantry cranes on the quay. However, gearless vessels dominate the container ships and will be introduced in the West Africa services in the future. To cope with the change in calling vessels, the Port of Namibe will need to install gantry cranes in a mid-term or long-term development plan.

Trucks will play a major role in the transportation from/to the Port of Namibe, as the rehabilitation of main roads is in progress. The Mocamedes Railroad will also become a means of transportation to the hinterland after its rehabilitation is completed. Railroad tracks under the quay cranes will not be in use any more due to the fact that direct loading or unloading operations from a freight car into a ship or the reverse have almost disappeared to reduce mooring time at berth. Bulk cargoes are once stocked in a backyard and conveyed onto a ship by belt conveyor or pneumatic transportation. Break bulk cargoes are once stored in a shed. It will therefore be necessary to repair the railroad tracks in the middle and rear of the yard, but those in the quay front can be removed without any inconvenience.

Port Saco, located about 10 km north of the main terminal of the Port of Namibe, has a quay with a length of 325 meters and a depth of 19 meters. The quay was used to export iron ores, however, the operation stopped in mid 1980's due to the civil war. Since the belt conveyor and ship loader have rusted away, it will be difficult to repair the facilities. While the ship loader has a less possibility of the collapse presently, it will be necessary to remove the loader to avoid the collapse into water in the future. Since the steel piles of the quay are not so deteriorated, it is recommended to perform corrosion protection work and maintain the quay for future use.

8.3.4 Rehabilitation Policy on the Port of Cabinda

The Port of Cabinda is located in the shallow water on the coast of Cabinda Enclave, which is quite different from the other three ports in its location. Therefore, the maximum depth of the present jetty is 3.4 meters and it is difficult to develop a deep water berth. Ocean going vessels come to an anchorage 10 km away from the jetty and discharge containers and other cargoes onto a barge, which conveys cargoes to the jetty. The port authority charges twice for the discharging operations from a main ship to the yard. While the government subsidizes a half of discharging cost, it is essential to develop a new wharf to accommodate ocean going vessels and reduce the maritime transportation cost to Cabinda Province.

The Port of Cabinda has a plan to develop a new concrete jetty with a length of 300 meters along the west side of the present jetty. Navigation channel over 500 meters will be necessary to reach waters with a depth of 6 meters. Since a concrete jetty may disturb the sand drift, sand accumulation and sedimentation shall be carefully studied before actual dredging.

Container vessels serving for smaller ports are about 5,000 DWT or larger and have a capacity of 300 - 500 TEU, whose operating draft is about 6 - 7 meters. In this connection, the port will be required to have a berth depth of 7.5 meters or greater. In order to reach waters with a depth of 7.5 meters, it is necessary to dredge a navigation channel of about 3,000 meters, which requires a big investment initially and maintenance dredging later. If a dredger is allocated in Cabinda area, it will be of great help to the port authority for timely maintenance dredging.

Urgent requirements for the Port of Cabinda are 1) the pavement on the yard surface; 2) maintenance dredging in front of the jetty and navigational channel; 3) the expansion of container storage yard; and 4) the procurement of cargo handling equipment. The port authority has already commenced such rehabilitation work and will finish the work by its own efforts. In this regards, the Study will not propose a short-term rehabilitation plan for the Port of Cabinda. Efforts should be focused on making a study on a deep water port in the Cabinda Enclave and develop a new port to accommodate ocean going vessels.

9. Demand Forecast

9.1 Premise of Demand Forecast

9.1.1 Methodology of Demand Forecast

Future cargo throughput of Angolan ports in 2010 is forecasted by using the relation between GDP of Angola and cargo throughput of each port. Two cases are forecasted using two different GDP growth rates. First, future cargo throughput of all Angolan ports is forecasted. Next, using that as a control total, cargo throughput of each port is predicted. Then, adding cargo of iron ore coming from Cassinga mine to the high case of Namibe port and adding cargo of copper coming from Zambia to the high case of Lobito port, forecast of the future cargo throughput of Angolan ports is finalized.

9.1.2 Associated Data

1) GDP Growth Rate

World Bank predicted Angola's GDP growth rate of 19.4% per year by 2008. Taking into consideration Angola's economic and social potential including the scheduled exploitation of crude oil deposits, this study adopts WB's growth rate by 2008. IMF also predicted GDP growth rate in 2005 (14.7%) and 2006 (27.6%). The two GDP predictions of 2005 and 2006 are almost the same. WB's growth rate of 19.4% for 2009 and 2010 is adopted in the high case of this study. On the other hand, GDP growth rate of 6.4 % in the low case of "Angola 2025" is adopted in the low case of this study. Actual performance and future forecast of Angolan GDP of this study is shown in Table 9-1. GDP growth rate of "Angola 2025" is shown in Table 9-2.

Table 9-1 GDP Forecast

Year	High Case GDP AKZ (Billions)	Annual Growth Percent	Low Case GDP AKZ (Billions)	Annual Growth Percent
2000	9.1	3.0	9.1	3.0
2001	94.5	3.1	94.5	3.1
2002	108.2	14.4	108.2	14.4
2003	111.9	3.4	111.9	3.4
2004	124.3	11.1	124.3	11.1
2005	148.5	19.4	148.5	19.4
2006	177.3	19.4	177.3	19.4
2007	211.6	19.4	211.6	19.4
2008	252.7	19.4	252.7	19.4
2009	301.7	19.4	268.9	6.4
2010	360.3	19.4	286.1	6.4
2010/2004	2.9		2.3	

Table 9-2 GDP Growth ratio in Angola 2025

	GDP(2025)	GDP(2000)	2025/2000	Annual Growth Ratio
High	3500	689	5.079826	6.7%
Low	3250	689	4.716981	6.4%

9.2 Future Cargo Throughput of Angolan Ports

9.2.1 Total Volume of Cargo

Total volume of cargo through Angolan ports since 2000 is shown in Table 9-3. Cargo volume increases more than 15% every year except 2003.

Table 9-3 Cargo Throughput in Angolan Ports

Year	Tons	Growth (%)
2000	2,583,288	
2001	3,011,757	16.6
2002	3,492,696	16.0
2003	4,171,890	19.4
2004	4,409,770	5.7

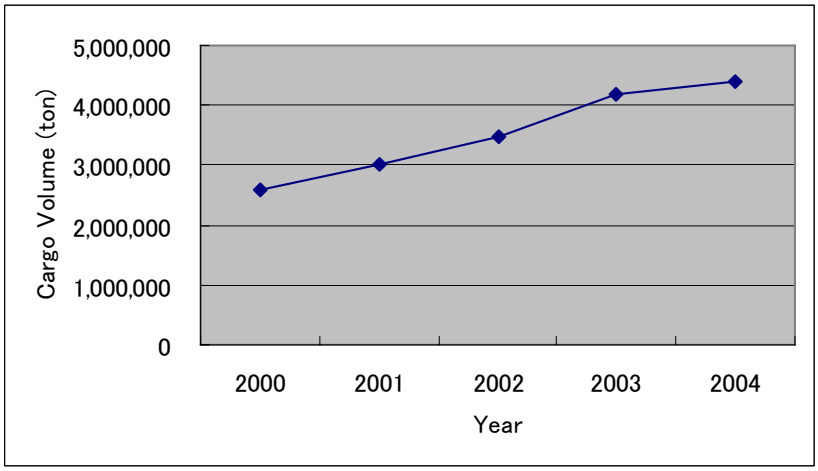

Figure 9-1 Cargo Throughput in Angolan Ports

Future cargo volume of Angolan ports is forecasted as follows;

Total cargo volume of Angolan ports and GDP are assumed to have a direct proportional relationship.

Y=A*X
Y: Total cargo throughput of Angolan ports (ton)
A: constant number
X: GDP (10 billion AKZ)

Constant number A is determined as 33.575 by the relationship of cargo throughput and GDP from 2000 to 2004. The relation of total cargo throughput with GDP is shown in Figure 9-2. Future cargo throughput of total Angolan ports is shown in Table 9-4 and Figure 9-3. Cargo throughput of Angolan ports in 2010 is forecasted as 13.3 m tons in the high case, 3 times greater than the throughput of 2004. In the low case, cargo throughput is forecasted 9.8 m ton and it reaches 2.2 times of that of 2004. Future cargo throughput of each port is calculated as follows. First, future cargo throughput of each port is calculated by the relation of cargo throughput of each port and GDP of Angola. Second, each port's throughput is adjusted, using total cargo throughput of Angola as a control total. Third, adding some cargo that cannot be forecasted by GDP, forecast of future cargo throughput is finalized.

