Chapter 7. Environmental Issues

7-1 Results of the environmental field surveys

To understand the environmental status around Toamasina Port, the following field surveys were conducted in March 2009. Air, water and biological surveys were also conducted in June 2009.

- Air quality survey
- Noise quality survey
- Water quality survey
- Sediment quality survey
- Biological survey

The ensuing sections summarize the results of the above field surveys.

7-1-1 Air quality survey

Air quality survey was conducted at 3 representative sites around Toamasina Port, during March 10-17, 2009 (hot season) and June 22-29, 2009 (cool season). Measured air quality parameters were nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particulate matter (PM_{10}).

Concentration of NO_2 and SO_2 were much lower than the WHO guideline values throughout the survey period at all the sites. PM_{10} concentration was high especially at the port access road and exceeded the WHO guideline value during most days. The main PM_{10} source at the access road is probably the exhaust gas of large vehicles (i.e. cargo trucks), as there was a strong correlation between traffic volume of large vehicles and PM_{10} concentration.

7-1-2 Noise quality survey

Noise survey was conducted at the same three sites as the air quality survey from March 7-10th.

Within the three survey sites, daytime noise level was highest at the port access road (71.2 dB (A)), and exceeded slightly the WHO guideline value for industrial area ((70.0 dB (A)). The main noise source is probably road vehicles as there was a relatively strong correlation between traffic volume and noise level.

7-1-3 Water quality survey

Water quality survey was conducted once each during the hot (March 15, 2009) and cool (June 22, 2009) seasons at representative locations around Toamasina Bay (7 sites) and at the mouth of Panganales Canal (1 site). Total nitrogen (T-N), total phosphorous (T-P), coliform bacteria and n-hexane extraction substances were selected as pollution indicators.

T-N and T-P concentration were relatively high for tropical waters with coral reef formations, as coral reefs generally develop in relatively oligotrophic waters. The most obvious nutrient source is Panganales Canal as it receives untreated household and municipal wastewater. However, since T-N concentration was similar between the inner and offshore areas of Toamasina Bay, there could be other sources of T-N such as river runoff from Ivolonia River.

Concentration of coliform bacteria exceeded EU's standard for bathing water at several sites. The main source of coliform bacteria is probably the Panganales Canal.

Concentration of n-hexane extraction substances was high at all sites. The main source of oil is probably ships, port oil terminals and port factories.

7-1-4 Sediment quality survey

Sediment quality was measured at 3 sites at the initially proposed dredging site on March 15, 2009. Total nitrogen (T-N), Total phosphorus (T-P), Total sulphur (T-S) and heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn) were measured as pollution indicators. A more comprehensive sediment quality survey was conducted in Toamasina Bay in 2007 by SOMEAH Consultants. It measured heavy metals, PCBs, PAHs and organotin compounds.

Concentration of arsenic (As), chromium (Cr) and nickel (Ni) were relatively high at all the sites, and exceeded screening levels for ocean disposal set by other countries (e.g. Australia). The results of the SOMEAH survey also showed relatively high levels of heavy metals (e.g. As, Cr, Zn, Hg) throughout the bay.

According to the SOMEAH survey, high levels of PCBs were found near the port, in particular along the wharfs (see Appendix 7-1 for the results).

Since the sediments of some areas in Toamasina Bay is contaminated with hazardous pollutants such as PCBs, it is necessary to carefully consider the disposal methods of dredge spoil.

7-1-5 Biological survey

Biological surveys were conducted to understand the status of corals and other marine fauna around Grand Reef and Point Hasti Reef, and the project sites.

Although hard corals were distributed throughout Grand Reef, coral coverage was highly variable. Hard coral coverage was highest in the central area of the inner reef flat, exceeding 80% in some areas. Relatively high coverage of hard corals (30-60%) was found along the outer reef edge, and the central and northern part of the outer reef slope. Although hard coral coverage was relatively low (10-29%) at the inner reef slope, the area was interspersed with massive Porites species; the diameter of some exceeding well over several meters. Although hard corals were distributed throughout Point Hasti Reef, coverage was generally much lower compared to Grand Reef. Figure 7-1-1 shows the main benthic features and percent coverage of hard corals around Grand Reef and Point Hasti Reef.

In total, 59 hard coral species (Grand Reef: 58 species; Point Hasti Reef: 15 species) were identified during the survey, which were comparable to the numbers identified by the Ambatovy Project survey for Nosy Faho (55 species) and Ile aux Prunes (53 species). Overall, hard coral diversity of Grand Reef and Point Hasti Reef can be considered to be relatively low when compared to the other coral reef areas in the northeast coast of Madagascar. For example, McClanahan et al (1998) found at least 164 hard coral species in the Masaola area, which is located approximately 100 km north of Toamasina (Appendix 7-2 shows list of marine fauna species identified during the survey).

Within the project sites, one hard coral species (Acanthastrea brevis) found at the seawall of Mole C was classified as threatened (category: Vulnerable) under the IUCN Red List, which was also found at Grand Reef and Point Hasti Reef. Generally, there was no notable species at the project sites that may be of major concern.

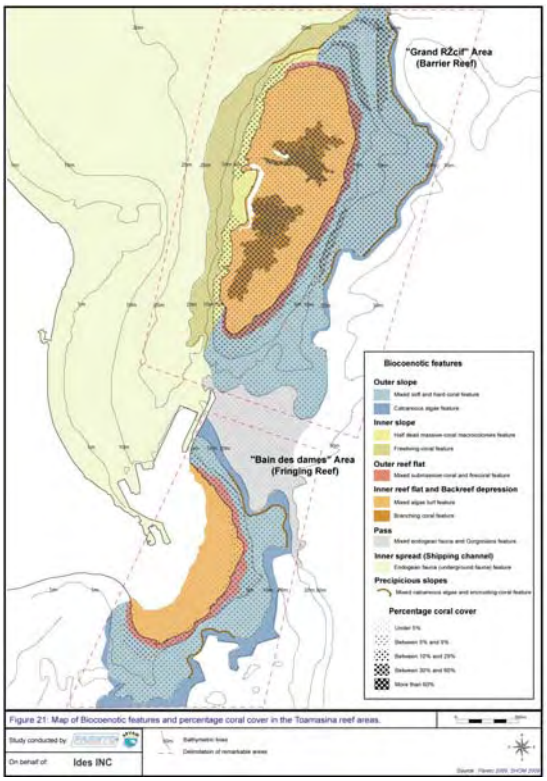


Figure 7-1-1 The main benthic features and percent coverage of hard corals around Grand Reef and Point Hasti Reef

7-2 Analysis of alternatives

Prior to the finalization of the proposed development plan, alternatives were considered and analyzed in terms of locality and facility layout.

7-2-1 Analysis of potential development areas

As an initial step, five locations were identified as potential development areas, namely Areas A, B, C, D and E. Figure 7-2-1 shows the location of the five potential development areas. The most appropriate location for this Project was then evaluated through a preliminary screening procedure by taking into account the main advantages and disadvantages in terms of port operation and environmental impacts. Note that the evaluation was conducted for container cargo only. Table 7-2-1 shows the results of the screening procedure.

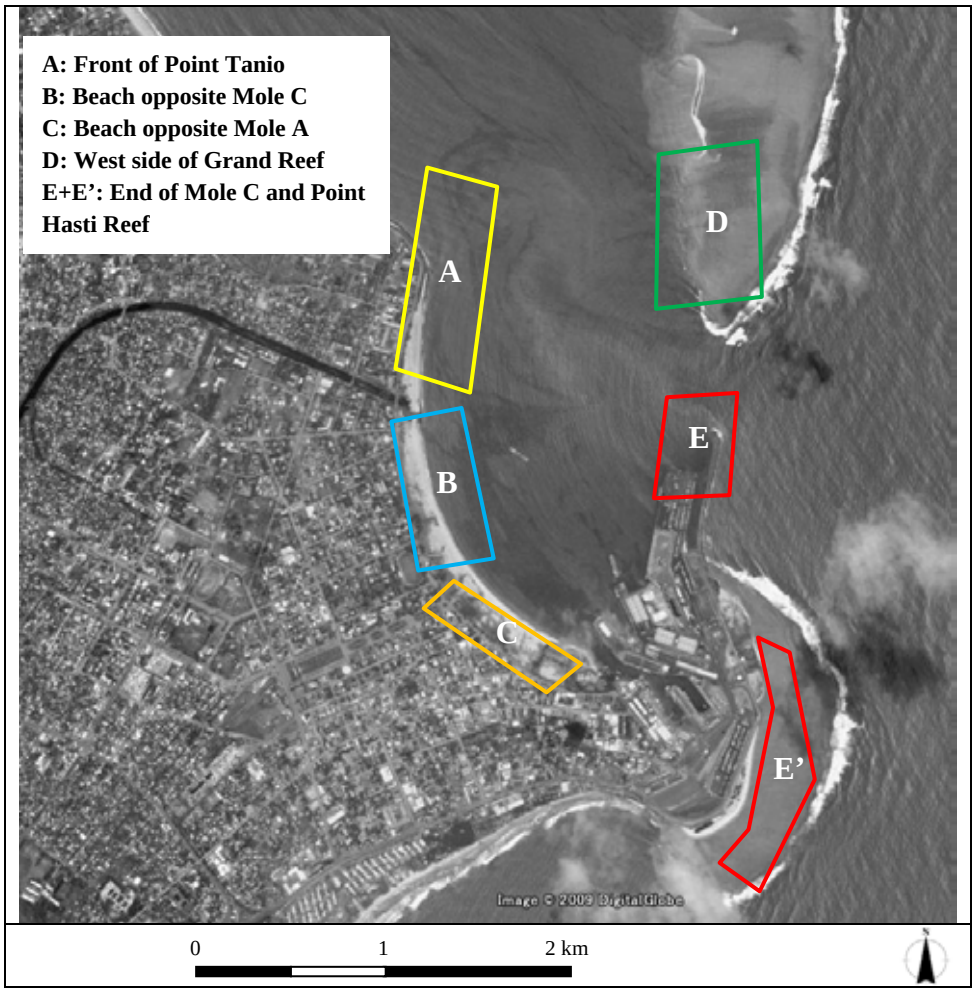


Figure 7-2-1 Location of the five potential development areas

Table 7-2-1 Results of the screening procedure

Area	Port operation		Environmental impact		Overall rating	
	Advantages	Disadvantages	Natural	Social	Opera.	Environ.
A	• Sufficient space for container yard.	• Possible requirement of initial and maintenance dredging. • Require breakwater extension and new access road and railway.	• Possible water quality degradation and change of coastal topography due to breakwater extension.	• Significant alteration of present land use due to construction of new access road and railway.	Unsuitable	Major impact
B	• No particular advantages.	• Require initial and maintenance dredging. • Require breakwater extension and new access road and railway. • Possible hindrance to Mole A and B operation. • Require alternative area for container yard but no viable option.	• Possible water quality degradation and change of coastal topography due to breakwater extension.	• Significant alteration of present land use due to construction of new access road and railway.	Unsuitable	Major impact
C	• No particular advantages.	• Require initial and maintenance dredging. • Require breakwater extension and new access road and railway. • Possible hindrance to Mole A and B operation. • Require alternative area for container yard but no viable option.	• Possible water quality degradation and change of coastal topography due to breakwater extension.	• Significant alteration of present land use due to construction of new access road and railway.	Unsuitable	Major impact
D	• Sufficient space for container yard. • No hindrance to existing port operation. • No need of dredging and breakwater extension. • Sufficient depth for large vessels.	• Require new bridge, hence large initial investment.. • Major technical difficulties and safety of construction.	• Impact on the coral community of Grand Reef. • Designated sensitive zone. • No impact on water quality and coastal topography as there will be no breakwater extension.	• Partial loss of Grand Reef fishing ground.	Good but high cost	Moderate impact
E	• No need of maintenance dredging. • Sufficient depth for large vessels. • Existing facilities can be utilized.	• Require breakwater extension. • Require alternative area for container yard.	• Possible water quality degradation and change of coastal topography due to breakwater extension. • Reclamation of reef flat of Point Hasti Reef for container yard.	• Loss of Point Hasti fishing ground.	Good	Minor to moderate impact

Although Areas B and C may have potential for future development, these areas were considered unsuitable for this Project primarily due to: need of frequent dredging; lack of space for container yard with no viable alternatives; requirement of new access road and railway; and significant social impacts. Area A was also ruled out for the above later two reasons.

Area D was considered as a good location in terms of port operation, but was considered unsuitable primarily due to the requirement of large initial investment and technical difficulties in construction. Furthermore, impacts on Grand Reef were another concern, as the reef is a designated sensitive area as well as fishing ground for local fishermen.

While Area E will require breakwater extension and alternative area for container yard, overall it was identified as the most suitable option for this Project, as it was considered to have no major hindrance in port operation and significant environmental impact. The only viable location of the container yard was considered to be the reef flat of Point Hasti Reef (Area E') due to:

- Lack of alternative spaces within the port area;
- Proximity to Area E (i.e. container berth);
- Relative easiness in construction due to shallow water depth;
- No requirement of relocation or resettlement.

7-2-2 Analysis of facility layout options

Once the most suitable development option was identified as Area E, the following two facility layout options were analyzed in detail:

Option 1: Extension of Mole C by 470 m (Mole C4); Extension of breakwater by 345 m
Option 2: Extension of Mole C by 470 m (Mole C4); Extension of breakwater by 480 m

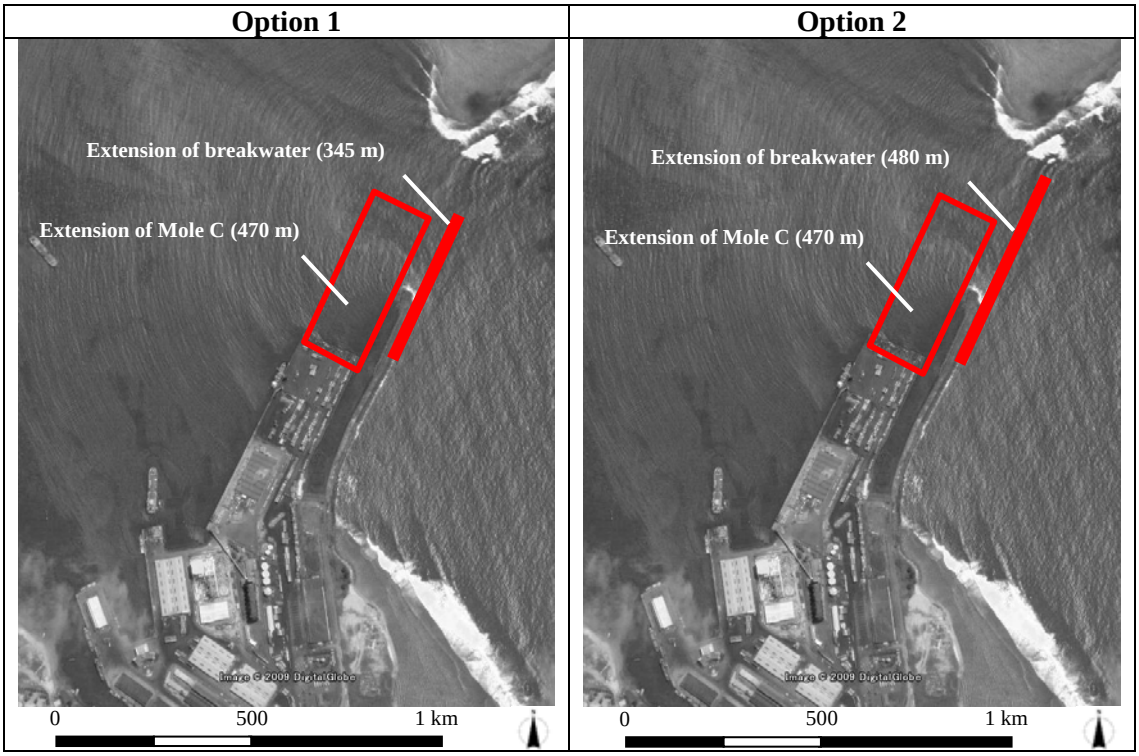


Figure 7-2-2 Facility layout options

The most suitable option was then selected by carefully analyzing the advantages and disadvantages of the two options in terms of environmental impact, port operation, technical difficulties in construction and cost. Environmental impacts focused on water quality, coastal

topography and fishing activity, as these factors were considered as most susceptible to the breakwater extension. Table 7-2-2 shows the analysis result of Option 1 and 2.

Table 7-2-2 Comparison of advantages and disadvantages of Options 1 and 2

Analysis factors	Option 1	Option 2
Environmental impacts	-	-
Water quality	According to the simulation, there will be slight elevation in nutrient levels inside the bay.	According to the simulation, the degree of nutrient elevation will be similar to Option 1 but will affect over a slightly larger area.
Coastal topography	According to the simulation, there will be an enhancement of ongoing beach erosion/accretion.	According to the simulation, the degree of beach erosion/accretion was similar to Option 1.
Fishing activity	The reef passage will probably still be passable.	The reef passage will not be passable.
Port operation	Improvement of safety and cargo handling efficiency throughout the port. Berth working rate of Mole C4 was estimated as 95%.	Safety and cargo handling efficiency will improve throughout the port, more so than Option 1. Berth working rate of Mole C4 is 100%.
Construction	No technical difficulties expected.	No technical difficulties expected.
Cost	Approx. 315 million euro	Approx. 317 million euro

While both options have their own advantages and disadvantages, overall there were no major differences between the two options. However, Option 1 was preferred for the following reasons:

- Since the issue of reef passage usage is not officially settled between the local fishermen and the port, it was considered to be preferable to leave the opening as long as it did not hinder port operation.
- Since there are still uncertainties on how the water quality of the bay will actually evolve, it was considered to be preferable to leave the opening as long as it did not hinder port operation.

7-3 Results of the numerical simulation

The following numerical simulation was conducted:

- Hydrodynamic simulation to predict the current field after the breakwater extension
- Water quality simulation to predict nutrient levels after the breakwater extension
- Sediment dispersion simulation to predict dredging impacts

7-3-1 Results of the hydrodynamic simulation

An advanced multilayer hydrodynamic model was used to predict how the current field around Toamasina Bay will change after the extension of the breakwater. Figure 7-3-1 shows the calculated average surface current field around Toamasina Bay for the present (before breakwater extension) and future (after breakwater extension) cases. Figure 7-3-2 shows the consequent differences in average current speed between present and future for the surface and 2nd layers.

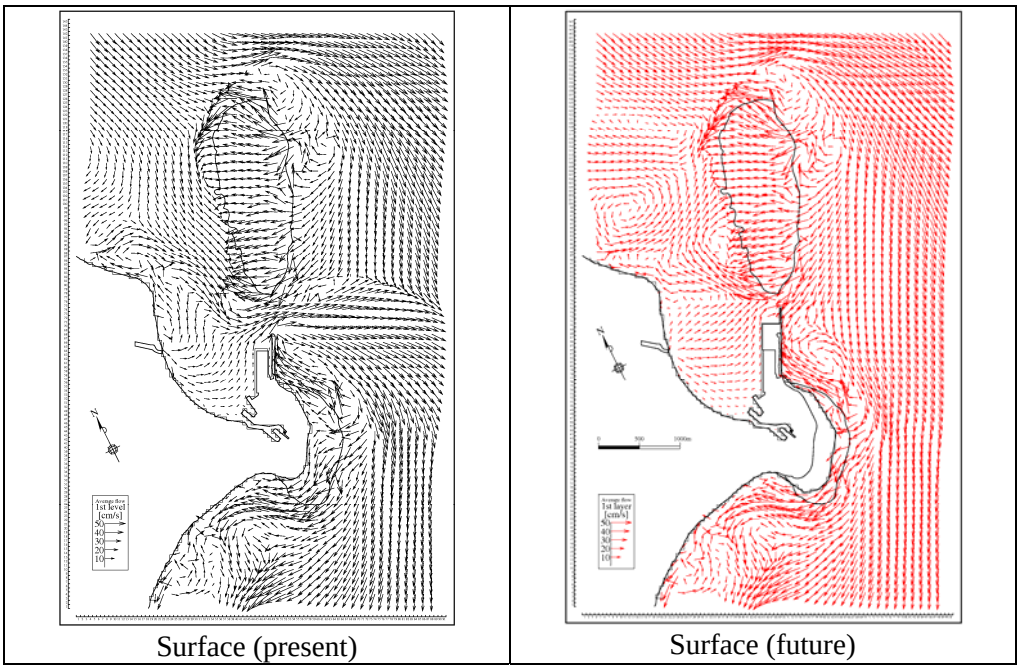


Figure 7-3-1 Calculated average surface current field around Toamasina Bay for the present and future cases

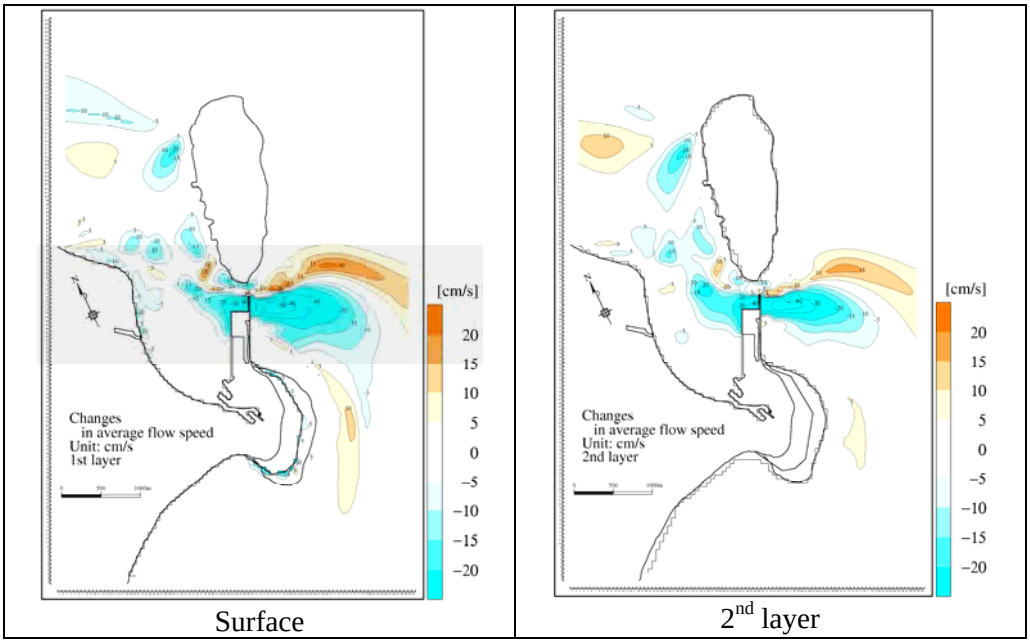


Figure 7-3-2 Differences in average current speed between future and present for the surface and 2nd layers

The extension of the breakwater will permanently alter some areas of the present current field, in particular around the reef passage and west side of Grand Reef. The waters around these areas will generally become more stagnant, which may have negative consequences on water quality and ecosystem.

7-3-2 Results of the water quality simulation

Water quality simulation was conducted to predict the nutrient levels (T-N) around Toamasina Bay after the breakwater extension. The model only incorporated nutrient loads from the Panganales Canal. The simulation was conducted for the following two future cases:

Case 1 Breakwater extension: 345 m, T-N load from Panganales Canal: same as present level
Case 2 Breakwater extension: 345 m, T-N load from Panganales Canal: 1.5 times of present level

Figure 7-3-3 shows the predicted surface layer T-N concentration distribution for both Case 1 and Case 2. The present T-N concentration distribution is also shown for comparison. Figure 7-3-4 shows the consequent differences in surface layer T-N concentration between present and future for both Case 1 and 2.

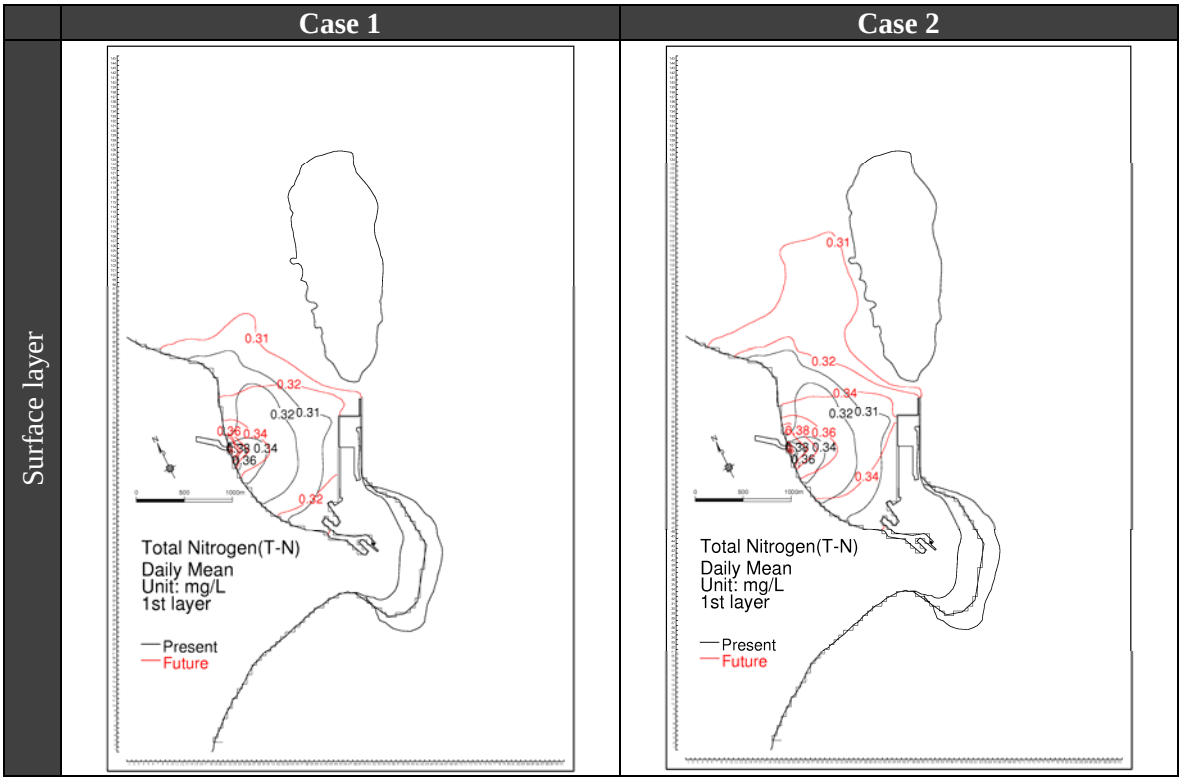


Figure 7-3-3 Predicted T-N concentration distribution of Case 1 and 2 (surface layer)

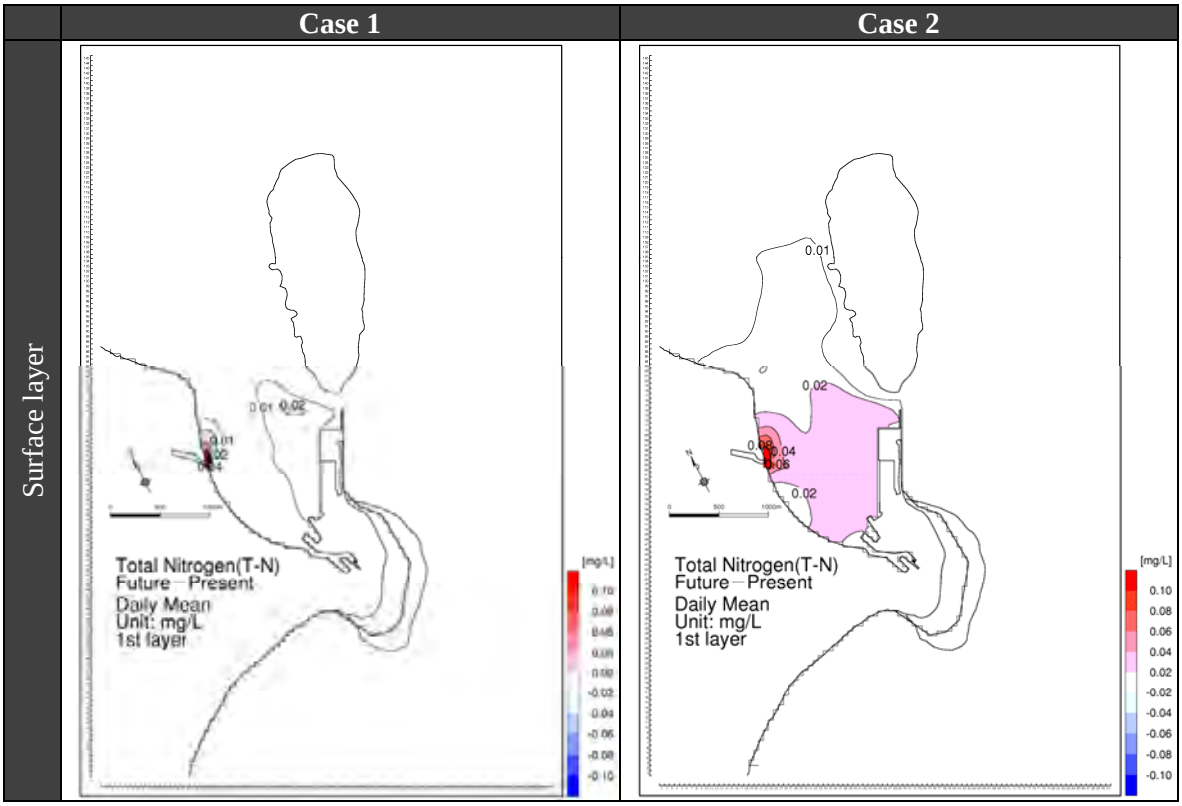


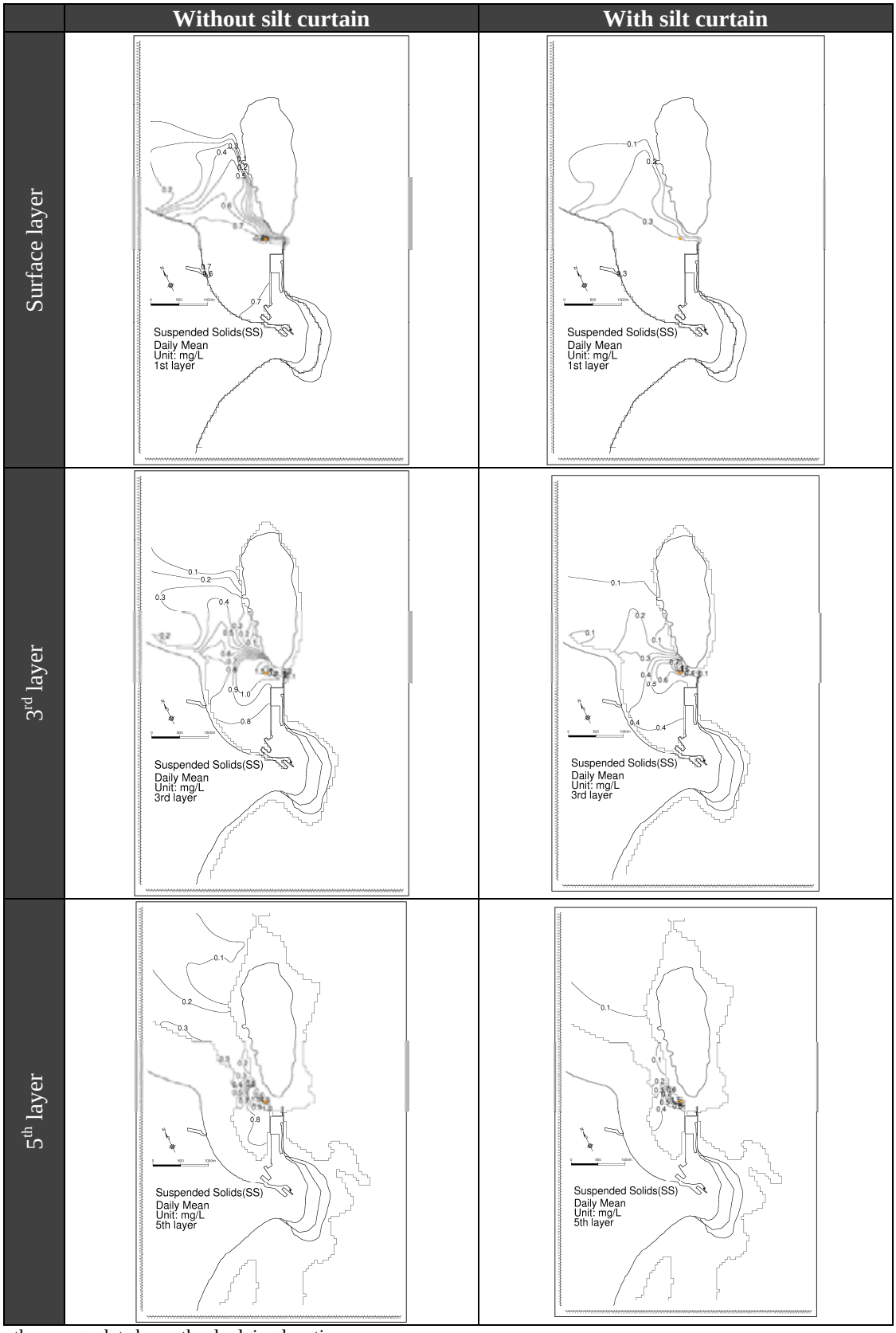
Figure 7-3-4 Differences in T-N concentration between present and future for Case 1 and 2 (surface layer)

According to the water quality simulation, the breakwater extension alone will result in only a very minor elevation in T-N concentration, and will be limited within the vicinity of the mouth of Panganales Canal and inner bay area. Meanwhile, if T-N load from the Panganales Canal increases as predicted, more areas will experience higher T-N concentration, but the degree of elevation will still be relatively small (in the order of 10^{-2} mg/l). However, this may not be the case if there are other major nutrient sources other than Panganales Canal.

7-3-3 Results of sediment dispersion simulation

Sediment dispersion from the dredging works was predicted by using suspended solids (SS) as an indicator. Although dredging works will be conducted at several locations, the simulation focused on the case of dredging Mole C turning basin, as this location was considered as the worst case scenario due to its proximity to Grand Reef. Also, SS dispersion was predicted for with and without the use of silt curtain. Dredging works at Mole C turning basin was assumed to be conducted after completion of the breakwater extension.

Figure 7-3-5 shows the predicted daily-averaged SS distribution from the dredging of Mole C turning basin for without and with silt curtain cases. Note that SS concentration in the figures show only the contribution from dredging works and does not include the background SS concentration.



Note: the orange dot shows the dredging location

Figure 7-3-5 Predicted SS distribution from dredging of Mole C turning basin (Surface, 3rd and 5th layers)

According to the simulation, SS dispersion was limited inside the bay with all layers. SS concentration was generally higher in the inner bay area (i.e. south of the dredging site) and the deeper layers. Except near the dredging site, SS concentration in the bay was lower than 1 mg/l with all the layers.

With silt curtain, SS concentration of all layers was reduced to almost half the level of the without silt curtain case.

7-4 Assessment of potential environmental impacts and proposed countermeasures

This section summarizes the results of the environmental impact assessment for the construction and operation phases, and also provides proposals for countermeasures.

7-4-1 Construction phase

Table 7-4-1 summarizes the results of the environmental impact assessment for the construction phase and also shows the proposed countermeasures

Table 7-4-1 Assessment of potential environmental impacts and proposed countermeasures (construction phase)

Category		Potential environmental impacts	Impact Rating	Rationale	Proposed countermeasures
Physical environment	Air quality	Impacts of dump-truck traffic on the air quality around the access road	Minor (-)	The additional traffic of dump-trucks was predicted to moderately increase the PM_{10} levels around the access road. However, its impacts will be temporary and localized, and should remain within minor levels with effective implementation of the proposed countermeasures.	• Use of new and low-emission dump trucks. • Regular maintenance of dump trucks. • Covering of dump trucks with sheet cover to prevent/minimize dust spills. • Prohibition of unnecessary engine idling. • Whenever possible, movement of dump trucks will be scheduled to avoid periods of traffic congestion (e.g. during peak cargo vehicle traffic).
	Noise	Impacts of pile-driving noise	No impact	Pile-driving noise from hydraulic pile-drivers was predicted to attenuate to insignificant levels (i.e. ambient noise standard) within approximately 100 m of the source. Since the nearest residential area is separated by more than 1 km from the construction sites, impacts of pile-driving noise can be considered to be insignificant.	• Use of hydraulic pile-drivers or pile-drivers with equivalent noise level.
		Impacts of dump-truck traffic on the noise levels around the access road	Minor (-)	The additional traffic of dump-trucks will inevitably raise the noise levels around the access road. However, its impacts will be temporary and localized, and should remain within minor levels with effective implementation of the proposed countermeasures.	• Use of new and low-noise dump trucks. • Regular maintenance of dump trucks.

Category		Potential environmental impacts	Impact Rating	Rationale	Proposed countermeasures
	Water quality	Impacts of dredging works on seawater quality	Moderate (-)	Although dredging works at Mole C will increase the suspended solids (SS) concentration of the water column, its extent was predicted to be limited inside the bay with the majority of the areas experiencing a moderate to minor increase between 0.1-1.0 mg/l. Furthermore, this increase will be reduced to almost half the level with the use of silt screens. Also as a precaution, water quality monitoring will be conducted during the dredging period. Overall, dredging impacts should remain within moderate to minor levels with effective implementation of the proposed countermeasures.	• Dredging will be conducted by installing silt screen around the dredger. • SS levels (turbidity levels) will be monitored regularly near the construction site. If SS levels exceed set standards, dredging methods will be reevaluated to reduce SS concentration to acceptable levels.
		Impacts of landfill works on seawater quality	No impact	Sediment dispersion from landfill works will be insignificant due to the property of the filling material (sand and gravel), presence of seawalls and use of silt curtains.	• Installation of silt curtains whenever necessary. • Start landfilling after securing protection from seawall.
	Groundwater quality	Impacts of disposal of contaminated dredge-spoil on groundwater quality	No impact	To prevent groundwater contamination, all contaminated dredge spoil will be contained inside a sealed concrete tank that will be built at the new container yard.	• All contaminated dredge spoil will be contained inside a sealed concrete tank. Effluent from the concrete tank will be monitored before discharge.
	Sediment quality	Impacts of dredging works on sediment quality	Moderate (-)	Inferring from the SS dispersion simulation, impact on sediment quality should be limited within the vicinity of the dredging sites and remain within moderate levels with effective implementation of the proposed countermeasures.	• Dredging will be conducted by installing silt screen around the dredger. • Enclosed bucket will be used when dredging contaminated areas. • Spills will be minimized during transportation of dredge spoil. • Water quality (i.e. turbidity levels) will be monitored during dredging. If unacceptable levels are recorded, dredging methods will be reevaluated.
	Waste	Impacts of construction wastes	No impact	No impacts are expected if all construction-related wastes are managed in accordance to the proposed countermeasures.	• Non-hazardous wastes (e.g. inert solid waste) will be dumped at the local waste disposal site. • Building waste will be used as either landfill material or disposed at the local waste disposal site. • Oily wastes will be treated/recycled through a local contractor. • Human waste will be

Category		Potential environmental impacts	Impact Rating	Rationale	Proposed countermeasures
					contained in a septic tank, then disposed through a local contractor. • Dredge spoil will be used as landfill material. All contaminated dredge spoil will be contained inside a sealed concrete tank. Effluent from the concrete tank will be monitored before discharge.
Natural environment	Ecosystem	Impacts of marine fauna mortality at the construction sites	Minor (-)	Although some hard corals and other marine fauna at the construction sites will be permanently lost, the consequences of their loss within the local/regional ecosystem can be considered to be minor, mainly due to the relatively low hard-coral coverage and species diversity at the construction sites. Also the new foundations and specially-designed armor blocks of the breakwater and seawall should provide new habitats for hard corals and other marine fauna.	• Use of specially-designed armor blocks that enhance coral larvae attachment.
		Impacts of dredging works on the hard coral community	Moderate (-)	According to the SS dispersion simulation, the hard corals in the inner reef slope of Grand Reef could be affected by the dredging works. However, dredging impacts should remain within moderate to minor levels with effective implementation of the proposed countermeasures.	• Dredging will be conducted by installing silt screen around the dredger. • Hard corals on the Grand Reef will be monitored regularly at fixed locations. If coral stress is observed, dredging methods will be reevaluated to reduce sediment dispersion.
		Impacts of dredging works on marine fauna other than hard corals	Minor (-)	According to the SS dispersion simulation, impacts of dredging works will be limited to the deeper layers and only within approximately 100-200 m of the dredging site. Also, since silt curtains will be used to further minimize sediment dispersion, impact on marine fauna (other than hard corals) should remain within minor levels.	• Dredging will be conducted by installing silt screen around the dredger.
		Impacts of underwater pile-driving noise on marine fauna	Minor (-)	Although pile-driving noise could potentially affect various marine fauna, its impact is considered to be minor as noise levels of pile-driving are below threshold levels of most species. Precautionary measures will also be implemented to minimize any risks.	• Prior to commencement of pile driving, an observer will check for any presence of cetaceans and other vulnerable fauna. • Pile driving will be ceased if any cetaceans and other vulnerable fauna are observed within 500 m radius of the pile driver. Pile driving will commence after confirming

Category		Potential environmental impacts	Impact Rating	Rationale	Proposed countermeasures
					their departure from the area. • Additional noise abatement measures (e.g. air bubble curtains) will be considered and implemented if any adverse impacts (e.g. fish mortality, whale stranding) are identified during the pile-driving works.
Social environment	Local economy	Impacts of construction works on the local economy	Moderate (+)	Construction works will have positive impacts on the local economy, due to employment of local work force, procurement of construction materials and other secondary benefits.	
	Fisheries	Impacts of marine construction works on reef-passage usage	Moderate (-)	During certain periods, the reef passage may become blocked and impassable for fishing boats in particular during construction activities such as dredging. In such case, fishermen will need to either take the route around Grand Reef, which will entail significant extra time and effort or shift temporary to other fishing grounds in the north. However, since the duration of such periods should be relatively temporary, the overall impact should remain within moderate to minor levels.	
		Impacts of marine construction works on fishery resources	Minor (-)	Impact of marine construction works on fishery resources will be limited within a very small area around the construction sites, which does not overlap with the main fishing grounds. Therefore, impact on fishery resources should be minor.	• The proponent will hold regular meetings with the local fishermen to monitor the impacts of the construction works.
	Public health	Impacts of construction workers on the public health of the local community	Minor (-)	Although there is a risk of spreading communicable diseases through influx of large numbers of construction workers, the risk should be relatively low with effective implementation of the proposed countermeasures.	• Implementation of regular health-checks of construction workers. • Education of construction workers on communicable diseases.

(-): negative impact, (+): positive impact

7-4-2 Operation phase

Table 7-4-2 summarizes the results of the environmental impact assessment for the operation phase and proposed countermeasures.

Table 7-4-2 Assessment of potential environmental impacts and proposed countermeasures (operation phase)

Category		Potential environmental impacts	Impact Rating	Rationale	Proposed countermeasures
Physical environment	Air quality	Impacts of cargo-vehicle traffic on the air quality around the access road	Inconclusive	PM_{10} concentration around the access road was predicted to increase significantly from present levels, mainly due to the increase in cargo-vehicle traffic. While one of the most effective solutions will be to renew or upgrade the cargo vehicle fleet to less polluting vehicles, these measures will be beyond the control of the proponent. The proponent instead will implement the proposed countermeasures, but their effectiveness are uncertain at this moment. Whenever necessary, the proponent will cooperate with the stakeholders and responsible entities to find/implement effective solutions.	• Recommendation to truck owners to stop unnecessary engine idling. • Establishment of inland depot for cargo vehicles to reduce congestion of the access road. • Implementation of air quality monitoring. • Cooperation with the stakeholders and responsible entities to find/implement effective solutions.
	Noise	Impacts of cargo-vehicle traffic on the noise levels around the access road	Inconclusive	The increase in cargo-vehicle traffic will inevitably further raise the noise levels around the access road, but this will be beyond the control of the proponent. The proponent instead will conduct noise monitoring, and whenever necessary, will cooperate with the stakeholders and responsible entities to find/implement effective solutions.	• Implementation of noise monitoring. • Cooperation with the stakeholders and responsible entities to find/implement effective solutions.
	Oceanography	Impact of breakwater extension on the current field	Moderate (-)	The breakwater extension was predicted to alter some areas of the present current field, in particular around the reef passage and west side of Grand Reef. The waters around these areas will generally become more stagnant, which may have negative consequences on water quality and ecosystem. In conclusion, the breakwater extension will moderately alter the present current field.	
	Water quality	Impacts of breakwater extension on water quality (nutrient levels)	Minor (-)	According to the water quality simulation, the breakwater extension alone will result in only a very minor elevation in T-N concentration, and its impacts will be limited within the vicinity of the mouth of Panganales Canal and inner bay area. Meanwhile, if T-N load from the Panganales Canal increases in proportion to the population growth, more areas will experience higher T-N concentration, but the degree of elevation will still be relatively	• Implementation of water quality monitoring.

Category		Potential environmental impacts	Impact Rating	Rationale	Proposed countermeasures
				small (in the order of 10^{-2} mg/l). In conclusion, although the extended breakwater will alter the present current field, nutrient elevation in the bay will remain within minor levels.	
		Impacts of ships and port operations on water quality	No impact	With effective implementation and enforcement of the proposed countermeasures, ships and port operations should have no impacts on water quality. Also as a precaution, the proponent will conduct regular water quality monitoring around Toamasina Bay.	• The new bulk yard will be designed to prevent direct discharge of stormwater. • Oily waste will be treated/recycled through local contractors. • All ships that berth at Mole C will be required to comply with MARPOL regulations (e.g. prohibition of sewage, bilge water and other wastewater discharge into coastal waters). • Implementation of water quality monitoring.
	Coastal topography	Impacts of breakwater extension on coastal topography	Moderate (-)	The breakwater extension will accelerate significantly the ongoing beach erosion/accretion around Toamasina Bay. Beach erosion will occur in the areas immediately north and south of Point Tanio, which will be more severe in the south (approx. 40 m after 5 years). Beach accretion will be most significant in the areas south of Point Tanio at around the mouth of Panganales Canal, and will advance approximately 50 m after 5 years. The effectiveness of three erosion/accretion countermeasures was evaluated. While none of the countermeasures will completely stop erosion/accretion, one of the option was predicted to be relatively effective. However, at this moment it will be premature to make any definite decisions on the countermeasures, as there are still uncertainties on how the beach topography will actually evolve after the breakwater extension. The proponent will therefore, continuously monitor the beach erosion/accretion status and cooperate with the stakeholders (e.g. fishermen, recreational users) and responsible entities to find the most appropriate solution.	• • Monitoring of beach erosion/accretion. • Cooperation with the stakeholders and responsible entities to find/implement effective solutions.
	Waste	Impacts of wastes generated from port operation	No impact	No impacts are expected if all wastes are managed in accordance to the proposed waste management methods.	**Wastes from incoming ships:** • The port will not collect domestic and sewage wastes from ships. The

Category		Potential environmental impacts	Impact Rating	Rationale	Proposed countermeasures
					ships must instead comply with MARPOL regulations. • Oily waste and bilge water can be collected and treated/recycled through a local contractor upon request of the ship owner. **Waste from cargo handling area:** • Domestic waste will be collected and disposed at the local waste disposal site. • Oily waste will be collected and treated/recycled through a local contractor. • Maintenance scrap will be sold or disposed at the local waste disposal site. • Residuals from drainage and sedimentation ponds will be disposed at the local waste disposal site.
Natural environment	Ecosystem	Impacts of nutrient elevation on coral community	Minor (-)	According to the water quality simulation, the inner slope of Grand Reef will experience a slight increase in nutrient levels. The coral reefs in this area could degrade as a consequence. However, since the degree of elevation is only 0.01 mg/l from background levels, the likelihood of any major degradation can be considered as low. However, to minimize the risks of coral reef degradation, the proponent will make the utmost effort to minimize water pollution from port activities. Also the proponent will conduct regular coral reef monitoring to check the health of the coral reefs.	• Minimization of water pollution from port activities (see) • Implementation of regular coral reef monitoring.
		Impacts of increased shipping traffic on marine fauna	Minor (-)	Impacts of increased shipping traffic should be minor, as the number of ship calls is estimated to be around 4-5 per day, which is an increase of only 1-2 calls from present.	
		Impacts of ship anti-fouling paints on marine fauna	Minor (-)	The risk of marine contamination from harmful anti-fouling paints should remain within low levels as the use harmful anti-fouling paints should gradually reduce under the AFS Convention.	• Recommendation to ships to refrain the use of harmful anti-fouling paints.

