CHAPTER 4

PORTS SECTOR

CHAPTER 4 PORTS SECTOR

4.1 Present Situation of Ports

East Timor has three ports (Dili, Carabela and Com), smaller wharves in Oecussi and Liquica, and slip landing structures in Oecussi, Batugade and Suai. The location of these ports are be shown in Figure 4.1.1.

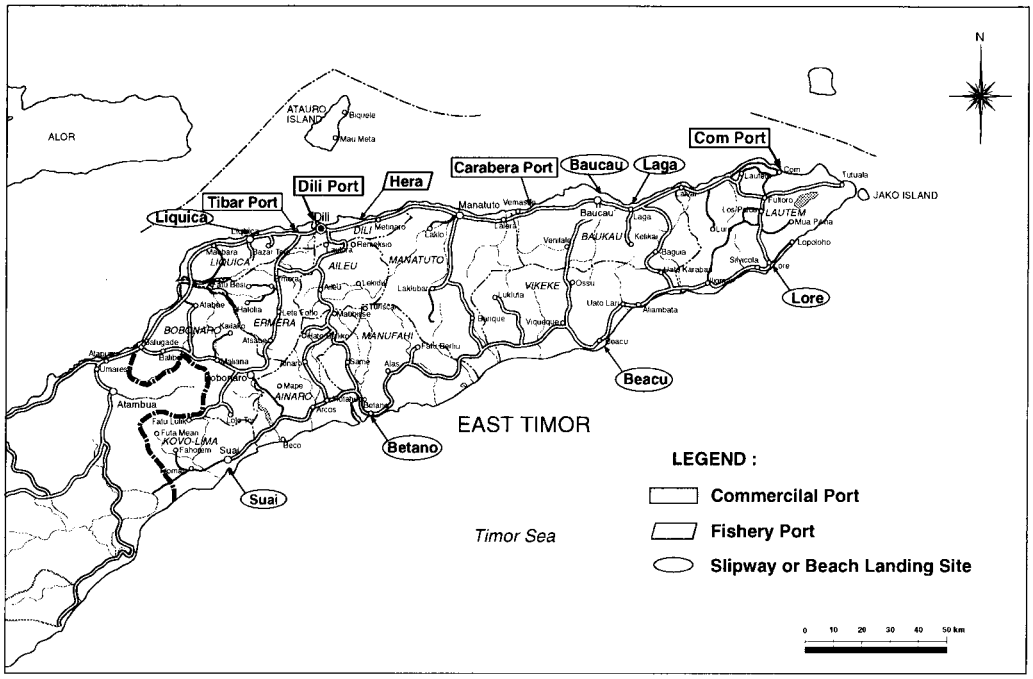


Figure 4.1.1 Location of Ports in East Timor

The port facilities have not incurred structural damage, but the most of equipment has been destroyed or is inoperable. Dili port is currently severely congested, with military and aid cargo crowding out commercial operations. Com port has moderate use by military, aid cargo and commercial vessels.

On the other hand Carabela port is considerably small compared to both Dili and Com ports. Also no berthing vessels were present during the three times site surveys, and no available data exists. Also other smaller wharves and slip landing structures are undocumented.

In addition, that two more ports exist nearby the Dili area, which are Tibar (16km West of Dili) and Hera (15km East of Dili). Tibar port had been planned as a substitution port for Dili port during the Indonesian rule in 1994. However, the project was not completed because of the shallow depth of the bay. So that it is used as a local port by the authority. Recent investigation shows that the port is only slightly used. The warehouse is good condition, even though the port administration office has incurred damage during the post-consultation destruction in 1999.

Hera Fishery Port has been improved recently in connection with loading and unloading of military vehicles. The port area is full of those military vehicles a so-called military zone. Thus the investigation of the port has been limited.

The Pertamina Oil Jetty is situated on the seaside of the oil depot and occurs near the navigation channel of the Western Entrance. The facilities of oil jetty are in poor condition. Fenders are badly damaged and the steel portion is unusable because of heavy corrosion.

Therefore, Carabela port, Tibar port, Hera fishery port, Pertamina oil jetty and other smaller facilities were excluded for field surveys in this sutdy.

4.1.1 Dili Port

4.1.1.1 Location

Dili port is the lifeline port in East Timor, and is located at latitude 08° 33' South and longitude125° 31' East. In addition that the port is located near the center of Dili city. The existing layout plan of the Port is shown in Figure 4.1.2 hereinafter.

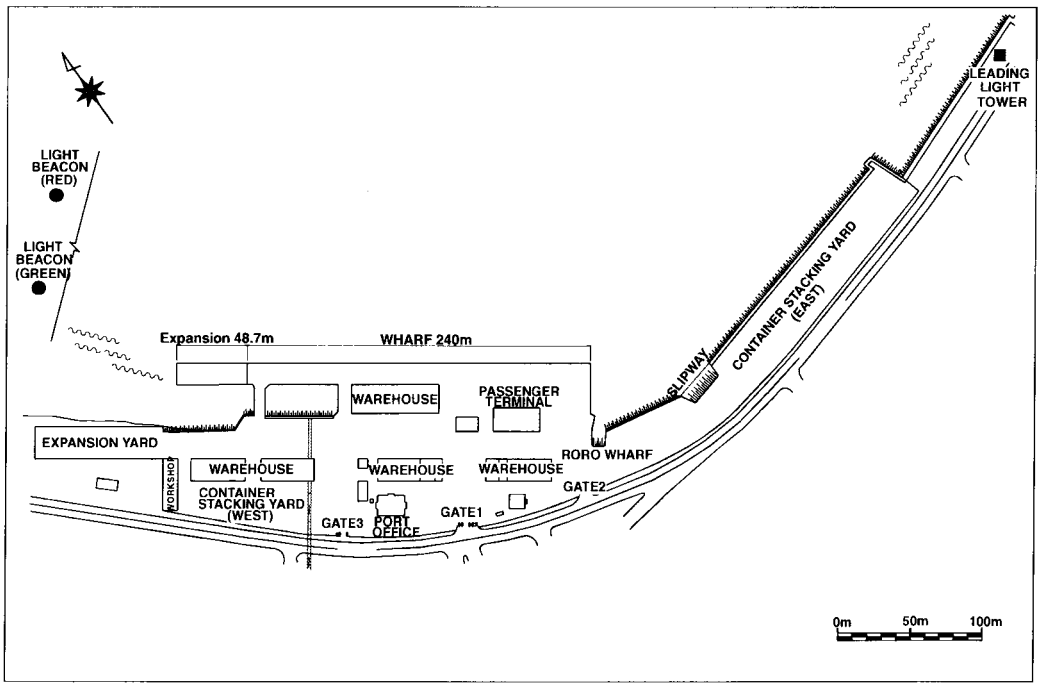


Figure 4.1.2 Existing Layout Plan of Dili Port

4.1.1.2 Approaches

The port is a small open natural port with available vessel drafts varying dramatically due to the presence of numerous reefs on a sandy seabed. The approach channel is characterized by a narrow passage on either side of the detached reefs. The reefs are visible during low water.

The Western passage is generally used, since it is wider and deeper than the eastern passage. Two large navigation aids (light beacon) exist at the entrance to the western approach channel.

The eastern passage should be only used by vessels with local knowledge, due to a very shallow coral patch is existing in the middle of the channel.

4.1.1.3 Tugboat

Presently the port is unable to offer any tugboat service so that the calling vessels are rather difficult to berth and unberth. A temporary tugboat is exists in the port, belonging to a foreign-based floating hotel, so that some of the calling vessels use this private tugboat. But the most of the called vessels do not use this tugboat because it is very expensive. However, the hotel with tugboat has scheduled to go back to its own country by September 2000, so that the port will be unable to offer even the private tugboat services after September 2000.

