including the genset, cabling and building is estimated in accordance with the 2,500m^2 area of passenger waiting hall.

(4) Route 9, Palembang - Muntok Terminals

25. The cost of the steel sheet piles breakwater is determined by using materials costs and basic construction costs of the steel materials and their driving cost (as listed in Table 7-1-1) and the estimated volume of works derived from the basic design.

26. The cost of truck scale installation is estimated in the same manner as for the Bajoe - Kolaka terminals excluding reclamation works,since the truck scale is installed on an existing land area.

27. The cost of water supply to a 500 GRT terminal is estimated to be about 1.2 times that of a 300 GRT terminal. The cost of electric power supply including the genset, cabling and building is estimated in accordance with the 1,400m^2 area of passenger waiting hall.

c) Local and Foreign Currency Components

28. The construction costs of all the facilities are estimated for the respective terminals and divided into local currency portion and foreign currency portion depending on the components of materials and works.

The local currency portion is estimated as the cost of the locally available materials, equipment and fablication near the site, and also tax.
The foreign currency portion is estimated as the cost of the imported materials such as piles, fenders, hydraulic system and by use of the imported equipment such as pile driving hammers, dredging equipment, floating barges, etc.

29. Considering the above aspects and components of works the proportions of the local and foreign currency for the main items of works have been estimated as follows;

Table 7-1-2 Proportion of Local and Foreign Currency of the Works

Item of Work	Proportion of Currency	
	Local	Foreign
- Dolphin structures	40 %	60%
- Movable bridge steel structure with hydraulic equipment	20	80
- Fender with front frame	40	60
- Wharf and Trestle		
with S.P.P	40	60
with Caisson	60	40
- Revetment works	70	30
- Reclamation works	70	30
- Road works,Pavement	70	30
- Building works	80	20
- Dredging work		
for coral reef	20	80
for soft clay	20	80
- Utility supply equipment	40	60

7-1-3 Cost Estimation of the Terminal Development

30. The construction costs of the terminal development are determined by considering the working methods, sequences and sources of materials and equipment mobilized to the site.

31. The details of sequences, arrangement and methods of works in relation to the schedule of the respective routes are described in section 7-2 Construction Schedule.

32. The construction cost of the main waterfront facilities and all the works required for the terminal with the respective quantities of works have been estimated and are shown in the Table 7-1-1A and 7-1-2A in the Appendix Part 3.

7-1-4 Cost Estimation of the Project

(1) Total Project Cost for the Feasibility Study

33. The total project cost of the planned routes for the feasibility study comprises of the following items of cost;

- Direct construction cost as estimated in 7-1-3
- Consulting cost of the engineering services including the surveys, soil investigation and detailed design and construction supervisory services
- Physical contingency for the construction works
- Value Added Tax for the Contract

34. Cost estimation of the above items is described as follows;

a) The Consulting Cost of the Engineering Services

35. The cost of the engineering services is estimated taking into account the following scope of services with the assumption that the consultants will be appointed to provide the required engineering services to the proposed four routes as one package,

- The topographic and hydrographic surveys and soil investigations required at 8 terminal sites,
- The detailed design of all the facilities at 8 terminals
- The construction supervisory services at 8 terminals for a two years period

b) Physical Contingency

36. A physical contingency is required for the construction works and is estimated as follows;

- Local currency portion; 10 % of construction cost
- Foreign currency portion; 5 % of construction cost

Physical contigency for the engineering services is included in the above consulting cost.

c) Value Added Tax (V.A.T)

37. The taxes required for the works are considered to be included in the basic cost of the works and the unit cost of the materials.

The Value Added Tax for the contract is assured for the project cost to be 10 % of the total construction cost.

These costs are added to the local currency portion.

38. The construction cost of each route is estimated by including the above items as the Total Terminal Construction Cost and is shown in Table 7-1-3A.