Category		Potential environmental impacts	Impact Rating	Rationale	Proposed countermeasures
Social environment	Local economy	Impacts of expanded port operations on the local economy	Moderate (+)	The expanded port operations will provide various benefits to the local economy, most notably by providing additional employment opportunities to the local community. According to preliminary estimates, there will be demand for approximately 200 new port-operation related jobs, which will include skilled engineer/operator and staff/labors.	
	Fisheries	Impacts of extended breakwater on reef-passage usage	Moderate (-)	Although the reef passage will be narrowed from approximately 400 m to 100m after the breakwater extension, there should be still enough width for the fishing boats when under normal weather and wave conditions. Still, the risk of passing may increase during adverse weather conditions. However, in such case, there will always be options to fish in the northern fishing grounds, which is also a major fishing ground for the local fishermen. Therefore, the overall impact should remain within moderate to minor levels.	
		Impacts of loss of Point Hasti fishing ground	Minor (-)	Due to the new container yard, fishing at the reef flat of Point Hasti Reef will no longer be possible. This may affect around 30 local fishermen, but the significance of the impact should be minor, as Point Hasti Reef is not the primary fishing ground for most of these fishermen, due to the limited availability of fishery resources in this area. Also no concerns were raised during the fishermen meeting and stakeholder meetings.	• The proponent will hold regular meetings with the local fishermen to monitor any impacts.

7-5 Environmental management plan

Based on the results of the environmental impact assessment, an environmental management plan has been prepared to ensure that the project proponent and other related entities implement the Project efficiently with minimal environmental impacts. The environmental management plan provides information on the proposed environmental countermeasures and environmental monitoring plan.

7-5-1 Environmental countermeasures

Table 7-5-1 shows the proposed countermeasures of the identified environmental impacts for the construction phase, with the timing of implementation and responsible entities.

Table 7-5-1 Timing of implementation and responsible entities of the proposed countermeasures (construction phase)

Category		Potential environmental impacts	Proposed countermeasures	Timing of implementation	Responsible entities
Physical environment	Air quality	Impacts of dump-truck traffic on the air quality around the access road	• Use of new and low-emission dump trucks. • Regular maintenance of dump trucks. • Covering of loading space with sheet cover to minimize dust spills. • Prohibition of unnecessary engine idling. • Whenever possible, movement of dump trucks will be scheduled to avoid periods of traffic congestion (e.g. during peak cargo vehicle traffic).	During transportation of landfill material etc.	Construction contractor
	Noise	Impacts of pile-driving noise	• Use of hydraulic pile-drivers or pile-drivers with equivalent noise level.	During pile-driving works	Construction contractor
		Impacts of dump-truck traffic on the noise levels around the access road	• Use of new and low-noise dump trucks. • Regular maintenance of dump trucks.	During transportation of landfill material etc.	Construction contractor
	Water quality	Impacts of dredging works on seawater quality	• Dredging will be conducted by installing silt screen around the dredger. • SS levels will be monitored regularly at selected monitoring sites. If SS levels exceed set threshold levels, dredging methods will be reevaluated to reduce SS levels to acceptable levels.	During dredging works	Construction contractor
		Impacts of landfill works on seawater quality	• Installation of silt curtains whenever necessary. • Starting of landfill works after securing sufficient protection from seawall.	During landfill works	Construction contractor
	Groundwater quality	Impacts of disposal of contaminated dredge-spoil on groundwater quality	• All contaminated dredge spoil will be contained inside a sealed concrete tank. Effluent from the concrete tank will be monitored before discharge.	During dredging works	Construction contractor
	Sediment quality	Impacts of dredging works on sediment quality	• Dredging will be conducted by installing silt screen around the dredger. • Enclosed bucket will be used when dredging contaminated areas. • Spills will be minimized during transportation of dredge spoil.	During dredging works	Construction contractor

Category		Potential environmental impacts	Proposed countermeasures	Timing of implementation	Responsible entities
			• Water quality will be monitored during dredging. If unacceptable levels are recorded, dredging methods will be reevaluated.		
	Waste	Impacts of construction wastes	• Inert solid waste will be disposed at the local waste disposal site. • Oily wastes will be treated/recycled through a local contractor. • Building waste will be used either as landfill material, sold to a local contractor or disposed at the local waste disposal site. • Human waste will be contained in a septic tank, then disposed through a local contractor. • Dredge spoil will be used as landfill material. All contaminated dredge spoil will be contained inside a sealed concrete tank. Effluent from the concrete tank will be monitored before discharge.	Throughout the construction period	Construction contractor
Natural environment	Ecosystem	Impacts of marine fauna mortality at the construction sites	• Use of specially-designed wave-absorbing blocks that enhance coral larvae attachment.	During breakwater construction	Construction contractor
		Impacts of dredging works on the hard coral community	• Dredging will be conducted by installing silt screen around the dredger. • Hard corals on the Grand Reef will be monitored regularly at fixed locations. If coral stress or mortality is observed, construction methods will be reevaluated to reduce sediment dispersion.	During dredging works	Construction contractor
		Impacts of dredging works on marine fauna other than hard corals	• Dredging will be conducted by installing silt screen around the dredger.	During dredging works	Construction contractor
		Impacts of underwater pile-driving noise on marine fauna	• Prior to commencement of pile driving, an observer will check for any presence of cetaceans and other vulnerable fauna. • Pile driving will be ceased if any cetaceans and other vulnerable fauna are observed within 500 m radius of the pile driver. Pile driving will commence after confirming their departure from the area.	During pile-driving works	Construction contractor

Category		Potential environmental impacts	Proposed countermeasures	Timing of implementation	Responsible entities
			• Additional noise abatement measures (e.g. air bubble curtains) will be considered and implemented if any adverse impacts (e.g. fish mortality, whale stranding) are identified during the pile-driving works.		
Social environment	Fisheries	Impacts of marine construction works on fishery resources	• The proponent will hold regular meetings with the local fishermen to monitor the impacts of the construction works.	Throughout the construction period	SPAT
	Public health	Impacts of construction workers on the public health of the local community	• Implementation of regular health-checks of construction workers. • Education of construction workers on communicable diseases.	Throughout the construction period	Construction contractor

Table 7-5-2 shows the proposed countermeasures of the identified environmental impacts for the operation phase, with the timing of implementation and responsible entities.

Table 7-5-2 Timing of implementation and responsible entities of the proposed countermeasures (operation phase)

Category		Potential environmental impacts	Proposed countermeasures	Timing of implementation	Responsible entities
Physical environment	Air quality	Impacts of cargo-vehicle traffic on the air quality around the access road	• Recommendation to truck owners to stop unnecessary engine idling.	Before and during the operation phase	SPAT
			• Establishment of inland depot for cargo vehicles to reduce congestion of the access road.	Ongoing	SPAT and other related entities
			• Implementation of air quality monitoring. • Cooperation with the stakeholders and responsible entities to find/implement effective solutions.	During operation phase	SPAT
	Noise	Impacts of cargo-vehicle traffic on the noise levels around the access road	• Implementation of noise monitoring. • Cooperation with the stakeholders and responsible entities to find/implement effective solutions.	During operation phase	SPAT
	Water quality	Impacts of breakwater extension on water quality (nutrient levels)	• Implementation of water quality monitoring.	During operation phase	SPAT
		Impacts of ships and port	• Oily waste will be treated/recycled through local contractors.	During operation phase	Ships and terminal

Category		Potential environmental impacts	Proposed countermeasures	Timing of implementation	Responsible entities
		operations on water quality			operator
			• All ships that berth at Mole C will be required to comply with MARPOL regulations (e.g. prohibition of sewage, bilge water and other wastewater discharge into coastal waters).	Before and during the operation phase	Ships
			• Implementation of water quality monitoring.	During operation phase	SPAT
	Coastal topography	Impacts of breakwater extension on coastal topography	• Monitoring of beach erosion/accretion. • Cooperation with the stakeholders and responsible entities to find/implement effective solutions.	During construction and operation phase	SPAT and other related entities
	Waste	Impacts of wastes generated from port operation	**Wastes from incoming ships:** • The port will not collect domestic and sewage wastes from ships. The ships must instead comply with MARPOL regulations. • Oily waste and bilge water can be collected and treated/recycled through a local contractor upon request of the ship owner.	During operation phase	Ships
			Waste from cargo handling area: • Domestic waste will be collected and disposed at the local waste disposal site. • Oily waste will be collected and treated/recycled through a local contractor. • Maintenance scrap will be sold or disposed at the local waste disposal site. • Residuals from drainage and sedimentation ponds will be disposed at the local waste disposal site.	During operation phase	Terminal operator
Natural environment	Ecosystem	Impacts of nutrient elevation on coral community	• Implementation of coral reef monitoring.	During operation phase	SPAT
		Impacts of ship anti-fouling paints on marine fauna	• Recommendation to ships to refrain the use of harmful anti-fouling paints.	Before and during operation phase	SPAT
Social environment	Fisheries	Impacts of loss of Point Hasti fishing ground	• The proponent will hold regular meetings with the local fishermen to monitor any impacts.	During operation phase	SPAT

7-5-2 Environmental monitoring plan

Environmental monitoring will be conducted during both the construction and operation phases, to confirm the environmental status and the effectiveness of the proposed countermeasures. Depending on the monitoring results, the countermeasures may be revised until impacts are reduced to satisfactory levels. The proposed environmental monitoring programs are described below for both construction and operation phases.

(1) Construction phase

During the construction phase, the following monitoring programs will be implemented:

- Monitoring of water quality
- Monitoring of coral reefs
- Monitoring of effluent water from dredge-spoil containment tank
- Monitoring of shoreline
- Monitoring of impacts on fishermen

Details of the above monitoring programs are described below.

Monitoring of water quality

The aim of the water quality monitoring is to ensure that dredging activities are not dispersing unacceptable levels of sediments into the surrounding marine environment and hence not causing adverse impacts on corals and other marine fauna. If SS levels exceed set threshold levels, dredging methods will be reevaluated until water quality improves. Following are further details of the water quality monitoring:

Frequency: Daily
Duration: Dredging period
Location: Inner reef slope of Grand Reef (1 monitoring site and 1 reference site), Toamasina Bay (1 monitoring site and 1 reference site).
Parameter: Suspended solids (SS)
Measurement depth: Two layers (surface and bottom layers)
Threshold level: When SS levels at either of the monitoring sites are above 2 mg/l of their respective reference sites. Dredging methods will be reevaluated accordingly after identifying the main cause.

Following are some dredging management options that may be employed to reduce SS dispersion:

- Optimization of grab hoisting speed;
- Minimization of barge overflow;
- Relocation of dredging site.

Monitoring of coral reef

The aim of the coral reef monitoring is to ensure that dredging activities are not causing adverse impacts on the coral reefs of Grand Reef. If any signs of coral stress are observed, dredging methods will be reevaluated. Following are further details of the coral reef monitoring:

Frequency: Once every fortnight
Duration: Dredging period
Location: Inner reef slope of Grand Reef (1 monitoring site and 1 reference site).
Method: Visual observation of selected hard corals by coral expert. The target hard corals will be determined prior to the commencement of dredging by coral expert. Species and individuals that are most vulnerable to turbidity and sedimentation will be selected. Suggested species include *Pocillopora* sp., *Porites* sp., *Acropora* sp.

Threshold level: Confirmation of coral stress due to dredging activity (e.g. excessive mucus production, sediment accumulation, change in color).

Monitoring of effluent water from dredge-spoil containment tank

The aim of the effluent water monitoring is to ensure that the effluent water quality from the dredge-spoil containment tank is under acceptable levels before discharge into the environment. Following are further details of the effluent water monitoring:

Frequency: Prior to discharge
Duration: Dredging period
Method: Measurement of SS concentration
Discharge standard: <50 mg/l

Monitoring of shoreline

The aim of the shoreline monitoring is to understand the beach erosion/accretion status south and north of Point Tanio. Following are further details of the shoreline monitoring:

Frequency: Every 3 months after the commencement of the breakwater construction. Monitoring will also be conducted during the operation phase.
Location: 6 sites (3 sites each at north and south of Point Tanio sites).
Method: Measurement of beach width from fixed point to shoreline, and photo record.

Monitoring of impacts on fishermen

Regular meetings will be held with representatives of the local fishermen under the assistance of Apostolat de la Mer. The aim is to notify the progress of the construction works and understand whether the construction activities are having any adverse impacts on their fishing operation. Meetings will be held once every 3 months.

(2) Operation phase

During the operation phase, the following monitoring programs will be implemented at least for the first year (if deemed necessary, monitoring will be continued for the ensuing years):

- Monitoring of air quality
- Monitoring of noise quality
- Monitoring of water quality
- Monitoring of coral reefs
- Monitoring of impacts on fishermen

Details of the above monitoring programs are described below.

Monitoring of air quality

The aim of the air quality monitoring is to understand the air quality status of the areas around the port access road, which is the area most susceptible to air pollution from port activities. Following are further details of the air quality monitoring:

Frequency: Once each during hot and cool seasons
Duration: 7 days
Location: Roadside of access road (1 site), residential area north and south of the access road (2 sites; 50 m from the access road)
Parameter: PM_{10}, traffic volume
Target concentration: 50 $\mu g/m^3$ (24-hour mean value)

Monitoring of noise quality

The aim of the noise quality monitoring is to understand the noise status of the areas around the port access road, which is the area most susceptible to noise pollution from port activities. Following are further details of the noise quality monitoring:

Frequency: Once per year
Duration: 1 day (24-hours)
Location: Roadside of access road (1 site), residential area north and south of the access road (2 sites; 50 m from the access road)
Parameter: Equivalent sound level (Leq), traffic volume
Target level: 70 dB (A) (industrial area), 55 dB (A) (residential area daytime), 45 dB (A) (residential area nighttime)

Monitoring of water quality

The aim of the water quality monitoring is to understand the water quality status around Toamasina Bay and to investigate if any impacts are generated from port activities. Following are further details of the water quality monitoring:

Frequency: Once each during hot and cool seasons
Location: Inside Toamasina Bay (5 sites), mouth of Panganales Canal (1 site), reference site (1 site).
Parameter: Water temp., salinity, pH, DO, SS, T-N, T-P, coliform bacteria, oil
Target concentration: T-N (<0.3 mg/l) and T-P (<0.03 mg/l), coliform bacteria (<500 MPN/100 ml), oil (no detection)

Monitoring of coral reefs

The aim of the coral reef monitoring is to understand the coral reef status around Grand Reef and to investigate if any impacts are generated from port activities. Following are further details of the coral reef monitoring:

Frequency: Once each during hot and cool seasons
Location: Inner reef slope (2 sites), reef flat (2 sites), outer reef slope (2 sites)
Method: Visual observation by coral expert
Impact indicator: Coral stress/mortality and algae coverage

Monitoring of impacts on fishermen

Regular meetings will be held with representatives of the local fishermen under the assistance of Apostolat de la Mer. The aim is to understand whether the port operations are having any adverse impacts on their fishing operation. Meetings will be held once every 6 months.

7-6 Stakeholder meetings

During the course of the Study, three stakeholder meetings were held by SPAT with the assistance of JICA Study Team. The stakeholders were invited by sending invitation letters to the relevant organizations. The meetings were held in English with French and Malagasy translation. Also SPAT held a meeting with the representatives of the local fishermen on June 23, 2009, to inform and discuss about the Project. Following are summaries of the above meetings. The minutes of these meetings are attached in Appendix 7-3. The presentation material used in the stakeholder meetings are attached in Appendix 7-4.

1st Stakeholder meeting

Date: March 12, 2009
No. of participants: approx. 50
Aim: Explanation of the outline of the study and identification of potential environmental impacts

Main questions/opinions of the stakeholders and responses by SPAT/JICA Study Team:

Questions/opinions raised during the meeting	Responses
The road traffic at the access road will further increase in the future due to the increase in container cargos. Is the construction of new roads considered in the feasibility study?	The construction of roads is not included within the scope of this study. However, if during the study, the need for new access road proves to be necessary, the study will make recommendations.
The port expansion may degrade the sensitive areas near the port.	Water quality simulations will be conducted to evaluate the impacts on coral reefs
Questions/opinions raised after the meeting	**Responses**
The breakwater extension may intensify siltation and erosion.	-
The impacts of construction waste should be considered.	-
Will local employees be selected during the construction phase?	-

2nd Stakeholder meeting

Date: July 3, 2009
No. of participants: approx. 55
Aim: Explanation of the progress of the study, results of environmental field surveys and proposed countermeasures
Main questions/opinions of the stakeholders and responses by SPAT/JICA Study Team:

Questions/opinions raised during the meeting	Responses
Will there be any impacts on fishery resources? There will be competition between port activities and fishing. Fishing tends to be sidelined in Toamasina.	According to interviewed fishermen, the principal fishing zones will not be affected from this Project. Utmost effort will be made to minimize impacts on Grand Reef and local fishing activities.
Will there be any socio-economic benefits from this Project?	-
Does the Project take into account the dry port for trucks?	The study will analyze the feasibility of the current proposal of the dry port, and if necessary propose other measures.
The responsibility of the proposed countermeasures should be clarified.	During the construction phase, the Contractor will be mainly responsible for implementing countermeasures. During the operation phase, SPAT will mainly be responsible and could use consultants to do the studies, and if necessary JICA may assist with technical solutions.
During the construction and operational phases, will there be any impacts on small scale fishing activities?	During the construction phase, it may be dangerous to use the reef passage for several months. During the operation phase, it is uncertain whether it will be safe to use the reef passage. Mr Avellin, MD of SPAT, added that it is illegal to enter the security perimeter of the port zone based upon «International Ship and Port Facility Security Code (ISPS Code)» of the International Maritime Organization (IMO).
The truck parking around the access road is major concern and may worsen by the port expansion.	The study will analyze the problems as there are many issues associated with the parking of trucks such as: -Town Planning issues;

	-Respect and application of the Highway Code; -Encouraging transport organizations into an Association and applying transport norms.

3rd Stakeholder meeting

Date: October 30, 2009
No. of participants: approx. 40
Aim: Explanation of the final layout of the Project; explanation of the main results of the environmental impact assessment
Main questions/opinions of the stakeholders and responses by SPAT/JICA Study Team:

Questions/opinions raised during the meeting	Responses
To reduce impact on air quality, will it be possible to shift more to railway transport instead of road transport?	Some companies are already using railway. For example Ambatovy will transport 14,000 containers/year by railway.
Fishermen requested the following: - To keep the reef passage open for small fishing boats; - New fishing port for artisanal/traditional fishermen; - Provision of motor boats.	Efforts have been made to keep the reef passage open. However, the risk of navigation will be greater due to the shorter opening. There is also an issue associated with the regulation of reef passage usage.
Almost all trucks used in Madagascar are second hand. Trucks will need financial assistance to improve their environmental performance, such as the case with railways.	Railways may receive assistance because they need new infrastructure. The port could establish incentives to encourage trucks to convert to less polluting vehicles. The establishment of inland depot will also reduce air pollution, which will require adequate management and strict enforcement of regulations.
A thorough social and economic impact assessment is necessary such as on: - Impact on fishermen; - Impact of air quality degradation and noise; - Economic impact (e.g. tourism).	Due to the limitation of the TOR, we were unable to expand our study to the town area. We recommend the preparation of development master plan of Toamasina, which integrate the town and port development. Town zoning will also be necessary; otherwise the town will become chaotic.
The high school north of Point Tanio needs rehabilitation. Will the school be affected by coastal erosion?	According to the simulation, the school should not be affected. However, monitoring of erosion/accretion will be necessary after the breakwater extension, as well as countermeasures.
The port expansion will result in population increase, as well as increase the demand for public services and equipment. Setting up of professional training schemes will also be necessary. A local committee should be established to manage this project, as well as study on social aspect of this project.	We recommend the preparation of development master plan of Toamasina, which integrate the town and port development. JICA should be pleased to have contacts with the local authorities.
Have you conducted a study on sedimentation?	We have only conducted simulation of the shoreline. However, it is unlikely that Mole B will be affected by sedimentation.
The oil tanks will be enclosed inside the container yard area.	Access will be available to the oil tanks.

Fishermen meeting
Date: June 23, 2009
No. of participants: approx. 17
Aim: Explanation of the project and to obtain opinions of the local fishermen
Main opinions of the fishermen:

- The fishermen officially requested to construct a traditional and artisan fishing port berth facing the Hopitaly Be (Big hospital)
- The fishermen officially requested to have the reef passage always open for traditional and artisanal embarkations.
- The fishermen also requested to have motorized fibre-glass boats to enhance safety and mobilization.

7-7 Recommendations

7-7-1 Air and noise quality

Due to the expected increase in cargo traffic along the access road during the operation phase, it is highly recommended to implement the air pollution countermeasures as soon as possible, before any health issues arise. Drastic improvements can be made if the cargo fleets are renewed or updated to less-polluting vehicles. Regular maintenance will also be effective. The prompt establishment of the inland depot is also highly anticipated. Air quality monitoring should also be implemented to check the air quality status during the operation phase. Noise monitoring should also be implemented for similar reasons.

(1) Water quality

Although the breakwater extension should not cause any significant deterioration of the Toamasina Bay water quality, the port should continuously improve their environmental performance by minimizing any discharge of wastewater and oil into the bay. Maintaining the water quality of Toamasina Bay is important for the health of the local community as well as for the regional ecosystem. Water quality monitoring should therefore be implemented to check the water quality status during the operation phase.

(2) Beach erosion/accretion

Beach erosion/accretion may become a major issue after the breakwater extension. Based on the shoreline monitoring results, the port, stakeholders and responsible government agencies should cooperate and proactively find solutions on beach erosion/accretion.

(3) Coral reefs

Coral reefs play a key role in the ecosystem and local fishery. Conservation of coral reefs is thus vital for the sustainable development of the port and Toamasina. The status of the Grand Reef corals should therefore be monitored during the operation phase.

(4) Local fisheries

Fisheries is an important industry for the local community as it provides income and food source to many people in Toamasina. Some fishermen, in particular the traditional fishermen, may suffer if the local fishery resources decline due to the port development. Hence, it is important to maintain the marine environment as clean as possible. Also the port should hold regular meetings with the local fishermen to monitor of any impacts to their activities.

(5) Harmful anti-fouling paints on ships

The port should recommend ships to refrain the use of harmful anti-fouling paints that contain organotin compounds such as tributlyn (TBT). These compounds are known to harm aquatic organisms other than that attached to the hulls of ships due to its persistence in water and sediments, inducing for example shell deformations in oysters; sex changes (imposex) in whelks; and immune response, neurotoxic and genetic affects in other marine species. More information on harmful anti-fouling paints is attached in Appendix 7-5.

(6) Decision-making process

As recommended by the representative of Antsinanana Region at the stakeholder meeting, the proponent should establish a local committee that consists of members of the local authority, port and stakeholders. The local committee will play a key role in managing future issues that will arise from this development. Opinions of vulnerable social groups (e.g. women, ethnic minorities, disabled person) should also be taken into account as far as possible during any future decision-making processes, which could be realized by for example holding public consultation meetings.

Chapter 8. Administrative Aspects

8-1 Outline of the marine transport sector in Madagascar

Major port-related organizations related to the Project are the Ministry of Transport (MOT), Agence Portuaire Maritime et Fluviale (APMF), the Société du Port à Gestion Autonome de Toamasina (SPAT), Société de Manutention des Marchandises Conventionnelles (SMMC), and Madagascar International Container Terminal Services Ltd.(MICTSL).

MOT - holding jurisdiction over marine and river transport, air transport, road transport and railway transport - has overall jurisdiction over ports. Main activities under the control of MOT are legislation, international relations and financial support from foreign countries. Responsibility for managing ports was transferred to APMF in 2005.

APMF was established under the government decree No. 2003-659 of June 2003, and is independent from MOT. APMF is a public corporation, but has rights to carry on commercial pursuits and give concessions of their ports or berths to a private terminal operator.

Toamasina Port is managed by SPAT, founded under the government decree No. 2004-702. Containers, general dry cargoes and liquid bulk cargoes are handled at Toamasina Port. The general cargo is dealt with by SMMC. The container terminal has been operated by MICTSL, a local company of ICTSI, since October 2005.

SMMC is company which carries out cargo handling and storage with the exception of containerized cargo. The company established in July 2008 and was privatized.

MICTSL is local company of International Container Terminal Services Inc. (ICTSI) of the Philippines which operates 11 container terminals throughout the world at present.

SPAT concluded a concession contract with MICTSL for the container business of Toamasina port in June 2005.

The Ministry of Transport (MOT), Agence Portuaire Maritime et Fluviale (APMF), and the Société du Port à Gestion Autonome de Toamasina (SPAT) are the major port-related organizations in Madagascar. The interrelation of these organizations is shown in Figure 8-1-1.

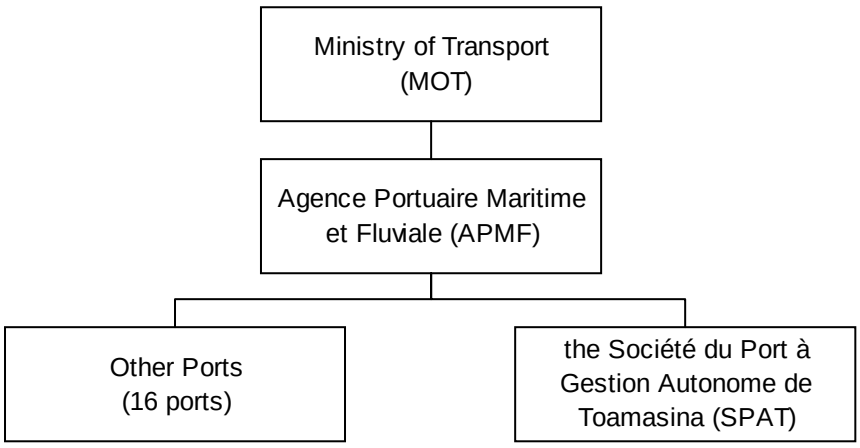


Figure 8-1-1 Interrelation of port-related organizations (1)

The Société du Port à Gestion Autonome de Toamasina (SPAT), Société de Manutention des Marchandises Conventionnelles (SMMC), and Madagascar International Container Terminal Services Ltd.(MICTSL) are the major port-related organizations in Toamasina Port. The interrelation of these organizations is shown in Figure 8-1-2.

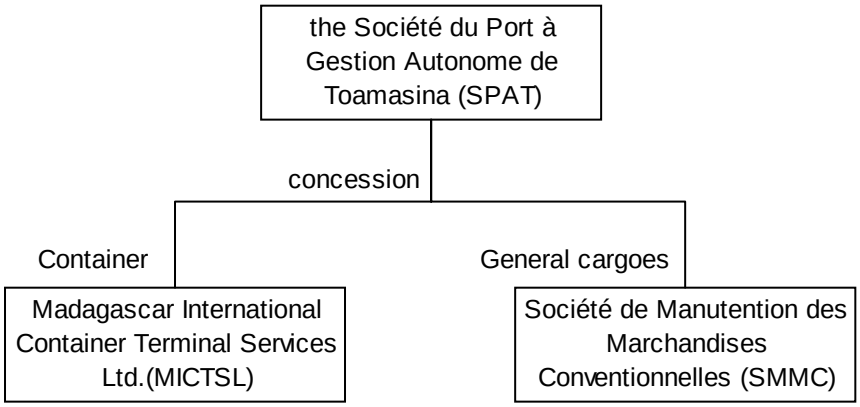


Figure 8-1-2 Interrelation of port-related organizations (2)

8-2 Ministry of Transport (MOT)

The authority and organization of MOT are stipulated in government decree No 2007-987. The Ministry has the following functions:

- To regulate Road transport, Marine transport, River transportation and Air transportation
- To design, construct and operate Railways, Ports, Airports and Roads.

And Minister of Transport supervises APMF which in turn has SPAT under its jurisdiction.

Transport headquarters of MOT has overall jurisdiction over ports. APMF which was established in accordance with government decree No 2003-659 is responsible for maritime and aviation services. Responsibility for managing ports was substantially transferred to APMF in 2005.

Main activities under the control of the MOT are legislation, international relations, financial support from foreign countries. The organization is shown in Figure 8-2-1.

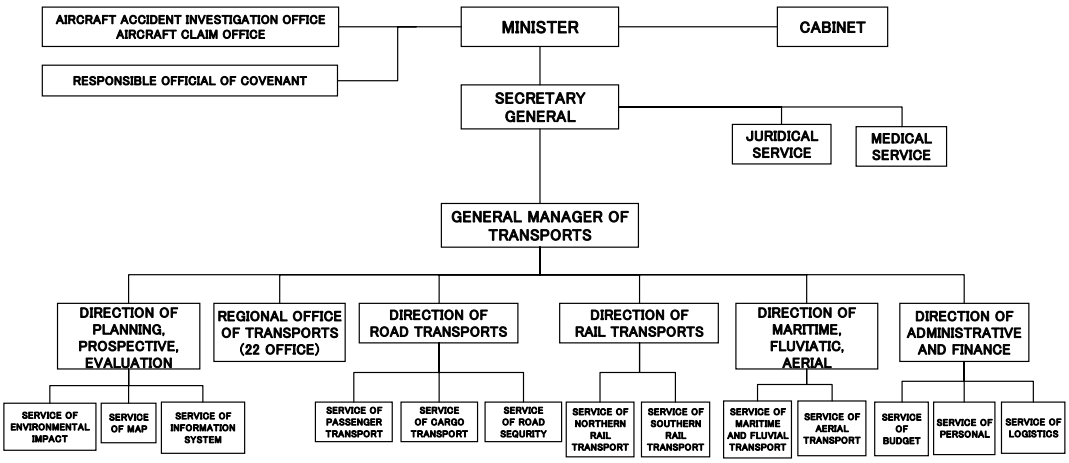


Figure 8-2-1 Organization Chart of MOT (1)

MOT is examining organization revision and is as follows by an original bill now. The organization is shown in Figure 8-2-2.

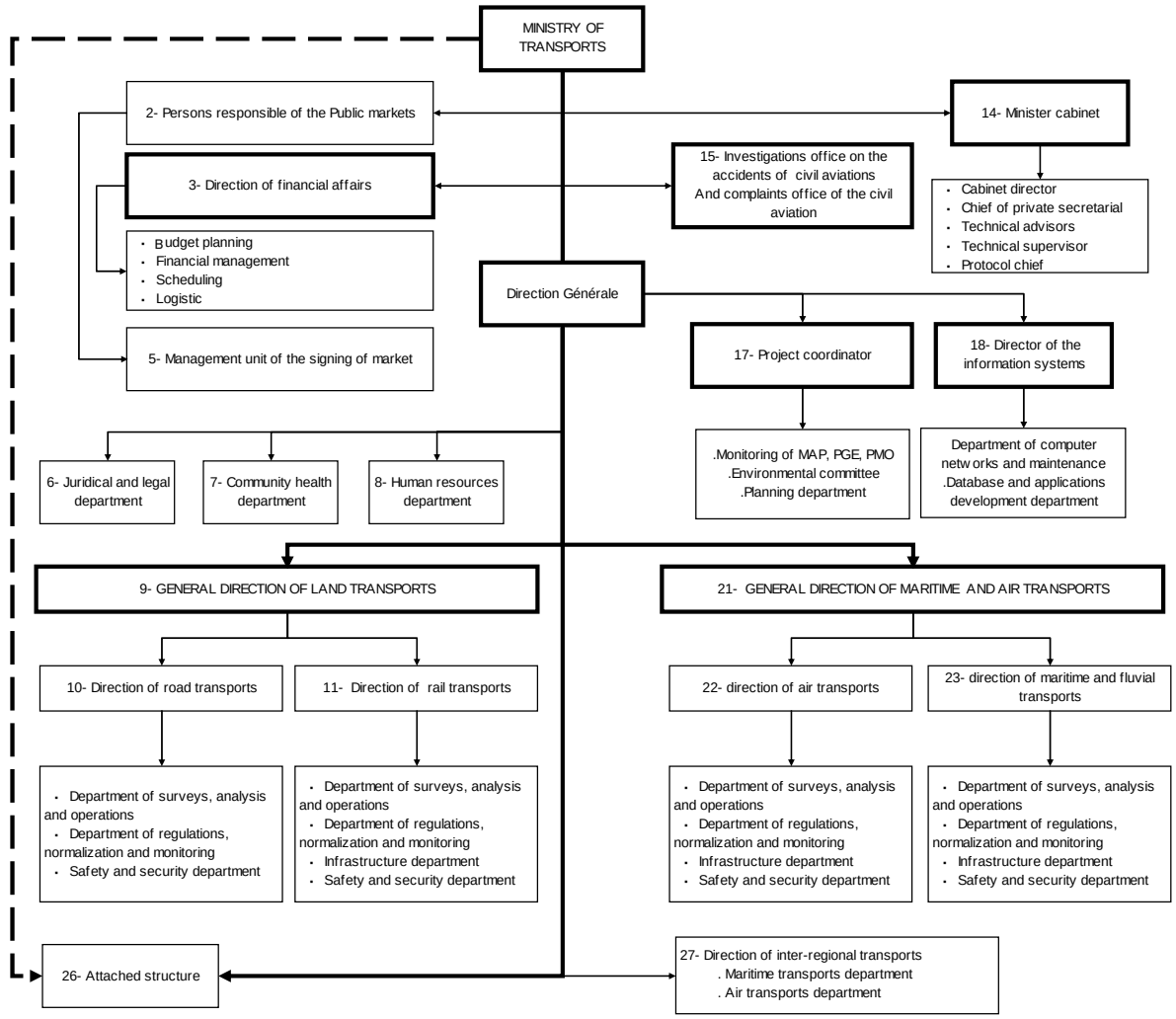


Figure 8-2-2 Organization Chart of MOT (2)

8-3 Agence Portuaire Maritime et Fluviale (APMF)

APMF was established under government decree No 2003-659. APMF is public corporation but commercial in nature. And it is financially and administratively autonomous, however, budget is supervised by the Minister of Budget, accounts are supervised by the Minister of Finance, technical subject is supervised by the Minister of Transport.

8-3-1 Regulatory agency

The APMF is a public utility company created by the decree of April 19th, 2000 and operational since 2004, autonomous on the administrative and financial level, under the technical supervision of the Ministry of Transport and the financial supervision of the Ministry of finance and Budget in Madagascar.

A board of trustees made up of four representatives of the State and private sectors exerts the deliberative role.

The executive body of the APMF is the head office. Its authority extends into province.

In Antananarivo, the head office has three management offices:

- regulation;
- technique and security;
- Administrative, financial and human resources.

8-3-2 Missions

The APMF is the authority in charge to ensure the regulation of the harbor, maritime and river sub-sectors. Consequently, it coordinates the implementation of the national policy in the field of the sub-sector.

In addition it ensures:

- the control and the follow-up of autonomous management ports;
- the work control of rehabilitation and improvement of the infrastructures works in the other ports;
- the conceding authority with respect to the holders of global concession of management and exploitation in the non-autonomous ports;
- the management and the harbor authority in the non-autonomous ports not subject to a global concession of management and exploitation, on a purely transitory basis, and during the period of the installation of various entities of management and exploitation of the ports,;
- the management of the coastal maritime signals maintenance;
- the maintenance of sea and river navigation route;
- the management of the maritime and river matters.

8-3-3 Resources

Since 2005, the APMF is financed by the remuneration of the services rendered to the port users and the maritime transport, such as:

- harbor dues and royalties;
- merchant navy fees;
- maritime flow royalties; and,
- Concession and permission royalties.

Roles of APMF are to regulate and manage port and maritime transport. Its duties include the following:

- Administration and supervision of self-supporting ports
- Repair and improvement of infrastructure of other ports, implementation of construction work
- Supervision of companies which operate and manage non-independent ports
- Maintenance of marine signals along the coast
- Maintenance of maritime and river
- Management of maritime and river affairs

Activities of APMF are decided at the board of directors meeting which is headed by the Chairman. The board of directors consists of 4 representatives from the public sector (MOT, Ministry of Finance (MOF), Ministry of Budget (MOB), Self-supporting port) and 4 representatives from the private sector.

Activity funds of APMF consist of the following items: government subsidy, usage fees, international cooperation funds and commission charges.

The usage and commission charges which APMF collects are as follows:

Port dues, commission charges,

commission charges on cargo vessels, commission charges on import cargo

In addition, payment of patent royalty is imposed on self-supporting ports. APMF has jurisdiction over 17 ports at present which are divided into the following 3 types.

8-3-4 Ports under APMF jurisdiction

APMF holds jurisdiction over 17 ports, including four self-supporting ports, i.e. Toamasina, Antsiranana, Mahajanga and Toliara (see Fig.8-3-1). Seventeen ports are classified as principal ports (Toamasina) and secondary ports (all other ports). The secondary ports are subdivided in ports long-couriers (3: Antsiranana, Mahajanga and Toliara), principal cabotage ports (8: Holy Port Louis, Nosy Be, Morondava, Morombe, Tolagnaro, Manakara, Mananjary and Vohemar) and secondary cabotage ports (5: Antsohihy, Maintirano, Holy Marie, Maroantsetra and Antalaha).

Table 8-3-1 Ports under APMF jurisdiction

Classification	Number of ports	Name of port
Self-supporting port	4	① Toamasina, ② Antsiranana, ③ Mahajanga, ④ Toliara
Management and operation commission port	2	⑤ Maroantsetra, ⑥ Antalaha
Direct management port	11	⑦ Nosy-Be, ⑧ Saint Louis ⑨ Antsohihy, ⑩ Maintirano, ⑪ Morondava, ⑫ Morombe, ⑬ Tolagnaro(Fort-Dauphin) ⑭ Manakara, ⑮ Mananjary, ⑯ Saint Marie ⑰ Vohemar(Iharana)

The Ports under APMF jurisdiction is shown in Figure 8-3-1.

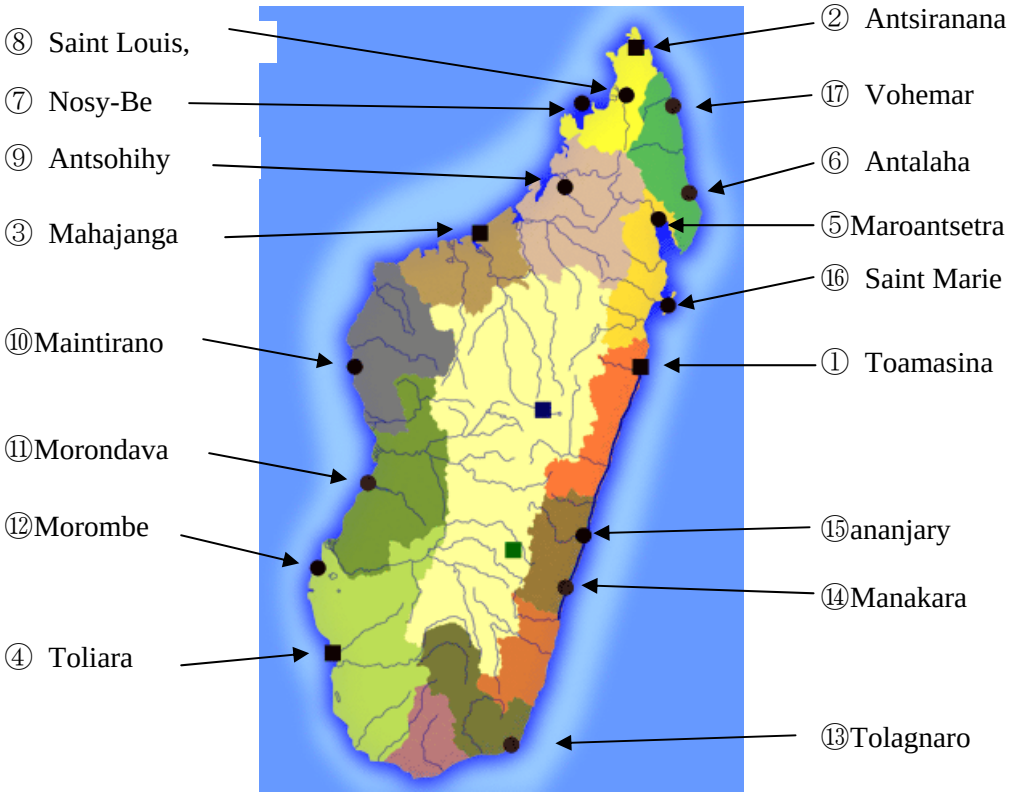


Figure 8-3-1 Ports under APMF jurisdiction

The organization is shown in Figure 8-3-2.

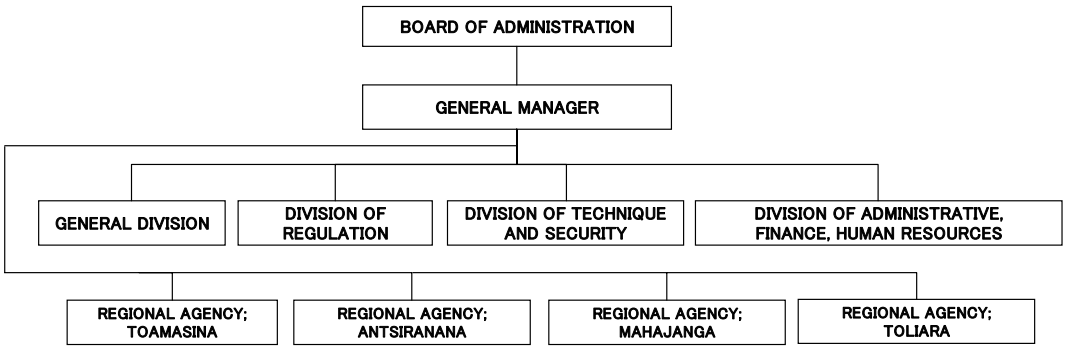


Figure 8-3-2 Organization chart of APMF

8-4 Société du Port à Gestion Autonome de Toamasina (SPAT)

8-4-1 Legal framework

SPAT was established by government decree No 2004-702. SEPT which had previously carried out management and operation of Toamasina port was abolished by government decree No 2004-703.

The texts on the harbor reforms is as flow,

- law n° 2003-025 on the statute of the ports
- decree n° 2003-659 on the creation of the Harbor, Maritime and River Agency (APMF)
- decree n° 2004-699 for the application of the law 2003-025
- decree n° 2004-702 conferring on the port of Toamasina the statute of port of national interest with autonomous management
- decree n° 2004-703 relating to the transition period planned for the new statute of autonomy to the port of Toamasina

This legislative and statutory framework:

- definite the essential tasks of the SPAT
- separate the regalians and administrative functions from the operational activities
- confer on the SPAT the role of regulator of the active companies in the harbor area by means of concession contracts and the control of the application of the agreed conditions

Roles of SPAT are as follows:

- Port safety management (Including safety management and maintenance of port)
- Maintenance of port facility, permission for exclusive use of port facility
- Permission to operate business within the port area
- Maintenance of water depth of port area, Implementation of dredging work
- Extension, repairing, new construction, reconstruction of port facilities

SPAT pays 10% of the port dues, commission charges and site rent which it collects to APMF.

SPAT receives no subsidies from MOT and APMF for the construction of facilities or port management.

SPAT which is a port authority will take responsibility about the whole of management administration of Toamasina port. SPAT which manage and administer in detail Toamasina port as follows.

Conversion of the SEPT as "service Port" into SPAT as "owner Port" to face context of globalisation of maritime flows and to fulfill the requirement of the modern economy

8-4-2 Organization of SPAT

In recent years the number of employees of SPAT has been decreasing. In January 2008, SPAT employed 1,076 people.

The number of employees in the last 7 years is shown in Table 8-4-1, Figure 8-4-1.

Table 8-4-1 Trend of number of employees

	SEPT	SPAT	SMMC	Number of staff
2003	1,814	–	–	1,814
2004	1,724	–	–	1,724
2005	1,274	–	–	1,274
2006	1,185	–	–	1,185
2007	1,101	–	–	1,101
2008	–	485	591	1,076
2009	–	477	582	1,059

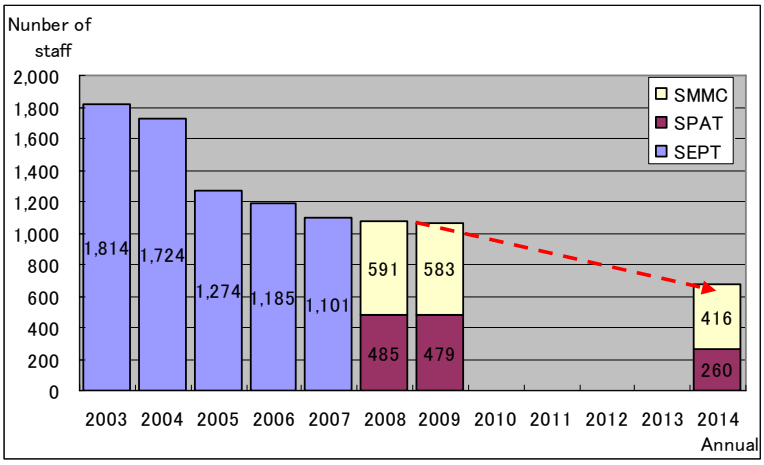


Figure 8-4-1 Trend of number of employees

The number of staff by age classification is shown in Figure 8-4-2.

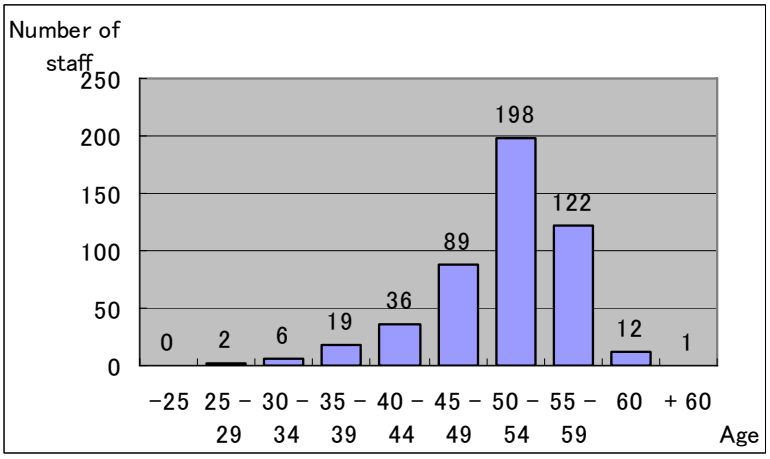


Figure 8-4-2 Number of staff by age classification

The organization is shown in Figure 8-4-3.