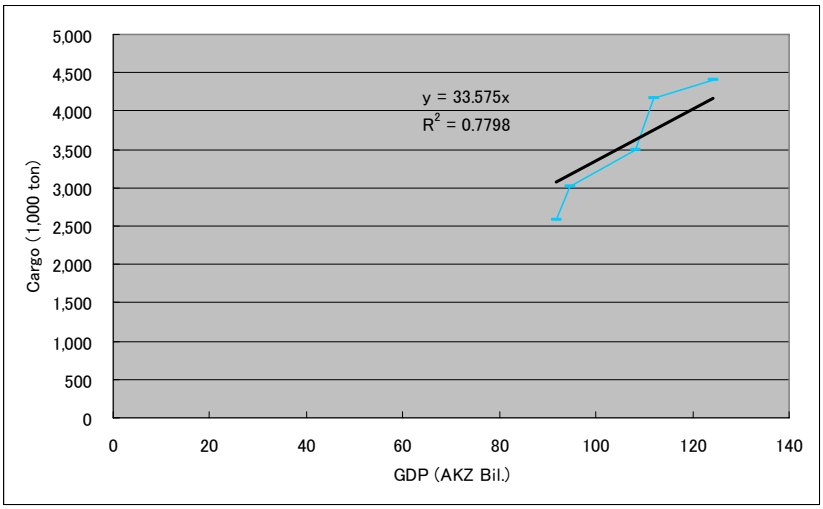

Figure 9-2 Relation between Cargo Throughput and GDP

Table 9-4 Estimated Future Cargo Throughput

Year		High Case (tons)	Low Case (tons)
2000	2,583,288		
2001	3,011,757		
2002	3,492,696		
2003	4,171,890		
2004	4,409,770		
2010		13,335,000	9,841,000
2010/2004		3.0	2.2

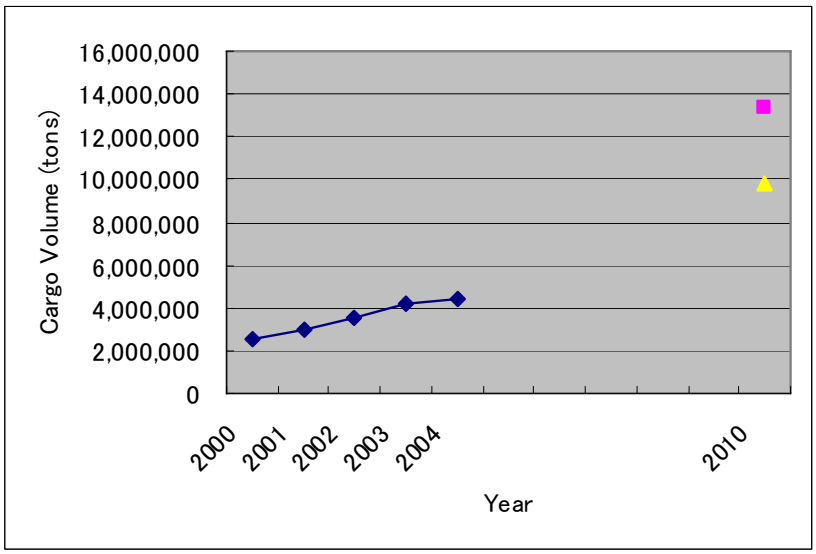

Figure 9-3 Future Cargo Throughput of Macro Prediction

9.2.2 Container Cargo

Total volume of cargo through Angolan ports since 2001 is shown in Table 9-5. The volume in 2005 is estimated by its 1st semester's throughput. The container throughput of 2005 is 1.9

times that of 2001.

Table 9-5 Container Throughput of Angolan Ports

Year	Container Throughput (Units)	Growth (%)
2001	148,691	
2002	199,579	34.2
2003	238,584	19.5
2004	269,519	13.0
2005	277,321	2.9

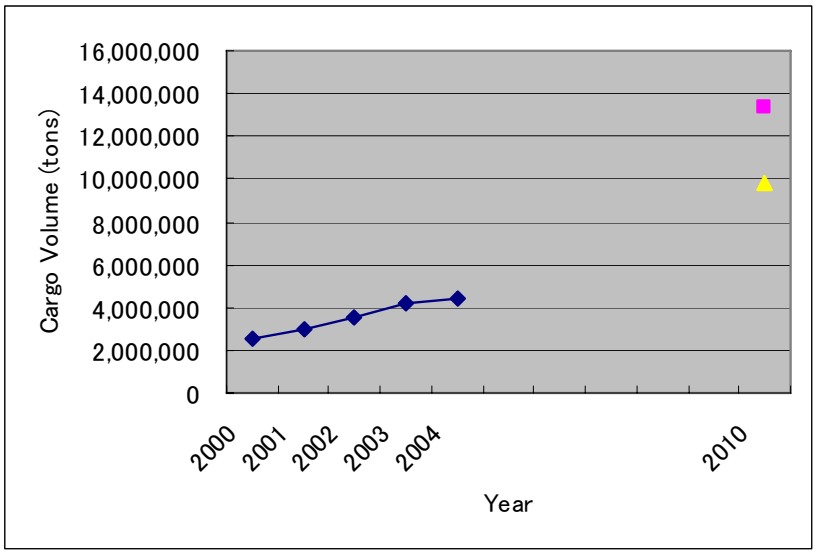

Figure 9-4 Container Throughput of Angolan Ports

The relation of total cargo throughput with GDP is shown in Table 9-6 and Figure 9-5. Using correlation analysis, between relation GDP and future container throughput in Angolan ports is determined as follows.

Y=2694.2X - 86598
Y: Container Throughput (Unit)
X: GDP (Billion AKZ)
R2=0.8935

Table 9-6 Container Throughput And GDP Changes in Angola

Year	Container Throughput (Units)	GDP Billion AKZ
2001	148,691	94.5
2002	199,579	108.2
2003	238,584	111.9
2004	269,519	124.3
2005	277,321	142.6

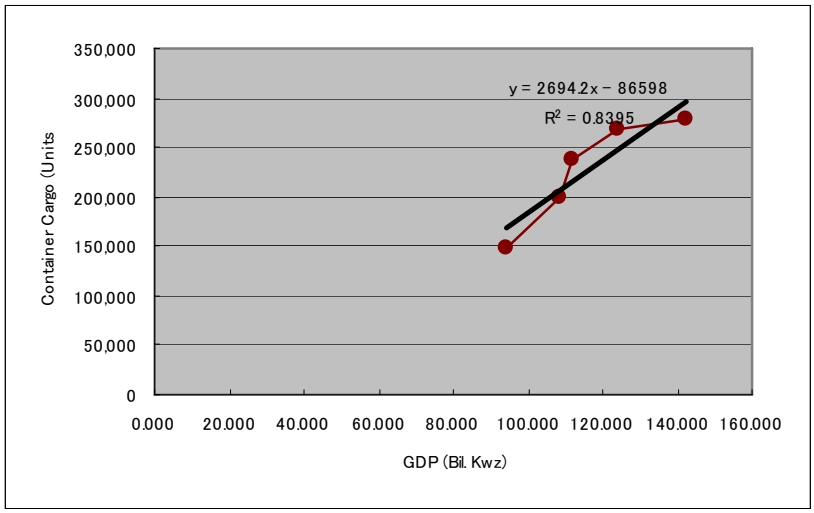

Figure 9-5 Container Throughput And GDP Relation in Angola

Future container cargo throughput of total Angolan ports is shown in Table 9-7 and Figure 9-6. Container throughput of Angolan ports in 2010 is forecast as 860 thousand units in the high case. In the low case, container throughput is forecast as 660 thousand units. Future container throughput of each port is calculated as follows. First, future container throughput of each port is calculated by the relation of container throughput of each port and GDP of Angola. Second, each port's throughput is adjusted, using total container throughput of Angola as a control total.

Table 9-7 Container Throughput in the Target Year

Year		High Case (units)	Low Case (units)
2001	148,691		
2002	199,579		
2003	238,584		
2004	269,519		
2005	277,321		
2010		864,000	664,000
2010/2004		3.1	2.4

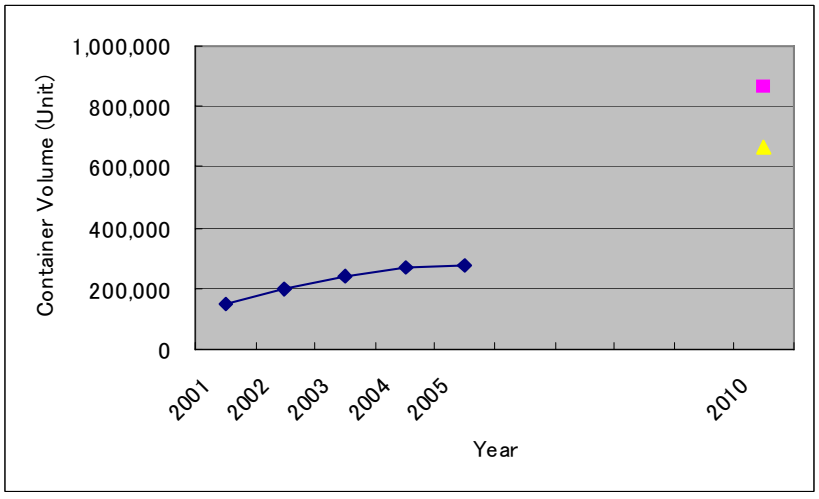

Figure 9-6 Container Throughput in the Target Year

9.3 Port of Luanda

9.3.1 Total Volume of cargo

Total volume of cargo through Luanda port since 1998 is shown in Table 9-8 and Figure 9-7. Cargo volume increases every year and it becomes 2.1times greater that of 1998.