Dili port had two tugboats existing during Portugal rule, however the port does not have any tugboat during Indonesian rule because of the financial reason.

On the other hand, this inconvenience situation is one of the reasons of damage of the fenders. The harbor master has been announced to the calling vessels that berthing or unberthing are recommending in morning calm or evening calm. Due to prevent damage of wharf and vessels, or vessel to vessel from the land and sea breeze. In this regard, however the vessels should share the inconvenient waiting time. In addition, that East Timorese also should share some extra transportation cost for imported commodities.

4.1.1.4 Wharf

The size of wharf is 240m long and 20m wide and it is reinforced concrete structure. The condition of the wharf is generally fair enough on the surface but it is poor at the bottom of the deck. Diameters 500mm and 600mm of spun type of foundation piles support the slab structure. The wharf allows berthing for vessels with a maximum length of 140m and 6.2m drought.

The western end of the wharf has been extended portion of 48m; the construction has not been completed.

V-2,000 x 500-type rubber fender is used although the most of these are poor condition and a few of them are missing.

The wharf is very busy since the vessel occupied ratio in April and May of 2,000 are more than 95%. In addition, on the wharf is very congested with loading and unloading cargo, containers, trailers, forklifts, trucks, sedans, and passengers. Many minor accidents occur everyday resulting in suggestions to extend the wharf.

The handling volume is 227, 474 ton and 556 vessels called at Dili port in 1997 (East Timor in Figures of 1997 edition). Presently two (2) vessels are berthing per day on average since February 2000. However, the gross weight tonnage (GWT) or dead weight tonnage (DWT) of those vessels are unknown. On the other hand, UNTAET is regulating that the wharf should be occupied by at least two (2) vessels the same time and the minimum vessel size is 1,500DWT. The record of berthed known vessel in April and May of 2000 are shown in Table 4.1.1.

Table 4.1.1 Record of berthed known vessel in April and May of 2000

Item	Month	Remarks
Average of overall length	Apr/May	between 75 and 80 meters
Average number of berthing vessels	Apr/May	2 vessels and a pontoon
Number of berthed vessel	April	43
	May	44
Number of container	April	1,373TEU
	May	1,861TEU
Number of unloaded vehicle	April	298
	May	390
Occupied ratio	April	more than 95%
	May	more than 95%

It is therefore, estimated that the cargo handling volume of the port might increase drastically in this year compared to1997.

4.1.1.5 Facilities

Buildings

The original built as the passenger terminal is now used by the Customs at the eastern end of the wharf. There are also several other buildings that are capable of being utilized as offices throughout the facility. These buildings have some power and telephone lines in place.

Storage Facilities and Marshalling Areas

Several storage and marshaling areas are existing throughout the port. The name, number and dimensions and other information are described herein after:

- Transshipment Shed;

  Dimensions : 56m x 21m

  Floor : Concrete

  Entrance / Exits : four double doors, 4m wide and approx. 6m high

  Special features :the shed is divided into 2 approx. equal areas (about 23m x 21m)

- Warehouse One and Two;

  Dimensions : 20m x 40m

  Floor : Concrete

- Warehouse Three and Four;

  Dimensions : 15.3m x 37m

  Floor : Concrete

There are numerous areas throughout the facility that can be used to marshal and place cargo.

Water system

The port has two water systems, which is city water and its own deep well water. The deep well system is described herein after.

- Depth : 60m
- Capacity of tank : 10m x 10m x 2m = 200 m^3

- Size, length and laid of pipe line

  : 6" x 12m, 1996

  : 5" x 332m, 1996

  : 3" x 218m, 1994

  : 2" x 60m, 1994

- Number of pump : 4 unit

- Driver of pumps : one Diesel engine (stolen)

  : three Electric motors (stolen)

The fire fighting water system does not exist and there is no potable water available. Therefore, a fire fighting water system must be provided as soon as possible to prevent damages to the valuable vessels, cargo, and other facilities from a fire.

Cargo handling equipment

The port has no cargo handling equipment, save for an inoperable forklift and crane on wheels. Thus, all vessels need to be equipped with lifting gear.

- Forklift : 5 t capacity, 1974 model (need to be repaired)
- Truck Mounted crane : 25 t capacity, 1983 model (need to be repaired)

Fender System

The fender system is one of the important facilities of port to avoid damage to the vessels to berth and/or during berthing.

Originally thirty- (30) rubber fenders (V-2,000 x 500-type) existed at the front face (seaside) of the wharf in order to prevent damage to the berthing vessels.

The total length of the wharf is 240m at present and the spacing of two fenders are 8m on average.

Presently most rubber fenders are in unsatisfactory condition. They are split, miss a portion and are hanging as pieces. In addition that some of them are completely missing.

Therefore, the called vessels are difficult to berth without any damages to their hull.

The typical photographs of the fender conditions are shown in Photo 4.1.1.

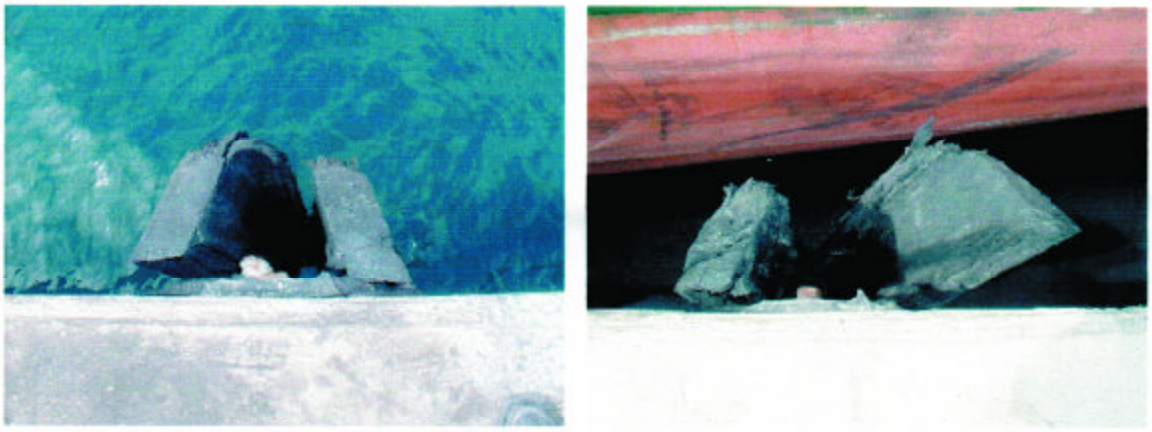


Photo 4.1.1 Typical photograph of the fender

Captains and owners of the calling vessel are complaining to the port sector of UNTAET regarding the unsafe berthing conditions.

Such unsatisfied conditions are caused by:

- Unsuitable rubber materials
- Unsatisfied manufacturing of fenders
- Berthing velocity is more than the designed (caused by unavailable situation of pilot and tugboat services)
- Berthing of vessels with more than permissible size
- Poor maintenance
- Improper installation

The above listed problems should be solved immediately to allow safe berthing from berthing vessels.

Therefore, the above existing rubber fenders should be changed to the adequate fenders in accordance with sound engineering principles.

Lighting system

The lighting system in the port is very poor, and also does not have a suitable substation, so that berthing vessels are using their own lighting system during nighttime operation. Work efficiency is thus rather small compared with other normal ports because of darkness. In addition that many valuable commodities are stolen during nighttime because of inadequate lighting causing constant anxiety of those owners of the commodities.

On the other hand, the port is using an outside power supply without any suitable substation. So that, the lighting becomes impossible when the outside power supply is disconnected. And it causes serious danger to the night cargo handling at the port. Therefore, installing of a substation and the generator would be necessary to obtain a safe port. The sizes of a substation and generator should be determined in consideration of other electrical equipment.