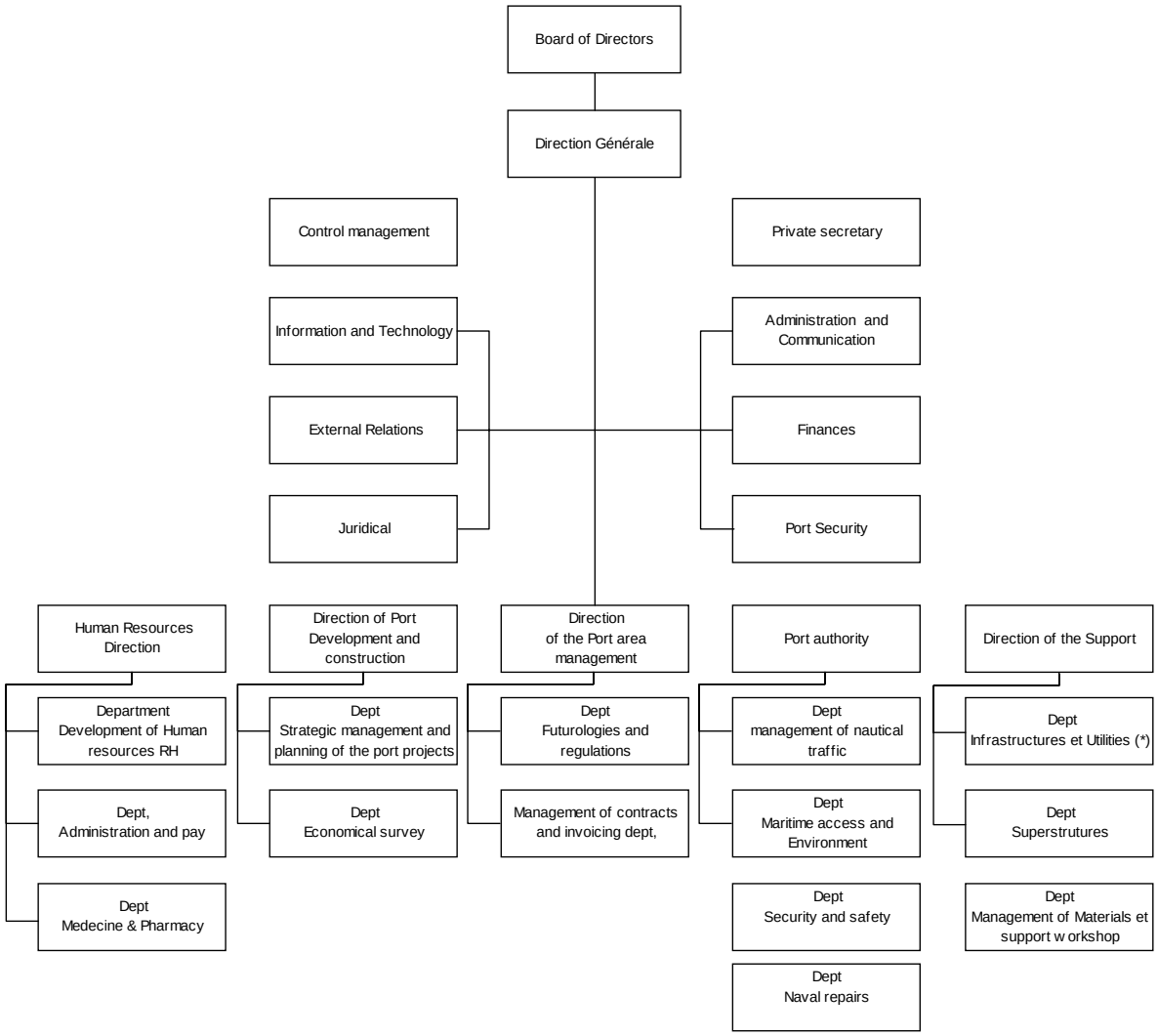


Figure 8-4-3 Organization chart of SPAT

The number of staff by job classification is shown in Table 8-4-2.

Table 8-4-2 Number of the staff by division

DIRECTION	Executive	Supervisor	Executant	Total
Head Office	28	33	62	123
Human Resources Direction	19	29	13	61
Direction of Port Development and construction	6	3	1	10
Direction of the Port area management	4	14	5	23
Port authority	7	33	109	149
Direction of the Support	10	58	43	111
Total	74	170	233	477

8-4-3 Financing conditions

(1) Returns

The returns in the last 2 year (2006, 2007) are shown in Figure 8-4-4, Table 8-4-3.

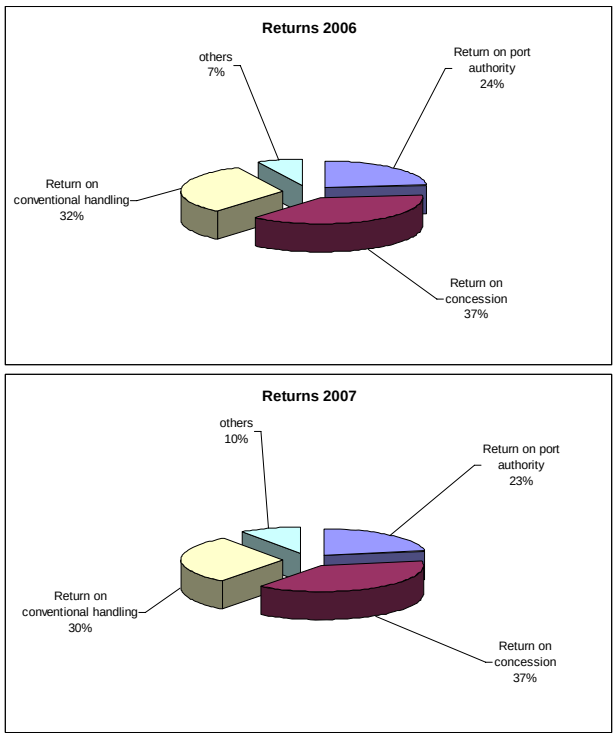


Figure 8-4-4 Returns in the last 2 year (2006, 2007)

Table 8-4-3 Returns in the last 2 year (2006, 2007)

	2,006	2,007
Return on port authority	11,451,328	12,596,461
Return on concession	18,062,610	20,860,897
Return on conventional handling	15,209,404	16,730,344
others	3,551,605	5,484,434
TOTAL	48,274,947	55,672,137

(2) Charges

The charges in the last 2 year (2006, 2007) are shown in Figure 8-4-5, Table 8-4-4.

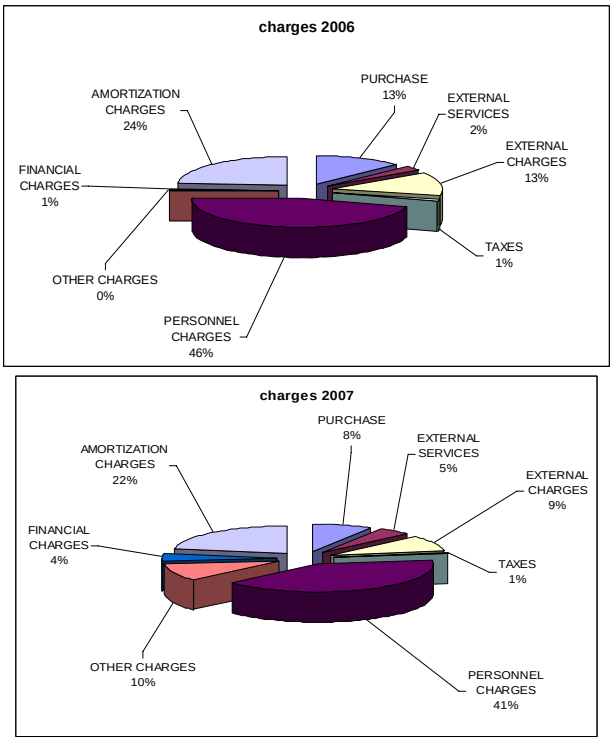


Figure 8-4-5 charges in the last 2 years(2006, 2007)

Table 8-4-4 charges in the last 2 years(2006, 2007)

	2006	2007
PURCHASE	3,007,748	2,320,814
EXTERNAL SERVICES	552,412	1,278,600
EXTERNAL CHARGES	2,930,717	2,474,183
TAXES	327,965	191,973
PERSONNEL CHARGES	10,457,222	11,174,742
OTHER CHARGES	58,979	2,804,834
FINANCIAL CHARGES	123,216	1,218,667
AMORTIZATION CHARGES	5,509,988	6,064,406
TOTAL	22,968,246	27,528,218

(3) Financial statements

The financial statement is shown in Table 8-4-5, Table 8-4-6.

Table 8-4-5 Balance sheet (2007, 2008)

FINANCIAL STATEMENTS ON DECEMBER 31 ,2008
BALANCE SHEET ON DECEMBER 31, 2008

Unity : in Ariary

ASSETS	AMOUNT ON 31/12/2008	AMOUNT ON 31/12/2007
NON CURRENT RECEIVABLES		
intangible assets	**-**	
amortization	-	
Tangible assets	**109 257 621 658.69**	**110 540 924 410.21**
Depreciation	(57 232 224 111.79)	(53 093 153 122.21)
investment properties	**25 682 245 900.65**	**4 624 670 885.23**
Long-term investment	**57 622 399 675.00**	**-**
TOTAL NON-CURRENT RECEIVABLE	**135 330 043 675.00**	**62 072 442 173.23**
CURRENT ASSETS		
stocks and supplies	**571 049 396.36**	**680 158 639.18**
Provisions	-	-
Debts	**34 088 422 778.52**	**9 181 403 308.38**
Provisions	(8 288 772 709.01)	-
Cash and cash equivalents	**32 061 102 299.01**	**67 120 084 137.92**
Investment	*10 043 275 327.44*	*37 945 504 028.92*
Cash (cash and sight deposit)	*22 017 826 971.57*	*29 188 483 114.59*
Waiting accounts	-	*(13 903 006.51)*
Connection account	-	-
TOTAL CURRENT ASSETS	**58 431 801 764.72**	**76 981 651 084.56**
TOTAL ASSETS	**193 761 844 887.27**	**139 054 093 257.79**

EQUITY CAPITAL AND LIABILITIES	AMOUNT ON	AMOUNT ON
EQUITY CAPITALS		
Issued capital	2 800 000 000.00	2 800 000 000.00
Bonus and reserves	47 227 923 349.03	46 886 171 450.80
Result of the period	17 814 057 644.60	6 835 037 964.64
Pending profit appropriation	27 858 416 291.72	27 858 416 291.72
Other equity capital – balance brought forward	39 656 215 252.19	41 224 124 725.44
I – TOTAL EQUITY CAPITAL	**135 356 612 537.54**	**125 603 750 432.60**
NON CURRENTS LIABILITIES		
Investment grant	5 171 648 387.00	-
II – TOTAL NON CURRENTS LIABILITIES	**5 171 648 387.00**	**-**
CURRENTS LIABILITIES		
Account payable and other attached accounts	5 441 153 724.73	2 756 464 036.15
Provisions and deffered income	4 470 945 126.47	4 470 945 126.47
Provisions	4 470 945 126.47	4 470 945 126.47
Deffered income	-	-
Other debts	*42 580 780 060.32*	*6 220 761 354.96*
Cash accounts (Bank overdrafts)	-	-
Suspense account	19 565 968.94	
Transfer accounts	721 139 082.27	2 172 307.61
III – TOTAL CURRENT LIABILITIES	**53 233 583 962.73**	**13 450 342 825.19**
TOTAL LIABILITIES	**193 761 844 887.27**	**139 054 093 257.79**

Table 8-4-6 Income statement (2007, 2008)

INCOME STATEMENT
PERIOD OF JANUARY 1ST TO DECEMBER 31, 2008

Unity : in Ariary

SECTION	AMOUNT ON 31/12/2008	AMOUNT ON 31/12/2007
Turnover	47 981 937 087.85	34 865 059 050.11
Investment on fixed assets	0	38 096 891.00
I – INCOME	**47 981 937 087.85**	**34 903 155 941.11**
Cost price	2 432 868 136.95	3 370 068 446.25
External services and other expenses	1 751 067 098.61	3 009 834 913.80
II – EXPENSES	**4 183 935 235.56**	**6 379 903 360.05**
III VALUE ADDED ON OPERATING ACTIVITIES(I - II)	**43 798 001 852.29**	**28 523 252 581.05**
Manpower cost(A)	7 562 346 248.70	5 351 871 103.47
Tax	765 066.09	129 150 991.96
IV GROSS OPERATING SURPLUS	**36 234 890 537.50**	**23 042 230 485.62**
other income on operating activities	1 495 153 306.51	1 138 796 633.99
other charges on operating activities	50 831 905.95	1 654 008 857.54
allocations to depreciation, provision and loss of value	14 787 636 751.42	17 186 084 163.89
recovery on provision and loss of value	-	4 183 669 623.91
V RESULT ON OPERATING ACTIVITIES	**22 891 575 186.64**	**9 524 603 722.10**
Financial income	865 630 554.83	2 284 858 175.74
financial charges	5 128 882.00	403 446 586.94
VI FINANCIAL RESULT	**860 501 672.83**	**1 881 411 588.79**
VII - EBIT (V + VI)	**23 752 076 859.47**	**11 406 015 310.89**
Tax on benefits	5 938 019 214.87	4 570 977 346.25
TOTAL INCOME FROM ORDINARY ACTIVITIES	50 342 720 949.19	42 510 480 374.75
TOTAL CHARGES FROM ORDINARY ACTIVITIES	32 528 663 304.59	35 675 442 410.10
VIII NET RESULT OF ORDINARY ACTIVITIES	**17 814 057 644.60**	**6 835 037 964.64**
Extraordinary income (to be precised)	0	0
Extraordinary charges (to be precised)	0	0
IX EXTRAORDINARY RESULT	**0**	**0**
X NET RESULT of THE FINANCIAL YEAR	**17 814 057 644.60**	**6 835 037 964.64**

Financial conditions of SPAT in 2008 based on the balance sheet and income statements are analyzed below.

A balance sheet shows the assets and capital. Comparing the SPAT's balance sheet for 2007 and 2008, it can be seemed that assets increased in 2008. This was due to increased profits through increased cargo handling volumes and increased capital investment. SPAT's main investments in 2008 were the purchase of one tugboat of 60t grade and one surveillance ship. The financing for these investments was in the loan from a city bank.

In income statements, profit (or loss) is calculated by subtracting expenses from the annual revenue. The profit of SPAT increased in 2008 are to the increase in handling volumes, increase of fixed fee from the concession with MICTSL are the decrease in personnel expenses as a result of organization.

Accordingly, it seems that SPAT's recent financial conditions are good. In addition, as the future demand is forecast to increase, a sound financial condition should be able to maintain even if the tariff structure is not greatly revised.

8-4-4 Port charges

SPAT sets and collects port charges except container handling-related fees. MICTSL handles the container handling-related fees.

The Port charge is shown in Table 8-4-7.

Table 8-4-7 Port charges

Port Dues		Inland vessel	Ocean vessel
Harbor charge	V＜3,000m3	1.833	3.483
	3,000m3≦V＜9,000m3	0.470Euro/100m3	0.893Euro/100m3
	V≧9,000m3	0.740Euro/100m3	1.405Euro/100m3
Pilotage	Entrance/Leave	0.537Euro/100m3	1.523Euro/100m3
Tug hire	V＜5,000m3	2.187Euro/100m3	4.154Euro/100m3
	V≧5,000m3	2.284Euro/100m3	5.363Euro/100m3
Line Handling	Freight ship	0.537Euro/100m3	1.021Euro/100m3
	Tanker	0.807Euro/100m3	1.523Euro/100m3
Dockage	General pier	0.033/m/hour	0.063/m/hour
	Special pier	0.048/m/hour	0.091/m/hour

※V=(LHT)×(lht)×TEE
V : Volume of vessel
LHT : Length of vessel
lht : Wedth of vessel
TEE : Summer load draft

The Tariff related to container cargo is shown in Table 8-4-8.

Table 8-4-8 Tariff related to container cargo

Unit : Euro

Container				Fare
Cargo handling charge	Inport	20 ft	Full	105.66
		40 ft	Full	178.59
		20 ft	Empty	27.33
		40 ft	Empty	44.06
	Export	20 ft	Full	105.66
		40 ft	Full	178.59
		20 ft	Empty	27.33
		40 ft	Empty	44.06
	Transspment	20 ft	Full	128.22
		40 ft	Full	219.11
		20 ft	Empty	13.67
		40 ft	Empty	22.03

Unit : Ariary

Receipt / Delivery		20 ft		5,937,000
		40 ft		10,865,000
		20 ft	Empty	3,069,000
		40 ft	Empty	5,855,000
Storage fee	Inport	8 days ～ 25 days		1,276,000
		26 days ～ 40 days		2,828,000
		41 days ～		5,658,000
	Export	5 days ～		1,276,000

The Tariff related to general cargo is shown in Table 8-4-9.

Table 8-4-9 Tariff related to general cargo

UNLOADING – LOADING	
– Conditioned goods	
Category of goods	
1 – goods in big–bags	5,15 Euros
2 – pre slung cargo	5,4 Euros
3 – goods in bag	7,67 Euros
4 – goods in bale	7,67 Euros
5 – goods on pallets	7,67 Euros
6 – iron loads	7 Euros
7 – goods in barrels (not including cans and small casks)	10 Euros
8 – goods in box	12 Euros
9 – goods in carton	12 Euros
10 – litchis in pallets	12,5 Euros
– Uncovered vehicles	
a) – Uncovered vehicles on pneumatic wheels	
– The handling of the vehicles in RORO is taxed with the automobile license unity, according to the following rates:	
Weights lower than 1 000 kg	92 Euros
Weight between 1001 kg and 2000 kg	154 Euros
Weight between 2 001 and 4 000 kg	245 Euros
Weight between 4 001 and 6.000 kg	305 Euros
Weight between 6001 kg and 10 000 kg	483 Euros
Weight higher than 10 000 kg	600 Euros
b) – uncovered vehicles on caterpillar or metallic wheel	
The tariffs to be applied are:	
– Volume Ratio/Weight lower or equal to 5	11 Euros per ton
– Volume Ratio/Weight higher than 5	22 Euros per ton

8-5 Société de Manutention des Marchandises Conventionnelles (SMMC)

8-5-1 Legal framework

SMMC is company which carries out cargo handling and storage with the exception of containerized cargo. The company established in July 2008.

- The law n° 2003-025 of September 5th, 2003 concerning the ports statutes, .
- The decree n° 2004-699 of July 13th, 2004, on application of the above mentioned law, .
- The decree n° 2004-702 of July 14th, 2004, classifying the port of Toamasina as port of national interest with autonomous management, .
- The decree n° 2007-867 of October 4th, 2007, relating to the creation of the Society of Handling of the Conventional Goods and approving its statutes.

8-5-2 Organization of SMMC

In recent years the number of employees of SMMC has been decreasing. In January 2008, SMMC employed 591 people.

The organization is shown in Figure 8-5-1.

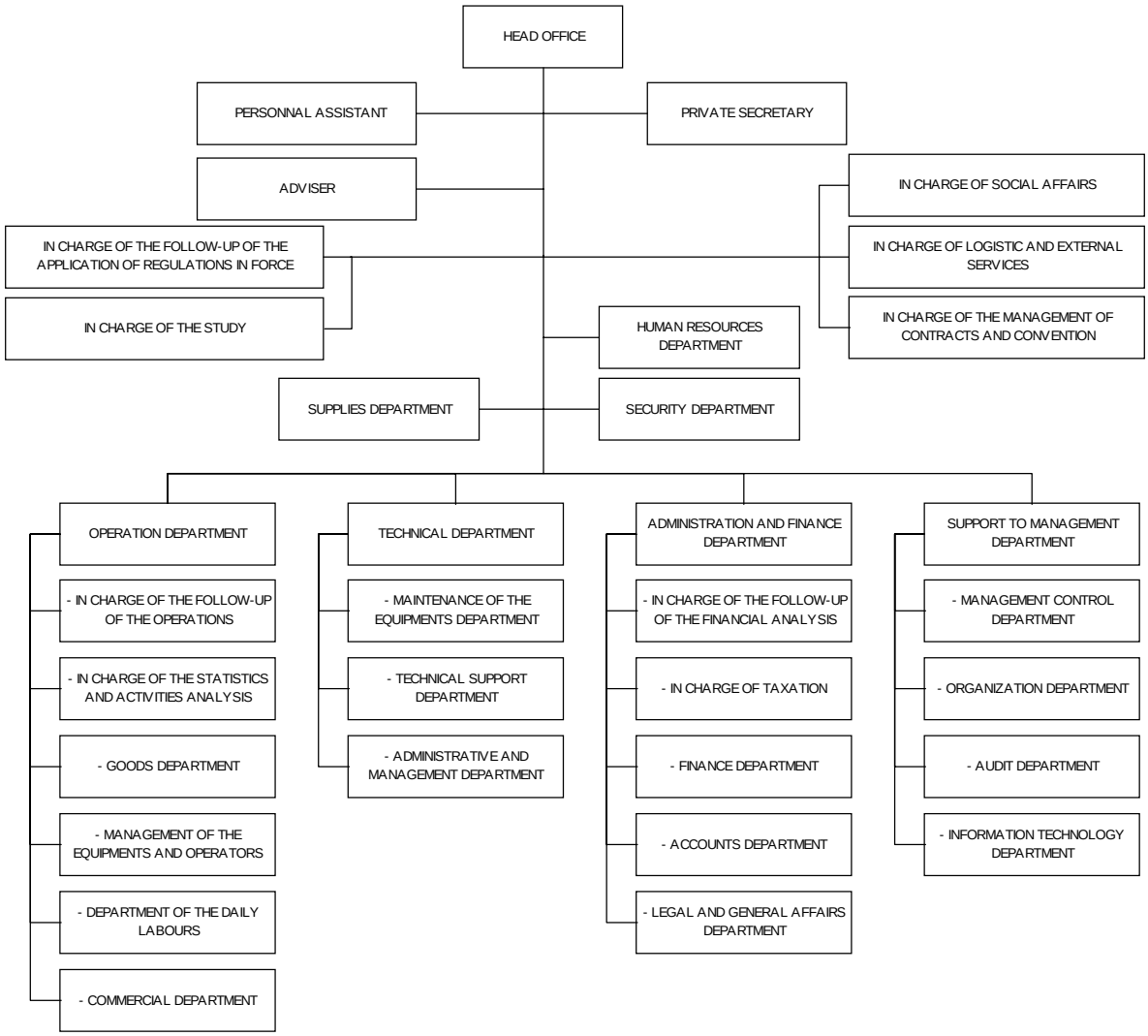


Figure 8-5-1 Organization chart of SMMC

8-5-3 Service

Generally speaking, these services can be grouped into two categories:

- services on the conventional goods;
- and other services.

Work hours

The SMMC exploitation sector works daily in shift:

1st shift : from 6 a.m. to 2 p.m.
2nd shift : from 2 p.m. to 10 p.m.
3rd shift : from 10 p.m. to 6 o'clock in the morning the following day.

Work classification of SPAT and SMMC is shown in Table 8-5-1.

Table 8-5-1 Work classification of SPAT and SMMC

		DISTRIBUTION OF THE ACTIVITIES OF THE PORT		
MAIN SERVICE		SPAT	SMMC	ADMINISTRA
1	ASSISTANCE TO NAVIGATION	X		
2	CHANNEL Of ACCESS (NAUTICAL ACCESSES, BEACONS AND LIGHTHOUSE)	X		
3	OFF ZONE PILOTING	X		
4	PILOTINGS IN OBLIGATORY AREA	X		
5	TOWING	X		
6	MOORING (MOORAGE/UNMOORAGE)	X		
7	BERTH	X		
8	BOARDING (for inspection)	X		X
9	OPENING/CLOSING OF THE SLIPWAY		X	
10	UNSTOWING/STOWING		X	
10	TRANSFER OF RESPONSIBILITY		X	
12	HANDLING ON BOARD		X	
13	SHIP TO SHORE/TAKING OFFLAND OPERATION		X	
14	HANDLING ON LAND		X	
15	TRANSPORT TO/FROM THE STOCKHOUSE		X	
16	STORAGE AND SECURITY		X	
17	DELIVERY/RECEPTION		X	X
OTHER SERVICE SUPPLIED TO SHIP				
1	BEACONS AND LIGHTHOUSES	X		
2	RADIO	X		
3	SECURITY VIGIL	X		
4	SUPPLY OF WATER	X		
5	TRANSPORT BY LAUNCH	X		
6	HIRING OF THE FLOATING MATERIALS	X		
7	REPAIR AND SPOT OF RUSTS	X		
8	FIGHT AGAINST FIRE	X		
9	COLLECTION OF REFUSES	X		
10	HIRING OF LIFTING MATERIALS	X	X	
OTHER SERVICES PROVIDED FOR GOODS				
1	TEMPORARY STORING	X	X	
2	SECURITY	X	X	
3	WEIGHING	X	X	
4	RECONDITIONING		X	
5	HIRING OF THE LIFTING MATERIALS	X	X	
6	STUFFING		X	
7	STRIPPING		X	
8	PRESELECTION AND WASHING OF CONTAINERS		X	
9	HIRING OF STOCKYARDS AND STORAGE AREA	X		
10	CONTAINERS BRANCH	X	X	
11	HIRING OF THE MANPOWER		X	
12	HIRING OF OTHER ROLLING STOCKS	X	X	

Concession fee with SPAT is shown in Table 8-5-2

Table 8-5-2 Concession fee with SPAT

SMMC	EUR 36.8 ／ 20 t

The Tariff related to container cargo by SMMC is shown in Table 8-5-3.

Table 8-5-3 Tariff related to container cargo by SMMC

SERVICES ON CONTAINERIZED GOODS	
Loading and unloading	
- Full Container 20'	66 000 Ariary/Box
- Full Container 40'	90 000 Ariary/box
- empty Container 20'	25 000 Ariary/Box
- empty Container 40'	35 000 Ariary/Box
Transfer (wheel barrowing)	
a) Inside the Port:	
- Full Container 20'	55 000 Ariary/Box
- Full Container 40'	80 000 Ariary/Box
- empty Container 20'	35 000 Ariary/Box
- empty Container 40'	65 000 Ariary/Box
b) into town:	
- Full Container 20'	137 500 Ariary/Box
- Full Container 40'	182 600 Ariary/Box
- Empty Container 20'	60 000 Ariary/Box
- empty Container 40'	80 000 Ariary/Box

8-6 Madagascar International Container Terminal Services Ltd.(MICTSL)

MICTSL is local company of International Container Terminal Services Inc. (ICTSI) of the Philippines which operates 11 container terminals throughout the world at present.

SPAT concluded a concession contract with MICTSL for the container business of Toamasina port in June 2005. Main details are as follows:

8-6-1 Process of concession

(1) Progress of bid

2004.11 16 Expressions of Interest (November 2004)
2005. 1 4 consortia pre-qualified (January 2005)
ICTSI, Maersk A.P. Moeller, Hutchinson Whampoa Ltd, and Malta Freeport Terminals Ltd
2005. 5 Commercial bid (May 2005)
Four consortia presented offers
ICTSI, Maersk A.P. Moeller, Hutchinson Whampoa Ltd, and Malta Freeport Terminals Ltd
2005. 6 Concession Award (June 2005):ICTSI

- Contract term: 20 years (from 2005 to 2025)
- Contract quay: C2(Length; 135m, Water depth; 10m),
- C3(Length; 172m, Water depth; 12m), Total; 307m
- Exclusivity of container terminal operations (up to a certain level of containerized cargo traffic 400,000 TEU)
- Payment of the rental fee (fixed and variable fee is paid to SPAT).
- Obligation to keep 350 employees for 5 years

(2) Concession fee

Concession fee consists of it by Fixed Fees and Variable Fees. Concession fee with SPAT shown in Table 8-6-1, Table 8-6-2.

1) Fixed Fees

TAC: In compliance with the agreed amounts as stipulated in the Concession Convention in Euro. Specifically, the annual amounts liable to TAC are as follows.

Table 8-6-1 TAC Concession Fees Payable

Periods	Concession Fees
2005 − 2007	Euro 1.0 million
2008 − 2010	Euro 1.5 million
2011 − 2015	Euro 2.0 million
2016 − 2025	Euro 2.5 million

2) Variable Fees

Variable fees are respectively set forth for TAC as follows.

Table 8-6-2 Variable Concession fees

TAC	EUR 36.8 /TEU

8-6-2 Organization of MICTSL

The organization is shown in Figure 8-6-1.

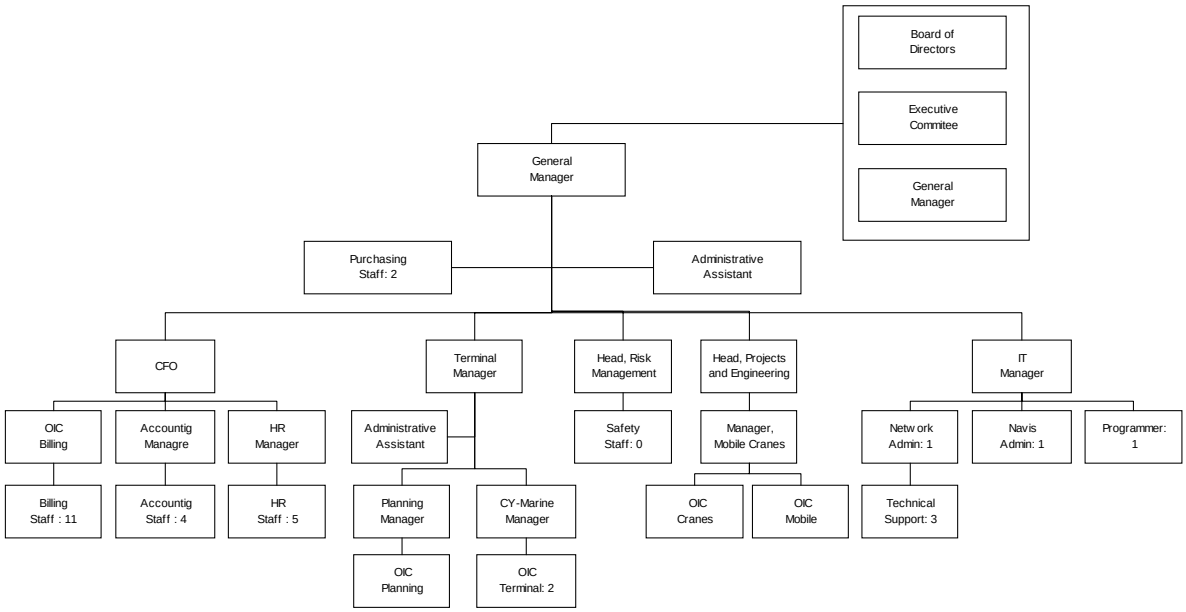


Figure 8-6-1 Organization chart of MICTSL

There is 462 staff in total, among them, 350 staff initially taken over from port authority. Operations are covered by 398 staff.

8-6-3 Terminal Management

(1) Standard Gang Composition for Ships Operation

Standard Gang Composition for Ships Operation is shown in Table 8-6-3.

Table 8-6-3 Standard Gang Composition for Ships Operation

Kind of Equipment	Driver per Shift	Remarks
Harbor Crane	1 Unit/5Drives	For ships Operation
Signal Man	1 man	For ships Operation
Yard Equipment		
RTGs (Transfer Crane)	1 Unit / 6 Drivers	Laden Boxes Operation
Reach Stacker (for Empty)	1 Unit /3 Drivers	Empty Boxes Operation
Tractor & Trailer	1 Unit /2 Drivers	For ships Operation
Lashing Labor	n/a	For on deck stow containers
Tally Clerk	n/a	Checking Container No.

(2) Gang Working Schedule

Gang Working Schedule is shown in Table 8-6-4.

Table 8-6-4 Gang Working Schedule

Shift	First Shift	Second Shift	Third Shift
Working time	06:00 ~ 14:00	14:00 ~ 22:00	22:00 ~ 06:00
Meal Time	Non	Non	Non
Tea Break Time	Non	Non	Non

(3) Number of Terminal Staff

Office Workers	70 Persons
Terminal workers	398 Persons

(4) Workers Employment Condition:

Direct Employment:	Key labors (Terminal Equipment operator)
Daily Hired (Union members):	6 labors

(5) Payment System of Employer:

All members for monthly payment system

Management	EUR700/person/Month
Skilled Engineer/Operater	EUR385/person/ Month
General Staff/Labor	EUR182/person/ Month

(6) Container Handling Productivity (Per monthly on June 2009)

Container Handling Productivity is shown in Table 8-6-5.

Table 8-6-5 Container Handling Productivity (Per monthly on June 2009)

Equipment	Average Productivity per hour
Harbor Crane	15 Containers per hour
Ships Self Gear	8 containers per hour

(7) Container and Cargo handling Equipment

Container and Cargo handling Equipment is shown in Table 8-6-6.

Table 8-6-6 Container and Cargo handling Equipment

Kind of Equipment	No. of Unit	Capacity	Owner & Maker
Harbor Crane	2 Units	100 tons	MICTSL, Gottwald
Harbor Crane	1 Unit	120 tons	MICTSL, Gottwald
RTG (Transfer Crane)	4 Units	40 tons	MICTSL, NOELL
Reach Stacker (Laden)	3 Units	45 tons	MICTSL, KALMAR
Reach Stacker (Laden)	2 Units	45 tons	MICTSL, FANTUZZI
Reach Stacker (Empty)	2 Units	15 tons	MICTSL, KALMAR
Fork Lift Truck	3 Unit	Various	MICTSL, KALMAR
Tractor Head	19 Units	Various	MICTSL, OTTAWA & KALMAR
Trailer/Chassis	21 Unit	20'/40'Comb	MICTSL, HANJIN

(8) Container Terminal Operation Computer System

MICTSL is using NAVIS SPARCS terminal operating system、and this ready made software is covering ships planning, yard planning and gate container movement.

MICTSL development its own software for billing and accounting system and gate validation.

8-7 Current Issues and Problems at Toamasina Port

The current management and operation system at Toamasina Port is not sufficient. Areas where improvement is necessary are identified as follows:

(1) Harbor statistics

Statistics of port freight such as containerized cargo, general cargo handled in Toamasina port are available. However, since these statistics are collected individually by APMF, SPAT, SMMC, MICTSL, they are not unified and there are discrepancies in cargo handling data.

(2) Staff constitution of SPAT

As one of the port reform plans SPAT is slimming the organization by personnel reduction. The number of staff by 2013 including SPAT, SMMC, is going to become around 670 people. The 50's generation holds 68% by staff constitution, there will be sudden staff decrease after there retirement in 5-10 years. On the other hand, the proportion of the 20's-30's generations, and 40’s are 6%, 26% respectively. The maintenance / reinforcement of the organization will be issue after the decrease in staff number.

(3) Deterioration of the port facilities

The port facilities which SPAT manages include berth, yard and warehouse. In these facilities, periodical facilities check and repair are not performed enough since it is built. There are a lot of deterioration / damage facilities. These are used routinely, dent of a berth apron, damage of a fender bar influence, particular safety / work efficiency of handling. These facilities should be repaired immediately.

(4) The narrow yard space in the terminal

In the site of a terminal, there are still many warehouses that are used for storage of general cargo. However, due to the advance in containerization, the uses of these facilities are becoming less frequent. With increase of containerized cargo, it will seem that, the use of these facilities will further decrease in future.

(5) Various port procedures

According to the cargo demand forecast of this study, the volume of containerized cargo is expected to increase around three to four times in 2020 from present levels. Various harbor procedures related to the import and export of container will also increase equally, too. Although there are no major problems now, with the rapid increase of future containerized cargo, port procedures such as gate management and customs may become a bottleneck.

8-8 Improvement Measures on Port Management and Operation

(1) Improvement of port statistics

Port statistics are very important for conducting a port demand forecast. In addition, the statistics serve basic data for the port corporate strategy in the future. Therefore, the parties concerned should share and collect data using a standard format to ensure the port statistics are accurate.

(2) Recruitment of staff and improvement of staff capacity

SPAT employs the staff regularly in order to groom younger staff that will eventually be responsible for the management of Toamasina port in future. Furthermore, it is important that the present capacity of the port be maintain even if the number of employees decrease. Therefore, carrying out the training by OJT (On the Job Training) to plan ability improvement of staff each one. In addition, a technical staff is under 1% the present conditions, SPAT employs a technical staff, and the succession of port technology in Toamasina port is important.

1) Recruitment of staff

In the next 5-10 years, many of SPAT's current staff will reach retirement age. Accordingly, SPAT periodically recruits staff who will become key players in the management and operation of the port in future. With the port reform initiative, a staff of about 670 persons is thought reasonable. There is a shortage of technical skilled staff as stated above. It is rare for management of a harbor to perform business in administering it directly, but because there are technical experience and knowledge with the mask of supervisors of a practitioner, it depends, and effective harbor management administration is enabled. On this account, recruiting staff more technical staff will be required in order to introduce technology to Toamasina port.

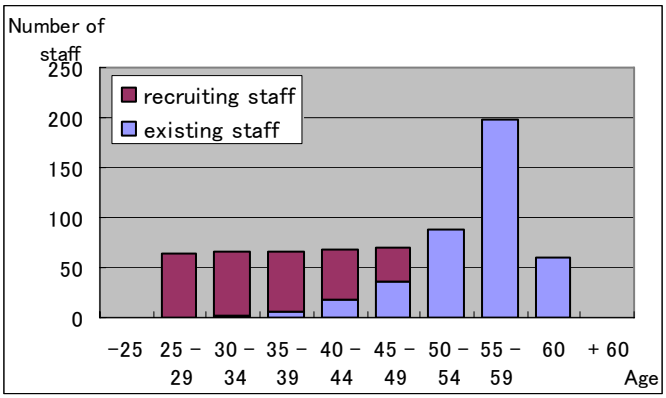


Figure 8-8-1 Number of staff by age classification (5 years later)

2) Improvement of staffs capacity

SPAT maintains a fall of capacity for organization by decrease of the number of the staffs by ability improvement of staff each one. On this account SPAT carries out the training by OJT and plans ability improvement of the staff. OJT improves necessary ability through a duty to the staff.

Therefore, OJT grasps something with ability found for the duties, and it is necessary to grasp a gap with staff ability. On this account SPAT turn a PDCA cycle premeditatedly, and to improve ability of the staff surely.

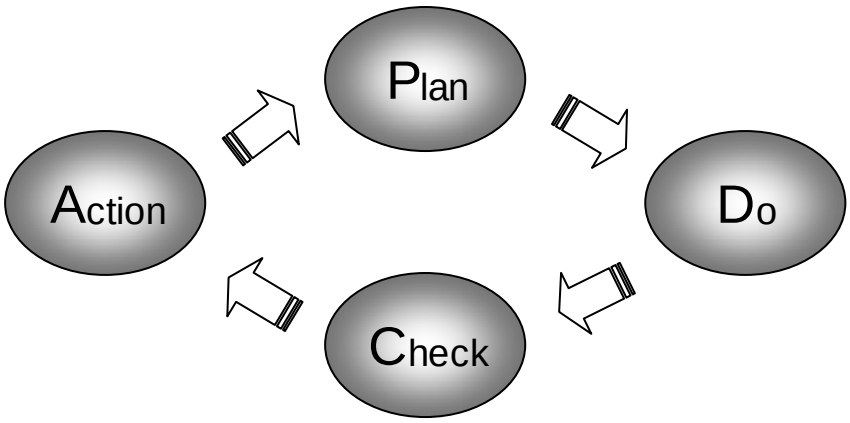


Figure 8-8-2 PDCA cycle of OJT

(3) Establishment of a maintenance system of the port facilities

By periodically checking and repair in port facilities, the working life of facilities can be deled and the life cycle cost reduces in audition, operations will become more reliable and safer. Towering

introduction of such a facilities management technique, SPAT showed keep records of maintenance checks and repair as well as cost.

(4) Effective use of terminal space

SPAT plans to demolish old warehouse and convert the area into a container yard. It is necessary to draft an appropriate usage plan that solves the problem of narrow yard are makes if possible to cope with the expected future demand

(5) Improvement of efficiency of various port procedures

SPAT is thing to improve the efficiency of various port procedures port entry and departure, customer as simplification and standardization. Furthermore, SPAT will introduce an electronic processing system to ease uses burden.

(6) Improvement of website

To publicize in Toamasina port's advantageous location on the international shipping route, SPAT has created a homepage on the Internet. SPAT perform reporting such as harbor facilities summary, ship call at a port conditions positively. At present, only French is used but SPAT plus to add an English version to reach more potential users.

8-9 Port management plan and a maintenance plan

8-9-1 Port management plan

SPAT manages Toamasina port. MICTSL operates the container terminal under a concession contract. While SMMC runs the general cargo terminal, also by concession contract.

MICTSL is a local corporation of a world-famous operator (ICTSL) based in the Philippines. The company has been running the container terminal since 2005. The company finished the investment necessary for operations and has shown good results. The company has the right to handle up to 400,000TEU until 2025.

The company has top priority negotiating rights as an operator when the project is carried out. This project's most important point is handling by increase of containerized cargo, but it seems that MICTSL has sufficient capability to lope with it. In addition, MICTSL is eager to participate.

Following the organizational reform in 2005, SPAT functioned as the landlord and port master of Toamasina port in what was very slim organization. SPAT bid on the concession in 2005 using funds of the International Finance Corporation. It is desirable the SPAT employs a consultant for this project or for it to be given an opportunity to acquire the know-how of concession contracts through the technical cooperation of JICA.

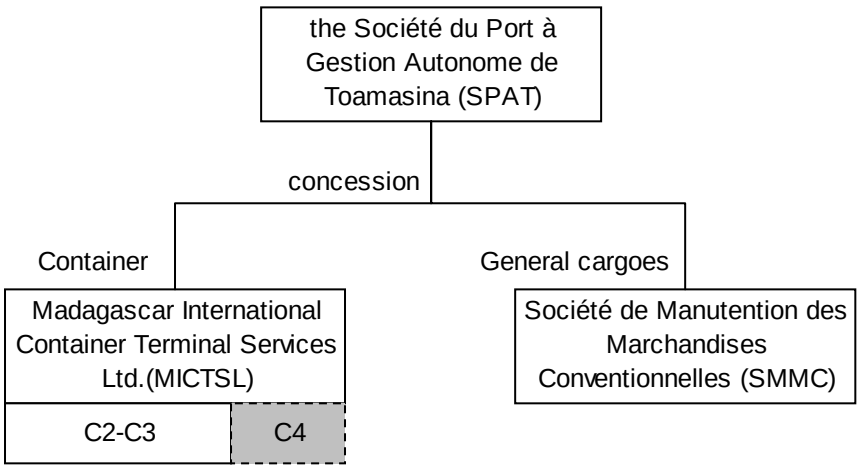


Figure 8-9-1 Interrelation of port-related organizations (3)

8-9-2 Maintenance plan

SPAT is responsible for the breakwater, quay, sea area of sea and beacons. If port facilities are not checked / repaired adequately, performance deteriorates. Furthermore, large-scale repairs are necessary. The cost of large-scale repairs can be similar in scale to the original construction costs.

On the other hand, it is not economical to perform passive checks and repairs. Therefore it is important in drafting a maintenance plan to seek a balance between cost and effectiveness.

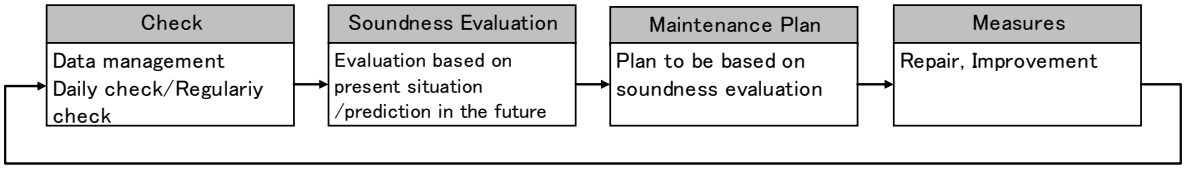


Figure 8-9-2 Maintenance plan of the port facilities

As for the cost that is necessary for maintenance, it is desirable to allocate a budget of 1.7 million euros every year which is around 1% of the construction cost. SPAT has to check the port facilities regularly. SPAT are improve the reliability / safety of facilities by this maintenance plan rationalize facilities management, and reduce the life cycle cost of facilities.

Figure 8-9-3 Damaged condition of the port facilities

Chapter 9. Viability of the Project

Viability of the project, i.e. Economic Analysis and Financial Analysis, is analyzed based on the Urgent Development Plan described in Chapter 4 Port Planning.

9-1 Economic Analysis

9-1-1 Method of Economic Analysis

The economic analysis is a method to quantify the effect of public investment in view of national economic benefit. In the analysis, future situation identified as "Without Project Case" is assumed which is the case that the concerned project would not be achieved. The national benefit is calculated based on the comparison between the "With Project Case" and the "Without Project Case". All benefits and costs in market price are converted to the economic price in order to eliminate distortion due to political economic factors such as import duty or government subsidy, etc. The feasibility of the project is evaluated with the calculated Economic Internal Rate of Return (EIRR). The procedure of economic analysis is shown in the following Figure.

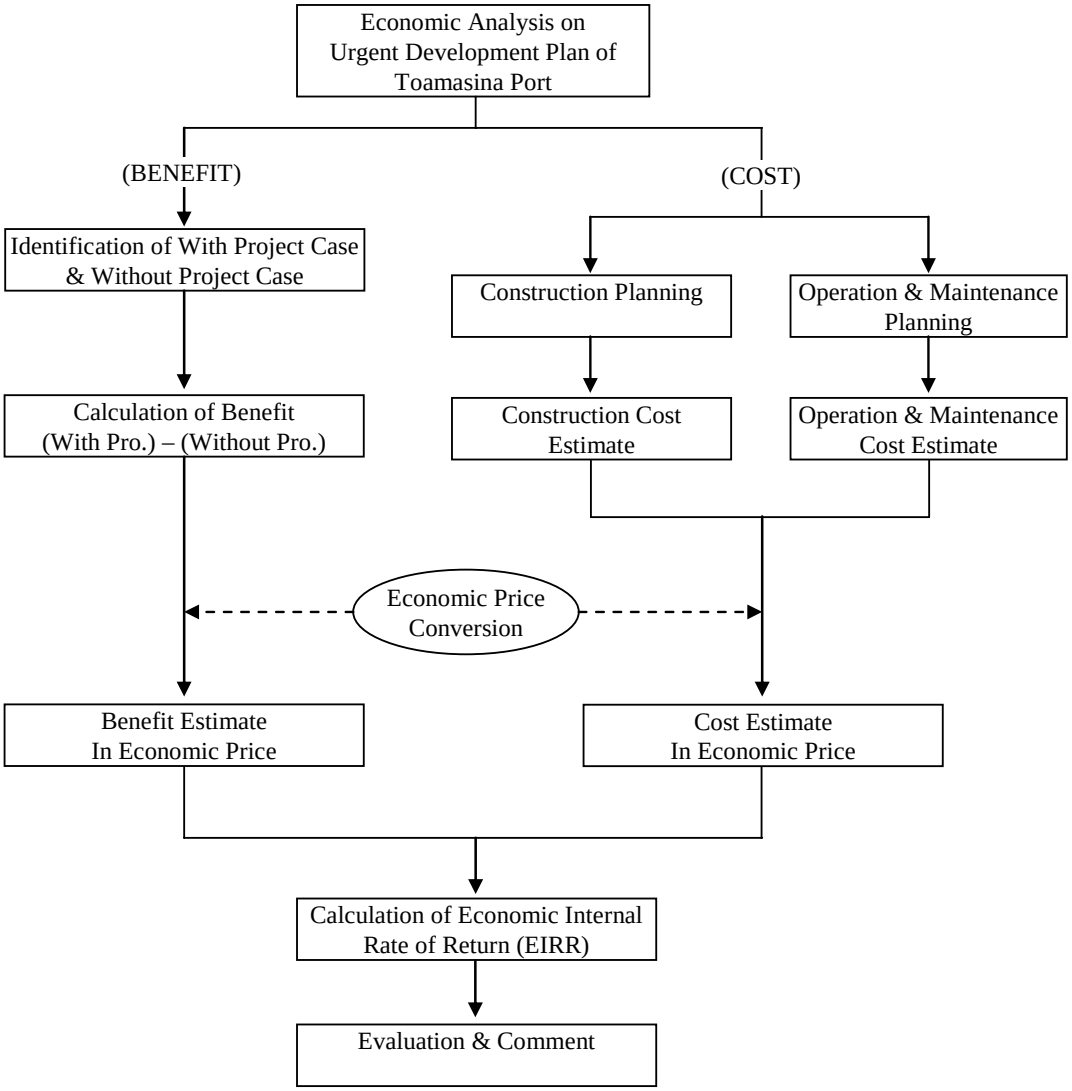


Figure 9-1-1 Flowchart of Economic Analysis

9-1-2 Project Life and Exchange Rate

(1) Project Life Period:

The project life period of this analysis is assumed for 35 years.