Table 9-8 Cargo Throughput of Luanda Port

Year	Tons	Growth (%)
1998	1,487,264	
1999	1,408,046	-5.3
2000	1,867,568	32.6
2001	2,120,234	13.5
2002	2,605,329	22.9
2003	3,072,117	17.9
2004	3,194,756	4.0

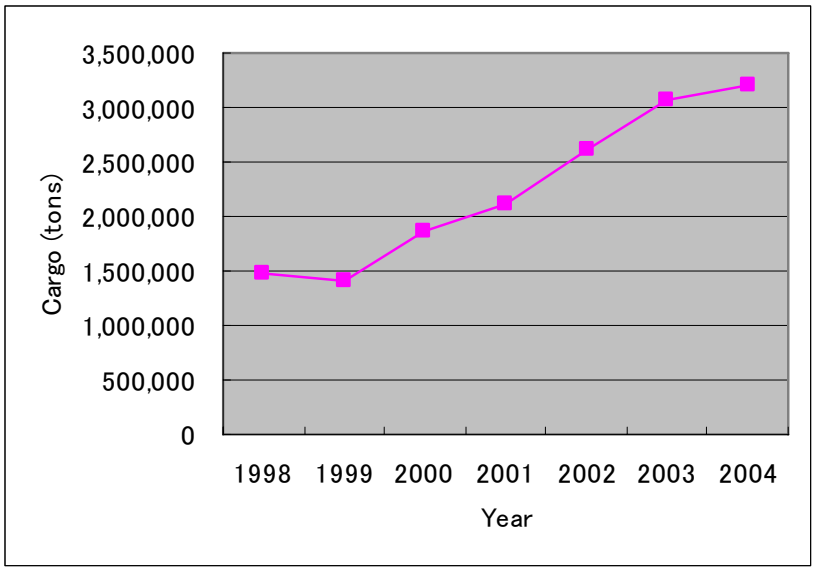

Figure 9-7 Cargo Throughput of Luanda Port

The relation of total cargo throughput with GDP is shown in Figure 9-8. Using correlation analysis, relation between GDP and cargo throughput of Luanda port is determined as follows.

Y=49.199X - 2709.7
Y: Cargo Throughput (1000 ton)
X: GDP (Billion AKZ)
R2=0.9276

Future cargo throughput of Luanda port is calculated by using the above relation and then adjusting it with the total cargo throughput of Angola as a control total. Future cargo throughput of Luanda port is shown in Table 9-9 and Figure 9-9. Cargo throughput of Luanda port in 2010 is forecast as 9 m tons in the high case. In the low case, cargo throughput is forecast 7 m tons.

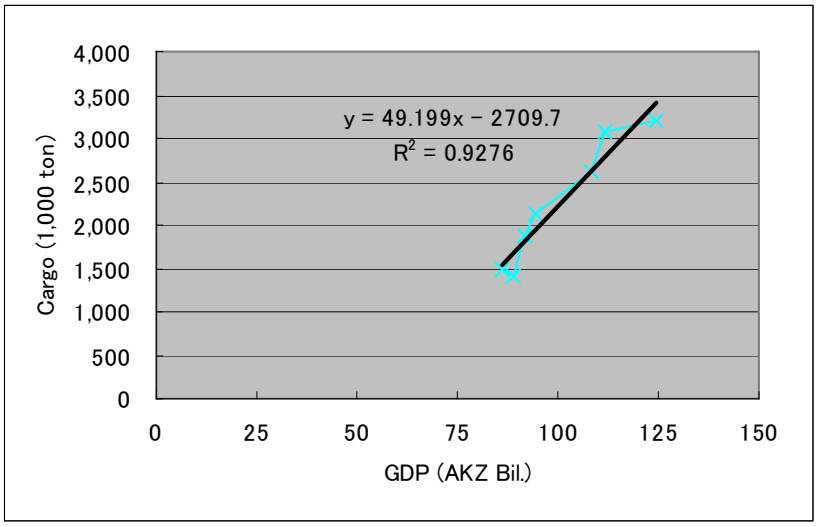

Figure 9-8 Relation between GDP and Cargo Throughput of Luanda Port

Table 9-9 Future Cargo Throughput of Luanda Port

Year		High Case (tons)	Low Case (tons)
1998	1,487,264		
1999	1,408,046		
2000	1,867,568		
2001	2,120,234		
2002	2,605,329		
2003	3,072,117		
2004	3,194,756		
2010		8,971,000	7,034,000
2010/2004		2.8	2.2

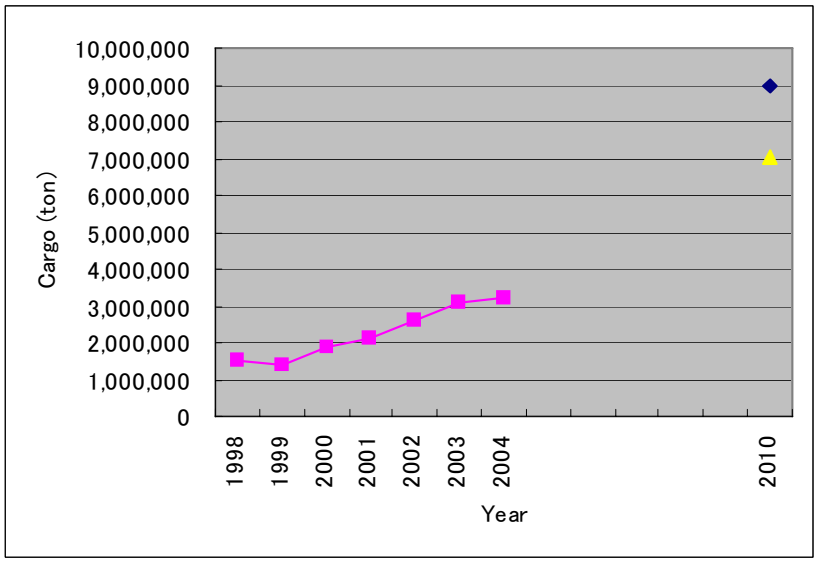

Figure 9-9 Future Cargo Throughput of Luanda Port

9.3.2 Container Cargo

Total volume of container through Luanda port since 1998 is shown in Table 9-10 and Figure 9-10. The volume in 2005 is estimated by its 1st semester's throughput. The container throughput of 2005 is 240 thousand units or 2.6 times that of 1998.

Table 9-10 Container Throughput of Luanda Port

Year	Container Throughput (Units)	Growth (%)
1998	90,936	
1999	74,113	-18.5
2000	50,270	-32.2
2001	126,970	152.6
2002	165,871	30.6
2003	210,031	26.6
2004	235,411	12.1
2005	239,064	1.6

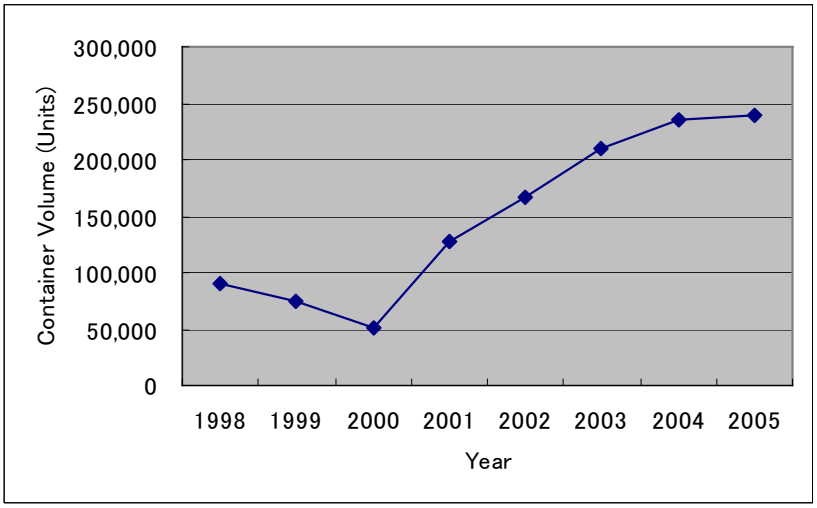

Figure 9-10 Container Throughput of Luanda Port

The relation of total cargo throughput with GDP is shown in Figure 9-11 and Table 9-11. Using correlation analysis, relation between GDP and future container throughput of Luanda port is determined as follows.

Y=2385X - 81904
Y: Container Throughput (Unit)
X: GDP (Billion AKZ)
R2=0.8056

Future container throughput of Luanda port is calculated by using the above relation and then adjusting it with the total container throughput of Angola as a control total. Future container cargo throughput of Luanda port is shown in Table 9-12 and Figure 9-12. Container throughput of Luanda port in 2010 is forecast as 740 thousand units in the high case. In the low case, container throughput is forecast as 570 thousand units.