Others

- Boat : 2 x 105 Hp engines, 1985 model (sunken by some)

4.1.1.6 Harbour Beach-Landing Site (East Container Stacking Yard)

The port includes a beach-landing site with a reinforced concrete ramp located at the Southeast end of the wharf.

The site is located at the East Container Stacking Yard and is in poor condition, especially the ramp.

4.1.1.7 Navigation Aids

The navigation aids are classified into three (3) groups in this Dili Port, which are;

1) Entrance Light Beacon

2) Lighthouse

3) Leading Light

All of these are poor condition, of which the details are described individually herein after;

1) Entrance Light Beacon

Two light beacons are located at the entrance of the Western passage with 185m of distance between the beacons.

The beacons were inspected during high tide at 14.30 o'clock in March 23, and low tide at 15.30 o'clock in April 2nd 2,000.

The result of the inspection is described below.

- The light beacons are installed in fiber grassed made container on the platform supported by steel foundation piles.
- Equipment is still in a reasonable condition.
- The platforms and foundation piles are in a extremely poor and dangerous condition caused by totally corroded steel material without corrosion prevention and maintenance. For instance, corroded portions have been laminated in total.

- These structures are forecasted to collapse at any time if the abnormal waves appear or if a small rowboat collides with it.

The typical photographs of the pile structure are shown in Photo 4.1.2.

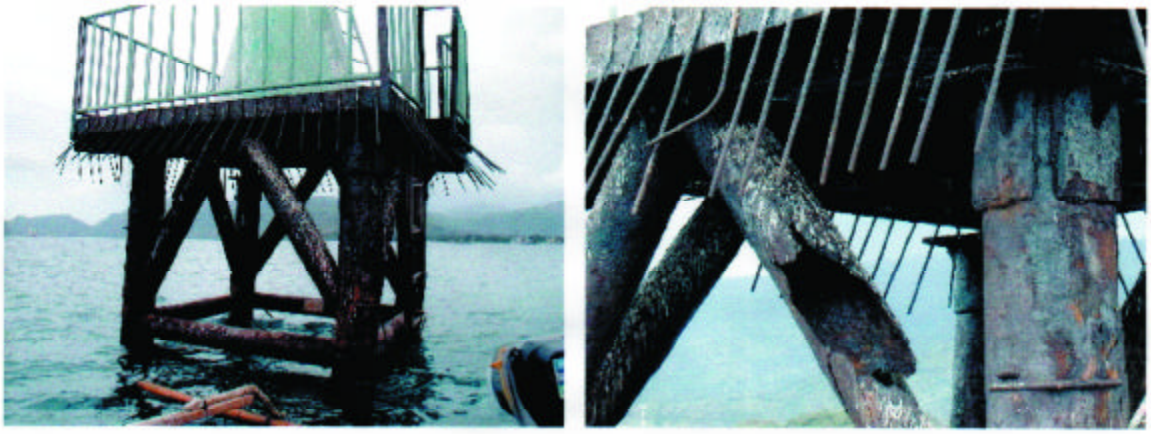


Photo 4.1.2 Typical photograph of the pile structure

Therefore, it is recommended to reconstruct the entrance light beacons immediately to obtain a safe navigable port. On the other hand, the above equipment is still in a reasonable condition.This equipment can be reinstalled on the new platforms. Thus the platforms and foundation piles should be reconstructed immediately in order to utilize the equipment.

Once the existing structures have collapsed, the disadvantage will be:

- The Port is unable to operate until the temporary or permanent navigation aids placed.
- The equipment cost will be added, which is the same as the construction cost of the platform.
- During non-operation of port, the everyday life of the Timorese will be severely affected by lack of daily commodities. It thus becomes a social problem of the Timorese.
- Approximately four (4) months of the manufacturing time is needed for the equipment after the purchase ordered.

It is important that the platforms and foundation piles shall be reconstructed immediately so that the port can be operated as a navigable port.

2) Lighthouse

The lighthouse is located on the western end of Dili Port and the area was off-limited until recently, so that the field investigation was impracticed to carry out until April 15th 2000.

Field investigations were carried out in the entire lighthouse area on April 15 and 25 of 2000. The investigation showed:

- The first floor was ravaged, and/or destroyed, and nothing remained.
- A light device works by connecting to an outside power supply.
- The battery power-supply unit for an emergency on the roof (charge it from solar energy panel) is in bad condition caused by lack of maintenance and management. These units are impossible to use.
- A light device on top of an iron pole has been recently installed, and does not need to be replaced.
- The reinforced concrete building is badly damaged and dangerous to inhabit. The poor condition is caused by improper construction works and lack of maintenance.
- The steel column is comparatively good; however, the rust on the spiral ladder is caused by lack of maintenance.

The lighthouse uses an outside power supply and functions.

However, if repairs are not carried out immediately the following matters are likely to occur.

- The lighting stops when the outside power supply is disconnected suddenly. Thus there may be serious danger to the vessels that navigate in this area.
- The house is a reinforced concrete structure which has not been constructed properly. Reinforcing bars of bottom surface of the ceiling are exposed. It is feared that the ceiling will collapse.
- The rust of the spiral ladder should be removed and the ladder be re-painted immediately. Otherwise, the everyday light device check becomes impossible.
- Accordingly overall repair is necessary for this lighthouse to prevent the serious danger to vessels that navigate in this area during the night.

3) Leading Light

A leading light exists in the green belt on the north side of the Coast road (JL. ASADE BANDAIRA) in front of UNTAET Head Quarter, where it exists 12m North West of the Dili starting point. One (1) existing leading light was built in 1983. Previously two leading lights had been existed as to create the usual leading light system, however those were evacuated by some reasons in 1983.

The investigations have been made on April 15 and 25, 2000. Upon investigation the conditions are:

- The steel erected tower is in extremely poor condition, which most of the members are corroded. Members dropped to the ground, due to the heavy corrosion.
- A light device on top of the tower was replaced on November 1999, and the light is comparatively good and does not need to be replaced.
- Lighting works from an outside power supply, however the emergency power supply does not function. It is either battery itself or battery charger (from solar energy panel) that is not working due to lack of maintenance. Further investigation is impossible without climbing equipment for the tower.

The leading light uses an outside power supply and fulfills its function.

However, if the renovation is not carried out immediately, serious problems will occur such as:

- Lighting stops when the outside power supply is disconnected suddenly. Thus there may be serious danger to the entering vessels to the port.
- The body of the tower is extremely weak so that it may collapse due to heavy wind or vehicle collision.
- If the tower collapses:
  ① It would kill or injure personnel, and / or
  ② It would be an obstacle to the traffic.
  ③ The light device might be destroyed, so that there would be an addtional procurement cost for the light device.

Therefore, the tower of a leading light should be renovated as soon as possible to prevent from the above described serious accidents.

4.1.1.8 East Container Stacking Yard

A revetment protects the seaside of the east container stacking yard. The revetment consists of two portions, the west portion and the east portion, and is divided by a beach-landing site. The length of the West portion is 56m and the east portion is 172m.

The revetment is a gravity type.

The condition of the revetment is very poor since many portions have collapsed. The revetment was constructed during Portugal rule (in the early 1950th), and is a so

called overage structure. A typical photograph of the site is shown in Photo 4.1.3 hereinafter.

Photo 4.1.3 Typical photograph of East Container Stacking Yard

The elevation of the revetment is C.D. +2.65m, which is 45 cm higher than the high water level. The container-stacking yard is approximately 35 cm higher than the crown height of the revetment. It has no parapet on the revetment so that spray and even waves runup are over to the stacking yard. Most of overtopping seawater remain on the land.

The container-stacking yard is unpaved, therefore these seawater percolates into the ground.