(2) Exchange Rate of Foreign Currency

Exchange rate of foreign currency is assumed as,

1 EUR = 132.789 JPY
1 EUR = 1.43 USD
1 EUR = 2,700 MGA

9-1-3 Cargo Demand Forecast

The cargo demand forecast is shown below. Economic analysis is base on this forecast particularly on the figures of 2020.

Table 9-1-1 Result of Cargo Demand Forecast

Item			Unit	Present Figure		Growth Rate (%)	Forecast	
				Throughput	(Year)		2015	2020
Congtainer Cargo			TEU	143,307	(2008)	10%	264,562	426,079
Bulk & General Cargo	Conventional Cargo		TON	566,148	(2007)	3%	848,535	983,685
	New Project	Ambatovy Pro.	TON	—	—	—	3,100,000	3,100,000
		Oji Paper Pro.	TON	—	—	—	—	201,600
	(Subtotal)		TON	(566,148)	(2007)	—	(3,948,535)	(4,285,285)
Liquid Cargo			TON	621,923		2%	728,682	804,524

9-1-4 Identification of "With Project Case" and "Without Project Case"

As projected in demand forecast study, annual growth rate of container is 10% which is higher than the other cargos. On the other hand, the capacity of present container terminal is estimated at 200,000 TEU. If the current growth will remain in future, cargo demand will reach the terminal capacity by 2012. For the identification of "With/Without Project Case", container cargo handling is focused.

Figure 9-1-2 shows the projected curve of container throughput until 2020 in unit of TEU. "With Project Case" is assumed that the construction of the Urgent Development Project will commence in 2013 and will complete in 2017. Considering the terminal capacity is limited mainly by small marshaling yard space, construction works will be started from widening of yard so that terminal capacity should increase before completion of the works. After completion, terminal capacity is estimated to increase 450,000TEU which covers the projected demand.

As for "Without Project Case", cargo volume over 200,000 TEU shall be handled in second-best alternative method.

As shown in the Figure, transshipment cargo might be surplus on the conventional cargo. Although the transshipment business may create some benefit to Madagascar, such surplus is neglected in this analysis because it contains much unknown factors.

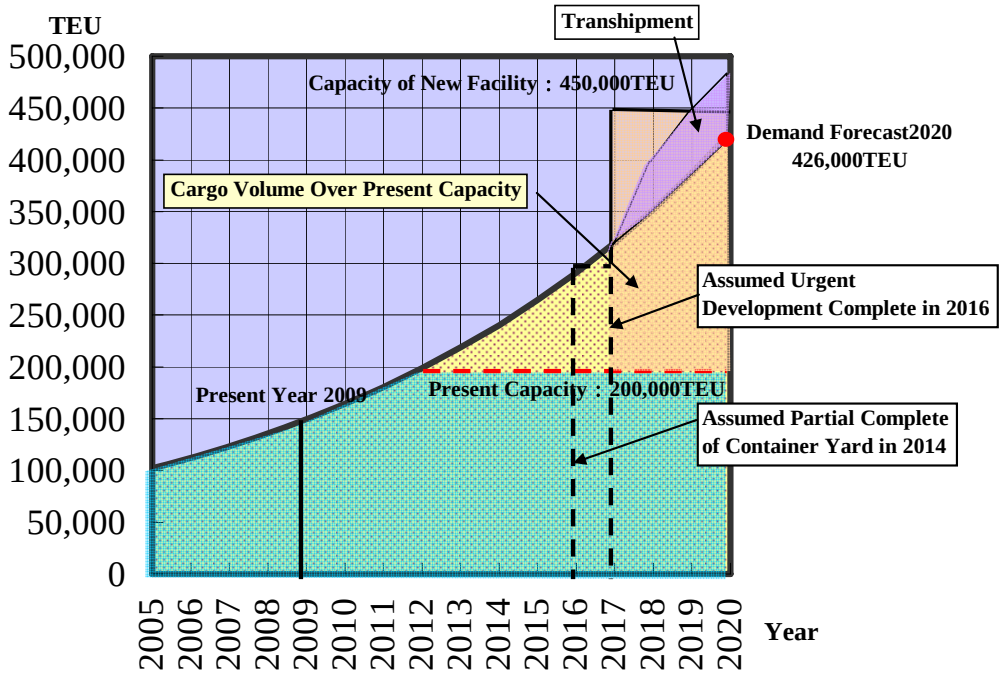


Figure 9-1-2 Conceptual Demand & Capacity Curve

Through discussions in the study team, the following two alternative methods are recognized.

(1) Use of other national ports to handle surplus cargos
(2) Use of smaller draft vessels or barges to handle surplus cargos at Mall A, B or other shallow shores near the port.

This report proposes to take (2) as a conclusion of identification of “Without Project Case”. Reason and comments are described as follows.

(1) Use of Other National Ports

Out of Toamasina port, there are 4 ports which might be able to handle container cargo. The following Figure shows the locations of these ports. Because the water depth of these ports are shallower than Toamasina, some smaller ships will have do be employed. Assuming Toamasina port will have full capacity in future, other overseas transshipment ports will be required for re-loading cargo from larger ships to small ships. Port Louis (Mauritius) might be suitable for the transshipment considering nearest location and current container ships' regular lines distribution.

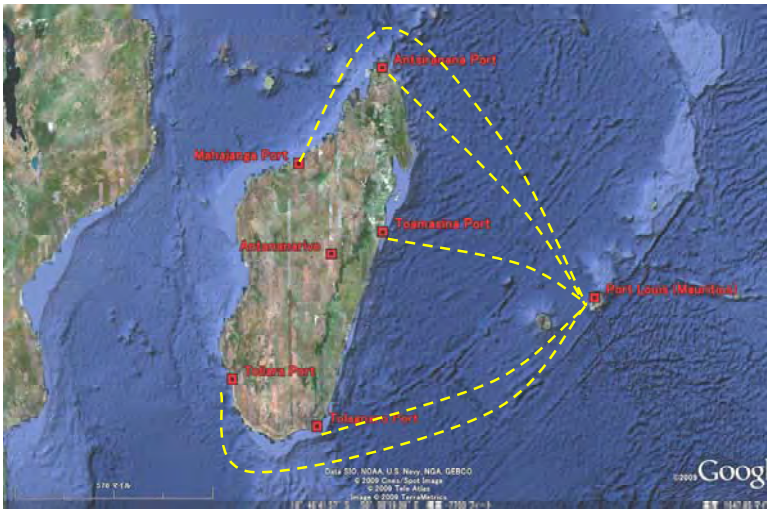


Figure 9-1-3 Conceptual Map for Port Louis Transshipment Routes

The recent container cargo throughput of these four ports ana Toamasina port are shown in the following Table. These Figures show cargo handling voleme of other ports are approximately 5,000 ~ 10,000 TEU for each. Tolagnaro port is newly developped for Lio-Tinto mine dovelopment project, where berth and facilities will open operation in 2009.

Table 9-1-2 Container Throuthput of Other Ports in Madagascar (unit in TEU)

	2003	2004	2005	2006	2007
Antsiranana Port	6,602	7,510	7,264	5,753	4,719
Mahajanga Port	12,416	10,669	9,232	10,472	10,720
Toamasina Port	94,847	102,306	116,615	92,529	112,425
Toliara Port	4,833	6,804	4,251	2,102	2,711
Tolagnaro Port	1,259	1,737	678	39	227

Figure 9-1-4 shows the density of population and road maps of Madagascar. From the density map, it is noticed that the areas of high population density are mainly located in the center of the island, which is closed to the capiltal Antananarivo. If it is assumed that overflowed cargo of Toamasina will be covered by these local ports, most of cargo will have to be transported by trucks/trailors between these ports and capital regeon.

From the road map, locations of local ports are far from capital regeon. In addition, only two ports ; Mahajanga and Toliara, have access to the Antananarivo for all seasons. The roads from Antsiranana and Tolagnaro have parts which allow traffics only in dry season. Table 9-1-3 shows distances between Antananarivo and each local ports.

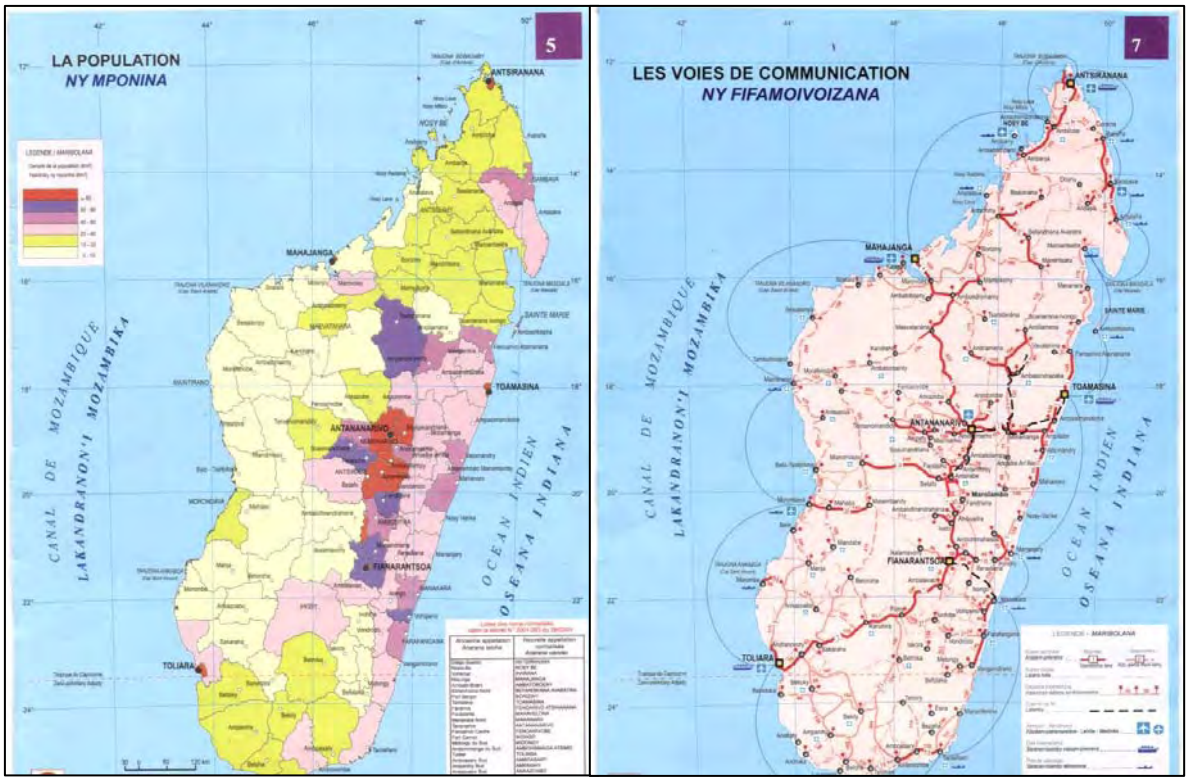


Figure 9-1-4 Maps of Density of Population and Road Networks

Table 9-1-3 Distances between Ports and Antananarivo

	Distance to Antananarivo (km)	Ratio vie Toamasina =1.0
Antsiranana Port	1,110	2.6
Mahajanga Port	550	1.3
Toamasina Port	420	1.0
Toliara Port	920	2.2
Tolagnaro Port	1,210	2.9

The alternative method to use other national port is not realistic from the following reasons.

1) The container handling volumes in other ports are much smaller than Toamsina port. Assuming approximately 20,000 TEU will be alocated to each port, which is loughly doubled figure of current throughput, only 80,000 TEU will be covered. Compared with overflowing volume at Toamasina port will be approximately 236,000 TEU, capacities of other local ports will be much smaller than the requirement.

2) Taking into account the access roads conditions from other local ports to capital region, Antsiranana and Talagnaro ports have only seasonal road on the way to Antananarivo. In addition, four ports are located far from the capital.

(2) Use of Smaller Draft Vessels or Barges to Receive Cargoes by Toamasina Port

In this case, the smaller draft vessels are used for surplus container cargo transportation. Figure 9-1-5 and 9-1-6 shows the comparison images of With Project Case and Without Project Case. In the With Project Case, all container vessels will be able to use newly constructed quay-wall C4 exclusively. On the other hand, smaller draft vessels which carry surplus containers have to dock Mole A, Mole B and C whenever they are available in Without Project Case.

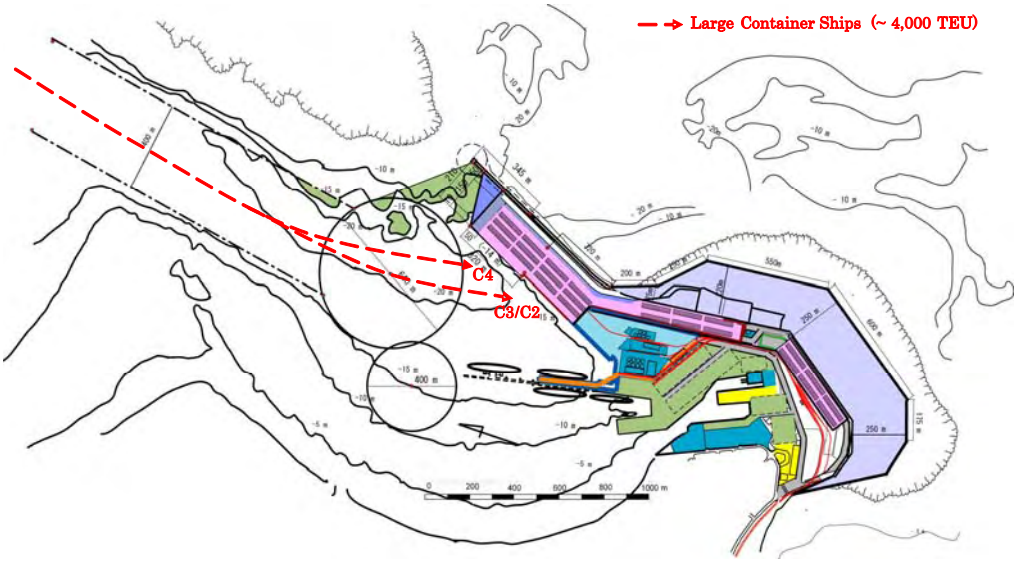


Figure 9-1-5 Container Vessels Docking Points for With Project Case

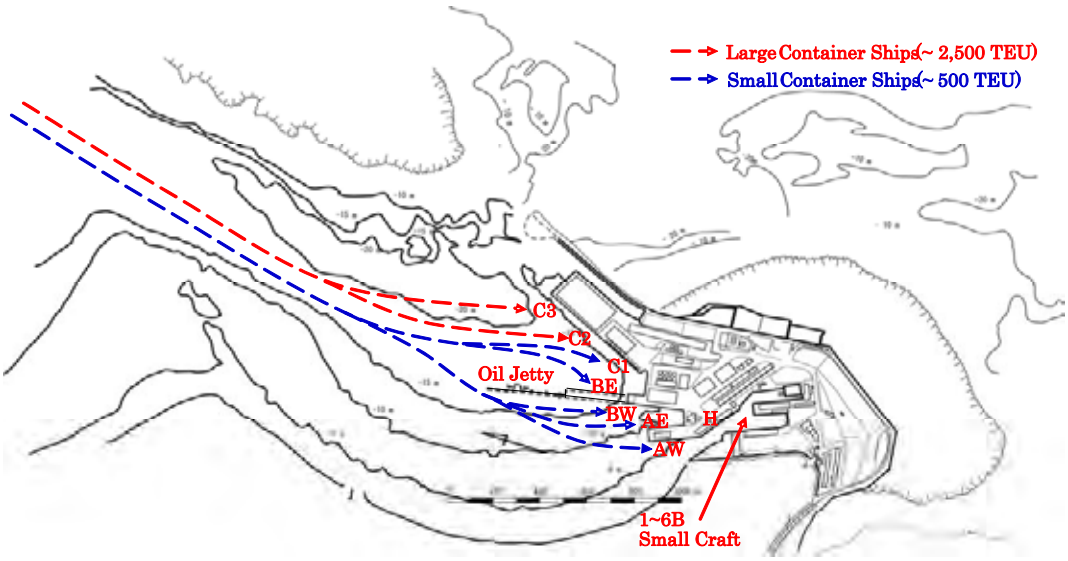


Figure 9-1-6 Container Vessels Docking Points for Without Project Case

Figure 9-1-7 shows the image of change in vessel sizes for the "With Project Case" in 2020. At present, maximum size of container carrier is 2,500 TEU where average size in 2007 was about 1,200 TEU. When the Urgent Development Project will be achieved, maximum vessel size will be nearly 4,000 TEU where average is estimated around 3,000 TEU.

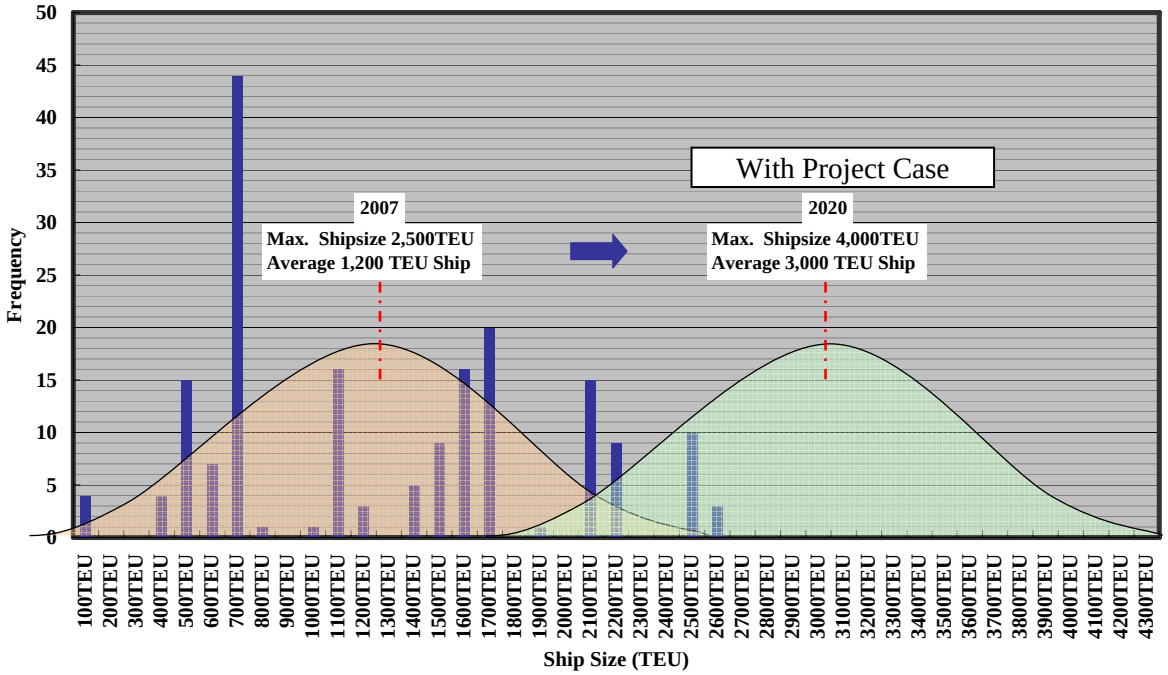


Figure 9-1-7 Shipcalls of Container Loaded Vessels of Toamasina Port and Future Trend of Ship Size (2007)

Figure 9-1-8 shows the relationship between ship sizes and their fully loaded drafts. As shown the Figure, the most of containers are carried by the full container ships but some are carried by general cargo ships which have smaller drafts. In “Without Project Case”, it is assumed that these smaller vessels will be chartered to carry surplus containers using the transshipment service at Port Louis in Mauritius. These smaller vessels will be able to dock not only at Mole C but also Mole A or Mole B because of their shallower drafts. The carrying capacities of these vessels are assumed at 500 TEU from the same Figure.

For reference, the length and depth of each quaywall is shown in Table 9-1-4, and their locations are shown in Figure 9-1-9.

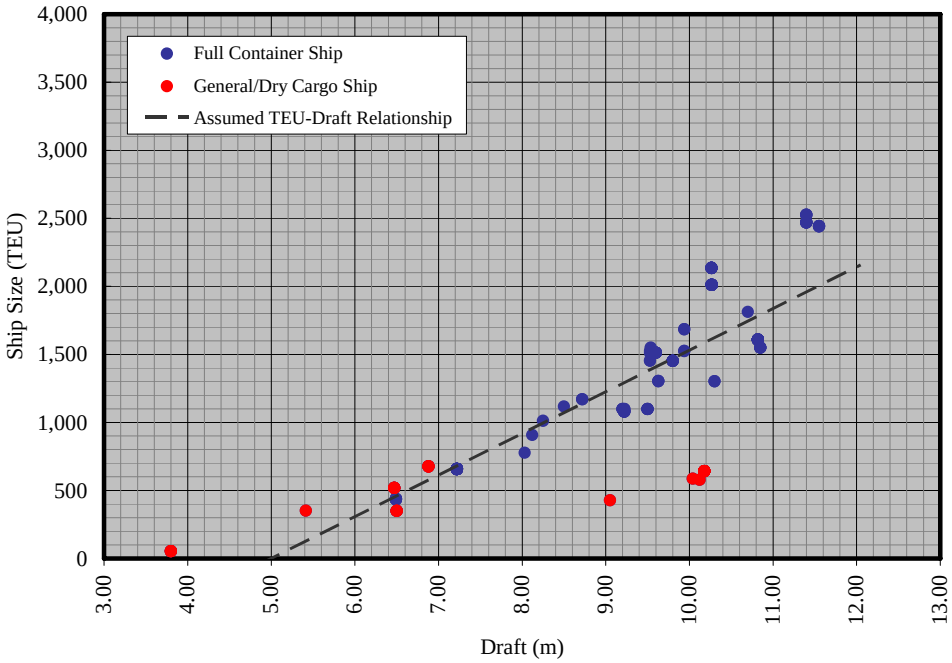


Figure 9-1-8 Relationship between Shipsize and Draft of Container Loaded Vessels of Toamasina Port (2007)

Table 9-1-4 Depth of Quaywalls of Toamasina Port

MARK	NAME	QUAY LEN. (M)	DEPTH (M)
H	QUAY H	210.0	3.50
TA	MOLE A NORTH	55.0	8.40
AW	MOLE A WEST	204.0	6.80
AE	MOLE A EAST	100.0	9.70
BW	MOLE B WEST	180.0	9.40
BP	MOLE B POINT	-	~ 14.00
C1	MOLE C1	219.5	12.10
C2	MOLE C2	135.0	12.10
C3	MOLE C3	171.5	14.10
1B		210.0	3.00
3B		137.0	3.00
4B		51.0	3.00
5B		135.0	3.00
6B		125.0	3.00

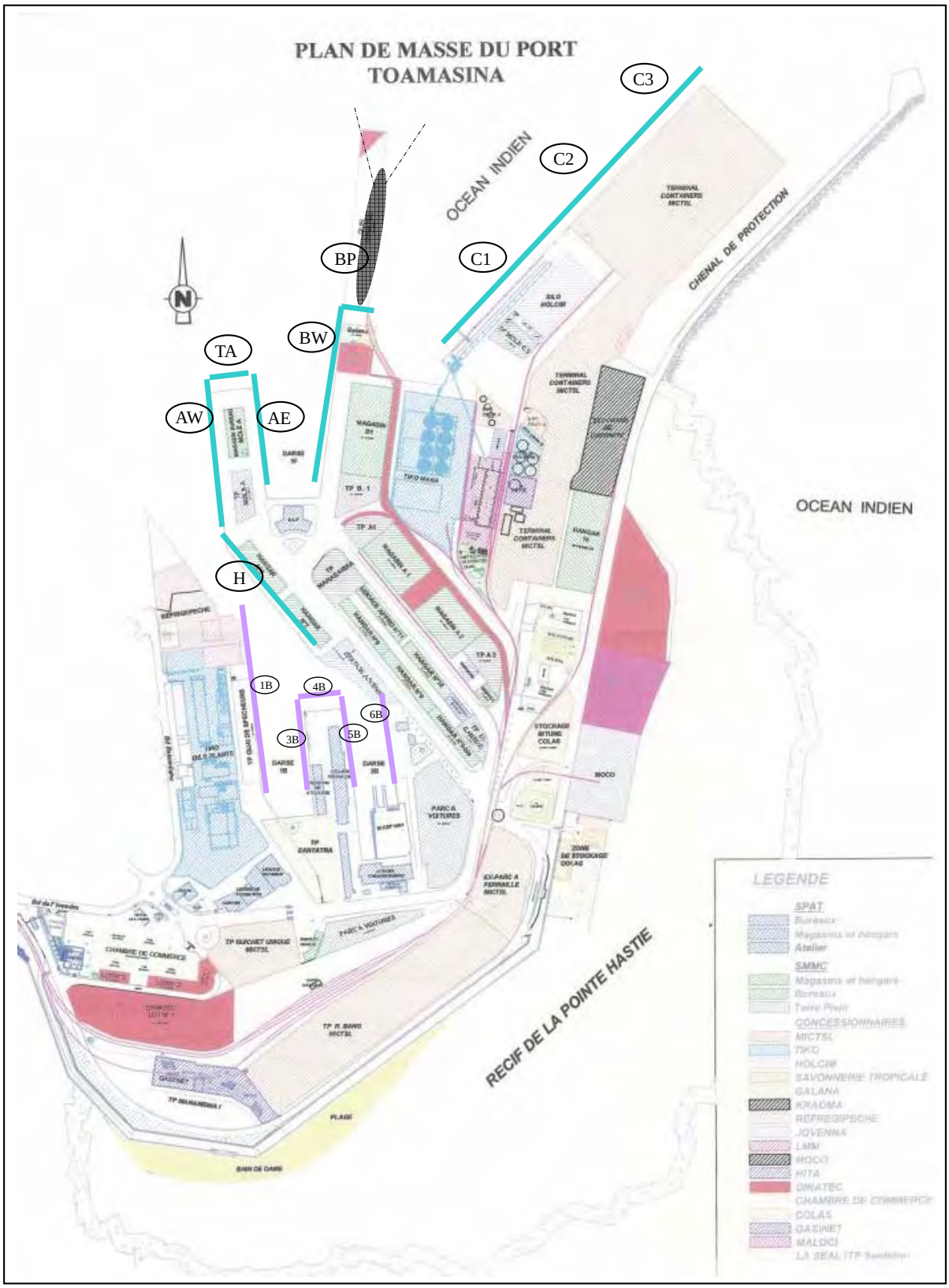


Figure 9-1-9 Existing Berths Layout of Toamasina Port

9-1-5 Benefit

(1) Contents of Benefit

In this report, container cargo handling is focused on and following items are priced to represent the project benefit.

1) Loss due to ship waiting

In the With Project Case, the port will be able to accommodate larger container vessels because quay-walls will be deepened to -14m. Accordingly ship calls can be reduced as larger vessels will carry more numbers of containers in one ship call. However, smaller vessels will require much more frequent trips for Without Project Case. The increase in ship calls might cause ship waiting at the channel mouth of the port. The losses due to these ship waiting are priced considering charter rates of waiting vessels. In order to predict the average waiting time, a ship arrival simulation is carried out. The details are explained in Chapter 6-4.

2) Loss due to chartering smaller vessels

Small container vessels are assumed to be chartered exclusively for Toamasina because it is thought to be the cheapest and the most time saving method. Port Louis is assumed as their transshipment port because it is the nearest port from Toamasina which will give the cheapest cost of trips. In Without Project Case, this chartering cost is counted as the losses, i.e., the benefit of the With Project Case.

3) Loss due to transshipment at Port Louis

As mentioned above, smaller vessels will require transshipment at Port Louis. This transshipment cost is considered to be the loss for the Without Project Case, i.e., the benefit of the With Project Case.

4) Gains due to increase in operation days owing to extension of breakwater

In the With Project Case, breakwater will be extended 345m in length. As a result of its extension, port basin will be calmer than present condition and the port will be able to receive more vessels. Also, calm basin might raise container handling efficiency. In this report, such benefit will be priced assuming ship waiting time will be reduced.

5) Savings due to larger container carrier transportation

As shown in Figure 9-1-7, container vessel sizes will be larger for With Project Case. Average size of the vessel 1,200 TEU will be 3,000 TEU. Usually, transportation cost of one unit container becomes lower when larger sized vessel carries containers. In this report, saving cost will be priced assuming normal sailing days as 20 days to the destination.

6) Loss due to cargo operation of small vessels and additional container marshaling yard

In the Without Project Case, numbers of small vessels will arrive at port and container cargos shall be handled at general cargo berths. This report assumes such cargo will be loaded/unloaded using vessel's ship gear. In addition, additional container marshaling yard outside the port will be required since existing port area is congested and space is not enough. For this economic analysis, required equipment, labor forces and fuels are estimated and counted as the benefit of With Project Case.

(2) Ship Arrival Simulation

Details of ship arrival simulation are described in Chapter 6-4; Analysis of Ship Waiting Time. The result of analysis is summarized as follows.

Table 9-1-5 Results of Ship Arrival Simulation (Ship Waiting Time)

	Average Ship Waiting Time (days)		
	2007	Without Project 2020	With Project 2020
Bulk/General (1)	0.15	2.09	0.49
Bulk/General (2)	0.00	3.65	0.55
Bulk/General (3)	0.00	0.82	0.36
Container	0.01	3.38	0.01
Container Small Vessel	--	1.28	--
Pass./Ferry	0.04	2.41	0.21
Car Carrier	0.02	2.63	0.43
Tanker	0.22	0.01	0.01
Bulk Ambatovy	--	0.00	0.00
Bulk Oji Paper	--	1.18	0.46
Others	0.32	0.02	0.01

Table 9-1-6 Results of Ship Arrival Simulation (Berth Occupancy Rate)

	Berth Occupancy Rate (%)		
	2007	Without Project 2020	With Project 2020
MOLE A WEST(AW)	45.7	67.3	39.6
MOLE A EAST(AE)	37.4	66.6	39.6
MOLE B WEST(BW)	24.4	82.1	62.8
MOLE B WEST(New Berth)	28.0	80.6	37.2
MOLE B EAST (Ambatovy)	--	64.8	58.4
MOLE B New Oil Jetty	--	25.5	23.2
MOLE C1(C1)	39.3	66.3	21.6
MOLE C2 (C2)	33.5	89.6	18.5
MOLE C3 (C3)	33.7	89.7	38.5
MOLE C4 (C4)	--	--	34.6

(3) Charter Rates of Container Vessels

Ship arrival simulation shows the differences in waiting time between With Project Case and Without Project Case. In order to estimate the losses, charter rates of container carriers are introduced.

Figure 9-1-10 shows the recent charter rates of various sized container vessels. Due to economic drop which has occurred since the latter half of 2008, the charter rates are falling rapidly. In this report, mean values of the rates in August 07 and August 08 are calculated and applied for calculation of losses.

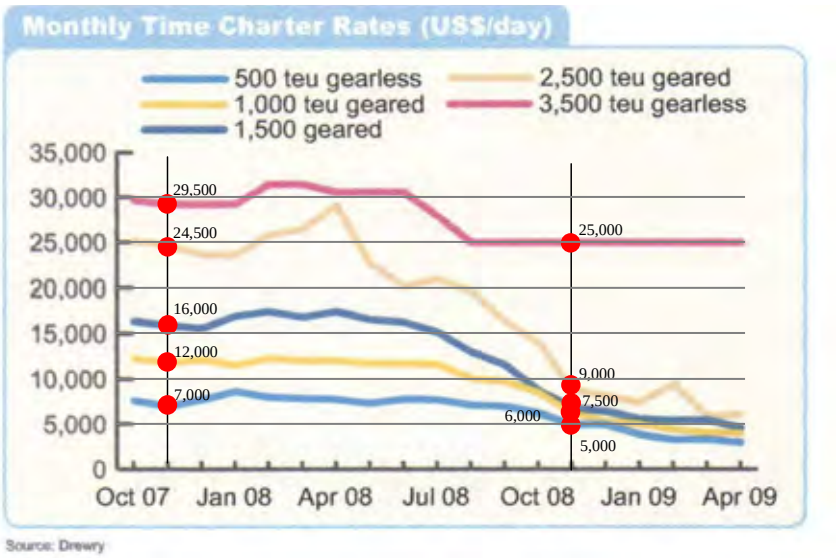


Figure 9-1-10 Recent Charter Rates of Container Vessels

Following Table shows the calculation of the mean valued prices.

Table 9-1-7 Calculation of Charter Rates of Container Vessels

Shipsize	Nov.2007	Nov.2008	Average
3,500 TEU Gearless	29,500	25,000	27,250
2,500TEU Geared	24,500	9,000	16,750
1,500TEU Geared	16,000	7,500	11,750
1,000TEU Geared	12,000	6,000	9,000
500 TEU Gearless	7,000	5,000	6,000

Figure 9-1-11 shows the plots of the calculated charter rates on the x(shipsize) – y(charter rate) graph. It is read that ship size and charter rate has nearly linier propotional relationship.

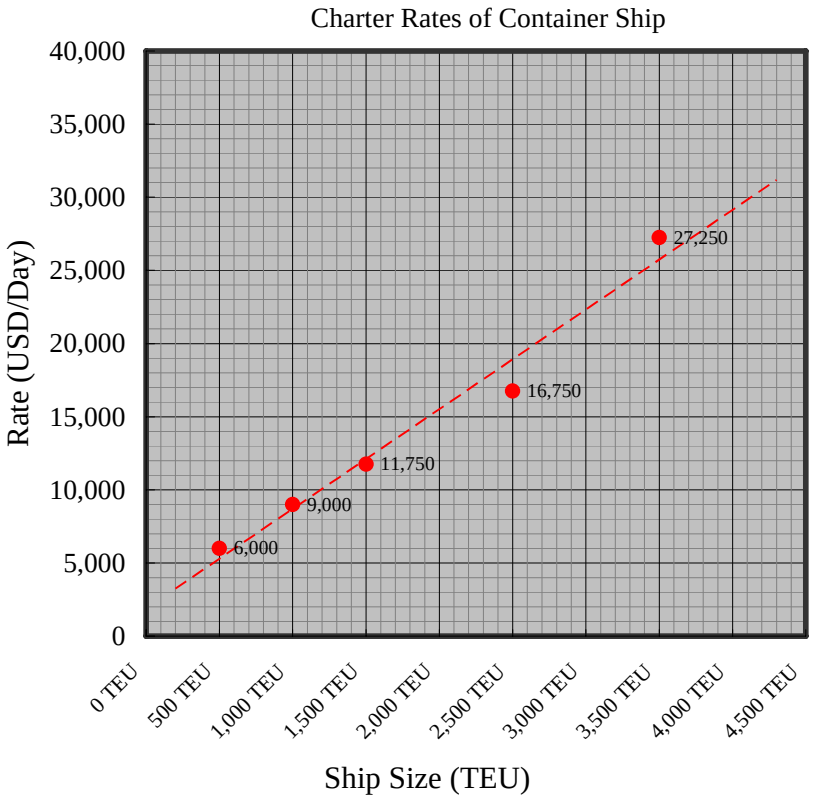


Figure 9-1-11 Charter Rates of Container Vessels

(4) Calculation of Benefit

1) Loss due to ship waiting

Table 9-1-8 shows the calculation of loss due to ship waiting for entering port. The loss is estimated at approximately 11.4 million EUR per year in 2020.

Table 9-1-8 Calculation of Loss due to Ship Waiting

Shipcalls	Average Ship Size (TEU)	Average Waiting Time (days)	Charter Rate (USD/day)	Loss per Year (USD)
With Project Case (2020)				
300	3,000	0.01	22,000	66,000
Total (A)				(66,000)
Without Project Case (2020)				
400	1,200	3.38	10,000	13,520,000
450	500	1.28	5,000	2,880,000
Total (B)				(16,400,000)
Losses due to Ship Waiting for Entering Port (B-A)				(16,334,000)
EUR conversion price				(11,422,378)

2) Loss due to chartering smaller vessels

[Cargo Voyage Time]

In the With Project Case, average 3,000 TEU container ships will come to Toamasina port. For Without Project Case, it is assumed that 3,000 TEU container ships will transport cargo to Port Louis, then transshipped to 500 TEU ships. In order to compare both cases and estimate cost difference, principal days of cargo trip have to be estimated. The following Table shows the typical destination regions from/to Toamasina and estimated voyage time.

Table 9-1-9 Typical Cargo Voyage Time

Description	Distance (mile)	Ship Speed (knot)	Time (hrs)	Time (days)
Toamasina- Port Louis	470	15	31.3	1.3
Toamasina- EU:Marseille (east)	5,700	20	285.0	11.9
Toamasina- EU:Marseille (west)	9,000	20	450.0	18.8
Toamasina- Asia: Shanghai	6,300	20	315.0	13.1

The following Table shows guidance of Port Louis regarding cargo voyage time.

Table 9-1-10 Typical Cago Voyage Time of Port Louis

Description	Time (Days)
Port Louis- SA: Durban	4
Port Louis- EU: Fellxtowe	27 / 31
Port Louis- US: New York	32
Port Louis- Asia: Chiwan	18
Port Louis- Asia: Singapore	10
Port Louis- Australia: Sydney	16

(Source : Mauritius Port Authority)

From these figures, typical cargo voyage time of Toamasina is assumed at 20 days. Voyage time between Toamasina and Port Louis is assumed at 2 days.

[Fuel Consumption of Container Vessel]

Typical vessels fuel consumptions during voyage are assumed as follows.

3,000 TEU Vessel	150 KL/Day
1,200 TEU Vessel	60 KL/Day
500 TEU Vessel	25 KL/Day

[Fuel Price]

Table 9-1-11 shows the price movement of Type-C Fuel during the period from 2004 to 2009. For calculation of loss due to chartering smaller ships, average price is assumed at 439 USD/KL.

Table 9-1-11 Fuel Price

Year	Term	Price of Type-C Fuel (JPY)	Average Exchange Rate 1 USD (JPY)	Price of Type-C Fuel (USD)
2004	Apr.-Jun.	26,350	109.61	240
	Jul.-Sep.	29,500	109.90	268
	Oct.-Dec.	31,500	105.79	298
2005	Jan.-Mar.	29,300	104.45	281
	Apr.-Jun.	35,750	107.50	333
	Jul.-Sep.	40,100	111.19	361
	Oct.-Dec.	45,350	117.20	387
2006	Jan.-Mar.	46,300	116.91	396
	Apr.-Jun.	50,150	114.49	438
	Jul.-Sep.	52,550	116.14	452
	Oct.-Dec.	49,650	117.80	421
2007	Jan.-Mar.	47,400	119.44	397
	Apr.-Jun.	52,050	120.76	431
	Jul.-Sep.	56,950	117.92	483
	Oct.-Dec.	62,750	113.20	554
2008	Jan.-Mar.	66,000	105.42	626
	Apr.-Jun.	73,600	104.48	704
	Jul.-Sep.	89,550	107.71	831
	Oct.-Dec.	52,100	96.29	541
2009	Jan.-Mar.	30,000	93.51	321
	Apr.-Jun.	37,550	97.49	385
	Jul.-Sep.	47,100	93.69	503
Average		47,798	109.13	439

(Source : Price :MOL, Exchange Rate :OANDA)

[Calculation of Loss due to Chartering Smaller Vessels]

Table 9-1-12 shows the calculation of loss due to chartering smaller vessels compared to the cost of larger vessels. The loss is estimated at approximately 12.9 million EUR per year in 2020. This calculation includes the effect of savings due to larger container carrier transportation.

Table 9-1-12 Calculation of Loss due to Chartering Smaller Vessels

Description	Average Ship Size (TEU)	Charter Rate (USD/day)	Fuel Consumption (KL/day)	Fuel Price (USD/KL)	Assumed Average Shipping Time (days)	Assumed Cost per 1 TEU (USD)	Shipcalls	Yeary Troughput (TEU)	Transportation Cost (USD)
	A	B	C	D	E	F=(B+CxD)xE/A	G	H	I= FxH
With Project Case (2020)									
Container Ship Direct	3,000	22,000	150	439	20	586	300	426,000	249,494,000
Total (X)									(249,494,000)
Without Project Case (2020)									
Container Ship Direct	1,200	10,000	60	439	20	606	400	200,000	121,133,333
Conteiner Ship Port Louis	3,000	22,000	150	439	20	586	140	226,000	132,360,667
Port Louis - Toamasina	500	5,000	25	439	2	64	450	226,000	14,441,400
Total (Y)									(267,935,400)
Losses due to Ship-size and Charter Rates (Y)-(X)									18,441,400
EUR conversion price									12,896,084

3) Loss due to transshipment at Port Louis

The cost of transshipment at Port Louis is calculated as shown in Table 9-1-13. The shear of full container and empty container are assumed at 70% and 30% respectively. Dual days of containers at Port louis are assumed at 2 days. The loss is estimated at approximately 8.7 million EUR per year in 2020.

Table 9-1-13Calculation of Loss due to Transshipment at Port Louis

Item	Numbers (TEU)		Transhipment Charge		Storage Charge		
			Tariff Rate (USD)	Cost (USD)	Tariff Rate (USD)	Days	Cost (USD)
Full Container	158,200	(70%)	54	8,542,800	6.4	2	2,024,960
Empty Container	67,800	(30%)	22	1,491,600	3.0	2	406,800
Total	226,000	--	--	10,034,400	--	--	2,431,760
Transhipment Charge + Storage Charge = 12,466,160 USD							
EUR conversion price = 8,717,594 EUR							

(Source : Tarrif : Mauritius Port Authority)

4) Gains due to increase in operation days owing to extension of breakwater

According to the wave analysis described in Chapter 6-1, berth efficiency and yearly operation days are estimated as shown in Table 9-1-14. Yearly operation days are considered as input of the ship arrival simulation analysis so that their effect should reflect to the result of calculation, i.e., forecast of ship waiting time.

Table 9-1-14 Estimated Operation Days With/Without Project Case

Description	Berth Efficiency (%)	Yearly Operation Days	At
Without Project Case (2020)	84.9	309	C2 & C3
With Project Case (2020)	94.5	345	C4

5) Savings due to larger container carrier transportation

As aforesaid, it is estimated that the present average ship size 1,200 TEU will increase to 3,000 TEU in 2020 for the With Project Case. The effect of this factor is included in the calculation of Loss due to Chartering Smaller Vessels as shown in Table 9-1-12.

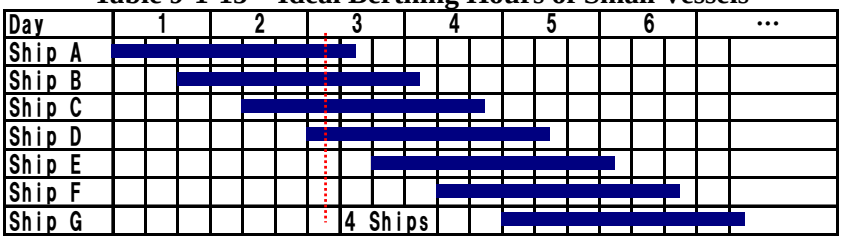
6) Loss due to cargo operation of small vessels and additional container marshaling yard

For Without Project Case, assuming surplus container 226,000 TEU over present terminal capacity 200,000TEU will be handled by small vessels, and assuming one small vessel will deal with 500 TEU at one ship call, it is estimated that additional 450 ship calls will be required in one year.

These small vessels have to handle container by its own ship gear, thus operation speed will be lower than fully equipped container terminal. If it is assumed the rate of operation will be approximately 8 TEU/hr, it will take 60 hours to complete 500 TEU loading and unloading.

Yearly operation days for Without Project Case are 309 days as shown in Table 9-1-14. Average intervals of 450 ship calls are calculated about 16 hours. Table 9-1-15 shows the ideal berth operations assuming the calculated ship arrival intervals (16 hrs) and berthing times (60 hrs). It is read that maximum 4 ships will be stationed at berths at the same time.

Table 9-1-15 Ideal Berthing Hours of Small Vessels



For these cargo handling, required costs are estimated as follows. Cost calculation is shown in Table 9-1-16.

[Equipment]

It is assumed that one small vessel has 2 ship gears and the container boxes are loaded/unloaded directry from vessel to tracter chassis. Additional container marshaling yard is assumed to be located near the port within 2 km distance. This container yard will be equipped with RTGs, Reach Stackers, Side Lifters, and suffishent computerised cargo managemant system. Work hours will be 24 hours.

These equipment is assumed to procure by the payment based on domastic bank loan. For the cost calculation, loan payment is assumed 10% annual bank interest and 10 years payment period. Annual payment for the first 10 years is estimated at 2.9 million EUR.

[Fuel and Powers]

Using the above equipment and their work hours, consumption of fuel and electlic powers are estimated. Unit price of fuel and poewer are assumed at 1.27 USD/Lt and 0.20 USD/KWH respectively. Annual cost is calculated at 1.98 million EUR.

[Labor]

At quay wall, 2 gangs for 1 vessel are deployed. 1 gang consist of 10 workers and 6 tracter operators. For 24 hours continuous operation, 3 shifts work hours are assumed, for which 4 shifts gangs are assumed for cost estimate as holidays for warkers are required. Workers wedges are assumed with information provided by MICTSL. At container marshaling yard, approximately 500 workers will be employed. Estimated annual cost is 3.4 million EUR.

[Land Acquisition]

It is assumed required land shall be approximetely 15 ha. The land is assumed to be acquired by reclamation at Hastie Reef area, because it is the most realistic method if we consider the port is sorrounded by city area. The cost of such reclamation is approximately 38.4 million EUR.

The land is assumed to procure by the payment based on domastic bank loan. For the cost calculation, loan payment is assumed 10% annual bank interest and 10 years payment period. Annual payment for the first 10 years is estimated at 6.3 million EUR.