Table 9-11 Relation between GDP and Container Throughput of Luanda Port

Year	Container Throughput (Units)	GDP Billion AKZ
1998	90,936	86.2
1999	74,113	89.0
2000	50,270	91.7
2001	126,970	94.5
2002	165,871	108.2
2003	210,031	111.9
2004	235,411	124.3
2005	239,064	142.6

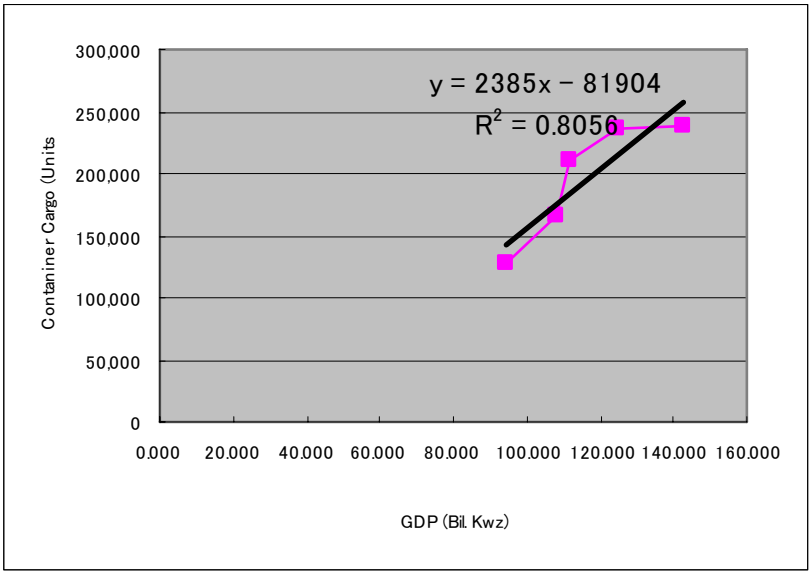

Figure 9-11 Relation between GDP and Container Throughput of Luanda Port

Table 9-12 Future Container Throughput of Luanda Port

Year		High Case (units)	Low Case (units)
1998	90,936		
1999	74,113		
2000	50,270		
2001	126,970		
2002	165,871		
2003	210,031		
2004	235,411		
2005	239,064		
2010		738,000	568,000
2010/2005		3.1	2.4

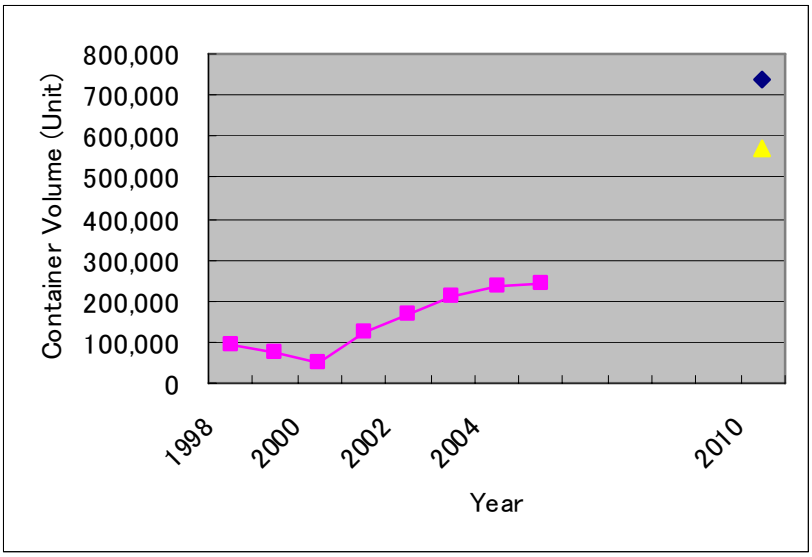

Figure 9-12 Future Container Throughput of Luanda Port

Future container throughput of Luanda port in TEU base is calculated and shown in Table 9-13, using the ratio of TEU to unit in 2004 given in Chapter 5.

Table 9-13 Future Container Throughput of Luanda Port (TEU)

Year	2005 (TEU)	2010 High Case (TEU)	2010 Low Case (TEU)
	294,000	906,000	698,000

9.4 Port of Lobito

9.4.1 Total Volume of cargo

Total volume of cargo throughput at Lobito port since 1995 is shown in Table 9-14 and Figure 9-13. Cargo volume increases every year and has become 7 times greater than in 1995.

Table 9-14 Cargo Throughput of Lobito Port

Year	Tons	Growth (%)
1995	121,900	
1996	128,400	5.3
1997	411,000	220.1
1998	461,300	12.2
1999	385,000	-16.5
2000	535,900	39.2
2001	702,200	31.0
2002	673,000	-4.2
2003	842,600	25.2
2004	872,349	3.5

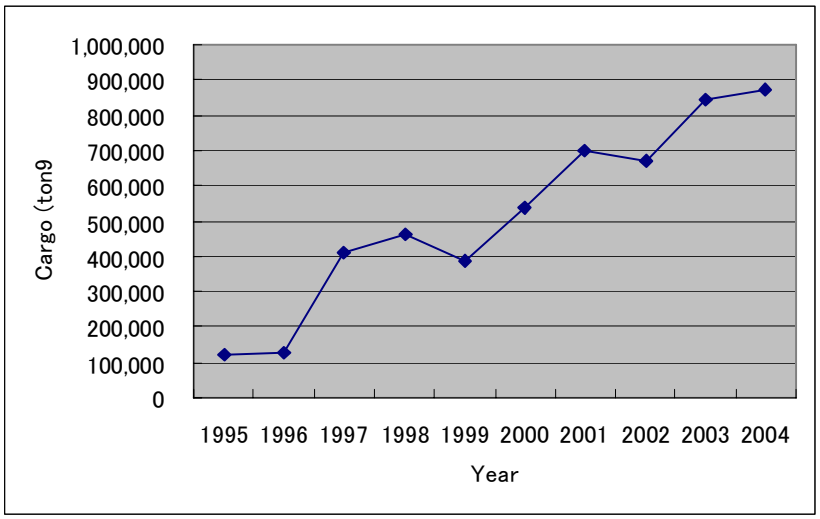

Figure 9-13 Cargo Throughput of Lobito Port

The relation of total cargo throughput with GDP is shown in Figure 9-14. Using correlation analysis, relation between GDP and future cargo throughput of Lobito port is determined as follows.

Y=14159X - 801336
Y: Cargo Throughput (ton)
X: GDP (Billion AKZ)
R2=0.8846

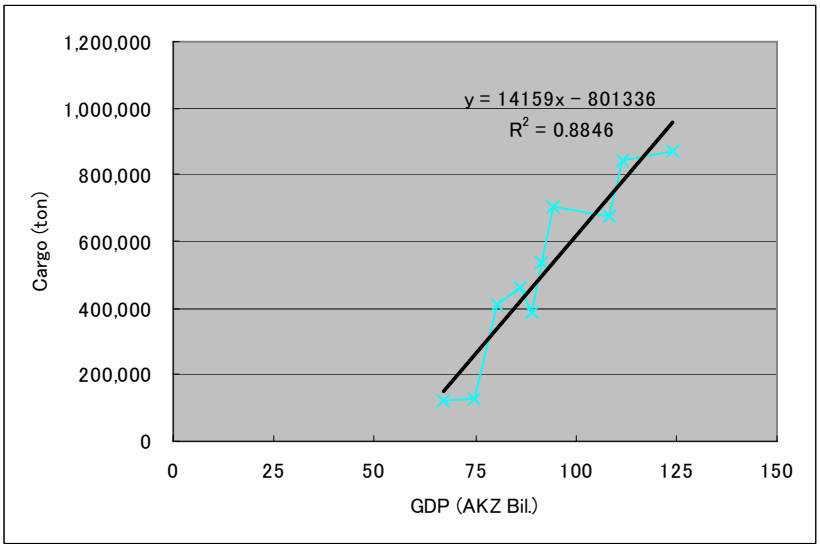

Figure 9-14 Relation between GDP and Cargo Throughput of Lobito Port

Future cargo throughput of Lobito port is calculated by using the above relation and then adjusting with the total cargo throughput of Angola as a control total. Future cargo throughput of Lobito port is shown in Table 9-15 and Figure 9-15. Cargo throughput of Lobito port in 2010 is forecast as 2.7 m tons in the high case. In the low case, cargo throughput is forecast as 2 m tons.