On the other hand, a sand protection layer was not placed to the backside of the revetment, which is confirmed at the open cross section of the revetment. Therefore, these percolated seawater returns to the ocean with valuable reclaimed soil.

If this natural phenomenon continues the container-stacking yard will be destroyed completely.

Storm water pipes and culverts are observed at front of the revetment. However, all of those are collapsed together with the revetment, so that once heavy rainfall begins the storm water will wash away these collapse wastes. Therefore it is forecasted that in the near future, the storm water will cover the container-stacking yard. Such water would directly flow to the ocean together with the surfaced soil/gravel and sand. This natural phenomenon would cause heavy damages to the container-stacking yard.

Recent observation shows that the degree of damaged revetment has became greater, caused by heavy rains of Tuesday April 4 and Saturday April 8 in 2,000.

Therefore, it is recommended to reconstruct immediately the east container stocking yards in accordance with good engineering design to prevent collapse of the container stacking yard.

Also, the container stacking yard should be paved with asphalt or interlocking concrete blocks to prevent serious damages to the reconstructed revetment. The Asian Development Bank is considering to do this pavement work, so that reconstruction of the revetment and pavement works will be well organized prior to the commencement of the works.

Recently, containers are leaning from a vertical position. This phenomenon of the leaning is becoming bigger day by day. This leaning is caused by unstable ground. The ground must be paved with the stable materials such as asphalt or concrete as soon as possible to prevent from fall of these containers.

It is important that:

- The revetment should be constructed as soon as possible, so that the reclaimed materials can be retained.
- The ground must be paved with the stable materials as soon as possible to prevent from fall of upper portions of the containers.

4.1.1.9 West Container Stacking Yard

The West Container Stacking Yard is surfaced with gravel so that stable materials such as asphalt or concrete pave the surface.

Graveled access roads are also very poor. They are dusty on dry days, and muddy on rainy and/or after rained days. Stable material such as asphalt must pave these access road.

Lighting system is very poor. Many lighting devices have been damaged or destroyed during the post-consultation destruction in 1999. Many valuable commodities are robbed during nighttime, and night cargo handling efficiency is very small, which is caused by darkness of the area. Therefore, the lighting system should be considered to be rehabilitated or reinstalled with a proper system.

In addition, the installation of a suitable generator is needed to prevent inconvenience when outside power supplies are disconnected.

The water system is also poor since water pumps are out of order, caused by both engine and motors being stolen during the post-consultation destruction in 1999. However, a 60m of deep-well, pump itself, 200m^3 of reinforced water tank and some of the water pipe lines are fair conditions. Therefore, the proper size of engine and motors should be reinstalled in order to rehabilitate the water system. Presently, vessels are buying potable water from a private water seller at 600 Australian dollars

per 3t. The cost is rather higher than other normal ports, so those vessel owners are hoping for a reasonable cost for the potable water.

The fire fighting system was planned during Indonesian rule, and the construction to lay of a 6" pipeline was started in 1996. However, it was stopped after only laying 12m. The fire fighting system is a minimum requirement of the equipment of the port. Therefore, the fire fighting system should be installed as soon as possible to offer a safe port.

On the other hand, a situation of the revetment is extremely poor even compared with the poor revetment of the East Container Stacking Yard. The revetment was constructed the same as the East Container Stacking Yard during Portugal rule (in the early 1950's).

The following items described the situation:

- the structure is old
- an adequate design criteria had not been considered
- there is no wave-breaking facilities
- a sand protection layer is not placed on the rear side of the revetment
- unsuitable construction materials include:
  - ① poor mixed concrete (even a human hand can break it easily)
  - ② poor backfilling materials
- poor maintenance

In addition, that according to the collapsed condition that it is conjectured that the revetment has been damaged by earthquake.

Presently, the stacking containers in the yard are exposed itself to the waves during high tide. On the other hand, valuable land is eroding every days caused by said waves. One can recognize erosion by the limited area's muddy seawater during high tide. Therefore, it is important that:

- The revetment should be constructed as soon as possible so that the valuable land can be saved.
- The ground must be paved with the stable materials as soon as the revetment has reconstructed.

The typical photographs of the site is shown by Photo 4.1.4 hereinafter.

Photo 4.1.4 Typical photograph of West Container Stacking Yard

4.1.1.10 Others

The city of Dili had a 6 ~ 7 on the Richter scale of earthquake at 11:33 AM of May 15, 1995. The location of epicenter was latitude 08° 36' South and longitude126° 16' East at a depth of 47 km, and is 78 km West of the port.

The earthquake hurt many lives and damaged Dili port badly. The said earthquake caused the damages or collapsed revetments of the East and West container-stacking yards.

Those damaged or collapsed structures are still remaining without any rehabilitation.

On the other hand, those structures are guiding the method of future planning and designing.

4.1.2 Com Port

4.1.2.1 Location

Com port is situated on the North East coast of East Timor, at latitude 08° 22' South and longitude127° 04' East. The highway distance is approximately 203 km East of Dili. It is the most east commercial port in East Timor. An opening in the coastal reef forms this small natural harbor.

On the other hand, the port was constructed for sugar export of the East district of the East Timor.

The existing layout plan of the Port is attached in Figure 4.1.3 hereinafter.

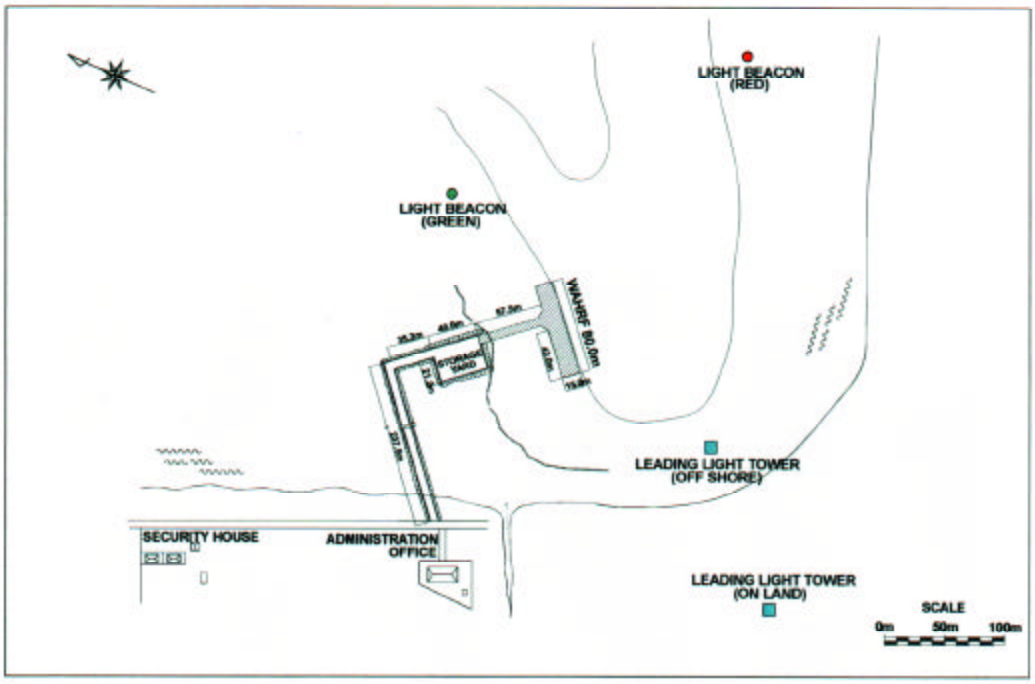


Figure 4.1.3 Existing Layout Plan of Com Port

4.1.2.2 Approaches

The approach to the harbor is marked by two (2) navigation aids on top of steel erected tower. These occur at the entrance together with the navigation aids (beacon) marking the approach. And two- (2) leading lights are existing on the splash zone and inland. The distance between two- (2) lights is horizontally 180m. The height of inland tower is measured approximately 15m. The condition of those navigation aids is structurally good, however all of the power supply system had been destroyed during the post-consultation destruction. Therefore, the port is unavailable to night calling vessels. The photographs of leading light tower and lamps is shown in Photo 4.1.5 hereinafter.