Table 9-1-16 Cost Calculation of Without Case (Additional Operation 226,000TEU)

1 EUR = 2,700 MGA
1 EUR = 1.43 USD

Equipment

	Item	Unit	Qty (1Gang)	Nos of Gang	Qty (Total)	U.P. (Mil. USD)	Price (Mil. USD)
1	Tractor and Chassis	no.	6	8	48	0.13	6.24
2	RTG	no.	--	--	6	1.50	9.00
3	Reach Stacker	no.	--	--	6	0.80	4.80
4	Side Lifter	no.	--	--	5	0.50	2.50
5	PC & Management System	l.s.	--	--	1	3.00	3.00
						Total (Mil. USD)	25.54
						Total (Mil. EUR)	17.86

Calculation of Amortization Cost

Loan (Million USD)	25.54
Bank Interest (%)	10%
Period of Payment (Years)	10
Annual Payment (Million USD)	4.157
Annual Payment (Million EUR)	2.907

Fuel & Powers

	Item	Electric Consum. (KH/Hr/Unit)	Fuel Consum. (Lt/Hr/Unit)	Nos of Equip.	Annual Wrok Hrs (Hr)	Annual Consum. (KWH or Lt)	U.P. (F: USD/Lt) (E: USD/KWH)	Total Cost (USD)
1	Tractor and Chassis	--	10.0	48.0	112,000	1,120,000	1.27	1,422,000
2	RTG	--	35.0	6.0	14,000	490,000	1.27	622,000
3	Reach Stacker	--	13.0	6.0	11,000	143,000	1.27	182,000
4	Side Lifter	--	13.0	5.0	9,000	117,000	1.27	149,000
5	Ship Gear	--	13.0	8.0	19,000	247,000	1.27	314,000
6	Lighting Syatem	150.0	--	1.0	4,500	675,000	0.20	135,000
							Total (USD)	2,824,000
							Total(EUR)	1,975,000

Labor (4 shift operation) Note: Nos of gang = 2 gangs/vessel x 4 vessels x 4 shifts = 32 gangs

	Item	Unit	Qty (1Gang)	Nos of Gang	Qty (Total)	Monthly Wage	Yearly Wage (MGA)	Yearly Cost (MGA)
1	Foreman	no.	1	32	32	763,000	9,156,000	292,992,000
2	Lasher	no.	6	32	192	525,000	6,300,000	1,209,600,000
3	Checker	no.	2	32	64	763,000	9,156,000	585,984,000
4	Gearman	no.	1	32	32	756,000	9,072,000	290,304,000
5	Tractor Driver	no.	6	32	192	902,000	10,824,000	2,078,208,000
6	CY Workers	no.	--	--	500	800,000	9,600,000	4,800,000,000
							Total (MGA)	9,257,088,000
							Total (EUR)	3,428,551

Land Acquisition

Hastie Leaf Reclamation Cost (10ha) (EUR)	25,600,000
Land Acquisition (15ha) x 1.5 (EUR)	38,400,000
Bank Interest (%)	10%
Period of Payment (Years)	10
Annual Amortization Cost (EUR)	6,249,000

Table 9-1-17 shows the details of the benefit calculation. For Without Project Case, it is assumed that 200,000 TEU will be handled by the existing MICTSL's terminal and surplus 226,000 TEU will be handled by small vessels operation. With Project Case is assumed newly constructed terminal equipped with 3 quay gantry cranes and CY facilities. The annual benefit is estimated at 6.8 million EUR for initial 10 years loan payment period and 3.4 million EUR upon completion of loan payment.

Table 9-1-17 Calculation of Loss due to Cargo Operation of Small Vessels and Additional Container Marshaling Yard (2020, Financial Price)

Without Project Case (426,000TEU in 2020)

Item	Price(EUR)	Remark
Using Existing Terminal (200,000TEU)		
Initial Investment		
Equipment	nil.	Existing equipment will be used.
Land Acquisition	nil.	Existing yard area will be used.
(Subtotal A)	nil.	
Operation & Maintenance Cost		
Labor	1,119,000	Estimated by existing operation.
Energy	2,378,000	Estimated by existing operation.
Equipment Maintenance & Repairing	909,000	Estimated by existing operation.
Facility Maintenance & Repairing	1,119,000	Estimated by existing operation.
(Subtotal B)	5,525,000	
Additional Operation (226,000TEU)		
Initial Investment		
Equipment	(17,860,000)	(Tractor, RTG, Reachstacker, Sidelifter & Management System)
Land Acquisition	(38,400,000)	(Assumed the cost is equivalent to 15ha reclamation of Hastie Reaf area)
(Subtotal C)	(56,260,000)	
Operation & Maintenance Cost		
Labor	3,429,000	Estimated 880 workers at berths and CY
Energy	1,975,000	Estimated fuel and electricity to operate above equipment.
Equipment Amortization	2,907,000	Assumed bank interest: 10%, period: 10years
Land Acquisition Amortization	6,249,000	Assumed bank interest: 10%, period: 10years
Equipment Maintenance & Repairing	625,000	3.5% of perchasing price incl. insurance
Facility Maintenance & Repairing	384,000	1.0% of construction price
(Subtotal D)	15,569,000	
Total Operation & Maintenance Cost (B+D)	21,094,000	During 10 years period of payment
Total Operation & Maintenance Cost (Excluding Amortization)	11,938,000	After 10 years period of payment

With Project Case (426,000TEU in 2020)

Item	Price(EUR)	Remark
New Terminal C4 and CY Operation (426,000TEU)		
Initial Investment		
Equipment	(21,330,000)	(Gantry Crane, RTG, Reach Stacker, Top Lifter, Tractor & Managemant System)
Land Acquisition	nil.	Existing yard area will be used.
(Subtotal)	(21,330,000)	
Operation & Maintenance Cost		
Labor	1,770,000	Estimated 600 workers at berth and CY
Energy	4,279,000	Estimated fuel and electricity to operate above equipment.
Equipment Amortization	5,697,000	Assumed interest: 6.6% MICTSL own finance, period:10 years
Equipment Maintenance & Repairing	1,401,000	3.5% of perchasing price incl. insurance
Facility Maintenance & Repairing	1,123,000	1.0% of construction price
(Subtotal)	14,270,000	
Total Operation & Maintenance Cost	14,270,000	During 10 years period of payment
Total Operation & Maintenance Cost (Excluding Amortization)	8,573,000	After 10 years period of payment

Benefit (Without Project Case - With Project Case)

Operation & Maintenance Cost	**6,824,000**	During 10 years period of payment
Operation & Maintenance Cost (Excluding Amortization)	**3,365,000**	After 10 years period of payment

Benefit Breakdown for Economic Price Conversion

Item	Price(EUR)	Remark
Equipment	-2,790,000	
Fuel	74,000	
Labor	2,778,000	
Unskilled Labor	1,666,800	Assumed 60 % of Labor Total
Skilled Labor	1,111,200	Assumed 40 % of Labor Total
Land Acquisition	6,249,000	
Equipment Maintenance & Repairing	133,000	
Facility Maintenance & Repairing	380,000	
Total	**6,824,000**	

Benefit Breakdown for Economic Price Conversion (Excluding Amortization)

Item	Price(EUR)	Remark
Equipment	0	
Fuel	74,000	
Labor	2,778,000	
Unskilled Labor	1,666,800	Assumed 60 % of Labor Total
Skilled Labor	1,111,200	Assumed 40 % of Labor Total
Land Acquisition	0	
Equipment Maintenance & Repairing	133,000	
Facility Maintenance & Repairing	380,000	
Total	**3,365,000**	

(5) Summary of Benefit

The calculated benefit in 2020 is summarized as follows. Total benefit is estimated at 61.2 million EUR in the year 2020.

Table 9-1-18 Summary of Benefit in 2020 (Financial Price)

Item	Financial Cost			
	Tradable (FC) (EUR)	Untradable (LC) (EUR)		Total
		Local Procurement	Import Material & Fuel	
Benefit 2020				
1) Loss due to ship waiting	**11,422,378**	--	--	**11,422,378**
2) Loss due to chartering smaller vessels	**12,896,084**	--	--	**12,896,084**
3) Loss due to transshipment at Port Louis	**8,717,594**	--	--	**8,717,594**
4) Gains due to increase in operation days owing to extension of breakwater	note) cost effect is included in the calclation of 1)			
5) Savings due to larger container carrier transportation	note) cost effect is included in the calclation of 2)			
6) Loss due to cargo operation of small vessels and additional container marshaling yard				
(During 10 years period of loan payment)	**-2,790,000**	**9,268,300**	**345,700**	**6,824,000**
a. Equipment & Fuel	-2,790,000	--	74,000	-2,716,000
b. Unskilled Labor	--	1,666,800	--	1,666,800
c. Skilled Labor	--	1,111,200	--	1,111,200
d. Land Acquisition	--	6,249,000	--	6,249,000
e. Equipment Maintenance & Repairing	--	13,300	119,700	133,000
f. Facility Maintenance & Repairing	--	228,000	152,000	380,000
(After 10 years period of loan payment)	**0**	**3,019,300**	**345,700**	**3,365,000**
a. Equipment & Fuel	0	--	74,000	74,000
b. Unskilled Labor	--	1,666,800	--	1,666,800
c. Skilled Labor	--	1,111,200	--	1,111,200
d. Land Acquisition	--	0	--	0
e. Equipment Maintenance & Repairing	--	13,300	119,700	133,000
f. Facility Maintenance & Repairing	--	228,000	152,000	380,000

9-1-6 Cost

(1) Contents of Cost

Cost is divided to two categories; one is initial investment cost and the other is maintenance & operation cost (OM).

Initial investment cost contains items of construction, procurement of equipment, engineering and contingency. The cost is spread to the initial 5 years with the rate according to the implementation schedule. Although initial investment of common project contains land acquisition cost, the case of Toamasina neglects it because all project area owned by SPAT and there are no needs to spend such cost.

The operation and maintenance cost for the economic analysis covers maintenance and repairing cost, and cargo operation cost. This cost is spread in all the period after commissioning of facilities and equipment.

(2) Initial Investment Cost

Construction cost is summarized in the Table 9-1-19. The location of each item is shown in Figure 9-1-12; project layout plan.

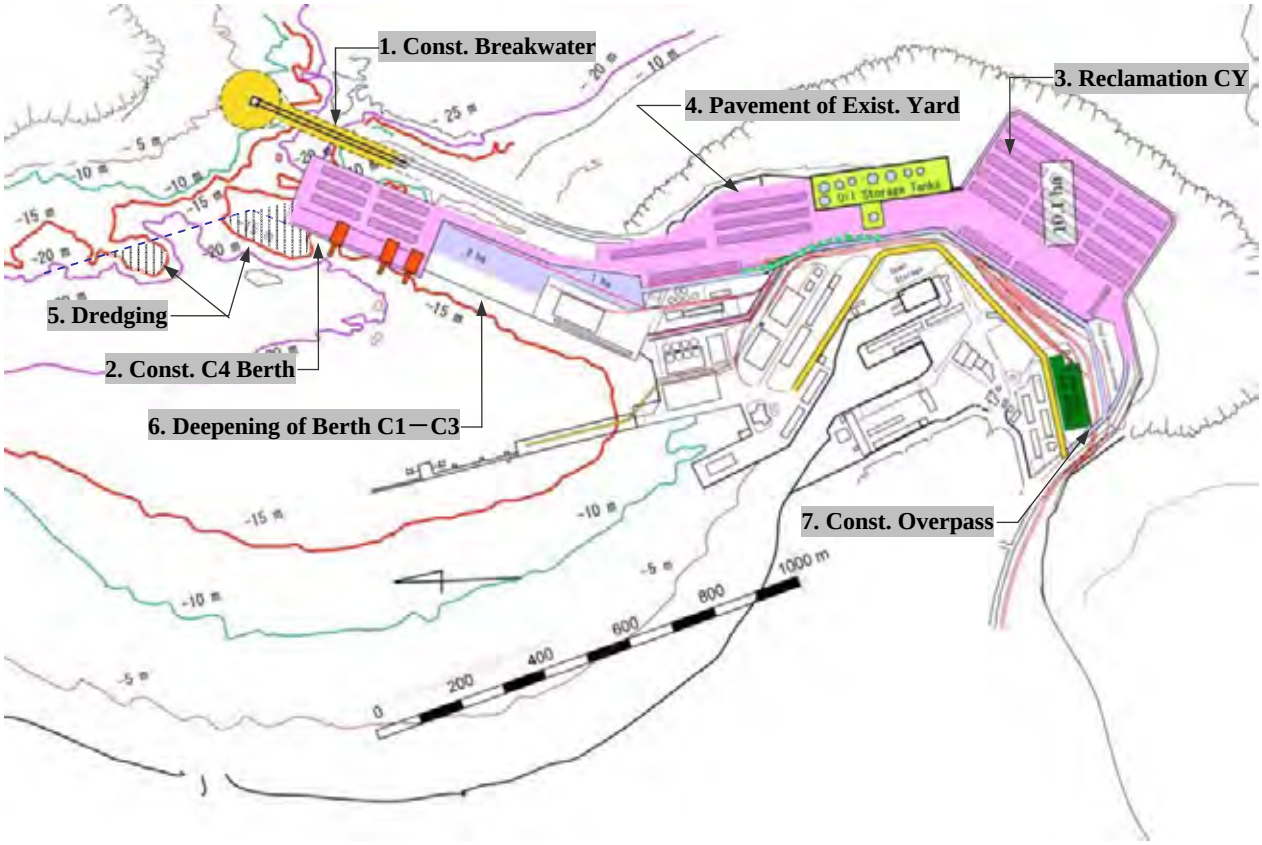


Figure 9-1-12 Project Layout Plan (Urgent Plan)

Table 9-1-19 Summary of Initial Investment Cost

Summary of Project Cost

No	Item	Description	Cost (EUR)
1	Construction of Breakwater	L = 345m	42,666,000
2	Construction of C4 Berth	L = 320m, D = -14m	55,380,000
3	Reclamation of Container Yard (Hasti Reef)	Incl. Revetment & Pavement	25,600,000
4	Pavement of Existing Yard		15,368,000
5	Dredging	D = -14m	3,845,000
6	Deepening of Berth C1－C3	D = -14m	9,809,000
7	Construction of Overpass		10,528,000
8	Environmental Expense	Monitoring & Measures for Contaminated Soil	4,188,000
(Subtotal Construction Civil Works)			(167,384,000)
10	Engineering	Detailed Design, Tendering & Supervision	13,043,000
(Subtotal Incl. Engineering)			(180,427,000)
11	Contingency		8,369,000
(Total Incl. Contingency)			(188,796,000)

(3) Operation and Maintenance Cost

The detailed operation and maintenance cost was estimated in the Table 9-1-17; With Project Case. Table 9-1-20 is the extraction of the Table 9-1-20 which shows the calculation of the Operation and Maintenance Cost.

In the operation cost, equipment is assumed to procure by the payment based on MICTSL's foreign financial loan. According to the interview to MICTSL, their loan interest is approximately 6.6% p.a. For the cost calculation, this interest is considered with 10 years payment period.

Maintenance cost is calculated based on the assumption that annual cost for facilities is 1% of construction cost, and the cost for equipment is 3.5% of procurement cost.

The annual cost expence is estimated at 14.3 million EUR for initial 10 years loan payment period and 8.6 million EUR upon completion of loan payment.

Table 9-1-20 Operation and Maintenance Cost

Item	Price(EUR)	Remark
New Terminal C4 and CY Operation (426,000TEU)		
Initial Investment		
Equipment	(21,330,000)	(Gantry Crane, RTG, Reach Stacker, Top Lifter, Tractor & Managemant System)
Land Acquisition	nil.	Existing yard area will be used.
(Subtotal)	(21,330,000)	
Operation & Maintenance Cost		
Labor	1,770,000	Estimated 600 workers at berth and CY
Energy	4,279,000	Estimated fuel and electricity to operate above equipment.
Equipment Amortization	5,697,000	Assumed interest: 6.6% MICTSL own finance, period:10 years
Equipment Maintenance & Repairing	1,401,000	3.5% of perchasing price incl. insurance
Facility Maintenance & Repairing	1,123,000	1.0% of construction price
(Subtotal)	14,270,000	
Total Operation & Maintenance Cost	14,270,000	During 10 years period of payment
Total Operation & Maintenance Cost (Excluding Amortization)	8,573,000	After 10 years period of payment

9-1-7 Economic Price Conversion

(1) Price Conversion Factors

For the economic analysis, price of goods and services are expressed in “economic prices”. The economic prices are usually identical to the international market price because these suffer from foreign strong price competitions. Contrary, domestic prices are influenced by the government interventions such as import / export taxes, domestic taxes, or other government subsidies, etc. These distortions are usually explained by two categories: border distortion and domestic distortion.

Border distortion is caused by import / export taxes, restrictions in quantities of import / export and export subsidies, etc. which are normally legalized by the Government. Project input materials / man-powers and output products / services can be divided into two categories: “tradable goods” and “non-tradable goods”. The prices of tradable goods are considered to be international market price, i.e., can be used as the “economic prices”. The prices of non-tradable goods shall be converted to the economic price to eliminate border distortion. In this report, the Standard Conversion Factor described in (2) of this section is applied to eliminate the border distortion.

Domestic distortion is caused by domestic taxes, subsidies, government control of prices, or government regulations of labor wages, etc. The Table 9-1-23 shows the list of government taxes. In addition, the factors of domestic labor wedge and land acquisition price are usually focused in domestic distortion. The reasons why these factors are focused are; the labor wedge is used to be controlled by government with labor law, and land price is apt to be the object of speculation and it always be influenced by uneconomic reasons. In case of Toamasina project, land acquisition is not necessary because all project areas are the land owned by port authority SPAT. The conversion factors for domestic taxes and labor wedge are discussed in (3) of this section.

(2) Standard Conversion Factor (SCF)

Standard Conversion Factor (SCF) is one of the national economic factors and represents an average rate of border distortion for all trading goods of the country. Equation to calculate SCF is as follows.

$$SCF = (M + E) / [M(1+t) + E(1-s)]$$

Where,

M: Total import value of the country (CIF indication)
E: Total export value of the country (FOB indication)
t: Average import tax
s: Average export subsidy

Table 9-1-21 shows the calculation of average import tax rate considering 25 major import commodities in 2007.

In accordance with the government regulation (Direction Generate des Imports-Madagascar), import duties are ruled as follows.

Feed, farm equipment:	0 %
Raw materials, inputs:	5 %
Capital goods	10 %
Consumer goods	20 %

Table 9-1-21 Calculation of Average Import Tax Rate

IMPORT								
Rank	Code	Description	Import 2007 (USD)	% (2007)		Import Tax Rate	VAT Tax Rate	Calc. Ave. Tax Rate
-	-	All Comodities	2,445,478,427	100.0%	(cumm.)			
1	27	Mineral Fuel, Oil Etc.	406,406,542	16.6%	16.6%	5%	20%	0.04321
2	84	Machinery	235,557,271	9.6%	26.3%	10%	20%	0.03082
3	85	Electrical Machinary	212,325,788	8.7%	34.9%	10%	20%	0.02778
4	87	Vehicles, Not Railway	143,780,842	5.9%	40.8%	20%	20%	0.02587
5	52	Cotton+Yam, Fablic	112,535,305	4.6%	45.4%	20%	20%	0.02025
6	51	Animal Hair+Yarm, Fabric	110,912,355	4.5%	50.0%	5%	20%	0.01179
7	10	Cereals	88,485,142	3.6%	53.6%	0%	20%	0.00724
8	73	Iron/Steel Products	80,111,313	3.3%	56.8%	10%	20%	0.01048
9	60	Knit Crocheted Fabric	75,412,608	3.1%	59.9%	20%	20%	0.01357
10	39	Plastic	69,848,115	2.9%	62.8%	5%	20%	0.00743
11	48	Paper, Paperboard	62,343,401	2.5%	65.3%	10%	20%	0.00816
12	15	Fats And Oils	56,703,277	2.3%	67.7%	5%	20%	0.00603
13	03	Fish and Seafood	56,700,856	2.3%	70.0%	20%	20%	0.01020
14	30	Phamaceutical Products	50,594,553	2.1%	72.0%	0%	0%	0.00000
15	72	Iron and Steel	46,778,783	1.9%	74.0%	5%	20%	0.00497
16	17	Sugars	43,334,017	1.8%	75.7%	5%	20%	0.00461
17	63	Misc Textile Articles	38,276,851	1.6%	77.3%	20%	20%	0.00689
18	23	Food Waste; Animal Feed	33,972,877	1.4%	78.7%	20%	0%	0.00278
19	40	Rubber	29,039,644	1.2%	79.9%	10%	20%	0.00380
20	50	Silk; Silk Yarm, Fablic	28,553,934	1.2%	81.0%	20%	20%	0.00514
21	38	Misc Chemical Products	26,564,686	1.1%	82.1%	5%	20%	0.00282
22	94	Furniture and Bedding	23,658,339	1.0%	83.1%	20%	20%	0.00426
23	25	Salt, Sulfer, Earth Stone	22,993,413	0.9%	84.0%	10%	20%	0.00301
24	55	Manmade Staple Fibers	22,383,979	0.9%	84.9%	20%	20%	0.00403
25	90	Optic, Nt 8544; Med Instr	22,184,917	0.9%	85.9%	10%	20%	0.00290
		Others		14.1%	100.0%	10%	20%	0.04528
				Average Tax Rate				0.31331

Further assuming export subsidy is zero, SCF is calculated as follows.

SCF = (M + E) / [M(1+t) + E(1-s)]
= (2,445,478,427 + 1,343,309,414) / (2,445,478,427 x 1.31331 + 1,343,309,414 x 1.0)
= 0.83

In JETRO Report 2008 recommended SCF=0.9 considering prevailing import duties and other factors. In general, the figure of SCF of other countries are commonly in the range of 0.8 ~ 0.9. Calculated SCF 0.83 is lower than the figure recommended by JETRO, but within the common range. In this report, SCF is assumed at 0.83 as calculated for the economic price conversions.

(3) Conversion Factors to Eliminate Domestic Distortion

In general, domestic distortions are commonly discussed on the items for labor cost and for land acquisition cost. In the case of Toamasina development project, land acquisition is not required because SPAT owns all land area related to the project. Followings are the discussions for conversion factors of general goods, unskilled labors and skilled labors.

1) Conversion Factor of General Goods

In this report, it is assumed that domestic distortion for general non-tradable goods is mainly caused by the government taxes. Table 9-1-23 shows the list of government taxes. Figure 9-1-13 shows the schematic price components of general goods. In this Figure, general goods are assumed to be manufactured by private firm. The brake-downs of material cost, manufacturing cost, labor cost, profit and VAT are assumed 30%, 30%, 15%, 10%, and 20% respectively. For easy interpretation, the price excluding VAT is set as 100%.

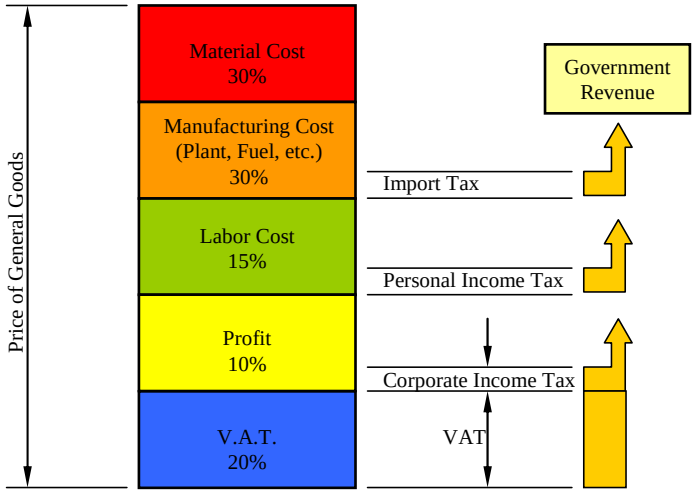


Figure 9-1-13 Schematic Description of Price of Genral Goods

From the above assumptions, the government tax share in the price are calculated as the following Table in which the relevant tax rates in the Table 9-1-22 are applied. The calculation shows that 36% (in 120% including VAT) of the general price are paid to the government when we purchase a domestic products.

Table 9-1-22 Tax Calculation for Genral Goods

Cost Breakdown	Assumed Share (x)	Government Taxes		
		Name	Rate (y)	Tax Share (xy)
Material Cost	30%	--	--	--
Manufacturing Cost	30%	Import Duty	20%	6.0%
Labor Cost	30%	Personal Income Tax	25%	7.5%
Profit	10%	Corporate Income Tax	25%	2.5%
VAT	20%	VAT	--	20.0%
Total	120%			36.0%

The conversion factor for the case is calculated as,

$$CF_{general} = 1.20 / 1.36 = 0.88$$

In JETRO Report, conversion factor for non-tradable goods are estimated at 0.9. This report will use the **0.88** from the above evaluetion.

Table 9-1-23 Tax Syatem of Madagascar (1)

2008			
Tax	**Nature and field of application**	**Exemption**	**Rate**
1. Income tax, tax on benefits and on earnings			
l.1. Income tax (IR)	Criterion of taxation to IR according to the annual turnover. IR is paid at the latest the May 15th or on November 15th or during the last four months of the financial year. Payment by two-monthly estimated deposits.	Benefit from exemption: public organization, interests paid by the CEM*, non-profit making associations and organizations, payments of communication services provided from abroad via satellites… *(CEM = Caisse d'Epargne de Madagascar /Saving Account of Madagascar)	Rate: 25%. Rate: 10% for non-resident persons. Minimum collection - Ar 100.000 + 5%o of turnover (agricultural, industrial, mining, hotel, tourism and transport - Ar 320.000 + 5%o of turnover for another activities.
1.3. Personal income tax (IRSA).	Annual tax deducted by the employers from the salaries and wages Implementation of a system of reduction for dependents and the standard deduction.	Are exempt of tax, the family benefits, the military and civil disablements pensions, combatant pension, the remunerations perceived by the personnel of diplomatic representations and the international organizations.	Progressive income according to the Ariary value - ≤ Ar 100.000: Ar 200 - Up to Ar 140.000: Ar 500 - Up to Ar 160.000: Ar 2.000 - Up to Ar 180.000: Ar 4.000 -< Ar 180.000: 25% Professional expenses: 30% without exceeding Ar 120.000 per month. Mode of evaluation of certain benefits in kind: - vehicle: 30% of the totality of the real monthly expenditure - other advantages: evaluation according to the actual value of all the monthly conceded elements.
1.4. Synthetic tax (IS).	Tax borne by persons or entities or private enterprises which realize a turnover ≤ 20.000.000 Ar.		6% of a contractually fixed basis. Minimum of Ar 16.000 IS revenue: 40% for the regions, 60% for the Communes
1.5. Income tax on movable assets (IRCM).	Tax on the dividends paid to the shareholders by the society, deducted at source by the concerned firms, as well as the investment revenues with fixed incomes.	amortization of capital, operations on current accounts, the Mutual credit and associations of mutual credit, dividends shared, etc	Rate: 25%
1.6. Contractual tax on transfers	Abrogated clauses		
1.7. Capital gains tax on property (IPVI).	Tax sitting on the transfers subject to payment of goods or real-estate laws.	Alienation of good or real-estate laws of the State or the communities	Proportional Rate: 25%

Table 9-1-24 Tax System of Madagascar (2)

2008			
Tax	**Nature and field of application**	**Exemption**	**Rate**
2. Tax on goods and services			
2.1. Value Added-Tax (VAT)	Recoverable tax on the selling operations and the Threshold: Ar 200.000.000 Monthly statement. Limit: in the first 15 days of the month which taxable products: importation and sale of paraffin,	Are exonerated: membership fees and subscription of the members of the management centers during the first 3 years, pharmaceutical product, products, inputs, medical services,	one rate of 20% Rate of 0% for exports
2.2. Tax on transactions (TST)	Abrogated clauses		
2.3. Excise duty (DA)	Tax on certain imported or made in Madagascar Limitation of the field of application of the receipt - series of taxation .	Are exonerated the alcoholic products used in medicines preparation .	Ad valorem rate from 7% to 326%
3. Registration fees and stamp			
Registration fees	Rights taken on property and movables transactions (hirings, sales, donations)		Buildings 6% Goodwills 6% Vehicles 2% to 4% Securities 2% Commercial lease: 2% Long lease: 1%
Tax on property advertising	Abrogated clauses		
Additional tax			
Tax on insurances.	Tax taken on the Conventions and insurance Limit: June 15th of each year.	Are exonerated, the contracts of reinsurance, the Social Security, etc	Rate from 4% to 20% according to the nature of the risk covered by the insurance policy.
Additional tax on the insurance policies of motor vehicles or TACAVA	private cars not used for public transport or not belonging to legal entity		Rate: 10% on the amount mentioned in the contract
Stamp duty	Liability for receipt stamp duty on the state of Abrogation of the mobile stamps Upgrading of the visa of foreign passport		- fiscal stamp of: 200 to 400 Ar - Ad valorem stamp on negotiable instruments: 1 Ar by section of 200 Ar - receipt stamp: 5%o - passport stamp of: 80.000 to 250.000 Ar
4.Tax on the goods and activities			
4.1. Professional tax (TP)	Abrogated clauses		
4.2. tax on income from property (built and not built)	Tax on land on built-up properties: supported by individual owners or effective occupant of a property	Exemptions: buildings assigned to religion or education activities; to a non-profit organizations for buildings belonging to the State… 5 years of exemption for the new buildings	5% to 10% voted by the local government agencies Transfer of management to the profit of the Communes
5. Rights and taxation for the foreign trade			
5.1 Customs duty for imports	Taken on CIF value of the imports.	Products of category 1 (rate zero) of the common external tariff (TEC). Elimination of the right within the framework of the COI and the COMESA agreements subject to reciprocity and alignment of the tariffs between States Members.	0%: feed, farm equipments 5%: raw materials, inputs 10%: capital goods 20%: consumer goods
5.2. Oil taxation.	Tax on the release to the market of oil products. Specific basis (volume)	Oil products intended for the fuelling of the ships and aircraft.	Tariff per liter variable according to the nature of the product
5.3. Right on the goods (toll)	Taken on the quantities of imported goods by the port authorities		Variable specific rates according to the destination and the nature of the product.

(source: Direction Generale des Impots Madagascar, www.impots .mg)

2) Conversion Factors of Labor Force

2)-1 Unskilled Labor

In JETRO Report, the conversion factor of unskilled labor was assumed 0.6. In this report, the opportunity cost for labor is evaluated using the unemployment ratio of Madagascar in which educational level of the labors is considered. The following Table shows the educational levels and their population enrollment ratio. The Table shows 96% of people in Madagascar receive the primary education, while 17% go on to secondary education, and 3% go on to college, tertiary education level. From these figures it is assumed that 79% (= 96% - 17%) become labor force when they finish the elementary school and work as the unskilled labors.

Table 9-1-25 Education Levels and Population Enrollment Ratio

Primary education Net enrollment rayio (%)			Secondary educatin Net enrollment rayio (%)			Tertiary education Gross enrollment ratio (%)		
Total	Male	Female	Total	Male	Female	Total	Male	Female
96	96	96	17	17	18	3	3	3

Net enrollment rayio: Ratio of children of official school age who are enrolled in school to the population of the corresponding official school age
Gross enrollment rayio: Ratio of total enrollemnt regardless of age to the population of the age
(Source: The World Bank, Africa Development Indicators 2008/09)

The next Table shows unemployment ratio by the education levels. From the figure, unemployment ratio of primary education is 61.5% while that of secondary education is 19.9%. If we assume the workforce on primary education is identical to the unskilled labors, cost conversion factor is nearly assumed as,

$$CF_{unskilled} = 1.0 - \text{Unemployment} = 1.0 - 0.62 = 0.38.$$

However, if we assume that workforce on secondary education is included in unskilled labors, the conversion factor is nearly estimated as,

$$\begin{aligned} CF_{unskilled} &= \{ER1 \times (1.0 - U1) + ER2 \times (1.0 - U2)\} / (ER1 + ER2) \\ &= \{0.79 \times (1.0 - 0.62) + 0.17 \times (1.0 - 0.19)\} / (0.79 + 0.17) \\ &= 0.46 \end{aligned}$$

where,

ER1: Enrollment ratio of primary education level
ER2: Enrollment ratio of secondary education level
U1: Unemployment ratio of primary education level
U2: Unemployment ratio of secondary education level

Table 9-1-26Unemployment by Educational Levels

Total labor force (in thouthands)	Unemployment (15 and over) (%)			Unemployment by educational level (%)								
				Primary education			Secondary educatin			Tertiary education		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
8,921	5.0	3.8	6.2	61.5	55.6	58.9	18.8	19.9	18.1	6.1	7.8	--

Unemployment: Share of the labor force ages 15 and over without work but available for and seeking employment
Unemployment of relevant education level: Unemployment by the relavant educational level attainment, as a percentage of the unemployme
(Source: The World Bank, Africa Development Indicators 2008/09)

The above calculations are one of the evaluations for the conversion factor in view of unemployment ratio, but actual factor should be based on opportunity cost of labors. Unemployment ratio is usually applied for wedge and salaried workers which share only 15% for Madagascar. From statistics, 77% people work for agriculture and the rest 28% is employed by industry or services. Thus real conversion factor might be some higher value than above calculated 0.38 or 0.45.

On the other hand, unskilled labor cost considered in this project is mainly construction workers which may include work force from agricultural industry. It is generally said that workers in agriculture who are thought to have least opportunity for employment are busy at least 6 month in a year, thus conversion factor for the minimum case is thought to be 0.5.

In this report, the conversion factor for unskilled labor is taken as **0.5** considering above calculations and statistical figures.

2)-2 Skilled Labor

For skilled labor, the following formula is applied similarly to the case of unskilled labor. If we assume that skilled labor comes only from tertiary education, conversion factor is estimated as,

$$CF_{skilled} = 1.0 - \text{Unemployment} = 1.0 - 0.03 = 0.97.$$

If we assume that skilled labor is weighted average unemployment ratio of secondary and tertiary education levels, conversion factor is estimated as,

$$\begin{aligned} CF_{skilled} &= \{ER2 \times (1.0 - U2) + ER3 \times (1.0 - U3)\} / (ER2 + NER3) \\ &= \{0.17 \times (1.0 - 0.19) + 0.03 \times (1.0 - 0.06)\} / (0.17 + 0.03) \\ &= 0.85 \end{aligned}$$

where,

ER2: Enrollment ratio of secondary education level
ER3: Enrollment ratio of tertiary education level
U2: Unemployment ratio of secondary education level
U3: Unemployment ratio of tertiary education level

In this report, skilled labor is defined as site foremen, superintendents or more trained workers, which might include labors of secondary educational level. Therefore conversion factor for skilled labor is taken as **0.85** in this report.

(4) Summary of Conversion Factors

The estimated conversion factors are summarized as follows.

Table 9-1-27 Summary of Conversion Factors

Description	Symbol	CF
For Border Distortion		
Standard Conversion Factor (SCF)	SCF	0.83
For Domestic Distortion		
Conversion Factor of General Goods	$CF_{general}$	0.88
Conversion Factors of Labor Forces		
Unskilled Labor	$CF_{unskilled}$	0.50
Skilled Labor	$CF_{skilled}$	0.85

(5) Economic Price Conversion

Table 9-1-28 and 9-1-29 shows the economic price conversion of the benefit and cost.

Table 9-1-28 Economic Price Conversion of Benefit

Item	Financial Cost				Economic Cost						
	Tradable (FC) (EUR)	Untradable (LC) (EUR)		Total	Tradable (FC)		Untradable (LC)				Total
		Local Procurement	Import Material & Fuel				Local Procurement		Import Material & Fuel		
					CF 1)	Cost (EUR)	CF	Cost (EUR)	CF	Cost (EUR)	
Benefit 2020											
1) Loss due to ship waiting	**11,422,000**	--	--	**11,422,000**	1.00	**11,422,000**	--	--	--	--	**11,422,000**
2) Loss due to chartering smaller vessels	**12,896,000**	--	--	**12,896,000**	1.00	**12,896,000**	--	--	--	--	**12,896,000**
3) Loss due to transshipment at Port Louis	**8,718,000**	--	--	**8,718,000**	1.00	**8,718,000**	--	--	--	--	**8,718,000**
4) Gains due to increase in operation days owing to extension of breakwater	note) cost effect is included in the calclation of 1)				--	--	--	--	--	--	--
5) Savings due to larger container carrier transportation	note) cost effect is included in the calclation of 2)				--	--	--	--	--	--	--
Total 1) - 5)	**33,036,000**	--	--	**33,036,000**	--	**33,036,000**	--	--	--	--	**33,036,000**
6) Loss due to cargo operation of small vessels and additional container marshaling yard	**-2,790,000**	**9,268,300**	**345,700**	**6,824,000**	--	**-2,790,000**	--	**7,097,000**	--	**287,000**	**4,594,000**
a. Equipment & Fuel	-2,790,000	--	74,000	-2,716,000	1.00	-2,790,000	0.73 2)	--	0.83 5)	61,420	-2,729,000
b. Unskilled Labor	--	1,666,800	--	1,666,800	1.00	--	0.42 3)	700,056	0.83 5)	--	700,000
c. Skilled Labor	--	1,111,200	--	1,111,200	1.00	--	0.71 4)	788,952	0.83 5)	--	789,000
d. Land Acquisition	--	6,249,000	--	6,249,000	1.00	--	0.87 6)	5,436,630	--	--	5,437,000
e. Equipment Maintenance & Repairing	--	13,300	119,700	133,000	1.00	--	0.73 2)	9,709	0.83 5)	99,351	109,000
f. Facility Maintenance & Repairing	--	228,000	152,000	380,000	1.00	--	0.71 4)	161,880	0.83 5)	126,160	288,000
Total 6) - Fixed fee (Equipment & Land Acquisition) (10 years loan)	**-2,790,000**	**6,249,000**	**0**	**3,459,000**	--	**-2,790,000**	--	**5,436,630**	--	**0**	**2,647,000**
Total 6) - Fixed fee (Maintenance)	**0**	**241,300**	**271,700**	**513,000**		**0**		**171,589**		**225,511**	**397,000**
Total 6) - Variable fee in propotion to cargo volume (Labor & Fuel)	**0**	**2,778,000**	**74,000**	**2,852,000**	--	**0**	--	**1,489,008**	--	**61,420**	**1,550,000**

note 1) CF: Conversion Factor
note 2) CF = CFgeneral x SCF = 0.88 x 0.83 = 0.73
note 3) CF = CFunskilled x SCF = 0.50 x 0.83 = 0.42
note 4) CF = CFskilled x SCF = 0.85 x 0.83 = 0.71
note 5) CF = SCF = 0.83
note 6) CF = 0.87 = Average factor of total construction cost

Table 9-1-29 Economic Price Conversion of Cost

Item	Financial Cost				Economic Cost						
	Tradable (FC) (EUR)	Untradable (LC) (EUR)		Total (EUR)	Tradable (FC)		Untradable (LC)				Total (EUR)
		Local Procurement	Import Material & Fuel				Local Procurement		Import Material & Fuel		
					CF 1)	Cost (EUR)	CF	Cost (EUR)	CF 6)	Cost (EUR)	
1. Initial Investment	**90,429,710**	**52,670,510**	**45,695,780**	**188,796,000**	--	**90,429,000**	--	**36,755,000**	--	**37,927,000**	**165,112,000**
(Excluding Contingency)	**86,496,280**	**50,410,880**	**43,519,840**	**180,427,000**	--	**86,496,000**	--	**35,105,000**	--	**36,121,000**	**157,723,000**
1) Construction Cost	**78,670,480**	**45,193,680**	**43,519,840**	**167,384,000**	--	**78,670,000**	--	**31,401,000**	--	**36,121,000**	**146,193,000**
a. Construction Equipment & Fuel	35,150,640	6,695,360	28,455,280	70,301,280	1.00	35,150,640	0.73 2)	4,887,613	0.83 5)	23,617,882	63,656,135
b. Construction Material	40,172,160	31,802,960	15,064,560	87,039,680	1.00	40,172,160	0.73 2)	23,216,161	0.83 5)	12,503,585	75,891,906
c. Unskilled Labor	0	5,021,520	0	5,021,520	1.00	0	0.42 3)	2,109,038	--	0	2,109,038
d. Skilled Labor	3,347,680	1,673,840	0	5,021,520	1.00	3,347,680	0.71 4)	1,188,426	--	0	4,536,106
2) Land Acquisition Cost	--	--	--	--	--	--	--	--	--	--	--
3) Engineering	**7,825,800**	**5,217,200**	**0**	**13,043,000**	1.00	**7,825,800**	0.71 4)	**3,704,212**	--	**0**	**11,530,000**
4) Contingency	**3,933,430**	**2,259,630**	**2,175,940**	**8,369,000**	1.00	**3,933,430**	0.73 2)	**1,649,530**	0.83 5)	**1,806,030**	**7,389,000**
2. Operation & Maintenance Cost	**5,697,000**	**2,584,000**	**5,989,000**	**14,270,000**		**5,697,000**		**1,543,000**		**4,971,000**	**12,211,000**
1) Operation Cost	**5,697,000**	**1,770,000**	**4,279,000**	**11,746,000**	--	**5,697,000**	--	**949,000**	--	**3,552,000**	**10,197,000**
a. Construction Equipment & Fuel	5,697,000	0	4,279,000	9,976,000	1.00	5,697,000	0.73 2)	0	0.83 5)	3,551,570	9,248,570
b. Construction Material	--	--	--	--	--	--	--	--	--	--	--
c. Unskilled Labor	0	1,062,000	0	1,062,000	1.00	0	0.42 3)	446,040	--	0	446,040
d. Skilled Labor	0	708,000	0	708,000	1.00	0	0.71 4)	502,680	--	0	502,680
2) Maintenance and Repairing Cost	**0**	**814,000**	**1,710,000**	**2,524,000**	--	**0**	--	**594,000**	--	**1,419,000**	**2,014,000**
a. **Facilities**	**0**	**674,000**	**449,000**	**1,123,000**	1.00	**0**	0.73 2)	**492,020**	0.83 5)	**372,670**	**865,000**
b. **Equipment**	**0**	**140,000**	**1,261,000**	**1,401,000**	1.00	**0**	0.73 2)	**102,200**	0.83 5)	**1,046,630**	**1,149,000**
Total - Fixed fee (Equipment & Land Acquisition) (10 years loan)	**5,697,000**	**0**	**0**	**5,697,000**	--	**5,697,000**	--	**0**	--	**0**	**5,697,000**
Total - Fixed fee (Maintenance)	**0**	**814,000**	**1,710,000**	**2,524,000**	--	**0**	--	**594,000**	--	**1,419,000**	**2,013,000**
Total - Variable fee in propotion to cargo volume (Labor & Fuel)	**0**	**1,770,000**	**4,279,000**	**6,049,000**	--	**0**	--	**949,000**	--	**3,552,000**	**4,501,000**

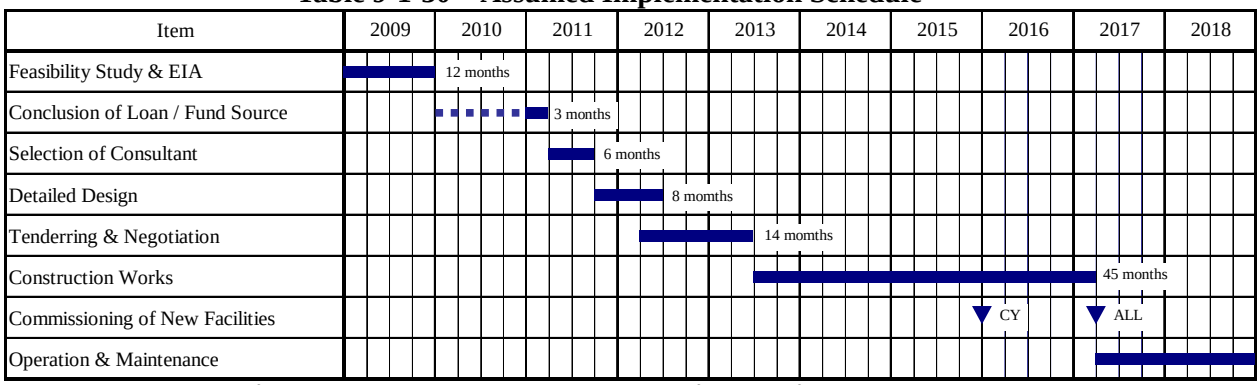
note 1) CF: Conversion Factor
note 2) CF = CFgeneral x SCF = 0.88 x 0.83 = 0.73
note 3) CF = CFunskilled x SCF = 0.50 x 0.83 = 0.42
note 4) CF = CFskilled x SCF = 0.85 x 0.83 = 0.71
note 5) CF = SCF = 0.83
note 6) Conversion Factor for Import Material & Fuel is assumed to be SCF because it contains only 'cement' and 'fuel' whose prices are quated as domestic market price.

9-1-8 EIRR Calculation

(1) Assumed Implementation Schedule

Table 9-1-30 shows the assumed implementation schedule for the economic analysis. Due to political issues of Madagascar, it is assumed that the survey of fund source and its negotiation will be commenced in early 2011. Construction of facilities will be started in the middle of 2013, and completed in early 2017. During the construction period, container yard which will be built by reclaiming Hastie Reef is assumed to be commissioned in the end of 2015.

Table 9-1-30 Assumed Implementation Schedule



Note: Due to political issues of Madagascar, it is assumed the Government will start finding loan/fund source in early 2011.

(2) Benefit Distribution

Table 9-1-31 shows the distribution of each benefit to the calendar years. As former estimated benefits are of the target year 2020, each year's figure is calculated in the way that figure should be proportion to the surplus demand of container over existing terminal's capacity, i.e. 200,000 TEU p.a.

The benefit is assumed to be counted from the year 2016 on partial completion of container yard. This additional container yard will increase the capacity of existing terminal, thus the effect of the project will be appeared in the same year.

The benefit is assumed to increase until the year when the container demand goes beyond the capacity of new built terminal. The figure of benefit is assumed to be constant after such year. The capacity of the new built terminal is assumed to be 450,000 TEU.

Table 9-1-31 Benefit Distribution Detail (Unit 1,000 EUR)

Year		Event			Cont. Demand (TEU)	Demand - Capa. (200,000)	Rate v.s. 2020	Ship Waiting	Ship Chartering	Tranship.	Operation & Maintenance				Total
		Cost Event	Benefit Event								Fixed 1	Fixed 2	Variable	Total	
2013	(1)	Commence Const.			218,646	18,646	8.2%								
2014	(2)				240,511	40,511	17.9%								
2015	(3)				264,562	64,562	28.6%								
2016	(4)	Complete C.Y.	Start Benefit	(1)	291,018	91,018	40.3%	4,598	5,192	3,510	2,647		624	3,271	16,571
2017	(5)	Complete Const.		(2)	320,120	120,120	53.1%	6,069	6,852	4,632	2,647	397	824	3,868	21,421
2018	(6)			(3)	352,132	152,132	67.3%	7,686	8,678	5,866	2,647	397	1,043	4,087	26,317
2019	(7)			(4)	387,345	187,345	82.9%	9,465	10,687	7,224	2,647	397	1,284	4,328	31,704
2020	(8)	Demend target yr.	Benefit calculated yr.	(5)	426,079	226,079	100.0%	11,422	12,896	8,718	2,647	397	1,550	4,594	37,630
2021	(9)	Demand exeed capa.	Max. benefit yr.	(6)	468,687	268,687	118.8%	13,575	15,326	10,361	2,647	397	1,842	4,886	44,148
2022	(10)			(7)			118.8%	13,575	15,326	10,361	2,647	397	1,842	4,886	44,148
2023	(11)			(8)			118.8%	13,575	15,326	10,361	2,647	397	1,842	4,886	44,148
2024	(12)			(9)			118.8%	13,575	15,326	10,361	2,647	397	1,842	4,886	44,148
2025	(13)		Equipment loan complt.	(10)			118.8%	13,575	15,326	10,361	2,647	397	1,842	4,886	44,148
2026	(14)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2027	(15)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2028	(16)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2029	(17)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2030	(18)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2031	(19)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2032	(20)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2033	(21)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2034	(22)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2035	(23)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2036	(24)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2037	(25)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2038	(26)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2039	(27)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2040	(28)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2041	(29)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2042	(30)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2043	(31)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2044	(32)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2045	(33)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2046	(34)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501
2047	(35)						118.8%	13,575	15,326	10,361		397	1,842	2,239	41,501

note: Fixed 1 means cost of procurement equipment and land acquisition.
note: Fixed 2 means maintenance and repairing cost of equipment and facilities
note: Valiable means the cost varies in proportion to the demand ; labor cost and fuel cost.

(3) Cost Distribution

Table 9-1-32 shows the distribution of each cost to the calendar years. Construction cost is distributed to each ear between 2013 and 2017 in proportion to the disbursement schedule of the construction contract. This construction cost includes engineering expense, contingency and price escalation during the period, but excludes the cost of cargo handling equipment.

The cost of cargo handling equipment such as quay gantry crane, RTG, and tractors, etc. are added to the operation cost because the equipment is assumed to be installed by the terminal operator, and is commonly procured with the bank loan. The column "Fixed 1"of Table 9-1-31 indicates the cost of equipment, assuming 10years loan payment.

Maintenance cost indicated in the column "Fixed 2" of the Table is assumed to cover 3.5 % p.a. of equipment procurement cost including insurance, and to cover 1.0% p.a. of construction cost of facilities.