Table 9-15 Future Cargo Throughput of Lobito Port

Year		High Case (tons)	Low Case (tons)
1995	121,900		
1996	128,400		
1997	411,000		
1998	461,300		
1999	385,000		
2000	535,900		
2001	702,200		
2002	673,000		
2003	842,600		
2004	872,349		
2010		2,553,000	1,995,000
2010/2004		2.9	2.3

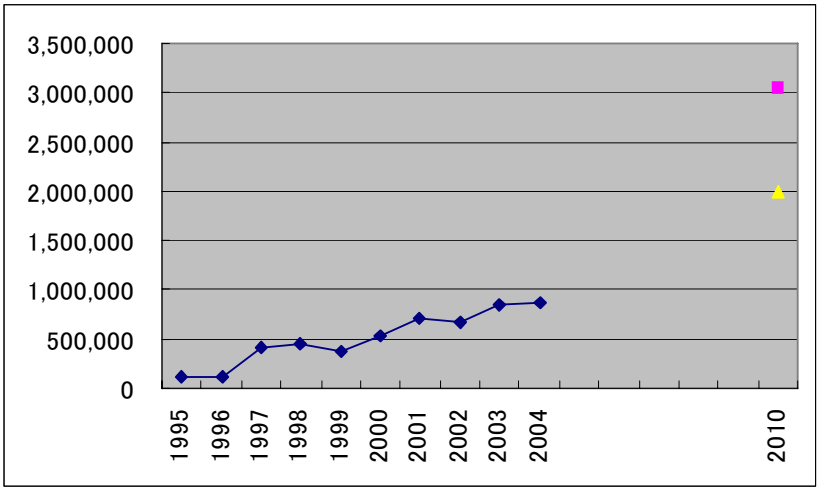

Figure 9-15 Future Cargo Throughput of Lobito Port

It is likely that Benguela railway will reopen by 2010. But it is uncertain how much copper ore will be exported from Zambia through Lobito port even after reopening of the Benguela railway. After closing of the Benguela railway, copper production of Zambia fell 500 thousand tons from 750 thousand tons in the 1970's to 250 thousand tons in the 1980's. These 500 thousand tons will be handled again after reopening of the Benguela railway. Therefore, this amount is added to the high case. Cargo throughput of Lobito port is shown in Table 9-16.

WFP imported 250 to 300 thousand tons of food to Angola in this three years (2003.1-2005.12). About 200 thousand tons of food was imported through Lobito port at that period. WFP will decrease the volume of imported food to Angola to 130 thousand ton in next three years (2006.1-2008.12). But WFP plans to increase Lobito port's presence and concentrate the share of Lobito port from 75% to 80- 85% of total volume. Lobito port will still play an important roll as a food import base of central Angola.

In construction field, there is small cement factory in Lobito. But the demand of cement from central Angola region is much bigger than the production of the factory. So, 9 thousand tons of cement is imported in 2004. Steel bar is also imported. In these five years to 2005, Angola will be more rehabilitated. The demand of construction material will increase and most of them will be imported through Lobito port.

Farm land will be also rehabilitated and the demand of fertilizer will increase. In 2010, more fertilizer will be imported or be conveyed from northern part of Angola by domestic ship.

Considering those causes, the cargo volume of break bulk in 2010 will increase. The share of break bulk cargo to the total cargo in 2010 is assumed to be the same in 2004. Future throughput of break bulk cargo is shown in Table 9-17.

Table 9-16 Cargo Throughput Prediction (Lobito)

Year	High Case (tons)	Low Case (tons)
2004	872,349	872,349
2010	3,053,000	1,995,000
2010/ 2004	3.5	2.3

Table 9-17 Break Bulk Cargo Throughput (Lobito)

Year	High Case (tons)	Low Case (tons)
2004	272,998	272,998
2010	956,000	612,000
2010/ 2004	3.5	2.3

9.4.2 Container Cargo

Total volume of container through Lobito port since 2000 is shown in Table 9-18 and Figure 9-16. The volume in 2005 is estimated by its 1st semester's throughput. The container throughput of 2005 is 32 thousand units or 2.1 times that of 2000.

Table 9-18 Container Throughput of Lobito Port

Year	Container Throughput (Units)	Growth (%)
2000	15,085	
2001	17,413	15.4
2002	21,924	25.9
2003	24,280	10.7
2004	28,950	19.2
2005	32,472	12.2

The relation of container cargo throughput with GDP is shown in Table 9-19 and Figure 9-17. Using correlation analysis, relation between GDP and future container throughput of Lobito port is determined as follows.

Y=343.52X-15187
Y: Container Throughput (Unit)
X: GDP (Billion AKZ)
R2=0.9714

Future container throughput of Lobito port is calculated by using the above relation and then adjusting with the total container throughput of Angola as a control total. Future container cargo throughput of Lobito port is shown in Table 9-20 and Figure 9-18. Container throughput of Lobito port in 2010 is forecast as 100 thousand units in the high case. In the low case, container throughput is forecast as 80 thousand units.

Future container throughput of Lobito port in TEU base is calculated and shown in Table 9-21, using the ratio of TEU to unit in 2004 given in Chapter 5.

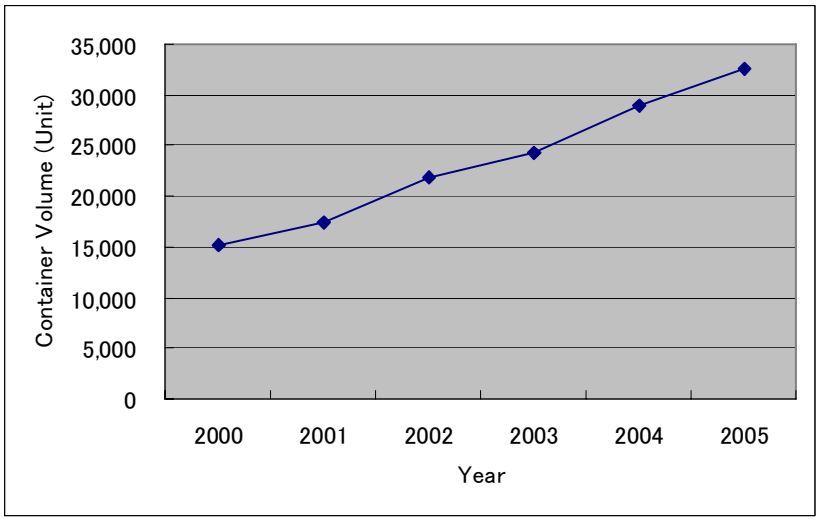

Figure 9-16 Container Throughput of Lobito Port

Table 9-19 Relation between GDP and Container Throughput of Lobito Port

Year	Container Throughput (Units)	GDP Billion AKZ
2000	15,085	91.7
2001	17,413	94.5
2002	21,924	108.2
2003	24,280	111.9
2004	28,950	124.3
2005	32,472	142.6

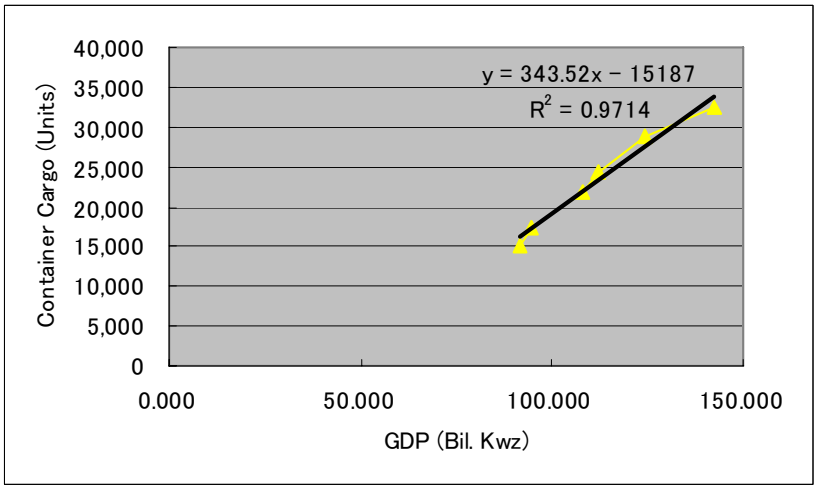

Figure 9-17 Relation between GDP and Container Throughput of Lobito Port

Table 9-20 Future Container Throughput of Lobito Port

Year	Actual (Units)	High Case (Units)	Low Case (Units)
2000	15,085		
2001	17,413		
2002	21,924		
2003	24,280		
2004	28,950		
2005	32,472		
2010		104,000	80,000
2010/2005		3.2	2.5

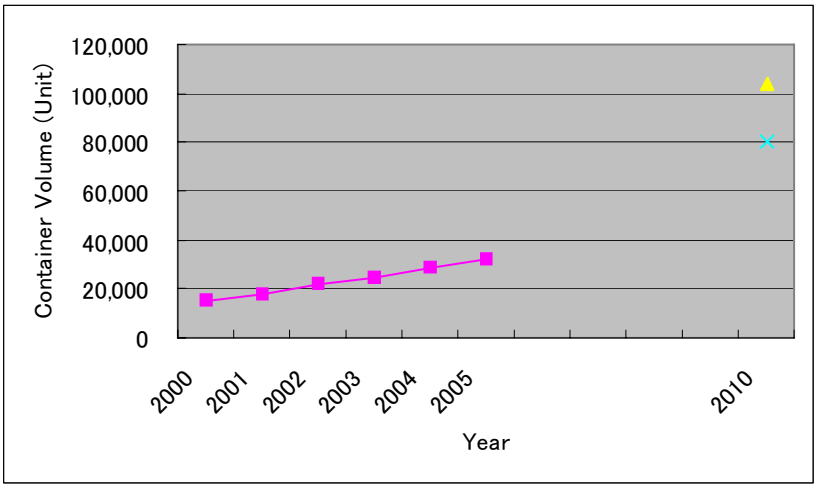

Figure 9-18 Future Container Throughput of Lobito Port

Table 9-21 Future Container Throughput of Lobito Port (TEU)

Year	2005 TEU	2010 High Case TEU	2010 Low Case TEU
	37,375	120,000	92,000

9.5 Port of Namibe

9.5.1 Total Volume of cargo

Total volume of cargo through Namibe port since 1997 is shown in Table 9-22 and Figure 9-19. Cargo volume increases every year and it becomes 3.9 times greater than that of 1997.