Photo 4.1.5 Leading light tower and lamp

4.1.2.3 Wharf

The wharf is a T-shaped quay with a pier of 80m in length and 15m in width and available draft alongside of 8.6m. Originally twenty- (20) V-1600 x 500-type rubber fenders are installed with spacing approximately 4.5m spacing. Most of the fenders are in poor condition and two- (2) are missing. Five- (5) concrete moving bits are located along the pier with spacing approximately 20m. The condition of the wharf is generally good, only a few spots need to be rehabilitated. The typical photographs of the fender are shown in Photo 4.1.6 hereinafter.

Photo 4.1.6 Typical photograph of Wharf and Fender

4.1.2.4 Open Storage Area

Approximately 850m^2 (40m x 21.2m) of paved open storage area is located at the middle of the access road. The paved 4.5m width access road so called Jl. Pelabuhan is connected to the main access road at an angle of 65 degree. It is in generally good condition.

4.1.2.5 Facilities

Buildings

Originally a number of buildings existed such as a Port Administration office building, a Generator building, a Security house and some others. However, most of the buildings have incurred damage during the post-consultation destruction so that none of them are usable.

Water

More than enough water comes from the mountain area. Also a water pump and two (2) engines exist behind the port administration building. People of the neighborhood utilize this water as their daily use water. Therefore, the planning and

designing of water distribution system should be done in consideration of this present water system.

Others

① As described the above that the port is completely incurred damage during the post-consultation destruction in 1999. The most of valuable items were stolen such as electric cables, batteries, battery chargers and even the earth wires of a lightning conductor.

② A large amount of sand is accumulating to the west of the access road, which is approximately 60m to the east.

4.1.2.6 Problem and Recommendation

Navigation Aids

The navigation aids are classified into two (2) groups in Com Port, which are;

1) A set of Entrance Light Beacon

2) A set of Leading light

All of those are not functioning after the post-consultation destruction in 1999.

Therefore, batteries and battery chargers should be replaced to offer to the night calling vessels as a safe navigable port.

Fender

The most of fenders are damaged seriously due to too large vessels, quality of the fenders and installation. In addition, two (2) fenders are missing as of May 3rd, 2,000.

Therefore, the fender size and quality shall be reconsidered prior to replacement, also the installation method should be properly specified.

Bit

The capacity of the concrete made bit is unknown and all of there base plates (metal portion) are badly corroded.

Therefore, the bit should be replaced in accordance with the size of berthing vessels.

Loading and unloading system

The port does not have any cargo handling equipment, so that calling vessels should be equipped with their own suitable gears. On the other hand, the port should

consider suitable cargo handling equipment to receive variable vessels for more income to the port.

Lighting

Lighting system for the wharf, open storage area and access road originally existed; however, lamps were stolen. The outside power supply has been disconnected since the post-consultation destruction in 1999. On the other hand, the power transmission and service wires were completely destroyed, so that the public power supply must be considered prior to rehabilitation of the port lighting system. Therefore, lamps should be replaced after the power sources have been rehabilitated.

4.2 3 Years Plan for Urgent Rehabilitation

4.2.1 Basic Concept for Urgent Rehabilitation Plan

The basic concept of the plan is a full-scale rehabilitation. In accordance with the concept that the planning should include:

1) safe navigable port

2) safe berthing port

3) safety, raising of the cargo-handling efficiency

4) port security

5) erosion protection for the inland port facilities.

On the other hand, the major two- (2) ports (Dili and Com) are prioritized in accordance with number of called vessels, location and future development etc. It is confirmed that Dili is a higher priority port than Com.

4.2.2 Formulation of Urgent Rehabilitation Plan

The Project is formulated in accordance with the basic concept and the present condition of the shortly listed sites. The present condition of such sites has been carefully studied. In general, the studies was made during both high and low tides hours as well as other weather conditions.

In addition, that the target of the urgent rehabilitation should be completed by June, 2003.

The project implementation will be conducted by UNDP. Therefore, the formulation of the projects must be made in accordance with the regulation of UNDP. However, the project will be implemented as a Japanese tight project even though applied UNDP regulation. Therefore, the engineering and construction materials will basically use Japan standards.

On the other hand, the Urgent Rehabilitation Plan will be made in consideration of the job opportunity for the East Timorese.

The candidate rehabilitation projects are listed as follows in accordance with the above-described basic concept. The satisfied basic concepts are described below by the name of the project.

1) Restoration of Navigation Aids and Fenders at Dili Port
   - safe navigable port
   - safe berthing port

2) Rehabilitation of West Container Stacking Yard at Dili Port
   (Fire fighting system, lighting system, lighthouse are included)
   - safe navigable port
   - safety, and raising of the cargo-handling efficiency
   - port security
   - inland port facilities protection from erosion

3) Restoration of East Container Stacking Yard at Dili Port
   (lighting system is included)
   - safety, and rise of the cargo-handling efficiency
   - port security
   - inland port facilities protection from erosion

4) Restoration of Navigation Aids and Fenders at Com port
   - safe navigable port
   - safe berthing port

Once the structure of the port management system has been determined, the following project would be short-listed.

5) Installation of rubber wheel loader at Dili port
   - safety, and raising of the cargo-handling efficiency

4.2.3 Preliminary Design

(1) Design Concept

The structural requirement has been determined. The local construction materials are practical for structure use except for special materials such as Steel Pipe Piles, Rubber Fenders, Navigation Aids, etc. Basically the design restores the original function of the existing facilities and does not upgrade them.

(2) Design Standards

Design standards for the port facilities do not exist in East Timor. The applied design standards are listed below.

- Technical Standards for Port and Harbor Facilities in Japan: The Overseas Coastal Area Development Institute of Japan.
- Manual for Asphalt Pavement: Japan Road Association
- Manual for Concrete Pavement: Japan Road Association

Seismic and wind forces were determined from the Japanese Standard basically considering local conditions.

(3) Outline of Design

1) Restoration of Navigation Aids and Fenders at Dili Port

- Install new foundation using of Steel Pipe Piles (ϕ350) as an alternative to the existing corroded steel piles and provide corrosion treatment for the surface of Steel Piles.
- Erect new platform using Steel Pipe Piles (ϕ250), I-Beam, Steel Channel, Steel Plate, etc.
- Install the existing Light Tower and Light Beacon on new platform.
- After removing existing fenders, existing concrete bases shall be rehabilitated and new fenders made in Japan, shall be installed. (Fender size : H500-L2,000)

2) Rehabilitation of West Container Stacking Yard at Dili Port

- Port inner road shall be paved with Asphalt Concrete and Container Stacking Yard shall be paved with Interlocking Concrete Block (ICB) surface courses provide easy maintenance characteristics. The pavement shall be designed for the following conditions and adopting the thickness as tabulated below:

  Classification by Traffic Volume : A traffic (less than 500 vehicles per day)
  Design CBR of Subgrade : More than 6

a) Thickness of asphalt pavement

Hot Asphalt Mix (Surface + Binder Course)	Base Course (CBR > 80)	Subbase Course (CBR > 30)
5 cm + 5cm = 10cm	40 cm	30 cm

b) Thickness of ICB pavement

Interlocking Concrete Block (ICB)	Base Course (CBR > 80)	Subbase Course (CBR > 30)
10cm	40 cm	30 cm

3) Restoration of East Container Stacking Yard at Dili Port

- Two alternative types of revetment, a Gravity type and a Steel sheet pile type, have been considered. However, steel sheet pile type is expensive and difficult to construct because the water depth at the site is not deep. Therefore, Gravity type which is the same as existing structure, recommended.
- The new revetment alignment shall be located on the seaside of existing alignment to decrease the volume of the demolition works for existing facilities.