The cost of labor and fuels for operation is shoun in the column "Variable" of the Table. The figures are calculated in proportion to the container cargo demand and sealed at the figure of 2021 when the demand goes beyond the terminal capacity.

Table 9-1-32 Cost Distribution Detail (Unit: 1,000 EUR)

Year		Event		Cont. Demand (TEU)	Rate v.s. 2020	Cost Distrib. Rate	Initial Investment (Const.Cost)	Operation & Maintenance				Total
								Fixed 1	Fixed 2	Variable	Total	
2013	(1)	Commence Const.		218,646	51.3%	9.4%	15,521					15,521
2014	(2)			240,511	56.4%	26.1%	43,094					43094
2015	(3)			264,562	62.1%	33.1%	54,652					54652
2016	(4)			291,018	68.3%	23.9%	39,462					39462
2017	(5)	Complete Const.	(1)	320,120	75.1%	7.5%	12,383	5,697		3,382	9,079	21,462
2018	(6)		(2)	352,132	82.6%	(100.0%)	(165,112)	5,697	2,013	3,720	11,430	11,430
2019	(7)		(3)	387,345	90.9%			5,697	2,013	4,092	11,802	11,802
2020	(8)	Demand target yr.	(4)	426,079	100.0%			5,697	2,013	4,501	12,211	12,211
2021	(9)	Demand exeed capa.	(5)	468,687	110.0%			5,697	2,013	4,951	12,661	12,661
2022	(10)		(6)		110.0%			5,697	2,013	4,951	12,661	12,661
2023	(11)		(7)		110.0%			5,697	2,013	4,951	12,661	12,661
2024	(12)		(8)		110.0%			5,697	2,013	4,951	12,661	12,661
2025	(13)		(9)		110.0%			5,697	2,013	4,951	12,661	12,661
2026	(14)	Equipment loan complt.	(10)		110.0%			5,697	2,013	4,951	12,661	12,661
2027	(15)				110.0%				2,013	4,951	6,964	6,964
2028	(16)				110.0%				2,013	4,951	6,964	6,964
2029	(17)				110.0%				2,013	4,951	6,964	6,964
2030	(18)				110.0%				2,013	4,951	6,964	6,964
2031	(19)				110.0%				2,013	4,951	6,964	6,964
2032	(20)				110.0%				2,013	4,951	6,964	6,964
2033	(21)				110.0%				2,013	4,951	6,964	6,964
2034	(22)				110.0%				2,013	4,951	6,964	6,964
2035	(23)				110.0%				2,013	4,951	6,964	6,964
2036	(24)				110.0%				2,013	4,951	6,964	6,964
2037	(25)				110.0%				2,013	4,951	6,964	6,964
2038	(26)				110.0%				2,013	4,951	6,964	6,964
2039	(27)				110.0%				2,013	4,951	6,964	6,964
2040	(28)				110.0%				2,013	4,951	6,964	6,964
2041	(29)				110.0%				2,013	4,951	6,964	6,964
2042	(30)				110.0%				2,013	4,951	6,964	6,964
2043	(31)				110.0%				2,013	4,951	6,964	6,964
2044	(32)				110.0%				2,013	4,951	6,964	6,964
2045	(33)				110.0%				2,013	4,951	6,964	6,964
2046	(34)				110.0%				2,013	4,951	6,964	6,964
2047	(35)				110.0%				2,013	4,951	6,964	6,964

note: Fixed 1 means cost of procurement equipment and land acquisition.
note: Fixed 2 means maintenance and repairing cost of equipment and facilities
note: Valiable means the cost varies in proportion to the demand ; labor cost and fuel cost.

(4) Calculation of EIRR

Table 9-1-33 shows the calculation of EIRR for the project. EIRR is estimated at 14.2%.

Table 9-1-33 Calculation of EIRR (Unit: 1,000 EUR)

Year		COST			BENEFIT					Net Benefit
		Initial Invest. (Const. Cost)	O.M. Cost	Total	Ship Waiting	Ship Chartering	Trans-shipment	Cargo Operation	Total	
2013	(1)	15,521		15,521						-15,521
2014	(2)	43,094		43,094						-43,094
2015	(3)	54,652		54,652						-54,652
2016	(4)	39,462		39,462	4,598	5,192	3,510	3,271	16,571	-22,891
2017	(5)	12,383	9,079	21,462	6,069	6,852	4,632	3,868	21,421	-41
2018	(6)		11,430	11,430	7,686	8,678	5,866	4,087	26,317	14,887
2019	(7)		11,802	11,802	9,465	10,687	7,224	4,328	31,704	19,902
2020	(8)		12,211	12,211	11,422	12,896	8,718	4,594	37,630	25,419
2021	(9)		12,661	12,661	13,575	15,326	10,361	4,886	44,148	31,487
2022	(10)		12,661	12,661	13,575	15,326	10,361	4,886	44,148	31,487
2023	(11)		12,661	12,661	13,575	15,326	10,361	4,886	44,148	31,487
2024	(12)		12,661	12,661	13,575	15,326	10,361	4,886	44,148	31,487
2025	(13)		12,661	12,661	13,575	15,326	10,361	4,886	44,148	31,487
2026	(14)		12,661	12,661	13,575	15,326	10,361	2,239	41,501	28,840
2027	(15)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2028	(16)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2029	(17)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2030	(18)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2031	(19)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2032	(20)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2033	(21)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2034	(22)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2035	(23)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2036	(24)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2037	(25)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2038	(26)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2039	(27)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2040	(28)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2041	(29)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2042	(30)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2043	(31)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2044	(32)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2045	(33)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2046	(34)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
2047	(35)		6,964	6,964	13,575	15,326	10,361	2,239	41,501	34,537
Total		165,112	266,732	431,844	405,765	458,107	309,697	93,836	1,267,405	835,561

EIRR= 14.6%

9-1-9 Sensitivity Analysis

For the sensitivity analysis, following factors are considered to evaluate the project investment risk.

1) Lower benefit by 10%
2) Capital cost overrun by 10%

Result of the EIRR calculation is shown in the following Table.

Table 9-1-34 Sensitivity Analysis

	EIRR
Base Case	14.6%
Benefit (-10%)	12.9%
Capital Cost (+10%)	13.5%
Benefit (-10%) + Capital Cost (+10%)	11.8%

Generally speaking, feasibility of the project is evaluated comparing EIRR with Social Discount Rate (SDR). The social discount rate is a reflection of a society's relative valuation on today's well-being versus well-being in the future. The appropriate selection of a social discount rate is crucial for cost-benefit analysis, and has important implications for resource allocations. There is wide diversity in social discount rates, with developed nations typically applying a lower rate (3–7%) than developing nations (8–15%). In the field of public infrastructures project in developing countries, if EIRR is over 10%, the project is normally feasible. The above calculated figures of EIRR shows higher than 10% even for the worst case 11.8%. Therefore it is assumed the project is well feasible.

Refered Documents of Chapter 9-1

1) Tadashi Matsuno & Tetsuo Yaguchi, Assessment of Development Project, 1999 *(for General Theory, in Japanese)*
2) Presidence de la Republique, Loi No. 2008-026 du 18 Decembre 2008 Portant Loi de Finances Pour 2009 *(Finance Bill for Tax & Duties, in French)*
3) Drewry Publications, Container Insight, May 09 *(for Charter Rate of Container Ship)*
4) The World Bank, Africa Development Indicators 2008/09 *(for Statistics of Education & Unemployment)*
5) Tariff of Mauritius Port Authority *(for Benefit Analysis)*
6) Direction Generale des Impots Madagascar *(for Domestic Tax Rate, in French)*

9-2 Financial Analysis

9-2-1 Purpose of the Financial Analysis

The purpose of the financial analysis is to examine the viability of the project. (The project means the urgent plan for the Toamasina port in this chapter.) When evaluating financial viability of the project, financial soundness of the executing agency of the project, viz SPAT, is assessed.

9-2-2 Methodology of the Financial Analysis

(1) Viability of the Project

The viability of the project is analyzed using the Financial Internal Rate of Return (FIRR) by means of the discount cash flow method. The FIRR is a discount rate that makes the costs and the revenues during the project life equal, and it is calculated using the following formula:

$$\sum_{i=1}^{n} \frac{R_i - C_i}{(1+r)^{i-1}} = 0$$

n : Project life
Bi: Revenue in the i-th year
Ci: Cost in the i-th year
r : Discount rate

Here, the revenues and the costs in this analysis cover the following items:

Revenues: operating revenues by the project
Costs: investments (initial investments and re-investments)
maintenance, repair and fuel costs
personnel and administration costs

When the calculated FIRR exceeds the weighted average interest rate of the total funds for the investments of the project, the project is regarded as financially feasible.

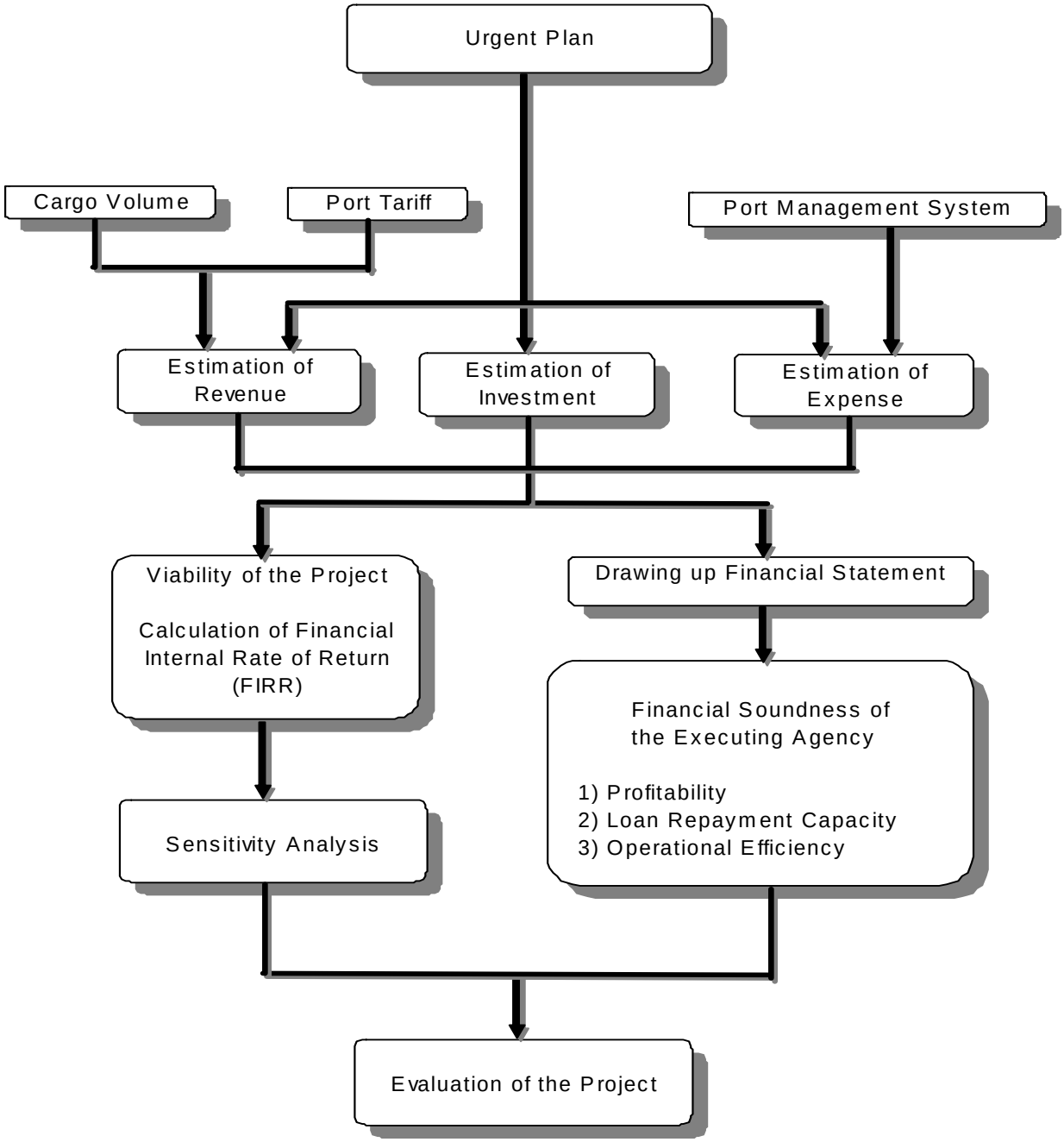


Figure 9-2-1 Procedure of Financial Analysis

(2) Financial Soundness

The financial soundness is appraised based on its projected financial statements (Profit and Loss Statement, Cash Flow Statement and Balance sheet). The appraisal is made from the viewpoints of profitability, loan repayment capacity and operational efficiency, using the following ratios:

1) Profitability

Rate of Return on Net Fixed Assets:

$$\frac{\textit{Net Operating Income}}{\textit{Total Fixed Assets}} \times 100\ (\%)$$

This indicator shows the profitability of the investments, which are presented as net total fixed assets. It is necessary to keep the rate above the average interest rate of the funds for investments.

2) Loan Repayment Capacity

Debt Service Coverage Ratio:

$$\frac{\textit{Net Operating Income before Depreciation}}{\textit{Repayment of and interest on long-term loans}}$$

This indicator shows whether the operating income can cover the repayment and the interest on long-term loans. The ratio must be higher than **1.0** and it is generally preferable to be higher than **1.75.**

3) Operational Efficiency

Operating Ratio:

$$\frac{\textit{Operating Expenses}}{\textit{Operating Revenues}} \times 100\ (\%)$$

The operating ratio shows the operational efficiency of the terminal management entity, namely the ratio of port revenue that is consumed by operating expenses. Generally it must be less than **70%-75%.**

Working Ratio:

$$\frac{\textit{Operating Expenses Depreciation Expenses}}{} \times 100\ (\%)$$

Operating Revenues

The working ratio shows the efficiency of the routine operations of the port. Generally it must be less than **50% - 60%.**

9-2-3 Assumption for the Financial Analysis

(1) Scope of the Analysis

The viability of the project was assessed, using the revenues and costs related to the project

(2) Base Year

Prices as of 2013 were used in this financial analysis. Price escalation due to inflation for the future considered as follows:

Price Escalation: FC 3%, LC 6%

(3) Project Life

Taking account of the conditions of the long-term loans and the service lives of the port facilities, the project life for the financial analysis was determined as 35 years including 5-year construction period.

(4) Covered Projects in the Analysis

The scope of the financial analysis covers the projects in the Urgent Development Plan for Toamasina port. The project major components and their implementing schedule are as follows:

Table 9-2-1 Development Schedule

Urgent Plan		2013	2014	2015	2016	2017
Breakwater	345m					
C4 Berth	−14×320m,Craine Foundation,CY(Reclamation,Pavement)					
Hasti Reef	CY(Reclamation,revetment,Pavement)					
Improvement of Existing Road	Pavement					
Dreadging	In front of C4 and Basin					
C1−C3	Improvement of Berth and Deadging					
Over-Pass	Entrance of Port					
Environment Aspect	Monitering, Concrete Tank, Countermesure for Transportation					
Cargo Handling Equipment	Container					
Cargo Handling Equipment	General					
Consultants						

(5) Implementation Scheme

The roles of SPAT and terminal operator are as follows based on the concept of cost allocation.

Table 9-2-2 Implementation Scheme

Urgent Plan		SPAT	Terminal Operater
Breakwater	345m	○	
C4 Berth	－14×320m,Craine Foundation,CY(Reclamation,Pavement)	○	
Hasti Reef	CY(Reclamation,revetment,Pavement)	○	
Improvement of Existing Road	Pavement	○	
Dreadging	In front of C4 and Basin	○	
C1－C3	Improvement of Berth and Deadging	○	
Over-Pass	Entrance of Port	○	
Environment Aspect	Monitering, Concrete Tank, Countermesure for Transportation	○	
Cargo Handling Equipment	Container		○
Consultants		○	

(6) Operating Cost

Study team estimated operating cost based on SPAT and MICTSL.

Table 9-2-3 Operating Cost

	SPAT	Terminal Operator
Number of Person	670 Persons	500～600 Persons
Personnel Cost	Management :EUR14,000/person/Year Staff :EUR2,800/person/ Year	Management :EUR700/person/Month Skilled Engineer :EUR385/person/ Month General Staff:EUR182/person/ Month
Administration and Other Cost	50% of Personnel cost	－
Maintenance Cost	Infrastructure : 1% of the original construction cost Equipment : 3% of the original construction cost	
Depreciation	Civil structure : 40 year Equipment : Gantry Crane 20 year : RTG 10 year	

(7) Cargo Handling Volume

To estimate revenues to be generated from cargo handling at the new wharf, the volumes of cargo shown in Table 9-2-4 were used (see Chapter 3).

Table 9-2-4 Cargo Handling Volume

Item			Unit	Present Figure		Growth Rate (%)	Forecast	
				Throughput	(Year)		2015	2020
Congtainer Cargo			TEU	143,307	(2008)	10%	264,562	426,079
Bulk & General Cargo	Conventional Cargo		TON	566,148	(2007)	3%	848,535	983,685
	New Project	Ambatovy Pro.	TON	－	－	－	3,100,000	3,100,000
		Oji Paper Pro.	TON	－	－	－	－	201,600
	(Subtotal)		TON	(566,148)	(2007)	－	(3,948,535)	(4,285,285)
Liquid Cargo			TON	621,923		2%	728,682	804,524

(8) Revenues and Port Tariff

Revenues for the project will be generated from receiving vessels and handling cargoes charged according to the port tariff. In this financial analysis, the present Toamasina port tariff was adopted (see Chapter 8).

(9) Fund Raising

1) Soft Loans

It was assumed that 80% of the total project costs will be financed by soft loans in this financial analysis.

The conditions of the soft loan were assumed as follows:

-Loan period: 40 years, including a grace period of 10 years
-Interest rate: 0.01% per annum
-Repayment: fixed amount repayment of principal

2) Domestic Funds

It was assumed that a remaining 20% of the total project costs will be raised by domestic funds.

The conditions of domestic funds were assumed as follows:

-Loan period: 20 years, including a grace period of 5 years
-Interest rate: 10% per annum
-Repayment: fixed amount repayment of principal

Any cash shortage should be covered by short-term loans

(10) Expenditure

1) Investments

In the financial analysis, the initial investment costs of the project need to include all taxes, namely, the goods and service tax (GST) and customs duty.

The investment costs show in Table 9-2-5.

Table 9-2-5 Project Cost

Unit: EUR

Urgent Plan		Total	2013	2014	2015	2016	2017
Breakwater	L=345m	42,666,000	5,333,000	13,333,000	16,000,000	8,000,000	0
C4 Berth	L=320m, D=-14m	55,380,000	6,795,500	16,550,500	14,980,000	11,139,500	5,914,500
Hasti Reef	CY(Reclamation,revetment,Pavement)	25,600,000	1,731,500	5,888,000	11,068,500	6,912,000	0
Rearrangement of Facilities	Pavement	15,368,000	0	0	7,684,000	7,684,000	0
Dredging	In front of C4 and Basin	3,845,000	0	1,922,500	1,922,500	0	0
C1－C3	Improvement of Berth and Dredging	9,809,000	0	2,788,000	4,904,500	2,116,500	0
Overpass	Entrance of Port	10,528,000	2,632,000	5,264,000	2,632,000	0	0
Environment Consideration	Monitoring, Concrete Tank	4,188,000	493,000	1,232,000	1,478,000	862,000	123,000
Subtotal Construction Civil Works		167,384,000	16,985,000	46,978,000	60,669,500	36,714,000	6,037,500
Engineering		13,043,000	3,781,500	4,767,000	2,024,500	1,754,500	715,500
Subtotal Inc. Engineering		180,427,000	20,766,500	51,745,000	62,694,000	38,468,500	6,753,000
Contingency		8,369,000	1,046,500	2,092,500	2,092,000	2,092,000	1,046,000
Total Inc. Contingency		188,796,000	21,813,000	53,837,500	64,786,000	40,560,500	7,799,000

2) Maintenance and Repair Costs

The annul maintenance and repair costs for the port facilities subject to depreciation were calculated according to the following conditions.

Infrastructure: 1.0% of the original construction cost.
Equipment: 3.0% of the original procurement cost.

3) Personnel and Administration Costs

The annual administration costs were calculated as 20% of the total annual personnel costs. This ratio was based on the actual accounts of the SPAT.

4) Depreciation Expenses

The annual depreciation expenses of the port facilities and equipment were calculated by the straight line method, based on the SPAT standard.

5) Taxes

Taxes to be levied for profit were income tax and deemed dividend tax.

9-2-4 Evaluation of the project

(1) Viability

The FIRR of the project is shown Table 9-2-6.

Table 9-2-6 FIRR of the Project

(Unit : EUR)

	Revenue		Cost				Difference	Net Present Volume(NPV)		
Year		Total	Investment	Expenses		Total	Revenue - Cost	Revenue	Cost	Revenue - Cost
				Maintenance Costs	Management Costs					
1 2013			21,813,000			21,813,000	-21,813,000		21,813,000	-21,813,000
2 2014			53,837,500			53,837,500	-53,837,500		50,619,260	-50,619,260
3 2015			64,786,000			64,786,000	-64,786,000		57,272,083	-57,272,083
4 2016	15,218,007	15,218,007	40,560,500			40,560,500	-25,342,493	12,648,834	33,712,893	-21,064,059
5 2017	16,145,254	16,145,254	7,799,000	1,673,830	3,654,000	13,126,830	3,018,424	12,617,361	10,258,491	2,358,869
6 2018	17,205,268	17,205,268		1,673,830	3,654,000	5,327,830	11,877,438	12,642,006	3,914,758	8,727,248
7 2019	18,360,271	18,360,271		1,673,830	3,654,000	5,327,830	13,032,441	12,684,242	3,680,746	9,003,497
8 2020	19,619,709	19,619,709		1,673,830	3,654,000	5,327,830	14,291,879	12,744,093	3,460,722	9,283,371
9 2021	19,619,700	19,619,700		1,673,830	3,654,000	5,327,830	14,291,870	11,982,284	3,253,851	8,728,434
10 2022	19,619,700	19,619,700		1,673,830	3,654,000	5,327,830	14,291,870	11,266,020	3,059,346	8,206,675
11 2023	19,619,700	19,619,700		1,673,830	3,654,000	5,327,830	14,291,870	10,592,572	2,876,467	7,716,105
12 2024	19,619,700	19,619,700		1,673,830	3,654,000	5,327,830	14,291,870	9,959,381	2,704,521	7,254,860
13 2025	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	9,602,679	2,542,853	7,059,826
14 2026	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	9,028,660	2,390,849	6,637,811
15 2027	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	8,488,954	2,247,931	6,241,023
16 2028	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	7,981,511	2,113,557	5,867,954
17 2029	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	7,504,401	1,987,215	5,517,186
18 2030	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	7,055,811	1,868,426	5,187,385
19 2031	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	6,634,036	1,756,737	4,877,299
20 2032	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	6,237,474	1,651,724	4,585,749
21 2033	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	5,864,617	1,552,989	4,311,627
22 2034	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	5,514,048	1,460,157	4,053,892
23 2035	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	5,184,435	1,372,873	3,811,563
24 2036	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	4,874,526	1,290,807	3,583,719
25 2037	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	4,583,142	1,213,646	3,369,495
26 2038	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	4,309,176	1,141,098	3,168,077
27 2039	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	4,051,586	1,072,887	2,978,699
28 2040	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	3,809,395	1,008,753	2,800,642
29 2041	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	3,581,681	948,453	2,633,228
30 2042	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	3,367,579	891,757	2,475,822
31 2043	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	3,166,276	838,451	2,327,825
32 2044	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	2,977,005	788,331	2,188,675
33 2045	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	2,799,049	741,207	2,057,842
34 2046	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	2,631,731	696,900	1,934,831
35 2047	20,119,700	20,119,700		1,673,830	3,654,000	5,327,830	14,791,870	2,474,414	655,241	1,819,173
Total	627,780,409	627,780,409	188,796,000	51,888,730	113,274,000	353,958,730	273,821,679	228,858,980	228,858,980	0

FIRR = 6.36%

The FIRR of the project was **6.36%**, exceeding the weighted average interest rate of funds of 2.41%. Opportunity cost of capital (OCC) as a cut-off rate for financial viability is set at 10.0 % in the analysis currently in place, while referring to the lending rate of the Central Bank to commercial banks. Calculated FIRR is lower than it. This means that the existing tariff should be raised or revised a concession condition.

(2) Comparison of alternative of FIRR

Alternative case shown as follows;

1) Case-1:

Concession Condition:

Fixed Fees (First 10 years)	EUR8,000,000/year
Variable Fees	
V＜300,000TEU	EUR10/TEU
300,000≦V＜350,000	EUR15/TEU
350,000≦V＜400,000	EUR20/TEU
400,000≦V＜450,000	EUR25/TEU
450,000TEU≦V	EUR30/TEU

※calculate a profit for 30% (see Table 9-2-7)

Port Charge: present conditions

FIRR= 8.22% (see Table 9-2-8)

2) Case-2:

Concession Condition: same Case-1
Port Charge: 10% up

FIRR= 8.50% (see Table 9-2-9)

3) Case-3:

Concession Condition: same Case-1
Port Charge: 25% up

FIRR= 8.82% (see Table 9-2-10)

4) Case-4:

Terminal Operator invests a part of pavement.
Concession Condition

Fixed Fees (First 10 years)	EUR7,000,000/year
Variable Fees	
V＜300,000TEU	EUR16/TEU
300,000≦V＜350,000	EUR20/TEU
350,000≦V＜400,000	EUR24/TEU
400,000≦V＜450,000	EUR28/TEU
450,000TEU≦V	EUR32/TEU

※calculate a profit for 30% (see Table 9-2-11)

Port Charge: 10% up

FIRR= 9.53% (see Table 9-2-12)

5) Case-5:

Terminal Operator invests a part of pavement.
Concession Condition: same Case-4
Port Charge: 25% up

FIRR=9.85% (see Table 9-2-13)

Table 9-2-7 Concession Condition (Case-1,2,3)

Toamasina Container Terminal: Income Statement

Case-1,2,3: 10 Years as Equipment Amortization Period.
Including GOM's Loan as 20% of Capital at 10% of IR
Weigted IR=2.41%

A. Conditions and assumptions

1. Capital costs for CT are shown in the Loan Repayment (Civil) table
2. Capital cost for CHE are shown in the CHE Amortization cost table
3. Facility maintenance cost is estimated as 1% of the total civil work cost.
   1) Construction (Civil) Cost for the Terminal **14,470.0** ;Yen, Mil
   109.0 ; EUR, mil
   * Facility Maintenance Cost for the Terminal as 1% of the cost **1.090** ; EUR, mil per year
   2) Yen Exchange Rate: **132.789** ; Yen/EUR
4. Operational costs are estimated by functions, based on the estimated productivities, fuel consumption rate by CHEs and operating hours.

B. Terminal Operational Income Statement by Handling Volume

		1	2	3	4	5	6	7	8	9	10
	Possible Year:	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025& after
1. Handling Vol	(TEU/year):	**290,000**	**322,500**	**355,000**	**387,500**	**420,000**	**450,000**	**450,000**	**450,000**	**450,000**	**450,000**
	(Box/Year):	**214,815**	**238,889**	**262,963**	**287,037**	**311,111**	**333,333**	**333,333**	**333,333**	**333,333**	**333,333**
2. Terminal Revenue											(EUR,'000/year)
1) Stevedoring revenue	*Ave. EUR106.5	22,877.8	25,441.7	28,005.6	30,569.4	33,133.3	35,500.0	35,500.0	35,500.0	35,500.0	35,500.0
2) Lift On/Off revenue	*Ave. EUR33.5	7,196.3	8,002.8	8,809.3	9,615.7	10,422.2	11,166.7	11,166.7	11,166.7	11,166.7	11,166.7
3) Storage & Other revenues (10% of Steve C.		2,287.8	2,544.2	2,800.6	3,056.9	3,313.3	3,550.0	3,550.0	3,550.0	3,550.0	3,550.0
Total Revenue		**32,361.9**	**35,988.6**	**39,615.4**	**43,242.1**	**46,868.9**	**50,216.7**	**50,216.7**	**50,216.7**	**50,216.7**	**50,216.7**
3. Capital Cost for Public(=Fixed Fee)											(EUR,'000/year)
* Most highest 10 years Average.		**7,974.8**	**7,974.8**	**7,974.8**	**7,974.8**	**7,974.8**	**7,974.8**	**7,974.8**	**7,974.8**	**7,974.8**	**7,974.8**
	Box/EUR	37.1	33.4	30.3	27.8	25.6	23.9	23.9	23.9	23.9	23.9
4. Operational Cost											(EUR,'000/year)
1) Human		1,382.6	1,468.6	1,560.0	1,657.0	1,760.1	1,822.5	1,822.5	1,822.5	1,822.5	1,822.5
2) Energy		3,122.1	3,369.3	3,636.0	3,923.9	4,234.5	4,510.2	4,510.2	4,510.2	4,510.2	4,510.2
3) Equipment Amortization (by 10 years)		4,417.9	4,703.6	5,007.7	5,331.6	5,676.4	5,802.5	5,802.5	5,802.5	5,802.5	5,802.5
4) Equipment MR.		1,083.6	1,154.5	1,230.0	1,310.4	1,396.1	1,427.3	1,427.3	1,427.3	1,427.3	1,427.3
5) Facility MR.		1,089.7	1,089.7	1,089.7	1,089.7	1,089.7	1,089.7	1,089.7	1,089.7	1,089.7	1,089.7
	S. Total:	11,095.9	11,785.6	12,523.4	13,312.5	14,156.7	14,652.2	14,652.2	14,652.2	14,652.2	14,652.2
	Box/EUR:	51.7	49.3	47.6	46.4	45.5	44.0	44.0	44.0	44.0	44.0
5. Total Cost		**19,070.7**	**19,760.4**	**20,498.2**	**21,287.3**	**22,131.5**	**22,627.0**	**22,627.0**	**22,627.0**	**22,627.0**	**22,627.0**
	Box/EUR:	88.8	82.7	78.0	74.2	71.1	67.9	67.9	67.9	67.9	67.9
6. Profit from the Operation before Tax		**13,291**	**16,228**	**19,117**	**21,955**	**24,737**	**27,590**	**27,590**	**27,590**	**27,590**	**27,590**
	EBIT (%):	41.1%	45.1%	48.3%	50.8%	52.8%	54.9%	54.9%	54.9%	54.9%	54.9%
7. Variable Fee:		**2,900**	**4,838**	**7,100**	**7,750**	**10,500**	**13,500**	**13,500**	**13,500**	**13,500**	**13,500**
	As an Idea: (EUR/TEU)	10	15	20	20	25	30	30	30	30	30
8. EBIT for Operator		**10,391**	**11,391**	**12,017**	**14,205**	**14,237**	**14,090**	**14,090**	**14,090**	**14,090**	**14,090**
	EBIT (%):	32.1%	31.7%	30.3%	32.8%	30.4%	28.1%	28.1%	28.1%	28.1%	28.1%

Table 9-2-8 FIRR of the Project (Case-1)

(Unit : EUR)

		Revenue		Cost				Difference	Net Present Volume(NPV)		
	Year		Total	Investment	Expenses		Total	Revenue - Cost	Revenue	Cost	Revenue - Cost
					Maintenance Costs	Management Costs					
1	2013			21,813,000			21,813,000	-21,813,000		21,813,000	-21,813,000
2	2014			53,837,500			53,837,500	-53,837,500		49,746,370	-49,746,370
3	2015			64,786,000			64,786,000	-64,786,000		55,313,888	-55,313,888
4	2016	15,560,619	15,560,619	40,560,500			40,560,500	-24,999,881	12,275,986	31,998,736	-19,722,750
5	2017	17,522,726	17,522,726	7,799,000	1,673,830	3,654,000	13,126,830	4,395,896	12,773,435	9,568,986	3,204,449
6	2018	19,881,145	19,881,145		1,673,830	3,654,000	5,327,830	14,553,315	13,391,337	3,588,665	9,802,672
7	2019	20,703,736	20,703,736		1,673,830	3,654,000	5,327,830	15,375,906	12,885,693	3,315,961	9,569,732
8	2020	23,727,917	23,727,917		1,673,830	3,654,000	5,327,830	18,400,087	13,645,680	3,063,980	10,581,700
9	2021	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	12,608,736	2,831,147	9,777,589
10	2022	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	11,650,594	2,616,007	9,034,586
11	2023	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	10,765,261	2,417,216	8,348,045
12	2024	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	9,947,205	2,233,531	7,713,674
13	2025	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	9,191,314	2,063,804	7,127,509
14	2026	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	8,492,862	1,906,975	6,585,888
15	2027	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	7,847,487	1,762,063	6,085,424
16	2028	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	7,251,154	1,628,163	5,622,990
17	2029	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	6,700,136	1,504,439	5,195,697
18	2030	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	6,190,990	1,390,116	4,800,874
19	2031	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	5,720,535	1,284,481	4,436,054
20	2032	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	5,285,829	1,186,872	4,098,957
21	2033	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	4,884,157	1,096,682	3,787,476
22	2034	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	4,513,009	1,013,344	3,499,664
23	2035	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	4,170,064	936,340	3,233,724
24	2036	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	3,853,179	865,187	2,987,992
25	2037	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	3,560,375	799,441	2,760,933
26	2038	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	3,289,820	738,691	2,551,129
27	2039	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	3,039,826	682,558	2,357,268
28	2040	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	2,808,828	630,690	2,178,138
29	2041	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	2,595,385	582,764	2,012,621
30	2042	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	2,398,160	538,479	1,859,681
31	2043	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	2,215,923	497,560	1,718,363
32	2044	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	2,047,535	459,750	1,587,784
33	2045	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	1,891,942	424,814	1,467,128
34	2046	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	1,748,172	392,532	1,355,640
35	2047	23,727,909	23,727,909		1,673,830	3,654,000	5,327,830	18,400,079	1,615,328	362,703	1,252,625
	Total	738,049,692	738,049,692	188,796,000	51,888,730	113,274,000	353,958,730	384,090,962	211,255,937	211,255,937	0

FIRR = 8.22%

Table 9-2-9 FIRR of the Project (Case-2)

(Unit : EUR)

	Year	Revenue		Cost				Difference	Net Present Volume(NPV)		
			Total	Investment	Expenses		Total	Revenue - Cost	Revenue	Cost	Revenue - Cost
					Maintenance Costs	Management Costs					
1	2013			21,813,000			21,813,000	-21,813,000		21,813,000	-21,813,000
2	2014			53,837,500			53,837,500	-53,837,500		49,618,011	-49,618,011
3	2015			64,786,000			64,786,000	-64,786,000		55,028,806	-55,028,806
4	2016	17,395,709	17,395,709	40,560,500			40,560,500	-23,164,791	13,617,755	31,751,679	-18,133,924
5	2017	17,902,726	17,902,726	7,799,000	1,673,830	3,654,000	13,126,830	4,775,896	12,916,267	9,470,605	3,445,662
6	2018	20,261,145	20,261,145		1,673,830	3,654,000	5,327,830	14,933,315	13,472,131	3,542,605	9,929,527
7	2019	21,083,736	21,083,736		1,673,830	3,654,000	5,327,830	15,755,906	12,920,352	3,264,955	9,655,397
8	2020	24,107,917	24,107,917		1,673,830	3,654,000	5,327,830	18,780,087	13,615,730	3,009,065	10,606,665
9	2021	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	12,548,599	2,773,231	9,775,368
10	2022	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	11,565,109	2,555,880	9,009,228
11	2023	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	10,658,698	2,355,564	8,303,134
12	2024	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	9,823,328	2,170,948	7,652,380
13	2025	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	9,053,429	2,000,801	7,052,628
14	2026	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	8,343,871	1,843,989	6,499,881
15	2027	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	7,689,924	1,699,467	5,990,456
16	2028	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	7,087,229	1,566,272	5,520,957
17	2029	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	6,531,771	1,443,517	5,088,255
18	2030	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	6,019,847	1,330,382	4,689,465
19	2031	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	5,548,044	1,226,114	4,321,930
20	2032	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	5,113,218	1,130,017	3,983,201
21	2033	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	4,712,472	1,041,453	3,671,019
22	2034	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	4,343,134	959,829	3,383,305
23	2035	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	4,002,743	884,603	3,118,140
24	2036	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	3,689,030	815,273	2,873,757
25	2037	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	3,399,904	751,376	2,648,528
26	2038	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	3,133,438	692,487	2,440,951
27	2039	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	2,887,856	638,214	2,249,642
28	2040	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	2,661,522	588,194	2,073,328
29	2041	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	2,452,926	542,095	1,910,831
30	2042	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	2,260,679	499,608	1,761,071
31	2043	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	2,083,500	460,452	1,623,048
32	2044	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	1,920,206	424,364	1,495,842
33	2045	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	1,769,711	391,105	1,378,606
34	2046	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	1,631,011	360,452	1,270,559
35	2047	24,107,909	24,107,909		1,673,830	3,654,000	5,327,830	18,780,079	1,503,181	332,202	1,170,979
	Total	751,664,781	751,664,781	188,796,000	51,888,730	113,274,000	353,958,730	397,706,051	208,976,617	208,976,617	0

FIRR = 8.50%

Table 9-2-10 FIRR of the Project (Case-3)

(Unit : EUR)

	Year	Revenue		Cost				Difference	Net Present Volume(NPV)		
			Total	Investment	Expenses		Total	Revenue - Cost	Revenue	Cost	Revenue - Cost
					Maintenance Costs	Management Costs					
1	2013			21,813,000			21,813,000	-21,813,000		21,813,000	-21,813,000
2	2014			53,837,500			53,837,500	-53,837,500		49,473,911	-49,473,911
3	2015			64,786,000			64,786,000	-64,786,000		54,709,644	-54,709,644
4	2016	17,965,709	17,965,709	40,560,500			40,560,500	-22,594,791	13,941,787	31,475,844	-17,534,057
5	2017	18,472,726	18,472,726	7,799,000	1,673,830	3,654,000	13,126,830	5,345,896	13,173,356	9,361,066	3,812,290
6	2018	20,831,145	20,831,145		1,673,830	3,654,000	5,327,830	15,503,315	13,651,172	3,491,461	10,159,712
7	2019	21,653,736	21,653,736		1,673,830	3,654,000	5,327,830	16,325,906	13,040,102	3,208,474	9,831,628
8	2020	24,677,917	24,677,917		1,673,830	3,654,000	5,327,830	19,350,087	13,656,771	2,948,424	10,708,347
9	2021	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	12,549,870	2,709,451	9,840,420
10	2022	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	11,532,690	2,489,847	9,042,843
11	2023	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	10,597,952	2,288,042	8,309,911
12	2024	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	9,738,977	2,102,594	7,636,383
13	2025	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	8,949,622	1,932,176	7,017,446
14	2026	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	8,224,245	1,775,571	6,448,674
15	2027	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	7,557,661	1,631,659	5,926,002
16	2028	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	6,945,104	1,499,411	5,445,693
17	2029	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	6,382,196	1,377,882	5,004,313
18	2030	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	5,864,912	1,266,203	4,598,708
19	2031	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	5,389,554	1,163,576	4,225,978
20	2032	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	4,952,725	1,069,267	3,883,458
21	2033	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	4,551,301	982,602	3,568,699
22	2034	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	4,182,413	902,961	3,279,452
23	2035	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	3,843,424	829,775	3,013,649
24	2036	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	3,531,910	762,521	2,769,389
25	2037	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	3,245,645	700,718	2,544,927
26	2038	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	2,982,582	643,924	2,338,658
27	2039	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	2,740,840	591,733	2,149,107
28	2040	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	2,518,692	543,772	1,974,920
29	2041	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	2,314,549	499,699	1,814,850
30	2042	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	2,126,953	459,198	1,667,755
31	2043	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	1,954,561	421,979	1,532,581
32	2044	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	1,796,141	387,777	1,408,364
33	2045	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	1,650,562	356,348	1,294,215
34	2046	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	1,516,782	327,465	1,189,317
35	2047	24,677,909	24,677,909		1,673,830	3,654,000	5,327,830	19,350,079	1,393,845	300,924	1,092,922
	Total	769,904,781	769,904,781	188,796,000	51,888,730	113,274,000	353,958,730	415,946,051	206,498,896	206,498,896	0

FIRR = 8.82%

Table 9-2-11 Concession Condition (Case-4,5)

Toamasina Container Terminal: Income Statement

Case-4,5: 10 Years as Equipment Amortization Period. Including GOM's Loan as 20% of Capital at 10% of IR Weigted IR=2.41%

A. Conditions and assumptions

1. Capital costs for CT are shown in the Loan Repayment (Civil) table
2. Capital cost for CHE are shown in the CHE Amortization cost table
3. Facility maintenance cost is estimated as 1% of the total civil work cost.
   1) Construction (Civil) Cost for the Terminal **12,429.0** ;Yen, Mil
   93.6 ; EUR, mil
   * Facility Maintenance Cost for the Terminal as 1% of the cost **0.936** ; EUR, mil per year
   2) Yen Exchange Rate: **132.789** ; Yen/EUR
4. Operational costs are estimated by functions, based on the estimated productivities, fuel consumption rate by CHEs and operating hours.

B. Terminal Operational Income Statement by Handling Volume

	1	2	3	4	5	6	7	8	9	10
Possible Year:	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025& after
1. Handling Vol (TEU/year):	**290,000**	**322,500**	**355,000**	**387,500**	**420,000**	**450,000**	**450,000**	**450,000**	**450,000**	**450,000**
(Box/Year):	**214,815**	**238,889**	**262,963**	**287,037**	**311,111**	**333,333**	**333,333**	**333,333**	**333,333**	**333,333**
2. Terminal Revenue										(EUR,'000/year)
1) Stevedoring revenue *Ave. EUR106.5	22,877.8	25,441.7	28,005.6	30,569.4	33,133.3	35,500.0	35,500.0	35,500.0	35,500.0	35,500.0
2) Lift On/Off revenue *Ave. EUR33.5	7,196.3	8,002.8	8,809.3	9,615.7	10,422.2	11,166.7	11,166.7	11,166.7	11,166.7	11,166.7
3) Storage & Other revenues (10% of Steve C.	2,287.8	2,544.2	2,800.6	3,056.9	3,313.3	3,550.0	3,550.0	3,550.0	3,550.0	3,550.0
Total Revenue	**32,361.9**	**35,988.6**	**39,615.4**	**43,242.1**	**46,868.9**	**50,216.7**	**50,216.7**	**50,216.7**	**50,216.7**	**50,216.7**
3. Capital Cost for Public(=Fixed Fee)										(EUR,'000/year)
* Most highest 10 years Average.	**6,919.2**	**6,919.2**	**6,919.2**	**6,919.2**	**6,919.2**	**6,919.2**	**6,919.2**	**6,919.2**	**6,919.2**	**6,919.2**
Box/EUR	32.2	29.0	26.3	24.1	22.2	20.8	20.8	20.8	20.8	20.8
4. Operational Cost										(EUR,'000/year)
1) Human	1,382.6	1,468.6	1,560.0	1,657.0	1,760.1	1,822.5	1,822.5	1,822.5	1,822.5	1,822.5
2) Energy	3,122.1	3,369.3	3,636.0	3,923.9	4,234.5	4,510.2	4,510.2	4,510.2	4,510.2	4,510.2
3) Equipment Amortization (by 10 years)	4,417.9	4,703.6	5,007.7	5,331.6	5,676.4	5,802.5	5,802.5	5,802.5	5,802.5	5,802.5
4) Equipment MR.	1,083.6	1,154.5	1,230.0	1,310.4	1,396.1	1,427.3	1,427.3	1,427.3	1,427.3	1,427.3
5) Facility MR.	936.0	936.0	936.0	936.0	936.0	936.0	936.0	936.0	936.0	936.0
S. Total:	10,942.2	11,631.9	12,369.7	13,158.8	14,003.0	14,498.5	14,498.5	14,498.5	14,498.5	14,498.5
Box/EUR:	50.9	48.7	47.0	45.8	45.0	43.5	43.5	43.5	43.5	43.5
5. Total Cost	**17,861.4**	**18,551.1**	**19,288.9**	**20,078.0**	**20,922.2**	**21,417.7**	**21,417.7**	**21,417.7**	**21,417.7**	**21,417.7**
Box/EUR:	83.1	77.7	73.4	69.9	67.2	64.3	64.3	64.3	64.3	64.3
6. Profit from the Operation before Tax	**14,500**	**17,437**	**20,326**	**23,164**	**25,947**	**28,799**	**28,799**	**28,799**	**28,799**	**28,799**
EBIT (%):	44.8%	48.5%	51.3%	53.6%	55.4%	57.3%	57.3%	57.3%	57.3%	57.3%
7. Variable Fee:	**4,640**	**6,450**	**8,520**	**9,300**	**11,760**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**
As an Idea: (EUR/TEU)	16	20	24	24	28	32	32	32	32	32
8. EBIT for Operator	**9,860**	**10,987**	**11,806**	**13,864**	**14,187**	**14,399**	**14,399**	**14,399**	**14,399**	**14,399**
EBIT (%):	30.5%	30.5%	29.8%	32.1%	30.3%	28.7%	28.7%	28.7%	28.7%	28.7%

Table 9-2-12 FIRR of the Project (Case-4)

(Unit : EUR)

	Year	Revenue		Cost				Difference	Net Present Volume(NPV)		
			Total	Investment	Expenses		Total	Revenue - Cost	Revenue	Cost	Revenue - Cost
					Maintenance Costs	Management Costs					
1	2013			21,813,000			21,813,000	-21,813,000		21,813,000	-21,813,000
2	2014			53,837,500			53,837,500	-53,837,500		49,154,804	-49,154,804
3	2015			57,102,000			57,102,000	-57,102,000		47,600,715	-47,600,715
4	2016	16,686,727	16,686,727	32,876,500			32,876,500	-16,189,773	12,700,312	25,022,392	-12,322,080
5	2017	18,503,324	18,503,324	7,799,000	1,520,150	3,654,000	12,973,150	5,530,174	12,858,019	9,015,084	3,842,936
6	2018	20,669,672	20,669,672		1,520,150	3,654,000	5,174,150	15,495,522	13,114,115	3,282,800	9,831,315
7	2019	21,633,115	21,633,115		1,520,150	3,654,000	5,174,150	16,458,965	12,531,572	2,997,267	9,534,304
8	2020	24,386,155	24,386,155		1,520,150	3,654,000	5,174,150	19,212,005	12,897,659	2,736,570	10,161,089
9	2021	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	11,775,838	2,498,548	9,277,290
10	2022	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	10,751,595	2,281,228	8,470,367
11	2023	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	9,816,439	2,082,811	7,733,628
12	2024	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	8,962,621	1,901,651	7,060,970
13	2025	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	8,183,067	1,736,249	6,446,819
14	2026	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	7,471,318	1,585,233	5,886,085
15	2027	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	6,821,475	1,447,352	5,374,123
16	2028	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	6,228,154	1,321,464	4,906,691
17	2029	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	5,686,440	1,206,525	4,479,915
18	2030	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	5,191,843	1,101,583	4,090,259
19	2031	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	4,740,265	1,005,769	3,734,495
20	2032	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	4,327,964	918,289	3,409,675
21	2033	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	3,951,525	838,418	3,113,107
22	2034	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	3,607,828	765,494	2,842,334
23	2035	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	3,294,025	698,912	2,595,113
24	2036	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	3,007,516	638,122	2,369,394
25	2037	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	2,745,928	582,619	2,163,308
26	2038	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	2,507,091	531,944	1,975,147
27	2039	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	2,289,029	485,676	1,803,352
28	2040	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	2,089,933	443,433	1,646,500
29	2041	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,908,154	404,864	1,503,290
30	2042	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,742,186	369,650	1,372,536
31	2043	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,590,653	337,498	1,253,155
32	2044	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,452,301	308,143	1,144,158
33	2045	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,325,982	281,341	1,044,641
34	2046	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,210,651	256,871	953,780
35	2047	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,105,350	234,529	870,822
	Total	760,304,940	760,304,940	173,428,000	47,124,650	113,274,000	333,826,650	426,478,290	187,886,849	187,886,849	0

FIRR = 9.53%

Table 9-2-13 FIRR of the Project (Case-5)

(Unit : EUR)

	Year	Revenue	Total	Cost: Investment	Expenses: Maintenance Costs	Expenses: Management Costs	Total	Difference: Revenue - Cost	Net Present Volume(NPV): Revenue	Cost	Revenue - Cost
1	2013			21,813,000			21,813,000	-21,813,000		21,813,000	-21,813,000
2	2014			53,837,500			53,837,500	-53,837,500		49,008,113	-49,008,113
3	2015			57,102,000			57,102,000	-57,102,000		47,317,034	-47,317,034
4	2016	17,256,727	17,256,727	32,876,500			32,876,500	-15,619,773	13,016,904	24,799,040	-11,782,136
5	2017	19,073,324	19,073,324	7,799,000	1,520,150	3,654,000	12,973,150	6,100,174	13,096,607	8,907,951	4,188,655
6	2018	21,239,672	21,239,672		1,520,150	3,654,000	5,174,150	16,065,522	13,275,879	3,234,108	10,041,771
7	2019	22,203,115	22,203,115		1,520,150	3,654,000	5,174,150	17,028,965	12,633,175	2,943,999	9,689,176
8	2020	24,956,155	24,956,155		1,520,150	3,654,000	5,174,150	19,782,005	12,925,857	2,679,913	10,245,944
9	2021	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	11,766,365	2,439,517	9,326,848
10	2022	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	10,710,886	2,220,685	8,490,202
11	2023	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	9,750,087	2,021,483	7,728,605
12	2024	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	8,875,475	1,840,149	7,035,325
13	2025	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	8,079,318	1,675,082	6,404,235
14	2026	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	7,354,579	1,524,822	5,829,756
15	2027	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	6,694,851	1,388,041	5,306,809
16	2028	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	6,094,302	1,263,530	4,830,773
17	2029	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	5,547,625	1,150,187	4,397,438
18	2030	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	5,049,986	1,047,012	4,002,974
19	2031	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	4,596,987	953,092	3,643,895
20	2032	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	4,184,623	867,597	3,317,027
21	2033	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	3,809,250	789,771	3,019,479
22	2034	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	3,467,549	718,926	2,748,623
23	2035	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	3,156,499	654,436	2,502,063
24	2036	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	2,873,352	595,731	2,277,621
25	2037	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	2,615,603	542,292	2,073,311
26	2038	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	2,380,976	493,647	1,887,329
27	2039	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	2,167,395	449,365	1,718,030
28	2040	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	1,972,973	409,056	1,563,917
29	2041	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	1,795,991	372,362	1,423,629
30	2042	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	1,634,886	338,960	1,295,925
31	2043	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	1,488,231	308,555	1,179,677
32	2044	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	1,354,733	280,876	1,073,856
33	2045	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	1,233,209	255,681	977,528
34	2046	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	1,122,586	232,745	889,841
35	2047	24,956,146	24,956,146		1,520,150	3,654,000	5,174,150	19,781,996	1,021,887	211,868	810,019
	Total	778,544,940	778,544,940	173,428,000	47,124,650	113,274,000	333,826,650	444,718,290	185,748,627	185,748,627	0

FIRR = 9.85%

Case4 seems most applicable for the future tariff system.