The relation of total cargo throughput with GDP is shown in Figure 9-20. Using correlation analysis, relation between GDP and future cargo throughput of Namibe port is determined as follows.

Y=4445.5X-291473
Y: Cargo Throughput (ton)
X: GDP (Billion AKZ)
R2=0.9162

Table 9-22 Cargo Throughput of Namibe Port

Year	Tons	Growth (%)
1997	67,239	
1998	70,948	5.5
1999	82,485	16.3
2000	150,320	82.2
2001	151,423	0.7
2002	173,967	14.9
2003	207,073	19.0
2004	261,065	26.1

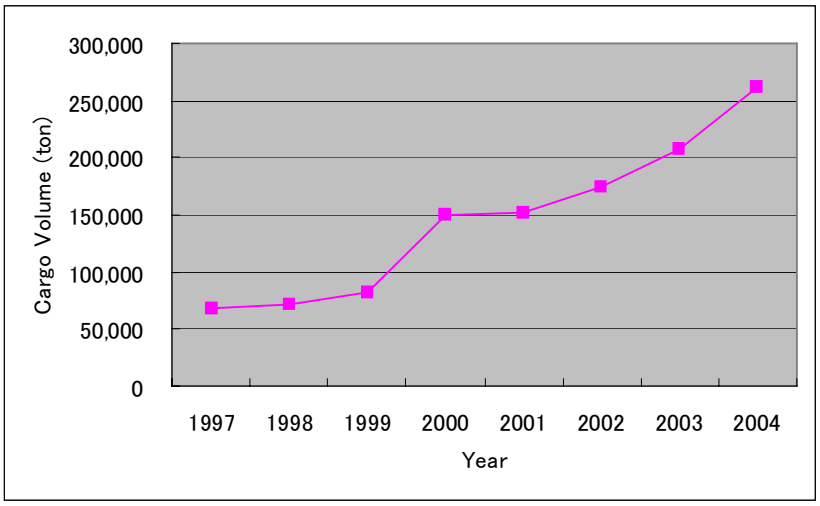

Figure 9-19 Cargo Throughput of Namibe Port

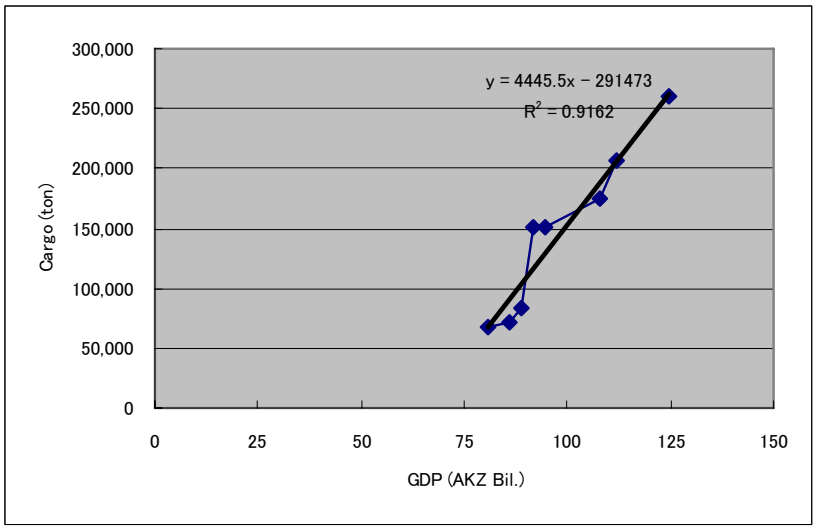

Figure 9-20 Relation between GDP and Cargo Throughput of Namibe Port

Future cargo throughput of Namibe port is calculated by using the above relation and then adjusting it with the total cargo throughput of Angola as a control total. Future cargo throughput of Namibe port is shown in Table 9-23 and Figure 9-21. Cargo throughput of Namibe port in 2010 is forecast as 0.79 m tons in the high case. In the low case, cargo throughput is forecast as 0.62 m tons.

Table 9-23 Future Cargo Throughput of Namibe Port

Year		High Case (tons)	Low Case(tons)
1997	67,239		
1998	70,948		
1999	82,485		
2000	150,320		
2001	151,423		
2002	173,967		
2003	207,073		
2004	261,065		
2010		794,000	618,000
2010/2004		3.0	2.4

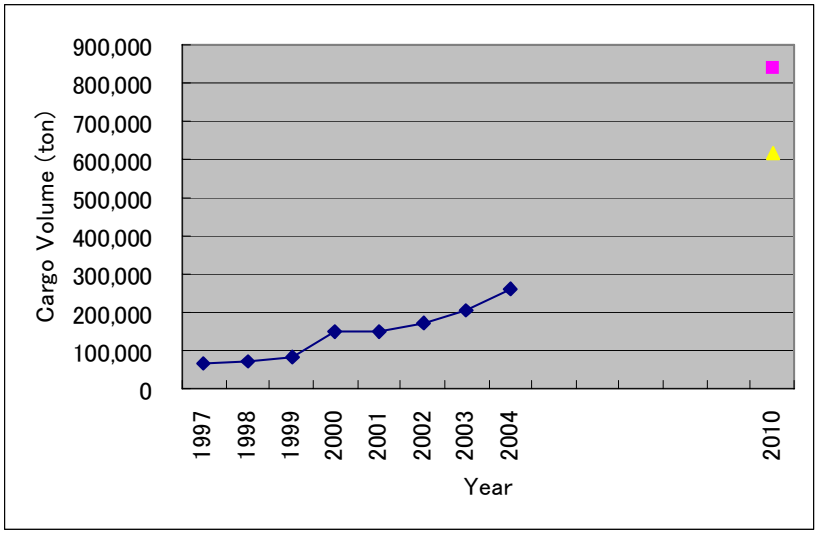

Figure 9-21 Future Cargo Throughput of Namibe Port

It is likely that Mocamedes railway will reopen by 2010. However, it is uncertain how much iron ore will be exported from Cassinga through Namibe port even after reopening of the Mocamedes railway. After closing of the Mocamedes railway, iron ore production which had reached six million tons in the 1970s stopped. This 6 m tons will be handled again after reopening of the Mocamedes railway. So adding this amount to the high case. Cargo throughput of Namibe port is shown in Table 9-24. Iron ore will be handled at Saco Mar.

About 110 thousand tons of food was imported through Namibe port in 2004. That comprises 40% of total cargo. In addition, many kinds of food such as potato or frozen chicken are imported by container. Namibe port will still play an important roll as a food import base of southern Angola.

In construction field, there is no cement factory in southern Angola and 27 thousand tons of cement is imported in 2003. Steel bar is also imported. In these five years from 2005, rehabilitation work will undergo in Angola more. The demand of construction material will increase and most of them will be imported through Namibe port.

Number of the company that handles granite increase 2 to 5 in 2005 and other company plans do so, so the volume of granite stone handled at Namibe port will increase.

Considering those causes, the cargo volume of break bulk in 2010 will be greater than

that of 2004. The share of break bulk cargo to the total cargo in 2010 is assumed to be the same in 2004. Future throughput of break bulk cargo is shown in Table 9-25.

Table 9-24 Future Cargo Throughput of Namibe Port (Final)

Year	High Case (tons)	Low Case (tons)
2004	261,065	261,065
2010	6,794,000	618,000
2010/ 2004	26.0	2.4

Table 9-25 Break Bulk Cargo Throughput (Namibe)

Year	High Case (tons)	Low Case (tons)
2004	186,262	186,262
2010	566,000	441,000
2010/ 2004	3.0	2.4

9.5.2 Container Cargo

Total volume of container through Namibe port since 2000 is shown in Table 9-26 and Figure 9-22. The volume in 2005 is estimated by its 1st semester's throughput. The container throughput of 2005 is 5.8 thousand units or 2.7 times that of 2000.