4) Restoration of Navigation Aids and Fenders at Com port

- Beacon light, battery and solar panel shall be replaced because the foundations such as for the navigation tower undamaged.
- After removal of Existing fenders the treatment of existing concrete bases shall be made, and new fenders made in Japan which is internationally reliable shall be installed. (Fender size : H500-L1,600)

(4) Drawings

The following Preliminary Design Drawings are shown in Appendix.

(Dili Port)

- General Plan of Dili Port Project
- Structural Plan of Foundation for Navigation Aids
- Plan of Restoration of Fenders
- Plan of Pavement for Rehabilitation of West Container Stacking Yard
- Plan of Utilities for Rehabilitation of West Container Stacking Yard
- Plan of East Container Stacking Yard
- Typical Cross Section of New Revetment for East Container Stacking Yard

(Com Port)

- General Plan of Com Port Project
- Plan of Restoration of Fenders

4.2.4 Project Cost

Summary of the quantities and the costs of major items in US dollars are tabulated as follows.

(1) Restoration of Navigation Aids and Fender System at Dili Port

Description	Unit	Q'ty	Cost in US$	
			Unit Rate	Amount
Pile Driving	Nos.	8	7,450	59,604
Erection of the Stages	Nos.	2	82,837	165,674
Installation of Navigation Aids	Nos.	2	8,164	16,329
Installation of New Fenders	Nos.	30	27,403	822,084

(2) Rehabilitation of West Container Stacking Yard at Dili Port

Description	Unit	Q'ty	Cost in US$	
			Unit Rate	Amount
ICB Pavement	m2	5,500	76.3	734,006
Asphalt Pavement	m2	5,370	70.1	394,663
Drainage	m	1,074	234	263,484
Water Supply (6" Pipe)	m	1,110	130	144,300
Fire Fighting (6" Pipe)	Nos.	12	32,500	260,000
Power Distribution	m	2,000	32	48,960
Lighting Tower (H = 20m)	Nos.	3	37,700	113,100
Street Light (Single H=9m)	Nos.	34	2,340	28,080
Street Light (Double H=9m)	Nos.	21	2,860	85,800
Improvement of Ware Houses	Nos.	4	104,000	416,000

(3) Restoration of Revetment of East Container Stacking Yard at Dili Port

Description	Unit	Q'ty	Cost in US$	
			Unit Rate	Amount
Foundation Rubble Rock	m3	2,580	40.1	103,369
" Leveling	m2	440	28.5	12,541
" Slope Trimming	m2	1,640	13.9	22,753
Concrete Wall	m	180	1,348.0	242,634
Outlet of Drainage	Nos.	3	2,354.4	7,063
Sand filter sheet	m2	1,700	18.8	31,993
Backfilling & Compaction	m3	2,800	35.9	100,517
Armor Rock	m3	720	44.7	32,159
" Trimming	m2	1,560	44.3	69,069
Concrete Pavement	m2	880	101.3	89,156

(4) Restoration of Navigation Aids and Fenders at Com port

Description	Unit	Q'ty	Cost in US$	
			Unit Rate	Amount
Entrance Light Beacon (Off shore)	Nos.	2	34,756	69,511
Leading Light (Off shore)	Nos.	1	8,771	8,771
Leading Light (On land)	Nos.	1	5,091	5,091
Installation of Fenders	Nos.	20	22,378	447,561

4.2.5 Construction Planning

The construction method considered procurement of locally available materials and local conditions of the construction industry in East Timor. Certain construction materials such as steel products are not available in the local market and are imported from Australia, Indonesia, Singapore, etc., but the procurement source was determined based on the market price. Construction planning of each projects are described in sub-chapter 4.3.

4.3 Implementation of Urgent Rehabilitation Funded by Japan

"Restoration of Navigation Aids and Fender System at Dili Port" will be financed by the Government of Japan and will be implemented this year. The contents of this project are summarized as follows. Application Form of this project is provided in the Appendix (see App. 4.3.1).

(1) Objectives of the project

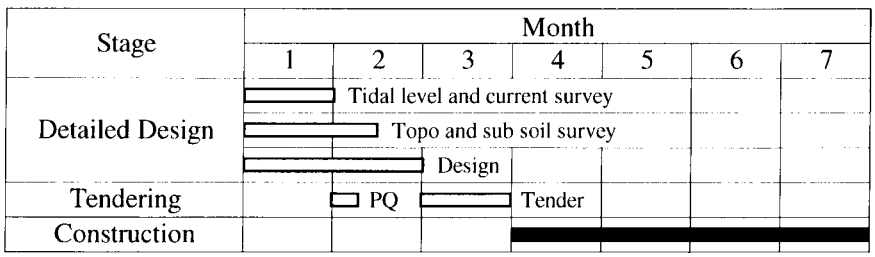
To operate a safe navigable port capable of operating 24 hours.

(2) Project Formulation Concepts

- To reconstruct the platforms and foundation piles of the navigation aids since they are in an extremely poor and dangerous condition,
- To restore the fender system of the wharf because they are in extremely poor condition,

(3) Implementation Period

The total project implementation period to complete the project is estimated at seven (7) months, after procuring of a project consultant.



(4) Project Cost

The total project cost is estimated to be US$ 2,500,000.00 as tabulated below:

Items	Amount in US$
Construction Cost	2,050,000.00
Consulting Services	450,000.00
Total	2,500,000.00

4.4 Maintenance and Operation Plan

Formerly port operation and port maintenance of Dili are implemented by PT.(Persero) PELABUHAN INDONESIA III, the Ministry of Communications, Directorate General of Sea Communications. However, the most of personnel are returned to Indonesia during the post-consultation destruction in 1999.

At the present, the port is undertaken by UNTAET without any concrete regulations. In addition, the port does not have usable budget and UNTAET does not make a public announcement of the tariff yet as of June 2000. So that, both operation and maintenance of the port are rather difficult.

In these regards, Asian Development Bank (ADB) is creating the structure of operation and maintenance for the port, therefore both of those shall wait for the recommendation of ADB.

On the other hand, described the above in section 2.3.4 that the decision of UNTAET regarding the total number of personnel for the port sector would be fifty (50) for next three (3) years. In this regard that the considerable operation and maintenance plan will be described herein after.

4.4.1 Operation

(1) Present Organization

The Port Sector under the Transportation Department in UNTAET is responsible for formulating and developing institutional policies, sea transport regulation activities, planning, design and operation activities for ports and harbour in East Timor. The organization of the Ports Sector as of the end of June 2000 is depicted Figure 4.4.1.