(3) Financial Soundness

The projected financial statements and financial indicators (rate of return on net fixed assets, debt service coverage ratio, operating ratio, and working ratio) with regard to the project are shown below.

1) Profitability

The rate of return on net fixed assets exceeded the weighted average interest rate of funds (2.41%) in 1 years from the beginning of operation (see Table 9-2-14).

2) Loan Repayment Capacity

Throughout the project life, the debt service coverage ratios exceeded 1.0, satisfying required criteria (1.75) shown in this chapter (see Table 9-2-14).

3) Operational Efficiency

Both the operating ratios and the working ratios maintained positive levels.

(see Table 9-2-14).

Table.9-2-14 Financial Statements

Income Statement

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Revenue	0	0	0	16,686,727	18,503,324	20,669,672	21,825,952	25,376,091	26,163,766	27,085,613	28,017,354	29,007,614	30,025,761	31,011,260
Operating Revenue	0	0	0	16,686,727	18,503,324	20,669,672	21,633,115	24,386,155	24,386,146	24,386,146	24,386,146	24,386,146	24,386,146	24,386,146
Financial revenue	0	0	0	0	0	0	192,837	989,936	1,777,620	2,699,467	3,631,208	4,621,468	5,639,615	6,625,114
Operating Expenses	0	0	0	0	8,974,525	8,974,525	8,974,525	8,974,525	8,974,525	8,974,525	8,974,525	8,974,525	8,974,525	8,974,525
Personnel & Administration	0	0	0	0	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000
Maintenance	0	0	0	0	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150
Depreciation	0	0	0	0	3,800,375	3,800,375	3,800,375	3,800,375	3,800,375	3,800,375	3,800,375	3,800,375	3,800,375	3,800,375
Net Operating Income	0	0	0	16,686,727	9,528,799	11,695,147	12,851,427	16,401,566	17,189,241	18,111,088	19,042,829	20,033,089	21,051,236	22,036,735
Interest on Long-term Loans	0	328,940	1,140,810	2,001,908	2,497,685	2,615,294	2,582,575	2,469,099	2,269,970	2,021,527	1,761,385	1,501,185	1,240,841	980,345
Interest on Short-term Loans	0	0	32,894	150,264	365,482	0	0	0	0	0	0	0	0	0
Net Surplus before Tax	0	-328,940	-1,173,704	14,534,555	6,665,632	9,079,853	10,268,852	13,932,467	14,919,271	16,089,561	17,281,444	18,531,904	19,810,395	21,056,390
Tax	0	0	0	2,906,911	1,333,126	1,815,971	2,053,770	2,786,493	2,983,854	3,217,912	3,456,289	3,706,381	3,962,079	4,211,278
Net Surplus after Tax		-328,940	-1,173,704	11,627,644	5,332,506	7,263,882	8,215,081	11,145,974	11,935,417	12,871,649	13,825,155	14,825,523	15,848,316	16,845,112
Accumulated Earnings	0	-328,940	-1,502,644	10,125,000	15,457,505	22,721,388	30,936,469	42,082,443	54,017,860	66,889,509	80,714,665	95,540,188	111,388,504	128,233,616

Cash Flow

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Cash Beginning	0	0	0	0	-2,906,911	2,571,154	13,199,151	23,701,598	35,992,897	48,416,108	61,619,573	75,194,863	88,334,854	100,974,918
Cash Inflow	21,813,000	54,166,440	58,604,644	36,531,316	26,302,324	20,669,672	21,825,952	25,376,091	26,163,766	27,085,613	28,017,354	29,007,614	30,025,761	31,011,260
Operating Revenue	0	0	0	0	18,503,324	20,669,672	21,633,115	24,386,155	24,386,146	24,386,146	24,386,146	24,386,146	24,386,146	24,386,146
Interest on Deposit	0	0	0	0	0	0	192,837	989,936	1,777,620	2,699,467	3,631,208	4,621,468	5,639,615	6,625,114
Short-term Loans	0	328,940	1,502,644	3,654,816	0	0	0	0	0	0	0	0	0	0
Long-term Loans	21,813,000	53,837,500	57,102,000	32,876,500	7,799,000	0	0	0	0	0	0	0	0	0
Cash Outflow	21,813,000	54,166,440	58,604,644	39,438,227	20,824,259	10,041,675	11,323,505	13,084,792	13,740,554	13,882,149	14,442,064	15,867,623	17,385,697	18,251,106
Investment	21,813,000	53,837,500	57,102,000	32,876,500	7,799,000	0	0	0	0	0	0	0	0	0
Personnel & Administration	0	0	0	0	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000	3,654,000
Maintenance	0	0	0	0	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150	1,520,150
Repayment of principal (long)	0	0	0	0	0	436,260	1,513,010	2,655,050	3,312,580	3,468,560	4,050,240	5,485,907	7,008,627	7,885,333
Interest on Long-term Loans	0	328,940	1,140,810	2,001,908	2,497,685	2,615,294	2,582,575	2,469,099	2,269,970	2,021,527	1,761,385	1,501,185	1,240,841	980,345
Repayment of principal (Short)	0	0	328,940	1,502,644	3,654,816	0	0	0	0	0	0	0	0	0
Interest on Short-term Loans	0	0	32,894	150,264	365,482	0	0	0	0	0	0	0	0	0
Tax	0	0	0	2,906,911	1,333,126	1,815,971	2,053,770	2,786,493	2,983,854	3,217,912	3,456,289	3,706,381	3,962,079	4,211,278
Cash Balance	0	0	0	-2,906,911	5,478,065	10,627,997	10,502,446	12,291,299	12,423,212	13,203,464	13,575,290	13,139,991	12,640,064	12,760,154
Cash Ending	0	0	0	-2,906,911	2,571,154	13,199,151	23,701,598	35,992,897	48,416,108	61,619,573	75,194,863	88,334,854	100,974,918	113,735,072

Balance Sheet

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Current Assets	0	0	0	0	2,571,154	13,199,151	23,701,598	35,992,897	48,416,108	61,619,573	75,194,863	88,334,854	100,974,918	113,735,072
Cash & Deposit	0	0	0	0	2,571,154	13,199,151	23,701,598	35,992,897	48,416,108	61,619,573	75,194,863	88,334,854	100,974,918	113,735,072
Fixed Assets	21,813,000	75,650,500	132,752,500	165,629,000	169,627,625	165,827,250	162,026,875	158,226,500	154,426,125	150,625,750	146,825,375	143,025,000	139,224,625	135,424,250
Total Assets	21,813,000	75,650,500	132,752,500	165,629,000	172,198,779	179,026,401	185,728,473	194,219,397	202,842,233	212,245,323	222,020,238	231,359,854	240,199,543	249,159,322
Liabilities	21,813,000	75,979,440	134,255,144	169,283,816	173,428,000	172,991,740	171,478,730	168,823,680	165,511,100	162,042,540	157,992,300	152,506,393	145,497,766	137,612,433
Short-term Loans	0	328,940	1,502,644	3,654,816	0	0	0	0	0	0	0	0	0	0
Long-term Loans	21,813,000	75,650,500	132,752,500	165,629,000	173,428,000	172,991,740	171,478,730	168,823,680	165,511,100	162,042,540	157,992,300	152,506,393	145,497,766	137,612,433
Net Worth	0	-328,940	-1,502,644	10,125,000	15,457,505	22,721,388	30,936,469	42,082,443	54,017,860	66,889,509	80,714,665	95,540,188	111,388,504	128,233,616
Total Liabilities & Net Worth	21,813,000	75,650,500	132,752,500	179,408,816	188,885,505	195,713,128	202,415,199	210,906,123	219,528,960	228,932,049	238,706,965	248,046,581	256,886,270	265,846,049

Financial Indicators

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Rate of Return Fixed Assets (Criterion: over 2.41%)					5.6%	7.1%	7.9%	10.4%	11.1%	12.0%	13.0%	14.0%	15.1%	16.3%
Debt Service Coverage Ratio (Criterion: over 1.75%)					5.34%	5.08%	4.07%	3.94%	3.76%	3.99%	3.93%	3.41%	3.01%	2.91%
Operating Ratio (Criterion: under 70-75%)					48.5%	43.4%	41.5%	36.8%	36.8%	36.8%	36.8%	36.8%	36.8%	36.8%
Working Ratio (Criterion: under 50-60%)					28.0%	25.0%	23.9%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%	21.2%

(4) Sensitivity Analysis

Sensitivity analysis was conducted to examine the impact of unexpected future changes such as cargo volume, construction cost, inflation or exchange rate. The following cases were envisioned.

- The investment costs increase by 10%
- The revenues decrease by 10%
- The investment costs increase by l0% and the revenues decrease by 10%

The results of the sensitivity analysis were shown in Table 9-2-15. In all the cases, FIRR exceeded the weighted average interest rate of the funds (2.41%).

Table 9-2-15 Sensitivity Analysis for FIRR

Case	
Base Case	9.53%
Cost +10%	8.56%
Revenues -10%	8.18%
Cost +10% and Revenues -10%	7.29%

(See Table 9-2-16,17,18)

Table 9-2-16 Sensitivity Analysis for FIRR (Cost +10%)

(Unit : EUR)

		Revenue		Cost				Difference	Net Present Volume(NPV)		
	Year		Total	Investment	Expenses		Total	Revenue - Cost	Revenue	Cost	Revenue - Cost
					Maintenance Costs	Management Costs					
1	2013			23,994,300			23,994,300	-23,994,300		23,994,300	-23,994,300
2	2014			59,221,250			59,221,250	-59,221,250		54,550,215	-54,550,215
3	2015			62,812,200			62,812,200	-62,812,200		53,294,427	-53,294,427
4	2016	16,686,727	16,686,727	36,164,150			36,164,150	-19,477,423	13,041,509	28,264,086	-15,222,577
5	2017	18,503,324	18,503,324	8,578,900	1,520,150	3,654,000	13,753,050	4,750,274	13,320,647	9,900,898	3,419,749
6	2018	20,669,672	20,669,672		1,520,150	3,654,000	5,174,150	15,495,522	13,706,547	3,431,101	10,275,446
7	2019	21,633,115	21,633,115		1,520,150	3,654,000	5,174,150	16,458,965	13,213,943	3,160,475	10,053,468
8	2020	24,386,155	24,386,155		1,520,150	3,654,000	5,174,150	19,212,005	13,720,679	2,911,195	10,809,484
9	2021	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	12,638,465	2,681,576	9,956,889
10	2022	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	11,641,615	2,470,069	9,171,546
11	2023	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	10,723,390	2,275,244	8,448,147
12	2024	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	9,877,590	2,095,786	7,781,805
13	2025	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	9,098,502	1,930,482	7,168,020
14	2026	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	8,380,864	1,778,217	6,602,648
15	2027	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	7,719,829	1,637,961	6,081,868
16	2028	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	7,110,933	1,508,768	5,602,165
17	2029	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	6,550,063	1,389,765	5,160,298
18	2030	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	6,033,431	1,280,148	4,753,283
19	2031	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	5,557,549	1,179,177	4,378,371
20	2032	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	5,119,201	1,086,171	4,033,030
21	2033	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	4,715,427	1,000,500	3,714,928
22	2034	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	4,343,501	921,586	3,421,915
23	2035	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	4,000,911	848,896	3,152,014
24	2036	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	3,685,342	781,940	2,903,401
25	2037	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	3,394,663	720,265	2,674,398
26	2038	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	3,126,911	663,455	2,463,456
27	2039	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	2,880,278	611,125	2,269,153
28	2040	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	2,653,098	562,923	2,090,175
29	2041	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	2,443,837	518,523	1,925,314
30	2042	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	2,251,081	477,625	1,773,456
31	2043	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	2,073,529	439,953	1,633,576
32	2044	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,909,980	405,252	1,504,729
33	2045	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,759,332	373,288	1,386,044
34	2046	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,620,566	343,845	1,276,721
35	2047	24,386,146	24,386,146		1,520,150	3,654,000	5,174,150	19,211,996	1,492,745	316,724	1,176,021
	Total	760,304,940	760,304,940	190,770,800	47,124,650	113,274,000	351,169,450	409,135,490	209,805,959	209,805,959	0

FIRR = 8.56%

Table 9-2-17 Sensitivity Analysis for FIRR (Revenues -10%)

(Unit : EUR)

	Year	Revenue		Cost				Difference	Net Present Volume(NPV)		
			Total	Investment	Expenses		Total	Revenue - Cost	Revenue	Cost	Revenue - Cost
					Maintenance Costs	Management Costs					
1	2013			21,813,000			21,813,000	-21,813,000		21,813,000	-21,813,000
2	2014			53,837,500			53,837,500	-53,837,500		49,767,435	-49,767,435
3	2015			57,102,000			57,102,000	-57,102,000		48,794,634	-48,794,634
4	2016	16,686,727	15,018,054	32,876,500			32,876,500	-17,858,446	11,863,007	25,969,686	-14,106,679
5	2017	18,503,324	16,652,992	7,799,000	1,520,150	3,654,000	12,973,150	3,679,842	12,160,005	9,472,987	2,687,018
6	2018	20,669,672	18,602,705		1,520,150	3,654,000	5,174,150	13,428,555	12,556,771	3,492,536	9,064,235
7	2019	21,633,115	19,469,804		1,520,150	3,654,000	5,174,150	14,295,654	12,148,532	3,228,503	8,920,029
8	2020	24,386,155	21,947,540		1,520,150	3,654,000	5,174,150	16,773,390	12,659,264	2,984,432	9,674,832
9	2021	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	11,702,231	2,758,811	8,943,420
10	2022	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	10,817,553	2,550,248	8,267,305
11	2023	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	9,999,756	2,357,451	7,642,305
12	2024	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	9,243,784	2,179,230	7,064,554
13	2025	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	8,544,962	2,014,482	6,530,480
14	2026	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	7,898,971	1,862,189	6,036,782
15	2027	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	7,301,816	1,721,410	5,580,407
16	2028	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	6,749,806	1,591,273	5,158,533
17	2029	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	6,239,527	1,470,974	4,768,553
18	2030	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	5,767,824	1,359,770	4,408,055
19	2031	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	5,331,782	1,256,972	4,074,810
20	2032	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	4,928,704	1,161,946	3,766,758
21	2033	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	4,556,099	1,074,104	3,481,995
22	2034	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	4,211,662	992,903	3,218,759
23	2035	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	3,893,264	917,841	2,975,424
24	2036	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	3,598,937	848,453	2,750,485
25	2037	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	3,326,861	784,310	2,542,550
26	2038	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	3,075,353	725,017	2,350,336
27	2039	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,842,859	670,207	2,172,653
28	2040	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,627,942	619,540	2,008,402
29	2041	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,429,272	572,703	1,856,569
30	2042	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,245,621	529,407	1,716,214
31	2043	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,075,854	489,384	1,586,470
32	2044	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	1,918,922	452,387	1,466,534
33	2045	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	1,773,853	418,187	1,355,666
34	2046	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	1,639,751	386,573	1,253,179
35	2047	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	1,515,788	357,348	1,158,439
	Total	760,304,940	684,274,446	173,428,000	47,124,650	113,274,000	333,826,650	350,447,796	197,646,335	197,646,335	0

FIRR = 8.18%

Table 9-2-18 Sensitivity Analysis for FIRR (Cost +10% and Revenues -10%)

(Unit : EUR)

	Year	Revenue		Cost				Difference	Net Present Volume(NPV)		
			Total	Investment	Expenses		Total	Revenue - Cost	Revenue	Cost	Revenue - Cost
					Maintenance Costs	Management Costs					
1	2013			23,994,300			23,994,300	-23,994,300		23,994,300	-23,994,300
2	2014			59,221,250			59,221,250	-59,221,250		55,198,966	-55,198,966
3	2015			62,812,200			62,812,200	-62,812,200		54,569,597	-54,569,597
4	2016	16,686,727	15,018,054	36,164,150			36,164,150	-21,146,096	12,161,126	29,284,538	-17,123,412
5	2017	18,503,324	16,652,992	8,578,900	1,520,150	3,654,000	13,753,050	2,899,942	12,569,145	10,380,362	2,188,783
6	2018	20,669,672	18,602,705		1,520,150	3,654,000	5,174,150	13,428,555	13,087,086	3,640,038	9,447,048
7	2019	21,633,115	19,469,804		1,520,150	3,654,000	5,174,150	14,295,654	12,766,792	3,392,808	9,373,985
8	2020	24,386,155	21,947,540		1,520,150	3,654,000	5,174,150	16,773,390	13,414,035	3,162,369	10,251,665
9	2021	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	12,502,954	2,947,583	9,555,372
10	2022	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	11,653,759	2,747,384	8,906,375
11	2023	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	10,862,240	2,560,783	8,301,457
12	2024	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	10,124,481	2,386,855	7,737,625
13	2025	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	9,436,830	2,224,741	7,212,089
14	2026	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	8,795,884	2,073,637	6,722,247
15	2027	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	8,198,471	1,932,797	6,265,674
16	2028	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	7,641,634	1,801,522	5,840,112
17	2029	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	7,122,617	1,679,163	5,443,454
18	2030	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	6,638,852	1,565,115	5,073,737
19	2031	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	6,187,944	1,458,813	4,729,130
20	2032	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	5,767,661	1,359,731	4,407,930
21	2033	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	5,375,924	1,267,379	4,108,545
22	2034	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	5,010,793	1,181,299	3,829,494
23	2035	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	4,670,462	1,101,066	3,569,396
24	2036	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	4,353,246	1,026,282	3,326,964
25	2037	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	4,057,575	956,577	3,100,998
26	2038	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	3,781,986	891,607	2,890,380
27	2039	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	3,525,115	831,049	2,694,066
28	2040	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	3,285,691	774,605	2,511,086
29	2041	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	3,062,528	721,994	2,340,534
30	2042	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,854,522	672,956	2,181,566
31	2043	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,660,644	627,249	2,033,395
32	2044	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,479,934	584,647	1,895,288
33	2045	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,311,498	544,938	1,766,560
34	2046	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,154,502	507,926	1,646,576
35	2047	24,386,146	21,947,532		1,520,150	3,654,000	5,174,150	16,773,382	2,008,169	473,428	1,534,741
	Total	760,304,940	684,274,446	190,770,800	47,124,650	113,274,000	351,169,450	333,104,996	220,524,101	220,524,101	0

FIRR = 7.29%

(5) Financial soundness of the Executing Agency

Together with the above-mentioned financial analysis of the Toamasina port project, overall financial soundness of SPAT as the executing agency of the Toamasina port project was assessed to confirm the feasibility of the project. In the assessment, current financial statements, loan repayment programs and income prospects for the future were considered covering the Toamasina ports.

(6) Conclusion

Financial soundness of executing agency, viz SPAT, will be maintained according to the Case-4 scheme.

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1. Member List of the Study Team

Dr. Osamu Kunita

Team Leader/
Port Policy

Dr. Koji Kobune

Port Planning

Mr. Masatoki Nakanishi

Demand Forecast /
Economic Analysis

Mr. Tamaki Ikari

Port Management System /
Financial Analysis

Mr. Teruki Eto

Port Operation and Cargo
Handling

Mr. Shinichi Tezuka

Port Operation and Cargo
Handling

Mr. Masafumi Ito

Design of Port Facility 1

Mr. Hideki Yokomoto

Design of Port Facility 2

Mr. Takahisa Aoyama

Construction Planning / Cost
Estimation

Mr. Kenji Kuroki
Natural Conditions
Investigation

Dr. Kazumasa Kato

Shore-line Change Analysis

Ms. Kyoko Mishima

Social and Marine
Environment Investigation 1

Mr. Takeshi Sato

Social and Marine
Environment Investigation 2

Mr. Yuji Osaki

Coordinator

2. Study Schedule

No.	Work Item	Person In Charge (see note 1)	2009										
			FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Phase 1 : February - May 2009													
A	**Information Survey**												
A1	Preparation Before Entering Madagascar												
A1-1	Survey of Exist. Documents & Information	All Members											
A1-2	Study Concept, Method, & Work Schedule	Kunita											
A2	Information Survey (Existing)												
A2-1	National Policy & Development Plan	Kunita, Kobune											
A2-2	Port Development Policy & Plan	Kunita, Kobune, Itoh, Yokomoto											
A2-3	Natural & Maritime Conditions	Kuroki											
A2-4	Socio-Economic Conditions	Nakanishi											
A2-5	Environmental Conditions	Kato, Mishima, Sato											
A2-6	Port Access Infrastructures	Nakanishi											
A2-7	Port Management & Maintenance	Ikari											
A2-8	Cargo Handling Operation	Tezuka, Ikari											
A2-9	Maritime Operation	Tezuka, Ikari											
A2-10	Cargo/Passenger Throughputs	Nakanishi											
A2-11	Care to Environment & Society	Kato, Mishima, Sato											
B	**Feasibility Study on Expansion of Toamasina Port**												
B-1	Natural Condition Survey	Kuroki											
B-2	Environmental & Society Survey	Kato, Mishima, Sato											
B-3	Cargo Demand Forecast	Nakanishi											
B-4	Socio-Economic Forecast of Port Sorounding Area	Nakanishi											
Phase 2 : June - August 2009													
B-5	Development Concept	Kunita, Kobune											
B-6	Basic Design of Port Expansion	Itoh, Yokomoto											
B-7	Comparison of Alternative Plan	Itoh, Yokomoto											
B-8	Preliminary Construction Plan	Aoyama (see note 2)											
B-9	Preliminary Cost Estimate	Aoyama (see note 2)											
B-10	EIA Analyses	Kato, Mishima, Sato (see note 3)											
B-11	Environmental Assessment	Kato, Mishima, Sato (see note 3)											
B-12	Economic & Financial Analyses	Nakanishi, Ikari (see note 4)											
B-13	Port Management & Maintenance Plan	Ikari, Tezuka											
Phase 3 : September - December 2009													
C	**Total Project Evaluation and Recommendation**	Kunita, Kobune, Nakanishi, Ikari, Itoh, Aoyama											
No.	**Work Item**	**Person In Charge**	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Activities During Entire Project Period													
D	**Meeting and Workshops**												
	Stirring Committee Meeting	Kunita, Kobune and concerned members											
	Technical Committee Meeting												
	Workshop	Concerned members											
E	**Stake-Holder Meetings**	Kunita, Kato, Shimada, Sato											
Reports			ICR		PR1		PR2		ITR		DRFR	FR	

note 1) Shown name of persons are only key persons for the work items. Team members will help each other subject to the unforeseen increased volume of works.
nlote 2) Aoyama will work field survey during Phase 1 period for collecting required information for construction plannning and cost estimates.
note 3) Kato is in charge of shoe-line deformation analyses. Mishima and Sato are in charge of field survey and general enviromnet assessment.
note 4) Nakanishi is in charge of Economic Analysis. Ikari is in charge of Financial Analysis.

: Works in Japan

: Works in Madagascar

3. List of Parties Concerned in the Recipient Country

1) Central Goverment Offices

Ministry of Transport (MOT)
Agence Portuaire Maritimr et Fluviale (APMF)
Ministry of Finance (MOF)
Ministry of Budget (MOB)
Ministry of Environment, Water and Forest (MINENVEF)
National Office for the Environment (ONE)

2) Regional Organization Toamasina

Societe du Port a Gestion Autonome de Toamasina (SPAT)

3) Port Operators

Societe de Manutention des Marchandises Conventionneles (SMMC)
Madagascar International Container Terminal Services Ltd. (MICTSL)

4. Record of Meetings

■ Steering Committee Meeting (February 27, 2009)

February 27, 2009 10:00 to 11:00

Meeting with the Ministry of Transport and the environment committee
Place: room 264 of the MOT

Members (25 peoples):

- JICA

Mr HIGA Isaya , Mr RATODISOA Ando ,
Contact: 22 300 17

- JST

Mr KUNITA Osamu, Mr KOBUNE Koji, Mr NAKANISHI Masatoki, Mr Tamaki IKARI, Mr ITO Masafumi, Mr Hideki YOKOMOTO, Mr Takahisa AOYAMA, Mr Kenji KUROKI, Mr Takeshi SATO, Mr OSAKI Yuji ,

- Ministry of Finance and Budget

Ms RAHARISOA Clemence – Responsible of the foreign loan service
Ms RAKOTOMALALA Misa – Public debt direction
Contact : 24 533 89

- National office for the environment (ONE Office National de l'Environnement)

Ms RAZAFINDRIAKA Bénie Vonjy – Study manager
Contact: 22 259 99 – vonjy@pnae.mg

- Ministry of transport

Mr RAMAHEFARIVO Jean Bruno – general secretary
Contact: 032 07 466 58
Mr RAKOTOARINRINA Rigobert – Technical Director
Contact: 032 02 111 76
Mr RAMANANTSIHOARANA Olivier Rolland – Responsible of the Environment department
Contact: 032 46 646 61 – olivier.ramanantsihoarana@yahoo.fr
Ms Christine – Responsible of the maritime service

- APMF

Mr SAMBALIS Jérôme – director general
Contact: 032 11 257 19
Mr RABARY Jean Germain – Responsible of the Civil engineering
Contact: 032 02 408 76

- SPAT

Mr RAKOTONDRAINIBE Hery Zo – Chairman of the board
Contact: 032 11 257 12

- MAESTRO

Ms RANDRIAMANANTSOA Zoly	033 11 997 96
Mr RAJAOBELINA Jocelyn	032 41 987 77
Mr RANDRIANJATOVO Roland	032 07 070 56

Subject: Toamasina Port development project

The general secretary welcomed the JST,
Introduced the MOT team from the MOT, APMF, SPAT, ONE, Ministry of Finance and budget,
He explained that the Minister could not attend the meeting, so he will arrange a meeting with him in the afternoon if possible.

Mr KUNITA introduced the JST,
Explained the schedule of the team,
Talked about the EIA`s importance,
Informed that

- The JICA Loan Appraisal Mission will come in November 2009
- Japanese study team will assist SPAT to formulate the EIA application to the ONE until August
- It is expected that the ONE will approve the EIA by the end of October

Explained the inception report,
Explained about the matter of the breakwater, the urgent plan of the study (page 6, IR), cargo forecast, natural condition, sole etc
Explained the aim of EIA analyses

- the simulation of the marine condition
- to know the impact of the project and then, find the best solutions to have the minimum effects that is to say the optimal solution
- to determine the viability of the project in terms of economy, and finance

Explained the main requests in page 42, IR
Requested for a meeting with technical committee (people that can give technical information) for more details and for future schedule
Asked for assistance to carry out the study successfully

Discussion about the formation of the Technical Committee, and the way to definite appropriate schedule
Technical Committee will be formed by the DG of APMF

The general secretary promised that they will give all necessary report to the team,
And stated that Mr Rigobert is the first responsible about this matter
Asked for the MOT team to make their schedule in order to arrange work in Toamasina

Mr NAKANISHI ask for demand forecast information

11.00 The general secretary leaves the meeting

11.20 resumption of the meeting as the First Technical Committee Meeting

■ **Technical Committee Meeting (February 27, 2009)**

February 27, 2009 11:20 to 11:45

Meeting with the Ministry of Transport and the environment committee
Place: room 264 of the MOT

*** Meeting attendants started the detailed discussions regarding Inception Report

Mr Rigobert stated that
- Requests of ST will be sent e-mail.
- MOT will introduce ST to other entities / ministry if necessary
- MOT asked if we need accompany staff us to Toamasina during the study

Mr SATO explained the proposed schedule of the EIA study
The Technical Committee advised Mr. Sato to discuss the schedule of the EIA in more detail with ONE.

Mr NAKANISHI made an appointment with Mr Rigobert on 06 Mar in Antananarivo for survey on Demand Forecast.

■ Technical Transfer Meeting for Progress Report 1 (April 15, 2009)

April 15, 2009 15:00 to 16:45

Technical Transfer & Workshop
Place: Conference Room of SPAT in Toamasina

Members (15):

- JST

Mr KUNITA Osamu,
Mr KOJI Kobune,
Mr Kazumasa KATO,
Mr Tamaki IKARI,
Mr Kenji KUROKI

- SPAT

Mr AVELLIN Christian – General Manager
Mr Samuel RANAIVOJAONA – DDAP
Mr Zandry Séraphin – Direction of Human resources
Ms RANDRIAMALALA Radotiana - Direction of Human resources
Mr TSILANGOUI Modeste – Law Manager
Mr RAKOTONDRAMAITSO James William – Information & Technology Manager
Mr TABIHA Larsène Nicolas – Economical study department

- Interpreter

Ms RANDRIAMANANTSOA Zoly
Mr RANDRIANJATOVO Roland
Mr RAJAOBELINA Jocelyn

Subject: Presentation of the Progress Report I and EIA.

JST submitted SPAT the document of Progress report I.

Mr KUNITA (JST) expressed thanks to the participants for the cooperation.
JST explained the contents of the Progress report I

JST explained the influence of the extension of breakwater is not included in PR I, but it will be included in the Progress report II to be submitted in July,
JST requested SPAT to urge ONE to carry on the procedure of EIA,
SPAT stated, will get information from ONE about the EIA soon.

1. Port Planning
JST explained progress on port planning,
- the role and functions of Toamasina Port
- Problems of Toamasina port
- Role an functions of SPAT

2. Survey of Natural Conditions and Shoe-line Change,
JST explained “historical change of coastal topography of Toamasina Port and surrounding area.”

■ **Steering & Technical Committee Joint Meeting for Progress Report 1 (April 17, 2009)**

April 17, 2009 10:30 to 12:00

Steering Committee Meeting & Technical Committee Meeting
Place: Room 264 of the MOT

Members (17):

- JICA

Ms Manoela RAZAFIMAHEFA

- JST

Mr KUNITA Osamu,
Mr KOJI Kobune,
Mr Tamaki IKARI,
Mr ITO Masafumi,
Mr Takahisa AOYAMA,

- Ministry of Finance and Budget

Ms RAHARISOA Clémence – Responsible of the foreign loan service
Ms RAKOTOMALALA Misa – Public debt direction
Contact : 24 533 89

- National office for the environment (ONE Office National de l'Environnement)

Ms RAZAFINDRIAKA Bénie Vonjy – Study manager
Contact: 22 259 99 – vonjy@pnae.mg

- Ministry of transport

Mr RAKOTOARINIRINA Rigobert – Technical Director
Contact: 032 02 111 76
Mr RAMANANTSIHOARANA Olivier Rolland – Responsible of the Environment department
Contact: 032 46 646 61 – olivier.ramanantsihoarana@yahoo.fr
Ms Christine – Responsible of the maritime service

- APMF

Mr RABARY Jean Germain – Responsible of the Civil engineering
Contact: 032 02 408 76
Mr Louis de G. RANAIVOHARIJAONA 032 07 992 33

- SPAT

Mr Samuel RANAIVOJAONA

- Interpreter

Ms RANDRIAMANANTSOA Zoly 033 11 997 96
Mr RANDRIANJATOVO Roland 032 07 070 56

Subject: Presentation of the Progress report I.

JST submitted MOT and Steering Committee the document of Progress report I.
Mr Rigobert (MOT) welcomed the JST, and expressed thanks JST for the work for PR1,
MOT apologised that the General Secretary did not attend the meeting because he was assigned a mission to Tuléar,

MOT explained that the Minister of MOT had not appointed due to resent change in the President and his cabinet.

Mr KUNITA (JST) expressed thanks to the participants for cooperation.
JST explained the contents of the Progress report I
Mr Samuel (SPAT) expressed thanks for presentation of PR1.

JST explained the influence due to extension of the breakwater will be included in the Progress Report II to be submitted in July,
JST requested SPAT to obtain the public consent and understanding of ONE on the project implementation.
SPAT explained application fee paid to ONE is needed and it shall be prepared by SPAT and MOT.

JST explained progress on port planning,
- the role and functions of Toamasina Port
- Problems of Toamasina port
- Role an functions of SPAT

Discussions:

APMF asked the situations of the tanker berth in the development plan of the Port

JST explained scope of JST work is mainly for container and bulk cargo facilities, but will make comments on other facilities in the final report.

The ONE requested SPAT to complete EIA application form to be submitted.
SPAT made comment that the preparation of application EIA was under working.
SPAT stated that payment of application fee needs agreement between SPAT and MOT.

■ **Workshop for Port Planning (June 19, 2009)**

June 19, 2009 15:00 to 16:00

Technical Transfer & Workshop
Place: Conference Room of SPAT in Toamasina

Members (17):

JST
Mr KUNITA Osamu
Mr KOBUNE Koji
Mr NAKANISHI Masatoki
Mr IKARI Tamaki
Mr ITO Masafumi
Mr. YOKOMOTO Hideki
Mr. SATO Takeshi

SPAT

AVELLIN Christian Eddy (Managing Director)
RANAIVOJAONA Samuel (Director of Port Management)
RAONIZAFINIMANANA Rodolphe (Port Strategic Planning and Management Department Chief)
TABIHA LARSENE Nicolas (Economic Study Department Chief)
RAKOTONDRAMAITSO James William (Manager Information Technology)
MASY Lydie M. (DGDP)
LEDOA N'JY Leon (Financial Manager)
MIHA Antoine de Padou (Managment Controller)
RAKOTONIRINA Johnson (Manager Marketing International)

Interpreter
Mr RAJAOBELINA Jocelyn

Subject: Presentation of Progress on the Port Planning

Mr KOBUNE (JST) explained the present progress on the port planning works.

- Key elements considered in the preparation of facility layout plan
- Draft facility layout plan
- Tasks to be done in the coming months

Members of SPAT generally agreed JST's port layout plan for urgent development.

■ **Workshop for Environmental Issues (June 23, 2009)**

June 23, 2009 15:00 to 16:30

Technical Transfer & Workshop
Place: Conference Room of SPAT in Toamasina

Members (15):

JST
Mr. KUNITA Osamu
Mr. KOBUNE Koji
Mr. NAKANISHI Masatoki
Mr. IKARI Tamaki
Mr. ITO Masafumi
Mr. SATO Takeshi

SPAT

Mr. TAMBY Allrich Geraldo (Port Police Service Chief)
Mr. TIDAHY Z (Pilot)
Mr. RAKOTONJANAHARY (PFSO)
Mr. RAKOTONIRINA Johnson (Manager Marketing International)
Mr. RANAIVOJAONA Samuel (Director of Port Management)
Mr. RAONIZAFINIMANANA Rodolphe (Port Strategic Planning and Management Department Chief)
Mr. TABIHA LARSENE Nicola (Economic Study Department Chief)
Mr. JANI I SPAT (Captain)

Interpreter
Mr. RAJAOBELINA Jocelyn

Subject: Presentation of Contents of Environmental Issues (Material of 2nd Stakeholder Meeting)

2nd Stakeholder Meeting is scheduled on 3rd July. Mr. Sato explained the contents of the meeting and introduced the updated results of environmental survey.

- Status of pollution, and natural and social environment around Toamasina Port
- Potential environmental impacts of the Project and proposed countermeasures

Discussion:
- Prevention of air polution, noise and congestion on the access road to port gate
As one of the measures, JST proposed a conceptual scheme of traffic management system to clear the congestion on the access road by establishing a truck parking outside of the port All the cargo trucks should wait at the truck parking outside of residential area of Toamasina before proceeding to port gate until all the documents are ready and the clearance is issued. A large display board is installed informs drivers when they are permitted to proceed to the gate. The display board is operated by gate controller through on-line communication system.
SPAT (Mr. RAKOTONIRINA Johnson) explained such a system was formerly discussed in SPAT, but to-date it has not been improved. There are many issues to overcome like that port cargo forwarder seeks quick loading/unloading to reduce berthing time of ships, or truck driver likes to wait at places near shops and vendors, etc. In Tana, the city controls trucks entering downtown by limiting entry time. But such system will not function in Toamasina unless government fines to

driver or to force drivers the similar penalties. SPAT explained this problem shall be solved as the SPAT's own problem.

- Prevention measure to water contamination

SPAT (Mr. TIDAHYZ) explained that Toamasina Port has a regulation that prohibit ships from disposing of their waste. Regarding sewage, large ships have sewage tanks and do not dispose of sewage, while small coastal ships do not have sewage tanks, thus sewage is directly discharged into the sea. Therefore, SPAT provide a toilet for seamen of small ships while they are at the wharf.

JST explained that such effort to control by SPAT should be continued, as ship waste water is one of the causes of water contamination. JST mentioned in the presentation the other causes such as water flow out from Pangalanes canal.

- Urgent dredging in front of Mall A and B

SPAT (Mr. RANAIVOJAONA Samuel) explained ……

SPAT requested JST advice on how to handle the dredgespoisd soils in case it is contaminated. SPAT questioned how they can stop spoils to flow out by using geo-textile when they dump the dredged material onto Hastie Reef area.

JST answered that the prevention measure differs according to the rate of contaminations. If it is in high contamination level, dredge spoils should be enclosed and buried by sufficient dikes and fabrics. It should depend on the sediment sampling survey which SPAT will conduct.

JST questioned SPAT about fund for such dredging.

SPAT answered the study has just commenced and project cost should be negotiated with Ambatovy because the new jetty at Mall B construction might require additional dredging around other quay-walls.

- Port security

SPAT explained the port should comply with the ISPS code. Thus port area is should be secured by SPAT. Officially, benders, fishermen have no right to enter or pass the port area: the port area includes beach surrounding port bay.

JST advised SPAT should well explain and negotiate those parties to regulate the use of area. Existing activities should not be neglected in view of social environmental issues.

JST added that the proposing port land use plan divides access to container, bulk and general cargo. If SPAT can implement as proposed, security control will be much secured.

- Boat passage between the Grand Reef and breakwater

JST explained in the presentation, the result of interview to fishermen shows there is boat passage through water channel between the Grand Reef and the breakwater.

SPAT explained port regulation does not allow the area passage because of its ISPS code. The matter is not serious factor on JST's development project.

■ **Technical Transfer Meeting for Progress Report 2 (July 10, 2009)**

STEERING COMMITTEE REPORT
Friday 10 July 2009
Conference room of SPAT
10:05 to 12:20

Members: 25

JST

Mr KUNITA Osamu
Mr NAKANISHI Masatoki
Mr YOKOMOTO Hideki
Mr ITO Masafumi
Mr AOYAMA TAKAHISA
Ms MISHIMA Kyoko
Mr SATO Takeshi

SPAT

Mr RANAIVOJAONA Samuel (Director of Port Management
Mrs MASY Lydie M. (DGDP)
Mr RAONIZAFINIMANANA Rodolphe (Port Stretegic Planning and Management Department chief)
Mr TABIHA LARSENE Nicolas (Economic Study Departement Chief)
Mr ZANDRY Séraphin (DRH)
Mr RABENANDRASANA Roger (DA)
Mrs RANDRIAMALALA Radotiana (DRH)
Mr RAKOTONDRAMAITSO James William (Manager Information Technology)
Mr DOMA NEDARD (Pilote)
Mr JANI Irjona (Captain of the Port)
Mr MIHA ANTOINE de Padou (Management Controller)
Mr LEDOA N'JY Leon (Financial Management)
Mr TSILANGOUI (Law Manager)
Mr TAMBY Allrich Geraldo (Port Police Service Chief)
Mr RAKOTONJANAHARY Clément (PFSO)

Interpreter
Mr RAJAOBELINA Jocelyn
Ms RANDRIAMANANTSOA Zoly
Mr RANDRIANJATOVO Roland

Subject: presentation of the Progress Report 2;

The presentation was divided into two parts.
The first part which lasted 55 minutes was presented by Mr Kunita and the second part which lasted 55 minutes also was done by Mr NAKANISHI.

Subject: Presentation of the progress report II

Mr Samuel welcomed the audience and give brief explanation concerning the schedule of the JST to the Staff of SPAT who were present at the meeting.

He explained the purpose of the meeting and asked to the SPAT's staff to make remarks and to ask more explanations or questions if necessary.
And then, apologises that the DG cannot intend the meeting.

Mr Kunita thanks for the cooperation and collaboration of the SPAT,
For their help during Mr Kato's attack in Toamasina,
For the data provided for the examination of the development project
Explained that he will give general outline of the PR II
And Mr Nakanishi will present the study concerning the cargo forecast.

Mr Kunita
Described the progress of the work and the schedule of the study,
Stated that the interim report will be done at the end of September and the Summary report in October.
Showed the records of the meetings carried out during the study

Introduced the chapter II of the PRII

Insisted on the point 2-11 and explained that the wind from the East generate big wave, wind from the South will accompany high wave and wind from the West should be calm.

Explained some points of the chapter II and stated that good soil constitute good foundation advantage for heavy structure of construction.
Showed the result of the bathymetric and topographic survey and explained that, from detailed precise conditions, we can design construction facilities

Explained that the Chapter IV was explained by Dr Kobune during the stakeholder meeting.

Explained that :
Regarding the page 4-14, concerning the conceptual plan of the port development,
this is just preliminary concept of 2020 but must be amended later.
4-16 preliminary concept of 2020 concept concern:
1- reclamation of the Hastie reef point (about 20ha)
2- extension of the breakwater of 345m
3- construction of new wharf 320m x 200m, and the extremity will be for bulk vessels
4- deepening of C3,C2 and C1 berths
5- the relocation of railway and hopper for the bulk cargos related to Ambatovy: which is not sure
6- construction of general cargo zone
7- Renovation of general cargo zone: which is not sure
8- Navigation aids is necessary and that the design must be rushed up

Concerning the chapter V, it relates to the conception condition.
Explained that the designing of the breakwater is very important because there is big cyclone in Madagascar, so it is very difficult to construct and maintain breakwater.

Explained that table 5-1-5 in page 5-5, shows the result of the analysis made by Mr Ito, showing that maximum wave height in 50 return period is 11.92m

Made some explanation about the cross section of breakwater,
And stated that we need improvement of existing breakwater. Because, in the present time the breakwater is overtopping even in normal wave.
Explained that the future breakwater should be about 8m higher compared to the current height.

Explained the layout of breakwater and the berthing facility through the page 5-28 and stated that the breakwater extension will be of 345m, extension of quay of 320m and its extremity of 184m will be used by bulk vessels.

Explained the criteria for the construction of the quay,
Stated that the cost estimation will be carried out regarding the structure shown in the page 5-40 and 5-49

Explained that the environmental issues were already explained by Mr Sato during the stakeholder's meeting
Stated in short that the water area in Toamasina port is contaminated by the discharge of the Pangalane channel.,
And that in order to protect the water in the port, there is preliminary examination indicated in page 6-11
Explained that the content concern the way how to administrate the beach area, and how to protect it from the contaminated water. So that these idea are shown in pages 6-12 and 6-13

Explained the figure 6-14 in page 6-15, showing the concept of the bypass road and car parks in order to prevent air pollution and reduction of CO2 gas.
Stated that construction of new line will minimize the congestion of city road

Showed the minutes of the meeting with the fishermen, in the page 6-16

Finished the presentation,

Handed over to Mr Nakanishi for the presentation of the result of the demand forecasts and financial analysis.

II – Mr NAKANISHI explained about the CARGO DEMAND FORECAST, a chapter that contains 5 items:

- Socio-Economical of Madagascar
- Demand Forecast of Container Cargo
- Demand Forecast of Bulk and General Cargo
- Demand Forecast of Liquid Cargo
- Summary

Mr NAKANISHI insisted on the importance of the Container Cargo Demand Forecast. His explanation began with giving the population number of Madagascar, the GDP growth, the Import and Export variations and commodities.

He began the explanation about the Cargo Demand Forecast by giving the movement of container throughput in the Indian Ocean, and made comparison from that. He divided the ports into 3 groups: A, B and C. The differences are so big according to the figure. This was due to the transhipment business factors.
Madagascar has no direct line and connection with Europe. Whereas Mauritius has 17 routes, Madagascar has only 5 regular routes and has to pass through Mauritius to tranship.
Of course the explanation was a mathematical one, but as Mr Nakanishi explained that if we follow the figure we can easily understand and follow his explanation.
He explained that the Import and Export are unbalanced. But within few year the export will gain strength thanks to Ambatovy project.
Mr Nakanishi's part ended at 11h50.

Then it was the Question and Answer session.

The first question was for Mr LEDOA about the access road and the proposed new road in the Progress report 2.
Mr KUNITA explained that it is an idea in order to avoid the traffic congestion. It is proposed in the urgent plan and also in middle term plan.
The second question is about the impact on the environment of the extension of Mole C. Mr LEDOA doubted. He said that the port must be developed which will of course develop the town. And during the last session of Stake holder meeting, he was afraid that the port development would be stopped because it would affect the environment and the town. He rather suggested that the impact would affect remote villages in order to avoid the town and its surrounding as the cost of the town is much expensive than remote villages.