Table 9-26 Container Throughput of Namibe Port

Year	Container Throughput (Units)	Growth (%)
2000	2,174	
2001	4,308	98.2
2002	11,784	173.5
2003	4,273	-63.7
2004	5,158	20.7
2005	5,785	12.2

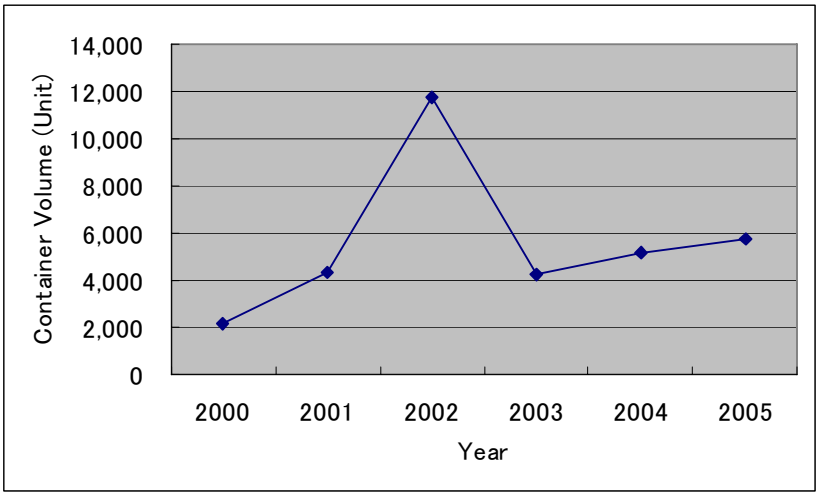

Figure 9-22 Container Throughput of Namibe Port

The relation of container cargo throughput with GDP is shown in Table 9-27 and Figure 9-23. Using correlation analysis, relation between GDP and future container throughput of Namibe port is determined as follows.

Y=59.945X – 1869.1
Y: Container Throughput (Unit)
X: GDP (Billion AKZ)
R2=0.7288

Table 9-27 Relation between GDP and Container Throughput of Namibe Port

Year	Container Throughput (Units)	GDP Billion AKZ
2000	2,174	91.7
2001	4,308	94.5
2002	11,784	108.2
2003	4,273	111.9
2004	5,158	124.3
2005	5,785	142.6

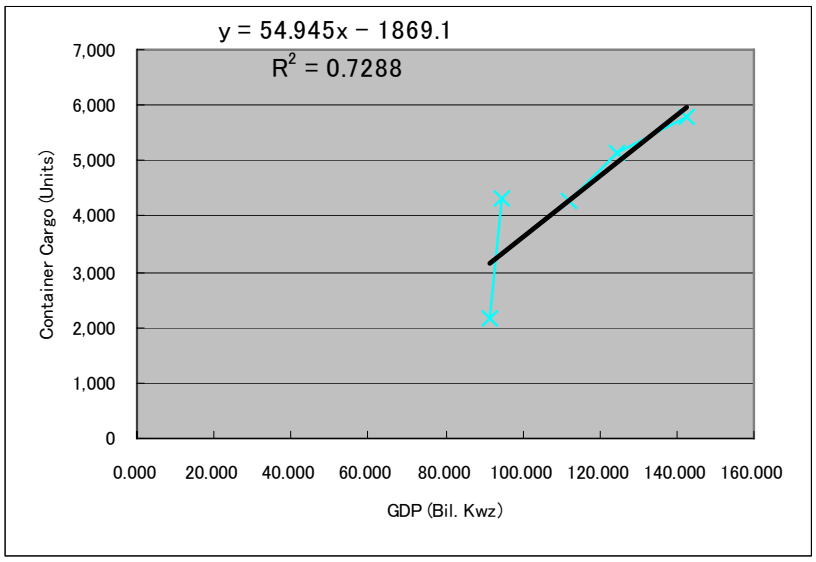

Figure 9-23 Relation between GDP and Container Throughput of Namibe Port

Future container throughput of Namibe port is calculated by using the above relation and then adjusting with the total container throughput of Angola as a control total. Future container cargo throughput of Namibe port is shown in Table 9-28 and Figure 9-24. Container throughput of Namibe port in 2010 is forecast as 17 thousand units in the high case. In the low case, container throughput is forecast as 13 thousand units.

Future container throughput of Namibe port in TEU base is calculated and shown in Table 9-29, using the ratio of TEU to unit in 2004 given in Chapter 5.

Table 9-28 Future Container Throughput of Namibe Port

Year		High Case (units)	Low Case (units)
2000	2,174		
2001	4,308		
2002	11,784		
2003	4,273		
2004	5,158		
2005	5,785		
2010		17,000	13,000
2010/2005		2.9	2.2

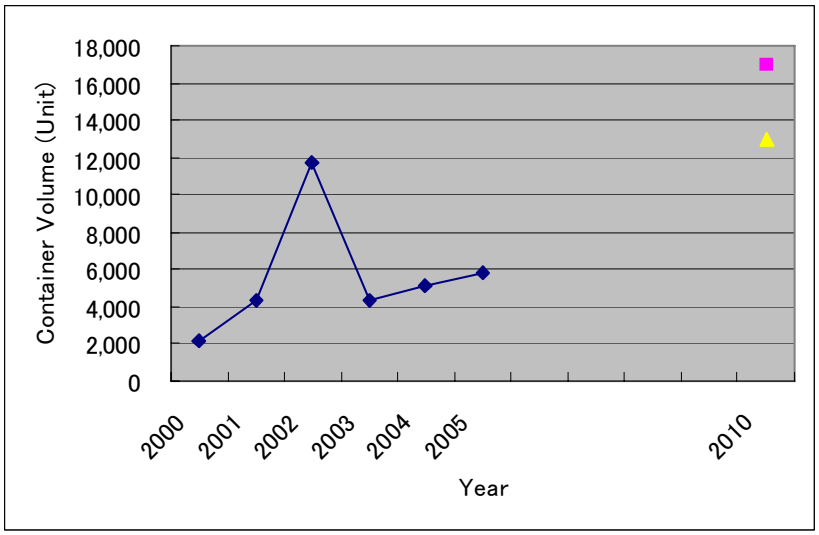

Figure 9-24 Future Container Throughput of Namibe Port

Table 9-29 Future Container Throughput of Namibe Port (TEU)

Year	2005 TEU	2010 High Case TEU	2010 Low Case TEU
	8,330	24,000	19,000

9.6 Port of Cabinda

9.6.1 Total Volume of cargo

Total volume of cargo through Cabinda port since 2000 is shown in Table 9-30 and Figure 9-25. Cargo volume increases every year and it has become 2.8 times greater than that of 2000.

Table 9-30 Cargo Throughput of Cabinda Port

Year	Tons	Growth (%)
2000	29,500	
2001	37,900	28.5
2002	40,400	6.6
2003	50,100	24.0
2004	81,600	62.9

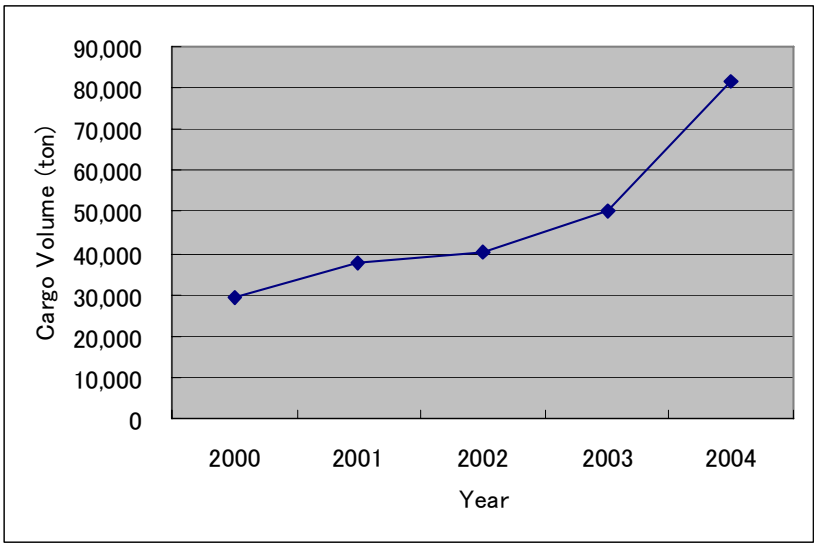

Figure 9-25 Cargo Throughput of Cabinda Port

The relation of total cargo throughput with GDP is shown in Figure 9-26. Using correlation analysis, relation between GDP and future cargo throughput of Cabinda port is determined as follows.

Y=1394.4X - 100070
Y: Cargo Throughput (ton)
X: GDP (Billion AKZ)
R2=0.8467

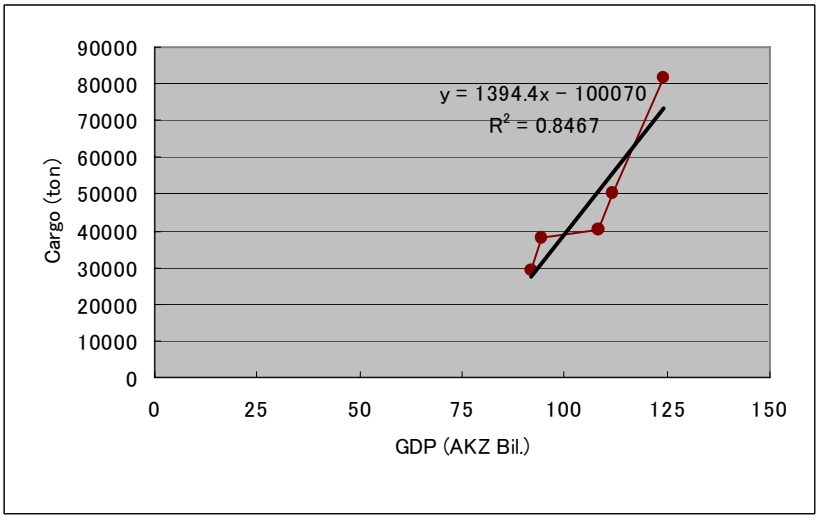

Figure 9-26 Relation between GDP and Cargo Throughput of Cabinda Port

Future cargo throughput of Cabinda port is calculated by using the above relation and then adjusting with the total cargo throughput of Angola as a control total. Future cargo throughput of Cabinda port is shown in Table 9-31 and Figure 9-27. Cargo throughput of Cabinda port in 2010 is forecast as 263 thousand tons in the high case. In the low case, cargo throughput is forecast as 194 thousand tons.