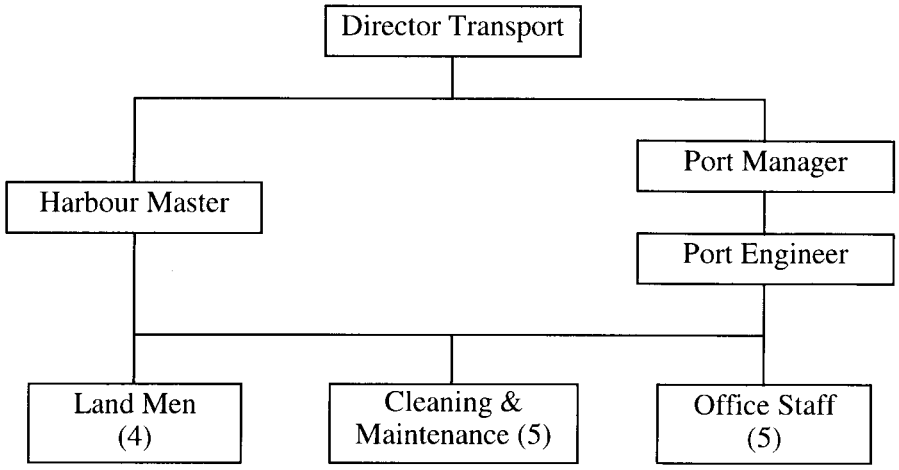


Figure 4.4.1 Present Organization Chart of Port Sector

The above Figure 4.4.1 indicates the present situation of the port that the major personnel from Portugal, which are Harbour Master, Port Manager, and Port Engineer. The assignment of these personnel is until end of October 2,000. Fourteen- (14) short term Timorese are also employed by UNTAET until end of October, 2,000 such as: lands men (4), maintenance and cleaning staff (5), and office staff (5).

In addition that CNRT (National Council of Timorese Resistance) has also an Infrastructure Department in its organization. The infrastructure division in CNRT is however not functioning as a real counterpart agency of UNTAET due to shortage of a number of experienced staff

(2) Organization Recommended by ADB

The ADB- funded TA 3401, Transport Sector Restoration Project includes establishment of institutions and regulatory frameworks in the road, port and airport sectors, and by reviewing the long-term development requirements to enable these sectors to contribute to poverty reduction and economic growth.

(3) Port's Staffing

UNTAET have been decided the total number of personnel would be fifty (50) for next three (3) years. In this regard that the appointed personnel by A Port Manager, Deputy Port Manager, Assistant Port Managers, and others. The considerable organization chart are shown herein under Figure 4.4.2.

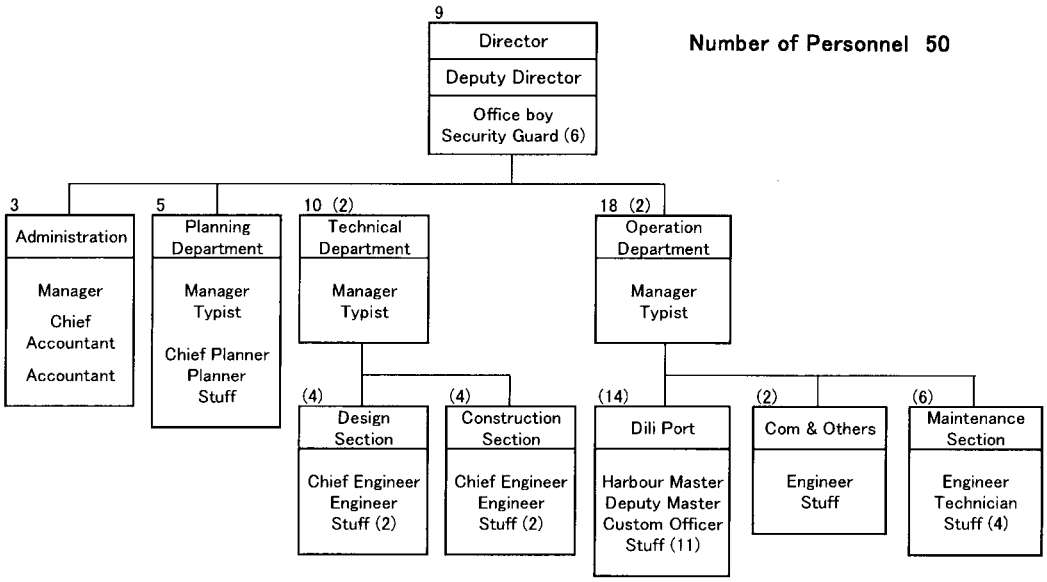


Figure 4.4.2 Plan of Organization Chart of Port Authority

4.4.2 Maintenance Works

As described in the above, the port facilities have not incurred structural damage during the post-consultation destruction in 1999. However, the most of facilities are unsatisfied condition due to lack of maintenance works during Indonesian rule. The port maintenance is very important to offer a safe port to calling vessels, cargo owners. The maintenance of a port are classified as follows:

1) navigation channel and port area (guarantee seawater depth and clear area)
2) navigation aids (light beacon, lighthouse, leading light)
3) wharf (fender system, concrete slab and foundation pile etc.)
4) yard (container stacking area, access road, revetment, drainage etc.)
5) facilities (building, storage facilities, water system, cargo handling equipment, electricity etc.)

It is proposed that the Port Authority should appoint supporting staff as shown in Figure 4.4.2 to the extent possible that the position will be filled with East Timoreses who have the adequate skills.

In case of the lighthouse, the operation and maintenance had been done by 10 persons who were three Indonesians and seven East Timorese during Indonesia rule. Those Indonesians left to the own country after social confusion of 1999. However, East Timorese are still remaining even though they have lost their jobs and they are waiting for returning to the work.

The maintenance works are classified into three (3) categories consisting of 1) routine, 2) periodic and 3) incidental maintenance. The scope of this categorized maintenance is described hereinafter:

1) Routine Maintenance

- Day time visual inspection of offshore(by boat), onshore(by foot), and detect work item,
- Night time visual inspection of offshore(by boat), onshore(by foot), and detect work item,
- Cleaning of office building, warehouse, pump house, wharf, container stacking area, access road, ditch, lighthouse, light beacon, leading light,
- Repair or replace of lighting and communication system,
- Repair and repainting of cargo handling equipment

2) Periodic Maintenance

- Pavement repair of container stacking yard and access road
- Repainting of office building, warehouse, pump house, lighting pole, fence, lighthouse, light beacon, leading light, bit, bollard, water pipeline, and etc.
- Corrosion control and major repair of lighthouse, light beacon, leading light,
- Overhaul, repair and change of the spare part of water pump and engine/motor, cargo handling equipment etc.
- Dry up the water tank for cleaning work.

3) Incidental Maintenance

- Restoration work for damaged structure by unpredicted natural phenomenon and/or accident,
- Replacement of the major damage water pump and/or engine/motor.

4.4.3 Maintenance and Operation System

(1) Operation System

It is recommended that the routine maintenance works shall be carried out by the Port Authority in accordance with an annual maintenance program. The sophisticated work requiring heavy construction equipment or periodical maintenance work in bulk should be conducted on a contract basis. The flow of operation system highlighting the relationship between DTW's HQ and Port Authority is shown in Figure 4.4.3.

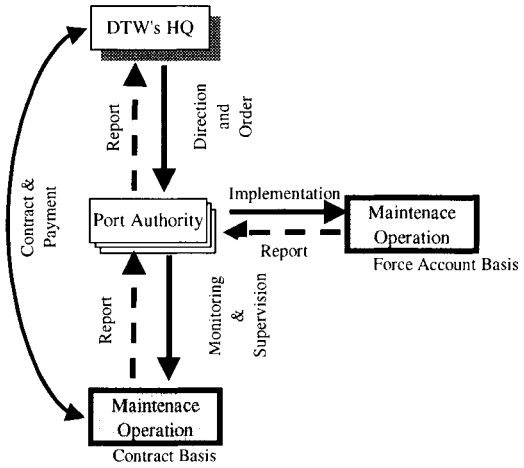


Figure 4.4.3 Chain of Command for Maintenance and Operation Activities

The responsibilities and duties at each level are as follows:

DTW's HQ is responsible for formulation of annual maintenance program, budget arrangement and control, monitoring field maintenance progress and quality and procurement of material / equipment for a force account basis and contractors for a contract basis. The Port Authority should be responsible to implement maintenance works based on force account and or contract basis, to report maintenance progress and activities to HQ and to maintain maintenance equipment and tools.