The third question was from Mr JAMIE: is it possible to widen the extremity of mole C4 further? Mr KUNITA answered that it depends on available fund and also the design is meant to avoid risk.

The fourth question was about the Economical and financial analysis. In 2002 there was political crisis and the GBP decreased. Now Madagascar undergoes another similar political crisis and also there is an international crisis, what will be the effect?

Mr NAKANISHI answered that this is not to be taken into account for the current study.

Another question that arose that day was that in the first republic there was a project for the extension of the port up to the Grand reef but it was stopped by the transition period. Is it not possible to take this project now?

The answer was that this is also proposed in the long term project of the development.
Mr JAMIE asked about the situation on car circulation in the port. He said that if we develop the road inside the port the problem would remain the same as it is like a funnel. If the problem inside the port is solved but the access road would remain unchanged the problem will be intensified as there will be more car circulation. So he suggested finding a solution in parallel with the development of the port.

Another question was about the way how Mauritius had managed to find the 17 routes.

The answer was that it depends on transhipment business. When the development of Toamasina port is finished it is also possible for Madagascar to manage to do the same.

The meeting ended up at 12h15.

■ Steering & Technical Committee Joint Meeting for Progress Report 2 (July 14, 2009)

July 14th, 2009

Steering Committee at the Ministry of Transport
Subject: Presentation of the Progress Report II
Place: Room 264 of the MOT

Beginning of meeting: 09.00

Members (21 peoples):

- JICA

Mr HIGA Isaya
Mrs RAZAFIMAHEFA Manoela

- JST

Mr KUNITA Osamu
Mr NAKANISHI Masatoki
Mr SATO Takeshi
Ms MISHIMA Kyoko
Mr ITO Masafumi
Mr AOYAMA Takahisa
Mr YOKOMOTO Hideki

- Ministry of transport

Mrs RATSIMBAZAFY Claudine – General Secretary
Mr ANDRIAMAMPIADANA Faly – General Director of Transports
Mr RAKOTOARINIRINA Rigobert – Technical Director (DTMFA)
Mrs RASOAMISAMANANA Christine – DTMFA/STMF

- SPAT

RAONIZAFINIMANANA Rodolphe
RABENANDRASANA Roger

- APMF

Mr RABARY Jean Germain – Responsible of the Civil engineering

- Ministry of Finance and Budget

Ms RAKOTOMALALA Misa – Public debt direction

- MAESTRO

Mr RAZAFINDRATSITA Mamy
Mr RANDRIANJATOVO Roland
Mr RAJAOBELINA Jocelyn
Ms RANDRIAMANANTSOA Zoly

I**. Introductory speech by Mrs RATSIMBAZAFY Claudine, Secretary of MOT**

II. Presentation of the draft final report by Mr KUNITA:

Mr Kunita thanked the SG,

Explained that the study was in the middle point, and the progress of the study will be presented by the PROGRESS REPORT II (PRII)

The schedule of the meeting was:

- Brief explanation of the PRII, by Mr Kunita
- Progress of EIA issues, by Mr Sato
- Details of cargo forecast, by Mr Nakanishi
- Discussions and questions

Mr Kunita explained about the work progress,
Explained about the influence of the wind on wave height and its influence on the construction.
Referred to the page from 2-5 and stated that strong wave during cyclone is very dangerous for construction of the breakwater and for structure of quays line. So, we have to be careful for the designing in such case of natural conditions.

About the soil condition, explained that SPAT has suitable soil for heavy construction

On chapter IV, the target year is 2020.
Page 4-17 and 4-18 show the idea for urgent plan and facility layout of the urgent plan.
Mr Kunita explained also that C1 and C2 could not be used during construction, so we have to construct the new wharf before.

Explained that the cost estimation increase due to the high cost related to the reclamation and to the structure in general,

Summarized the chapter V- engineering aspects

Chapter VI on environmental issues was explained by Mr Sato

The main points are the water quality, air quality, sedimentary, noise, ecosystem, fisheries.
And there are recommendations to prevent and/or minimize the impact of the project in the point of view of environment.

Mr Sato explained that Toamasina bay is quite polluted due to the Pangalanes canal, the port activities and the factories at the port.
Explained the recommendations to minimize the negative impact on the pollution of water quality, as levels of coliform bacteria in the sea were high.

On page 6-4, explained that the dredging work should be carried out in an appropriate way.

Page 6-8, on coral reef survey: the grand reef is considered as sensitive zone because there are good corals. We should do our best to protect these corals from the impact of the project: prevention from the water quality.

Concerning the issue on the problem to be solved with fishermen about the pass between the grand reef and the breakwater which will become narrower during construction and operation:
Mr Sato stated that the study team had meeting with fishermen, and the minutes of these meeting is reported in page 6-16. The fishermen submitted recommendation to SPAT and the original copy was attached at the last page of the report.

IV. Questions and Answers

Mrs Ratsimbazafy, the SG of MOT thanked for the presentation.
Requested to the JST to make the figures in the report bigger, so that they can be understood easily.

Asked what are the measures SPAT will take about the use of roads: Considering the environmental issue, the degree of pollution in Toamasina is high, so do the JST made any recommendations to prevent the pollution from now, before the project begin?
Mr Kunita answered that the access road needs to be improved. There is congestion because of the illegal parking of trucks on the road: SPAT should find another place for parking.

Mrs Manoela from JICA told to the SG that they can formulate a request to the government to solve such kind of problem. The SG of MOT thanked the JICA Study Team,

Mr Rigobert asked:

- When the pass becomes narrower, the wave will be stronger; don't you think it will be dangerous for fishermen to pass over there?
- Is there any technical problem if we extend the breakwater until the grand reef?

Mr Kunita answered that

- canoe should not be suitable for ocean fishing, and that the fishermen already requested for powerful engine
- There is not any technical problem about the extension of breakwater, but a fishery harbour should be constructed to develop the fisheries for small fishermen.

Mr Rabary, APMF asked if the capacity of UBP is enough for the reclamation considered for the port construction, and mentioned about the environmental issues related to this reclamation works.

Mr Kunita answered that the UBP is able to provide enough filling materials for the reclamation, and stated that UBP has already environmental permission, that is to say, there is no more environmental problem related to this point.

The SG thanked the team, and the participants.

The meeting ended at 11.20

■ **Steering & Technical Committee Joint Meeting for Interim Report (September 25, 2009)**

September 25 th, 2009

Meeting at the Ministry of transport
Place: Room 264 of the MOT

Beginning of meeting: 09.00

Members (21peoples):

- JICA

Mr Atsushi ASANO

- JST

Mr KUNITA Osamu, Mr KOJI Kobune, Mr NAKANISHI Masatoki, Mr Tamaki IKARI, Mr ITO Masafumi, Mr Takahisa AOYAMA, Mr ETO Teruki

- Ministry of transport

Mrs RATSIMBAZAFY Claudine – General secretary
Mr RAJOELISON Rado – General Director
Mr RAKOTOARINRINA Rigobert – Technical Director (DTMFA)
Mrs RASOAMISAMANANA Christine – DTMFA/STMF

- Ministry of Finance and Budget

Ms RAHARISOA Clemence – Responsible of the foreign loan service
Ms RAKOTOMALALA Misa – Public debt direction

- APMF

Mr SAMBALIS Jérôme – General Director
Mr RABARY Jean Germain – Responsible of the Civil engineering

- National office for the environment (ONE Office National de l'Environnement)

Ms RAZAFINDRIAKA Bénie Vonjy – Study manager

- MAESTRO

Ms RANDRIAMANANTSOA Zoly
Mr RANDRIANJATOVO Roland
Mr RAJAOBELINA Jocelyn
Mr RAZAFINDRATSITA Mamy

I. Introductory speech by Mrs RATSIMBAZAFY Claudine, Secretary of MOT
Followed by self introduction of the members of JST and the MOT

II. Presentation of the interim report by Mr KUNITA:

- Introductory words with summary of what are already done and the aim of this third and last stay in Madagascar: Mr kunita explained that we have finished the collect of informations and the survey, and we are at the final stage of the study,

Explained that the final report will be submitted at the end of october, and that the final meeting will be hold on 28th or 29th of october

- Presentation of the table of contents especially the new subject which is the engineering aspects
- Brief explanation on the chapter 6 and chapter 5 -3 that is on the simulation of Shoreline changes

III. Presentation by Mr NAKANISHI

- Brief introductory words
- Summarize of the previous chapter explained during the last meeting
- Explanation of the Chapter 5-4 which is the Analysis of Ship Waiting Time

IV. Presentation by Mr KUNITA
- presentation of the chapter 3

V. Questions and Answers

Mr SAMBALIS from APMF thanked the team for the clear explanation and asked 2 questions:

1/ Did the team take in consideration the extension of Mole B which is currently ongoing, when studying the options drawn in the report, because the extension (of Ambatovy project and the oil terminal) is not figured in the report?

2/ Did you already studied the possible consequences of the extension of the port on the shoreline and the town of Toamasina knowing that actually there is eroded portion in the bay?

In answer to the first question Mr KOBUNE explained that the team did considered the Mole B extension by Ambatovy project and the oil terminal but it is not drawn due to the fact that it is already considered as an existing facilities.
For the second question, it was already explained during the presentation so Mr Kunita explained again especially the page 5-50 to 5-53 and the figure 5-3-9 concerning the predicted shoreline changes for alternative Plan 3

The meeting ended at 11.05.

■ **Technical Transfer Meeting for Interim Report (October 1, 2009)**
October 1st, 2009
Meeting at the SPAT Toamasina
Place: Conference room of SPAT

Beginning of meeting: 09.00

Members (20 peoples):

- JST

Mr KUNITA Osamu, Mr KOJI Kobune, Mr NAKANISHI Masatoki, Mr Tamaki IKARI, Mr ITO Masafumi, Mr Takahisa AOYAMA, Mr ETO Teruki

- SPAT

Mr AVELLIN Christian – General Manager
Mr Samuel RANAIVOJAONA – DDAP
Mr RABENANDRASANA Roger
Captain JAMI
Mr RAKOTONIRINA Johnson – Marketing Manager
Mr TSILANGOUI Modeste – Law manager
Mrs RAKOTONIRINA Zoeline – Administration and Communication Manager
Mrs MASY Lydie – DGDP
Mr RAONIZAFINIMANANA Rodolphe – Department Chief in DDAP
Mr ZANDRY Séraphin – Human Resource Direction

- MAESTRO

Ms RANDRIAMANANTSOA Zoly
Mr RANDRIANJATOVO Roland
Mr RAJAOBELINA Jocelyn

Subject: Presentation of the Interim Report

I**. Introductory speech by Mr RANAIVOJAONA Samuel, DDAP of SPAT**:

He explained that this is the third and last part of the feasibility study of the port development.
This is an interim report of what is already done.
This report was also presented in Antananarivo but this time it is for the SPAT staff.

II. Presentation by Mr KUNITA:

- Introductory words with summary of what is already done and the aim of this third and last stay in Madagascar and the wish for further cooperation from the staff.
- Explanation on the chapter 5 -3 that is on the simulation of Shoreline changes
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III. Presentation by Mr NAKANISHI

- Brief introductory words
- Summarize of the previous chapter explained during the last meeting
- Explanation of the Chapter 5-4 which is the Analysis of Ship Waiting Time

IV. Presentation by Mr KUNITA
- Presentation of the environmental issue including the results of Hydrodynamic and water quality simulation

- Explanation on chapter 3 Port Planning and the costs of the project

Mr Samuel thanked for the presentation, and asked for the members if there wanted to ask for further information or have any questions and remarks.

V. Discussions, Questions and Answers

Mr AVELLIN Christian thanked the team for the report which is very clear and said that the SPAT would appreciate to get a good project with lower costs. They think that the option 1 is the most suitable for Toamasina Port and hope the implementation of this one. They are aware that it depends on funds and financial sponsors and asked the team to search for a better solution that is to say to consider the option 1 and search to reduce the costs at minimum.

Mr KUNITA replied that this is just a passing point, a first step for the development. That it is like a bridge to conduct the study to the next step. We should be careful because if this first step fail, the project also will fail.

Mr RANAIVOJAONA Samuel asked questions especially for Mr NAKANISHI
-What is the difference between container and container small vessels?
-If we consider the two figures in table 5-4-4 that is 400 + 450 = 850 shipcalls for container ships whereas in the table 5-4-7 the number of container shipcalls in 2020 is only 300. How would you explain that?
-If we look at this report we notice that there is an excess of 200.000 TEU between the present situation and the situation on the year 2020. Where will this excess be handle?

Mr NAKANISHI explained that the difference in ship-calls lays in the fact that the quay will be deepened to – 14m so the port may receive bigger container ships so the number of shipcalls will decrease. However, in terms of TEU, there will be significant increase.

Mrs RAKOTONIRINA Zoëline made a remark on the interpretation way. She suggested that this is a highly technical matter and all the vocabularies are purely technical and the Malagasy language lacks in technical term , she preferred that for the next meeting the interpretation should be done in French or preferably if the lecturer can speak louder and slowly so everybody will understand, as far as steering comity or technical comity are concerned.

Mrs MASY Lydie also suggested that in order to give opinion and discuss during the meeting, it is preferable to have the documentation earlier if possible.

Captain JAMI was concerned with the quay C4 and the container handling. He said that, if the policy runs well and the quay is deepened enough, this will surely have an effect on ship waiting time because the quay won't be enough for the container handling and then, many containers must be transported far away from the quay. It will need more time to the handling operation.

Mr KUNITA answered that during the stay in Toamasina, in order to finalize this study the team would appreciate the ideas of SPAT to improve the final version of the project. We should have many discussions with all the staff concerned. For the time being the team is working in accordance with the basic concept and this is the first step.

Mr KOBUNE explained that taking the Study led by JETRO last year, we must look at the future. Option 1 is something like a compromise. If we took Option 3 the space is much smaller and we must think about the handling of wood chips and so on… actually the time is very short but we have to consult all concerned entities: MICTSL, SMMC and others.

Mrs RAKOTONIRINA asked what was the opinion of the MOT. And she asked what should happen after the study that is to say, will the study be implemented or not. She stressed on this point because almost of previous studies are left as study without follow-up neither implementation.

Mr Kunita answered that there was no discussion done in Antananarivo. That, we will examine more here in Toamasina, and are expecting the implementation of this project. However it will depends on funds source. As now, due to political crisis in Madagascar, international societies wait for action. So the implementation of the project may delay 1 or 2 years than expected. The negociation of loan will take place after the election. And whenn after the loan is concluded, the preparation for the implementation begins, there will be the survey, design, tender and so on, and finally the beginning of the construction.

Mrs RAKOTONIRINA asked if the budget was been fixed or if it can be changed according to the result of the study. She invoked that the main problem of SPAT is the lack of space, so it should be enlarge and lead at the same time to the increase of costs of the project.

Mr RANAIVOJAONA Samuel explains generally to the SPAT members about the project since the beginning in 2008, such as the project has 2 parts and that the first part is the urgent plan and the second part is the middle term plan and these are in JETRO report. The urgent plan is estimated at 160 million euros and the middle term plan 190 million euros. He explained also that this study received an agreement in principle from the Japanese government. The SPAT and APMF is responsible for the realisation of the project and form the steering comity. If there is not this political crisis the loan negotiation is for the year 2010 according to the draft detailed technical document for the realisation of the project. The end of the construction is forecast at the end of 2015.
For the question whether the project will to be implemented or not, it depends on the situation.

The SPAT staff suggested to have specific meeting and to discuss together their ideas concerning the situation with the Study team.

The suggestion was accepted.

Mr RANAIVOJAONA Samuel discussed with the SPAT staffs about the time and the way the technical meeting should be done.

The meeting ended at 11.20

■ Technical Transfer Meeting for Draft Final Report (October 23, 2009)

DRAFT FINAL REPORT
Friday 23 October 2009
Conference room of SPAT
15:15 to 17:20

Members:

JST

Mr KUNITA Osamu
Mr KOBUNE Koji
Mr ITO Masafumi
Mr NAKANISHI Masatoki
Mr IKARI Tamaki
Mr SATO Takeshi

SPAT

Mr AVELLIN Christian Eddy (Managing Director of SPAT)
Mr RANAIVOJAONA Samuel (Director of Port Management)
Mr TABIHA LARSENE Nicolas (Economic Study Departement Chief)
Mrs RANDRIAMALALA Radotiana (DRH)
Mr RAKOTONDRAMAITSO James William (Manager Information Technology)
Mr JAMI Injona (Captain of the Port)
Mr MIHA ANTOINE de Padou (Management Controller)
Mr LEDOA N'JY Leon (Financial Management)
Mr RAKOTONIRINA Jhonson
Mrs RAKOTONIRINA Miniminy Zoëline

JICA

Mr KAWASE Junichi
Mrs RAZAFIMAHEFA Manoela

Interpreter
Mr RAJAOBELINA Jocelyn
Ms RANDRIAMANANTSOA Zoly
Mr RANDRIANJATOVO Roland

Subject: Presentation of the Draft Final Report;

Mr KUNITA began by thanking the audience for their time to come and listen to this report and gave the general layout of it which is his presentation, then that of Mr IKARI on financial analysis, then a short presentation by Mr SATO on the EIE issue and finally questions and answers.

He concluded that though it is a draft final report, the study team has to adjust its contents in accordance with the opinion formed and/or with JICA recommendation in the meanwhile in order to make the final report one. The team will wait within one month for any idea or suggestion and then will submit the final report within 2 months.

He then read what is written on the Abstract of the Draft Final Report.

- The target year
- The cargo demand
- The urgent plan
- The contents of the year 2020 plan
- The technical feasibility
- The economic feasibility
- The financial feasibility
- The environmental issue
- The advantageous implementation
- The smooth construction
- To expedite the implementation

When the presentation was finished then it was the time for questions and answers for this first part.

Mr SAMUEL asked about the environmental issue namely concerning the dredging material (sand) which can be used for the reclamation area to maintain a clean environment.

Mr KUNITA answered that the main intention is to have a flexibility of source of sand. At the present time there is a dredging activity in the port and if this continues within one to three years there will be a big amount of sand that can be used during for the reclamation area. This is cheaper.

Mrs MANUELA asked about the EIRR and FIRR.

Mr KUNITA answered that this will be explained by Mr NAKANISHI later. The financial issue is very important because from income you can invest.

Mrs RAKOTONIRINA made a remark concerning the interpretation language. She said that her request has been taken into account and she was pleased about that.

Mr NICOLAS asked about the extension work: the berth of 320 m and the breakwater of 345 m. And the additional 150 m was left.

Mr KUNITA explained that is the point. It is not good spending lot of money for something that can be done in a cheaper way. The target is to get a big return with small investment.
Mrs RADOTIANA wanted to know the car circulation within the port for the period 2013-2018 during the construction work and especially that the Ambatovy project and Oji Paper will also be implemented, there will be a lot of traffic. Are there any counter-measures for that?

Mr KUNITA answered that must be handled by SPAT which will find solution. It is stipulated in the report that new access roads will be constructed.

After this last question Mr IKARI took the floor and gave a explanation about financial analysis: the technique used, the result, the two different point of views (profitability and soundness), the FIRR, the Financial Ratio, the assumptions for the financial analysis, the development schedule, the loan, the cases and the financial statement.

After Mr IKARI's presentation there was a short explanation by Mr KUNITA who said that the document will be sent to Madagascar when the team go back to Japan and JICA will form a study corps including University professor, NGO, and many other people who will study it.

Finally Mr NAKANISHI spoke about the Mole A and B and their surrounding water depth and also about the future vessels that will come to the port.

The meeting ended up at 17.30.

■ **Steering & Technical Committee Joint Meeting for Draft Final Report (October 30, 2009)**

Minutes of the Meeting for Presentation of Draft Final Report

Date: October 30, 2009
At: Ministry of Transport, Antananarivo Madagascar

Minutes:

JICA Study Team for the study "The Feasibility Study on Toamasina Port Development in the Republic of Madagascar" submitted thirty (30) copies of the Draft Final Report to the Directorate General of Ministry of Transport, the Republic of Madagascar.
The Report was explained by JICA Study Team to the Steering Committee & the Technical Committee. The Committees generally accepted the contents of the Report.
JICA Study Team mentioned that the contents of the Report might be amended for the Final Report, in case of need suggested by headquarter of JICA in Tokyo.

Terms of Reference (TOR)

CONSULTING SERVICES (DETAILED DESIGN/CONSTRUCTION SUPERVISION)

FOR

TOAMASINA PORT DEVELOPMENT

IN

THE REPUBLIC OF MADAGASCAR

(Loan Agreement No. XX-XXX)

1. General

The Port of Toamasina (the Port) in Madagascar is located at latitude 18°9.43' S and longitude 49°25.5' E on the east coast of the Madagascar, facing the Indian Ocean (**Figure 1**). It is the largest international port among 4 in Madagascar.

The Port of Toamasina is administrated and managed by Société du Port à Gestion Autonome de Toamasina (SPAT), under the supervision of Agence Portuaire Maritime et Fuluviale (APMF). National Route 2 and railway connect Antananarivo with Port of Toamasina, which is a hub port for domestic marine transportation as well as being the best and main international port in Madagascar with an important role as the logistic center.

In spite of sudden fall of cargo traffic in Toamasina Port in 2002 due to changes of the internal situations, cargo throughput of the port was recovered to the average growth rate of 10%. Due to the influence of global Lehman shock and sudden political change of Madagascar in 2009, cargo throughput of Toamasina Port seemed to rapidly fall in the first half year in 2009 and movement of the recovery is forecast from the viewpoint of recent increase of cargo traffic volume. In the course of some fluctuation, the container volume in the target year 2020 with 10% growth is estimated at 420,000 TEUs that is three times of the present volume.

There remain problems in Toamasina Port: Insufficient water depth of wharves, Insufficient area of container yard for even handling the present volume, High berth occupancy of the container and bulk cargo terminals, Conflicts of traffic flows in the port area, etc. If the freight increases without the expansion of the harbor facilities, a long queue of ships will be formed. The damages for the industry, lives, and the trade are immeasurable.

In terms of the Port Development Plan, a feasibility study financed by JETRO was conducted from January 2008 to March 2008. Subsequent feasibility study financed by JICA was carried out from January 2009 to December 2009 which recommends the urgent development of a new container

terminal extended from the existing terminal in Mole C, extension of the Breakwater, reclamation for a new container yard in the reef flat, etc. The project is detailed in the study report on "The Feasiblity Study on Toamasina Port Development". The study report recommends the urgent development plan that is financially and economically viable.

In 20XX, the Government of the Republic of Madagascar requested to the Government of Japan assistance for implementation of the project through the loans scheme as Official Development Assistance (ODA).

The Terms of Reference (TORs) are prepared to provide the general scope of the required engineering services (the Services) for the international consultant (the Consultant) who will provide for detailed design, construction supervision, supervision for procurement and supply of equipment and other necessary services for the Project. In carrying out the Services, the Consultant shall abide by those TORs and cooperate fully with Société du Port à Gestion Autonome de Toamasina (SPAT) under the Ministry of Transport (MOT) in GORM.

2. Project Profile

The whole Project is to implement construction of port facilities by 20016 such as a breakwater that is extended from the existing breakwater for securing calmness of the new wharf, a new container terminal that is connected with the C3 wharf, a container yard that is provided on the reef flat and pavement in the new and existing yard that is provided in the port.

This project is designed to improve the required container handling capacity towards the target year of *2020* (**Figure 2**).

The project consists of the construction of the following facilities;

1) Construction of a **Breakwater**
2) Construction of one berth, i.e. **Wharf C4** (water depth: 14m)
3) Improvement of **Wharves C1, C2 and C3** to secure 14m depth
4) Construction of the **Apron, Container Yard** and **Rails Track for Quay Crane** behind the berths,
5) Construction of **Container and Bulk Cargo Yard** in the Pointe Hastie Recif ,
6) Construction of **Access Road** from New Container Yard to the New Terminal Areas,
7) **Dredging** in front of Wharves C1, C2 and C3,
8) Construction of **Overpass** at the port entrance,
9) Construction of **Utilities** for supply of electricity and communication, etc.,
10) Other **Miscellaneous Works**.

The components of the Project are divided into the following three Categories:

Category 1: Civil Works

The above items from 1 to 9, and a part of 11.

Category 2: Procurement of Equipment

The above items of 10.

Category 3: Consulting Services (Detailed Design & Construction Supervision)

Detailed Design and Construction Supervision and Supervision during defects liability Period (Dec 2010 to Nov 2017)

3. Objectives of the Services

The objectives of the Services by the consulting firm(s) are to assist the Executing Agency, i.e. SPAT, to implement the Project smoothly and successfully through carrying out necessary surveys, detailed design, tendering, and construction supervision.

In executing the Services, the Consultant shall follow the relevant regulations, guidelines and procedures of the GORM and JICA based on the FIDIC Conditions of Contracts. The Consultant shall assist SPAT in all aspects of the work including the bidding, construction supervision, procurement of equipment and goods, and project management support required for the completion of the Project.

The Consultant shall keep SPAT and JICA fully informed of all-important matters by means of "Monthly Reports" and meetings as may be considered necessary for the satisfactory implementation of the Project.

4. Scope of the Services

The Services for the Project are classified into the following two kinds:

A. Consulting Services for Construction Works (Surveys, Detailed Design and Cost Estimate, Preparation of Pre-qualification and Tender Documents, Assistance in Tendering, and Construction Supervision, Environmental Monitoring,)

B. Technology Transfer. See page 8

The Consultant shall carry out the following detailed works for the above Services:

A. Consulting Services for Construction Works

A.1 Surveys

Planning and execution of the following surveys:

(1) Natural Conditions Surveys and Laboratory Tests

1) Topographic survey on land and shore line,
2) Geotechnical survey (Boring and laboratory tests at the Offshore of the Mole C),
3) Bathymetric survey for sea area (Echo sounding at the berth, channel, basins, etc.),
4) Laboratory tests (Access Road, etc.),
5) Water Quality Survey (at the berth and basin),
6) Sediment Quality Survey (at the berth and basin),
7) Biological Survey (at end of berth, Grand Recif and Pointe Hastie Recif),
8) Others.

A.2 Detailed Design and Cost Estimate

Preparation of documents for detailed design: drawings, technical specifications, construction planning, and cost estimates for the following facilities:

(1) Breakwater

1) Extension of the Existing Breakwater (Length: 345m)
2) Crest elevation of the breakwater (CD+9.0m)

(2) Wharf, Container Yard and Revetment

1) Wharf C4 (length: 320m with water depth: 14m),
2) Container Yard behind the berth (length: 320m, wide: 120m), and
3) Revetment for container yard (430m long)

(3) Improvement of C1, C2 and C3

1) Renovation of the wharves of 497m length to be deepened to -14m below the chart datum

(4) Apron, Container Yard and Rail Track

1) Apron (Area: 12800 m^2)
2) Container Yard (Area: 38,400 m^2)
3) Rail Track (Length: 320 m)

(5) Container and Bulk Cargo Yard

1) Seawalls (Length: 895m, Crest elevation: CD+7.0m)
2) Reclamation (10ha),
3) Pavement (Apron, Yards, Inner Roads, Administration Areas; 41.5ha),
4) Utilities (Electric Work, Water Supply, Drainage, Communication, Security, etc.), and
5) Port Security System (Fence, CCTV, ID System, Access Control, Intrusion Detection, Management software etc.).

(6) Access Road and Parking Space

1) New Access Road (length: 1.6km, width: 33m)
2) Parking Spaces around the Access Road and the Inner Road.
3) C110 road from T-junction to be connected by new access road.

(7) Dredging

1) Dredging in front of Wharves C1, C2 and C3 (Volume: 37,000 m^3)

(8) Overpass

1) Overpass at the Port Entrance (Length: 200m)

(9) Utilities

1) Lighting system, other electrical facilities, etc.
2) Mechanical facilities

(10) Other Civil Works

1) A concrete box for confining contaminated dredged soil

A.4 Environmental Management

1. To propose the consultant's activities for environmental management in the entire period of consultancy services.

2 To propose environmental management and monitoring activities to be carried out by the Contractor, with a view to minimizing adverse impact on the environment, and include relevant clauses in

bidding documents.

3. To monitor the compliance with conditions stated in the EIA approval letter from ONE and make necessary recommendation on environmental mitigation measures.

4. To assist SPAT to conduct extensive field surveys on distributions of coral reefs and other sensitive organisms in areas likely to be subjected to significant potential impact based on the results from above simulations to identify any coral reef or other Organism with potential impacts from the disposal.

A.5 Preparation of Prequalification and Bidding Documents

Contract packages are divided into two (2) packages for the Project, i.e. **Package 1**: Civil Works and **Package 2**: Procurement of Equipment. The tenders shall be in accordance with the relevant JICA Procurement Guidelines. The tender procedures consist of Pre-qualifications (P/Q) and Tenders. The Services include preparation of the following P/Q and tender documents:

(1) P/Q Documents and P/Q Evaluation Criteria

1) Invitation for Prequalification
2) Conditions of Prequalification
3) P/Q Evaluation Criteria

(2) Tender Documents and Tender Evaluation Criteria

1) **Volume 1: Conditions of Contract**
   - Instructions to Tenderers
   - Conditions of Contract (General Conditions and Special Application)
   - Forms of Tender with Appendices, Tender Security, Performance Security, and Agreement
2) **Volume 2: Technical Specifications**
   - General Specifications
   - Technical Specifications
   - Information Drawings and Reference Data
3) **Volume 3: Proposal Book**
   - Bid Forms
   - Preambles
   - Bills of Quantities, etc.
4) **Volume 4: Drawings**
5) **Tender Evaluation Criteria**

A.6 Tender Assistance

Assistance in P/Q, and tendering and contracting of the Project, which include but shall not be limited to the following:

(1) Pre-qualification

Assistance for invitations to P/Q, evaluation of applications, and preparation of Prequalification

Evaluation Report to be submitted to SPAT for the approval of SPAT and JICA.

(2) Tendering

Assistance for invitations to tender, evaluation of bids, and preparation of detailed Tender Evaluation Report to be submitted to SPAT together with the recommendations for the award of the contract to the highest evaluated and most responsive bidders for the approval of SPAT and JICA.

In addition, the Consultant shall also assist SPAT in the preparation and finalization of contract agreements.

A.7 Construction Supervision

(1) Construction Period

The Consultant shall undertake construction supervision works for the Project, which include but shall not be limited to the following:

1) To check and recommend approval and/or modification, if necessary, of the proposals and documents, including **Construction Method Statement**, **Quality Control Plan**, **Environmental Management Plan**, and **Drawings** prepared/submitted by the Contractor and/or the Manufacturer relative to the execution of the Project.
2) To prepare additional designs, and supply of all necessary working drawings for the Contractor for approval by SPAT for satisfactory execution of works, including those required as a result of any modification and/or alterations in the original bid documents.
3) To check the location, alignment and workmanship of all works as laid out by the Contractor, and recommend SPAT the acceptance or rejection of the works as constructed as well as equipment procured, if needed.
4) To recommend acceptance or rejection of materials to be used or incorporated in the works, and verification, if necessary.
5) To continuously inspect the works on the Project and issue necessary **Instructions to the Contractor**.
6) To check monthly contract applications for payments and regularly progress payments on the construction works.
7) To assist SPAT in negotiating and execution of any **Change Order,** which may be deemed necessary.
8) To check, evaluate and recommend for approval by SPAT the Contractor's and Supplier's **Work Schedule** and **Progress Schedule** for the most effective, expeditious, and safe methods of carrying out the construction works as well as the manufacturing and installation works of the equipment.
9) To conduct periodic **Coordination Meetings** as may be required.
10) To maintain permanent **Records of Measurements** made for the works, quantities to be paid and results of all tests made on materials used in the works.
11) To evaluate and make recommendations for SPAT's approval of all claims, disputes and requests for time or changes that Contractor may request, and assist SPAT in negotiating with Contractor on prompt solutions for all such problems.
12) To supervise the fabrication/installation of all the equipment and facilities at the site and

performance of **Final Performance Tests**.

13) To recommend the issue of **Interim Payment Certificates**, **Certificates of Completion**, **Final Payment Certificates** and **Performance Certificates** in accordance with conditions of the Contract.
14) To submit to SPAT, upon the issuance of the **Final Certificate of Acceptance** of the Project, all job records, as-built drawings as well as the required written instructions for the satisfactory operation and maintenance of the Project.
15) To conduct management of site safety.

Within three (3) months after the issuance of Performance Certificate of the Project, the Consultant shall submit to SPAT a Contract Completion Report describing progress of work, construction records, variation orders, final cost and other matters as may be required by SPAT.

(2) Defects Notification Period

During the first year after project completion, which is defined as the **Defects Notification Period**, the Contractor shall rectify defects as notified in accordance with the Contract. The Consultant will inspect periodically the work to be executed by the Contractor.

1) During the Defects Notification Period, the Consultant will instruct the Contractor in writing to execute all such works as repair, amendment, recognition, rectification and making good effects of imperfections, shrinkage or other fault as may be required for the Contractor. After any substantial part of such work has been completed to the satisfaction of the Consultant, the latter will recommend the issue of **Performance Certificate** to the Contractor.
2) Upon issuance of the Performance Certificate, the Consultant will submit a **Defects Notification Completion Report** to SPAT, summarizing the conditions of the facilities and any remedial actions that were taken.

(3) Environmental Management

To review the **Environmental Monitoring Program** planned in EIA based on the result of the detailed design works and execute the Program,

To supervise the environmental management and monitoring activities to be implemented by Contractor(s), and if necessary to instruct the Contractor(s) to take necessary additional measures,

To propose SPAT specific actions and countermeasures to take care of any adverse impacts,

To monitor the compliance of the project with conditions stated in the EIA approval letter from NEMA and make necessary recommendation on environmental mitigation measures to SPAT and contractor of the project,

To assist SPAT in undertaking other activities relating to the environment affected by the Project, and

To prepare and submit to SPAT the **Environmental Monitoring Reports** periodically twice a year.

B. Technology Transfer to GORM, SPAT and Related Local Institutions

B.1 OJTs

The Consultant shall work with the SPAT's personnel and local engineers during the survey, detailed design, and supervision works in the Project for the purpose of the technological transfer. In particular, the Consultant shall for the entire duration of the detailed design, work with SPAT civil, electrical, mechanical and other engineers at the Consultant's design office, for the purpose of technology transfer. The consultant shall allow for all costs of such technology transfer in is financial submission. The consultant shall also similarly work with SPAT engineers for the entire duration of construction supervision.

B.2 Seminars and Workshops

The Consultant shall organize and execute seminars and workshops, when deemed necessary and appropriate, for orientation/guidance of supervision works by SPAT's personnel and local engineers.

5. Schedule of the Services

The Services for detailed design and construction supervision will be accomplished within 79 months, including one year for defects notification period.

	1		2		3		4		5		6		7	
Month	6	12	18	24	30	36	42	48	54	60	66	72	78	84
Detailed Design	———													
Construction Supervision					◄———		———		———		———		———►	
Construction of Port Facilities		·····	·····	·····	———		———		———		———			
Major Reports Submission	△				△							△		△

Note:

····· Tender for Construction

——— Construction

△ Reports

6 Reports and Documents

6.1 Reports and Documents to be Submitted to SPAT

The Consultant shall prepare and submit the following reports and documents in English to SPAT:

1) Inception Report

10 copies within 2 weeks after commencement of the Services

2) Survey Reports

5 copies for each Natural Conditions Survey, Environmental Baseline Survey, within 1 month after completion of each survey and

3) Design Reports

10 copies of Design Reports and Drawings at the scheduled date

4) Pre-qualification Documents and P/Q Criteria

10 copies each for Packages 1 and 2 by the scheduled date

5) Pre-qualification Evaluation Report

10 copies within 3 weeks after closing date of P/Q

6) Tender Documents and Tender Evaluation Criteria

10 copies each for Packages 1 and 2 by the scheduled date

7) Tender Evaluation Report

10 copies within 1 month after closing date of each tender

8) Monthly Progress Report

10 copies within 1 week in the next month

9) Project Completion Report

5 copies within 3 months after the project completion

10) Environmental Monitoring Reports

5 copies twice a year. Final Report within 1 month after the project completion

11) Defects Notification Completion Report

5 copies within 1 month after issuance of Performance Certificate

6.2 Reports and Documents to be Submitted to JICA

The Consultant shall assist SPAT in preparing reports to be submitted to JICA by SPAT, such as the Progress Report and the Project Completion Report, which are defined/ obliged in the Loan Agreement of the Project.

7. Required Expertise

7.1 Foreign Experts

The required expatriate experts for the Services will be, but not limited to, the following personnel and the total assignment man/months is estimated to be around 270 m/m.

1. Project Manager
2. Deputy Project Manager
3. Civil Engineer
4. Port Engineer (Breakwater)
5. Port Engineer (Wharves)
6. Port Engineer (Seawalls)
7. Civil Engineer (Road/Pavement)
8. Civil Engineer (Overpass)
9. Dredging Reclamation Engineer
10. Construction Planner
11. Soil Improvement Engineer
12. Cargo Handling Equipment Specialist
13. Utility Engineer (Electric)

14. Utility Engineer (Mechanical)
15. Shoreline Analyst
16. Marine Engineer
17. Geo-technical Engineer
18. Environmental Expert
19. Document Specialist
20. Quantity Surveyor (Cost Estimate)

7.2 Local Experts

The required local experts for the Services will be, but not limited to, the following personnel **and** the total assignment man/months is estimated to be around 310 m/m.

1. Civil Engineer (Deputy Project Manager)
2. Port Engineer (Breakwater)
3. Port engineer (Wharves)
4. Port Engineer (Seawalls)
5. Civil Engineer (Road/Pavement)
6. Civil Engineer (Overpass)
7. Dredging Engineer
8. Utility Engineer (Electric)
9. Utility Engineer (Mechanical)
10. Land Survey Expert
11. Geo-technical Engineer
12. Environment Investigator
13. Chief Site Inspector
14. Site Inspector (Materials, tests and quarries)
15. Site Inspector (Construction site)
16. CAD Operator (1)
17. CAD Operator (2)
18. CAD Operator (Utility)

7.3 Local Supporting Staff

The required local supporting Staff for the Services will be, but not limited to, the following personnel and the total assignment man/months is estimated to be around 180 m/m

1. Office Administrator
2. Accountant
3. Secretary

8. Obligation between SPAT and the Consultant

(1) Consultant's Requests

In the case of a difference of opinion between SPAT and the Consultant on any important matters involving professional judgment that might affect the proper evaluation or execution of the Project, SPAT shall allow the Consultant to submit promptly to SPAT a written report and, simultaneously, to submit a copy to JICA. SPAT shall forward the report to JICA with its comments in time to allow JICA to study it and communicate with SPAT before any irreversible steps are taken in the matter. In cases of urgency, the Consultant shall have the right to request to SPAT and/or JICA that the matter be discussed immediately between SPAT and JICA.

(2) JICA's Monitor

SPAT is responsible for supervising the Consultant's performance and ensuring that the Consultant carries out the assignment in accordance with the contract. Without assuming the responsibilities of SPAT or the Consultant, JICA may monitor the work as necessary in order to satisfy itself that it is being carried out in accordance with appropriate standards and is based on acceptable data. As appropriate, JICA may take part in discussions between SPAT and the Consultant. However, JICA shall not be liable in any way for the implementation of the Project by reason of such monitoring or participation in implementation of the Project. Neither SPAT nor the Consultant shall be released from any responsibility for the Project by reason of JICA's monitoring or participation in discussion.

9. Undertakings of SPAT

SPAT is to undertake the following ;-

(1) To assist with procedures for issuance of entry permits necessary for the Consultant's members to conduct the services.
(2) To assign counterpart staff to assist the Consultants in conducting the Services.
(3) To ensure the safety of Consultants' staff at place of works.
(4) To assist the Consultants' staff as the need arises for any medical services which may be required.
(5) To assist for duties and custom clearance exemption for equipment, instruments, tools and other articles to be brought into Madagascar in connection with the implementation of the services.
(6) To assist in obtaining customs clearance for personal effects which may be brought into Madagascar by the staff of the Consultant for the execution of the Services
(7) To assist in securing adequate office space to the Consultant.

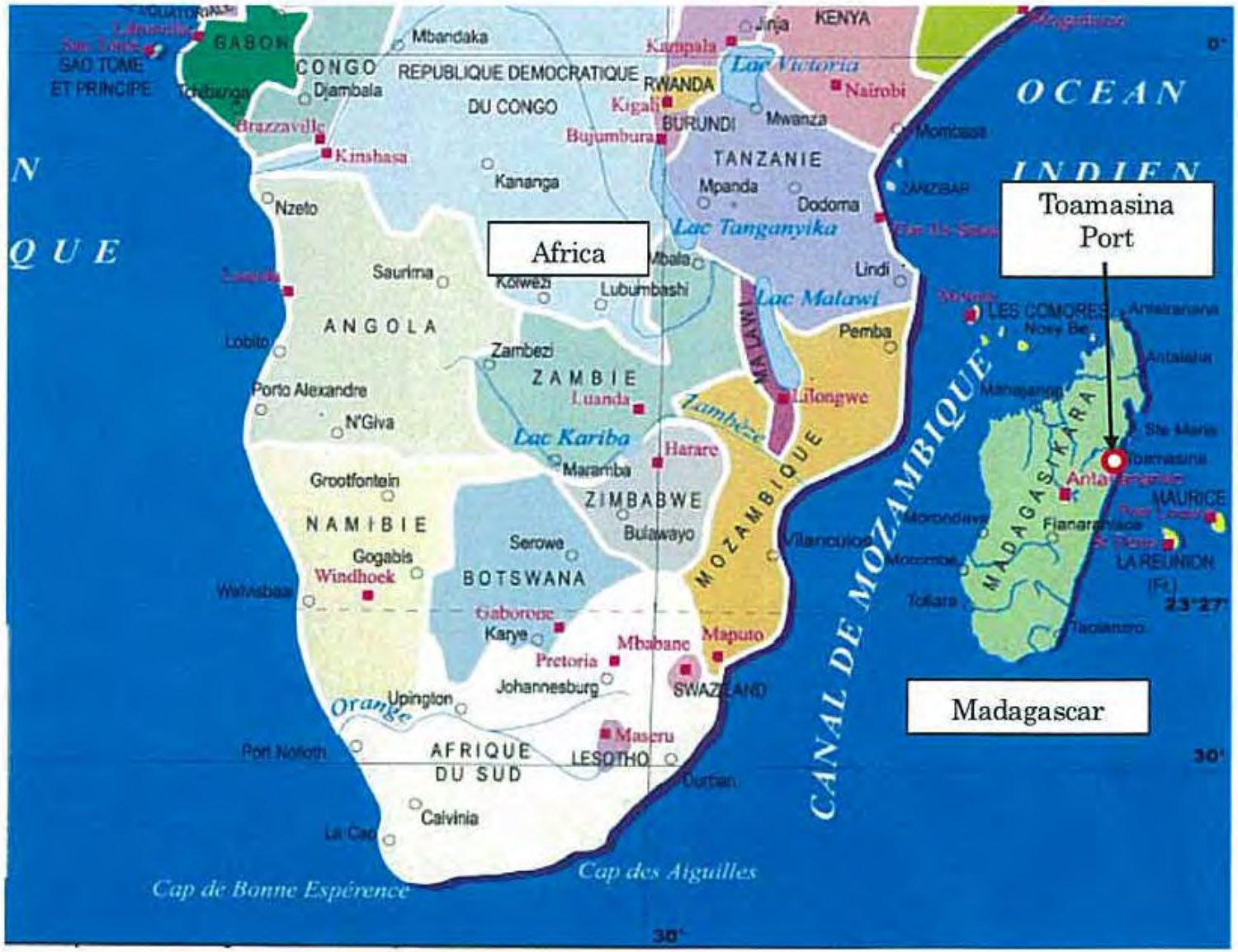

Figure 1 Location of Toamasina Port, Madagascar

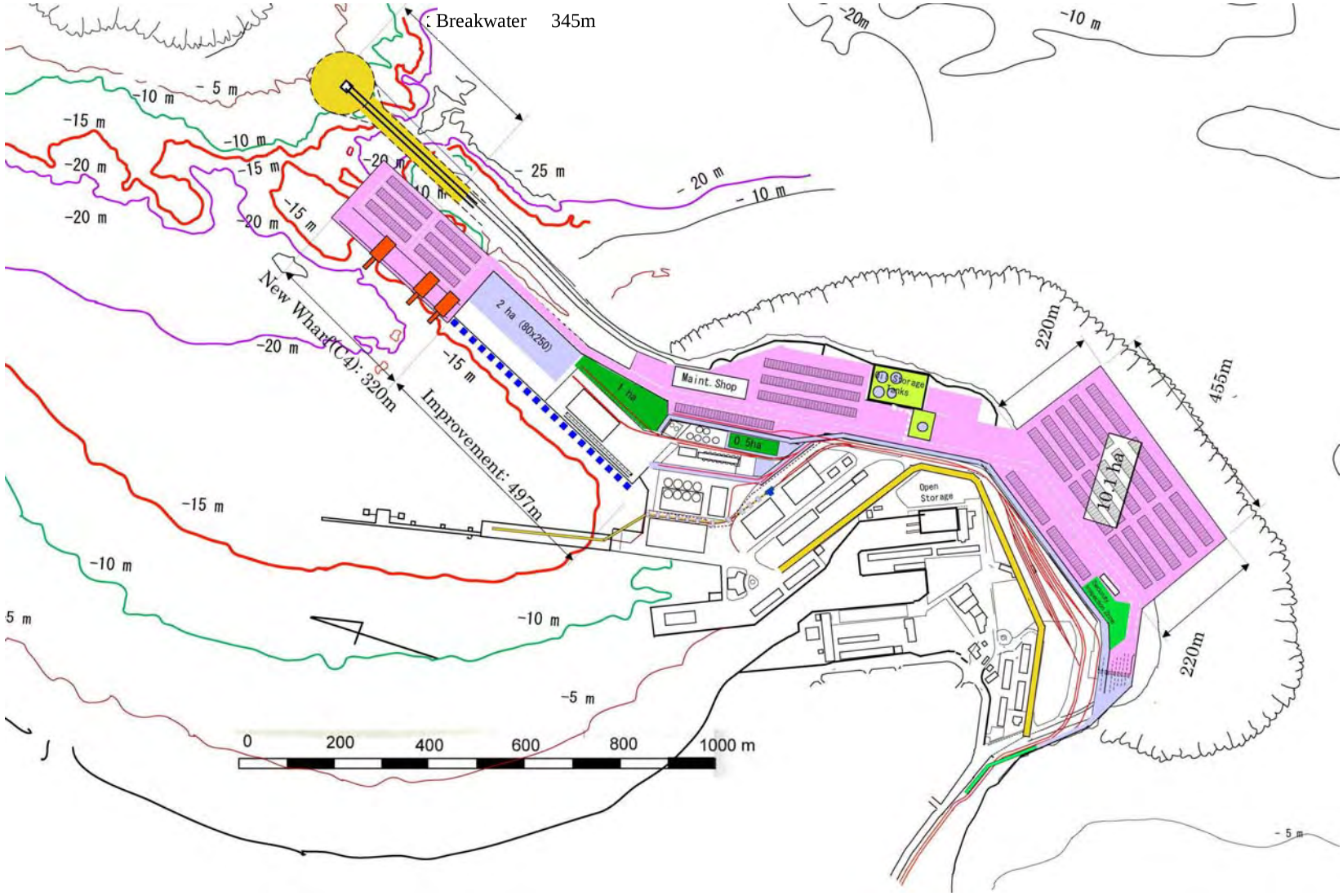

Figure 2 Layout of Port Facilities in Urgent Development Plan for Tamasina Port,