Table 9-31 Future Cargo Throughput of Cabinda Port

Year		High Case (tons)	Low Case (tons)
2000	29,500		
2001	37,900		
2002	40,400		
2003	50,100		
2004	81,600		
2010		263,000	194,000
2010/2004		3.2	2.4

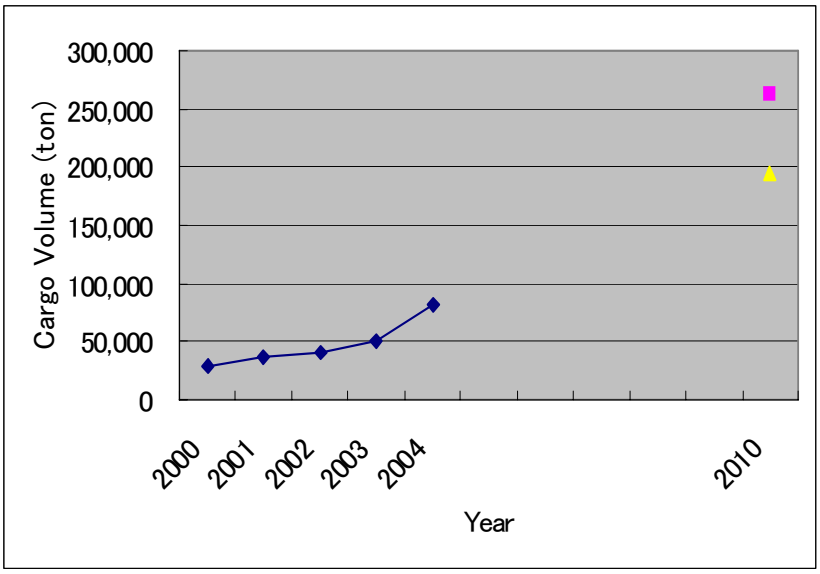

Figure 9-27 Future Cargo Throughput of Cabinda Port

9.6.2 Container Cargo

Total volume of container through Cabinda port is shown in Table 9-32. The container throughput of 2003 is 3.6 thousand units.

Table 9-32 Container Throughput of Cabinda Port

Year	Container Throughput (Units)	Growth (%)
2004	3,657	

The relation of container cargo throughput with GDP cannot be calculated due to the lack of time-series container throughput data. Applying national growth rate, future container throughput of Cabinda port is calculated in Table 9-33 and Figure 9-28.

Table 9-33 Future Container Throughput of Cabinda Port

Year		High Case unit	Low Case unit
2004	3,657		
2010		13,000	10,000
2010/2005		3.6	2.7

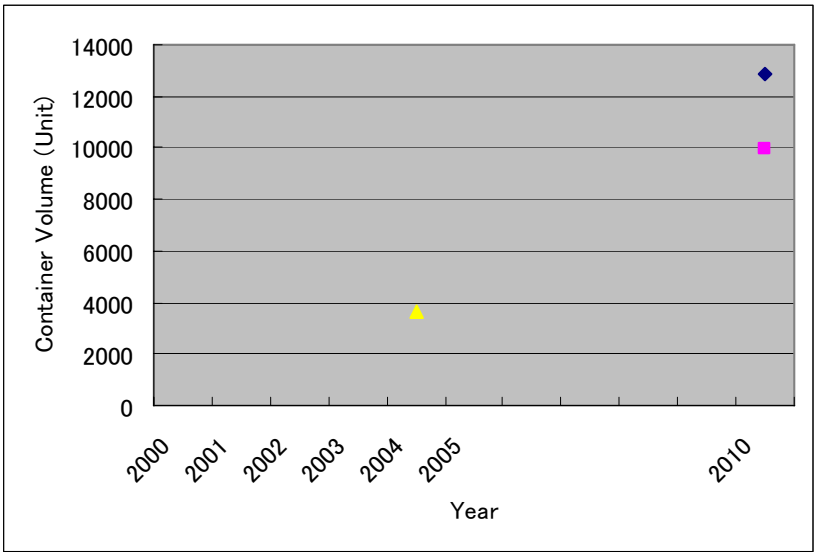

Figure 9-28 Future Container Throughput of Cabinda Port

There is no data of TEU/Unit ratio in Cabinda port. Using TEU/ Unit t ratio of Lobito port in 2004, Container throughput of Cabinda port in TEU base is calculated and shown in Table 9-34.

Table 9-34 Future Container Throughput of Cabinda Port (TEU)

Year	2004 TEU	2010 High Case TEU	2010 Low Case TEU
	4,491	16,000	12,000

9.6.3 Passengers

Number of passengers used Cabinda port to go or come to offshore drilling rig was 94,327 in 2005. According to the national crude oil development plan, number of passengers may increase 1.5 times.

9.7 Summary

The results of demand forecast are summarized in Table 9-35 and Table 9-36. In the high case, cargo volume of each port in 2010 increases 2.8 to 26 times that recorded in 2004. Cargo volume of Namibe port in 2010 except iron ore increases 3.0 times over the present one. In the low case, cargo volume of each port in 2010 increases 2.2 to 2.4 times that recorded in 2004.

Table 9-35 Demand Forecast of Angolan Ports

ton

Year/Ports	Luanda	Lobito	Namibe	Cabinda	Total
2004	3,149,756	872,349	261,065	81,600	4,409,770
2010 (High Case)	8,971,000	3,053,000	6,794,000	249,000	19,067,000
2010/ 2004	2.8	3.5	26.0	3.1	4.3
2010 (Low Case)	7,034,000	1,995,000	618,000	194,000	9,841,000
2010/ 2004	2.2	2.3	2.4	2.4	2.2

Table 9-36 Future Container throughput of Angolan Ports

TEU

Year/Ports	Luanda	Lobito	Namibe	Cabinda	Total
2004	288,981	33,321	7,428	4,491	334,000
2010 (High Case)	906,000	120,000	24,000	16,000	1,066,000
2010/ 2004	3.1	3.6	3.2	3.6	3.2
2010 (Low Case)	698,000	92,000	19,000	12,000	821,000
2010/ 2004	2.4	2.8	2.6	2.7	2.5

9.8 Maximum Size of Calling Vessels (Lobito Port, Namibe Port)

Major vessels calling at Lobito port or Namibe port in 2004 are shown in Table 9-37. Marina Schulte is the biggest container ship and Liberty Grace is the biggest bulk ship. The target year of the Short-term Development plan is 2010, and there will not be new construction of deep sea berth in both ports by then. There will not be a drastic change of calling ships in five years. So, in this study, existing maximum calling ships are assumed to be the maximum calling ships for design of short-term development plan.

Table 9-37 Spec of Major Calling Ships to Lobito Port

Vessel Name	LOA (m)	Draft (m)	Dwt	Gt	Flag	Main Vesse Type	Sub Type
Maria Schulte	**230.9**	**12.0**	**41,500**	**35,697**	**Cyprus**	**Container**	**Container Ship**
Maersk Volos	175.6	10.9	23,508	18,334	Liberia	Container	Container Ship
Maersk Vienna	168.7	9.2	21,152	17,167	Cyprus	Container	Container Ship
Pioner	148.6	8.4	10,442	9,715	Bulgaria	Container	Container Ship
Liberty Grace	**190.0**	**11.9**	**50,601**	**28,836**	**U.S.A**	**Bulker**	**Bulk Carrier Ore Strengthened**
Megalohari	188.0	10.8	37,677	22,009	St Vincent	Bulker	Bulk Carrier Ore Strengthened
Sersou	178.0	10.8	34,100	19,672	Algeria	Bulker	Bulk Carrier Ore Strengthened
Clipper Ipanema	166.0	10.3	22,882	15,992	Bahamas	Dry Cargo	Multi-Purpose Ship
Rosewood-I	161.4	10.0	21,727	13,450	Panama	Bulker	Bulker
Nds Prosperity	154.9	10.1	17,493	13,237	Belize	Dry Cargo	Multi-Purpose Ship
Talos	152.5	9.6	15,884	11,347	Bahamas	Dry Cargo	Multi-Purpose Ship
Hua Tuo	155.1	9.6	15,753	14,163	China	Dry Cargo	Multi-Purpose Ship
Pioner	105.7	6.8	4,638	3,736	Russia	Dry Cargo	General Cargo Ship
Talos	81.7	4.5	2,503	1,681	Netherlands	Bulker	Bulker