(2) Maintenance and Operations

The inspection and maintenance crew are organized in Port Authority that is responsible for actual maintenance works. The maintenance crew consist of one port engineer and one technician who should have some knowledge of the mechanical, electrical engineering and multi-discipline of the maintenance works, supported by labors required. The organization of maintenance crew is depicted in Figure 4.4.4.

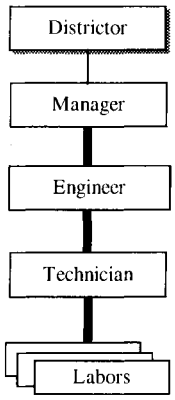


Figure 4.4.4 Proposed Organization of Maintenance Crew

(3) Maintenance Equipment, Tools and Materials

It is recommended that Dili Port should be equipped with a set of conventional maintenance equipment and tools to carry out proper maintenance works on a timely manner taking into account expected work items on a force account basis. A set of equipment and tools and materials recommended are shown in Tables 4.4.1 and 4.4.2.

Table 4.4.1 List of Proposed Maintenance Equipment

Item	Capacity	Unit
Boat with engine	5 ton/50hp	1
Pickup truck	1 ton	1
Workshop equips.	general	1
Ladder	5 m	2

Table 4.4.2 List of Proposed Tools

Item	Unit
Life jacket	10
Life buoy with rope	2
Paint brush	20
Wire brush	10
Paint (Various types & colors)	By request
Hammer	5
Shovel	5
Wheel barrow	1
Carpenter tool set	1
Electrician tool set	1
Mechanician tool set	1
Plumber tool set	1
Flash light	5
Safety hut	5
First aid kit	2

4.5 Implementation Plan

4.5.1 Basic Concepts for Formulating Implementation Plan

The basic concepts for formulating the Project Implementation Plan in this study are as follows:

- The scope covered in the Implementation Plan comprises Dili Port, Com Port and other beach landing sites;
- The implementation period to materialize the plan is the three Timorese financial years starting from July 2000 to June 2003;
- The implementation priority is 1) to secure safety navigation and berthing of vessel, 2) to secure safety and efficiency for cargo handling; and

- Collaboration with other funding agencies and donors such as UNDP and ADB should be on-going to represent a realistic plan without overlapping and repeating.

4.5.2 Implementation Plan on a Priority Basis

The implementation plan of each project has been scheduled on a priority basis taking into account the basic concepts mentioned above and is shown in Figures 4.5.1 to 4.5.3

The implementation plan has been formulated considering following matters:

- It is assumed that the project implementation agency will be Public Works Department to be newly established in UNTAET or UNOPS in UNDP with consulting services from international engineering firms undertaking detailed design and construction supervision.

- The implementation period covering detailed design, tendering activities and construction of each facility takes a minimum of one year to a maximum two years, depending on the scope of works involved.

4.5.3 Budgetary Allocation

The total capital cost required for rehabilitation of the existing ports in East Timor is estimated at 9.7 million US$ at June 2000 price tabulated in Figure 4.5.1

A summary of the budgetary allocation is shown below.

Unit: Million US$

Category	FY00	FY01	FY02	Total
Rehabilitation of Ports and other facilities	4.96	2.54	2.20	9.70

	Task Name	Capital Cost US$ Mill	Committed Agency
Dili Port	Completion of Wharf Extension	0.40	ADB-TFET
	Restoration of Landing Craft Slipway	0.04	ADB-TFET
	Rehabilitation of East Container Yard	0.20	ADB-TFET
	Emergency Repairs and Equipment	1.33	ADB-TFET
	Equipment (Assessed budget)	0.40	UNTAET
	Restoration of Navigation Aids & Fenders	2.50	Gov. of JAPAN
	Rehabilitation of West Container Yard	4.55	(Jica Study)
	Restoration of East Container Yard Revetment	1.89	(Jica Study)
	Interim Port Management Services	N/A	Portugal
	Port/Maritime Institutional Development	0.15	ADB
	Institutional "Operationalization" and Training	inc	ADB-TFET
	Port/Maritime Sector Development Plan	0.15	ADB
Com Port	Rehabilitation of Navigation Aids & Fenders	1.37	(Jica Study)
Others	Beach Matting : Suai, Betano, Beacu	0.09	ADB-TFET
Total of Capital Cost		13.07	

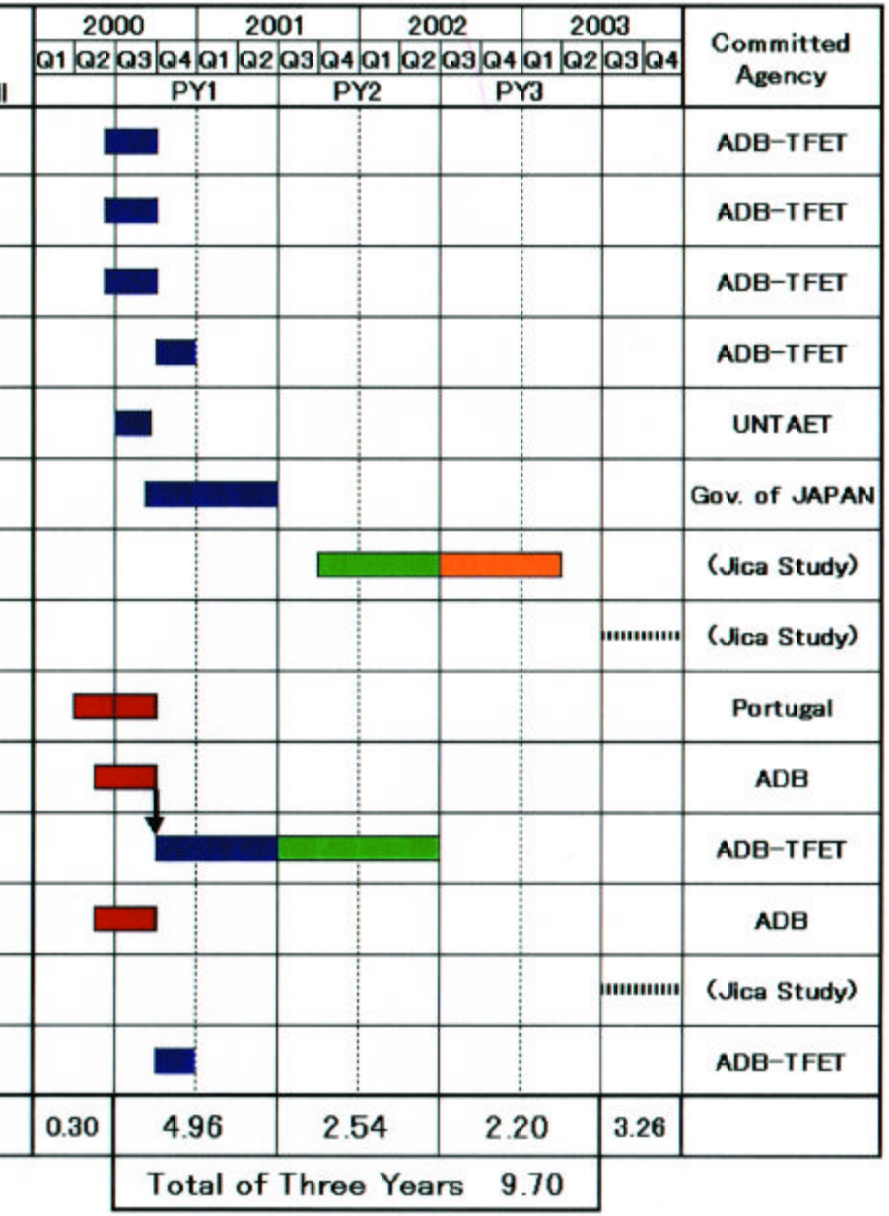


Figure 4.5.1 Implementation Schedule