(2) The Cost of the Replacement of Items during the Project Service Period

39. The following facilities will be renewed during the project facility service period.

- Fender facility installed on the berthing dolphins
- Hydraulic system for the movable bridge operation
- Overlay pavement for the road, parking area and causeway
- Electric generator for power supply

The costs of the above items are listed in Table 7-1-2A, Detailed Construction Cost.

(3) Cost Estimation of the Total Project Cost

40. The total project cost of each route and four routes as the whole of the project consists of the following items;

- Construction works,
- Engineering services,
- Physical contingency,
- Tax, and
- Procurement cost of the designed ship

The total Project cost is shown in Table 7-1-3.

Table 7-1-3 Total Project Cost Estimation for Phase 1

Total Project Cost Estimation for Phase 1

Route No.	Name of Terminal (Province /Island)	Facility	Terminal Construction Cost (Rp)	Items of Detailed Cost	Total cost for Feasibility Study (Rp)	Designed Ferry ship (GT)	Ship Cost including tax and contingecy for Phase 1.(Rp)	Total Project Cost (Rp)
2	Mokumer	New	3,885,000,000	1)	8,152,000,000	300		
	(Irian Jaya/Biak)			2)	1,127,000,000		2,100,000,000	12,964,000,000
	Saubeba	New	4,267,000,000	3)	597,000,000	300	for one ferry ship	
	(Irian /Yapan)			4)	988,000,000			
				5)	10,864,000,000			
3	Terong	New	6,358,000,000	1)	10,961,000,000	300		
	(NTT/Adonara)			2)	1,517,000,000		2,100,000,000	16,738,000,000
	Lewoleba	New	4,603,000,000	3)	829,000,000	300	for 1 ferry ship	
	(NTT/ Lomblen)			4)	1,331,000,000		for phase 1	
				5)	14,638,000,000			
8	Bajoe	New	11,732,000,000	1)	20,043,000,000	1000		
	(SE. Sulawesi)			2)	2,773,000,000		7,000,000,000	33,686,000,000
	Kolaka	New	8,311,000,000	3)	1,444,000,000	1000	for 1 ferry ships	
	(SE.Sulawesi)			4)	2,426,000,000		for phase 1	
				5)	26,686,000,000			
9	Palembang	New	6,244,000,000	1)	14,937,000,000	500		
	(S. Sumatra/Sumatra)			2)	2,089,000,000		3,500,000,000	23,409,000,000
	Muntok	New	8,693,000,000	3)	1,073,000,000	500	for 1 ferry ships	
	(S.Sumatra/Bangka)			4)	1,810,000,000		for phase 1	
				5)	19,909,000,000			
	ToTal		54,093,000,000		72,097,000,000		14,700,000,000	86,797,000,000

Note;
a),Terminal Construction Cost are consisted of the construction works of each terminal only
b) ,The total cost for the feasibility study is included the consulting services cost, physical contingency, Value Added Tax for the Construction works.
c),The ship procurement cost is addedd to the total cost for the study for the total project cost
d),In the colume of Total Cost for feasibility study the number of 1),2),3),4),5) are as follows
1), The total construction cost of two terminals
2), The consulting cost of the engineering services
3), The physical contingency of the construction works
4), The Value Added Tax for the Contract
5), Total Cost fot the Feasibility Study of the Route

7-2 Construction Schedule

7-2-1 General

41. The construction schedule for each route is determined based on the following assumptions.

- The construction works of each route will be started at the same time by one packaged contract after one year of engineering study and tender procedure.
- It is estimated that in the first year of the project the surveys, soil investigations, detailed design of all the facilities and preparation of the tender documents will be completed in six months, and thereafter the tender period and conclusion of the contract will take a further six months.

7-2-2 Construction Schedule and Construction Methods of Each Terminal

42. The construction schedule, arrangement and methods of works of the respective terminals have been determined according to the planned scope and type of works required for the construction of the complete ferry terminal facilities.

43. In preparation of the construction schedule the following equipment is assumed to be used for the works.

Crawler crane	Lifting capacity,65 Ton,180 PS
Diesel hammer	D-35,
Dump trucks	5 cum loading capacity
Backhoe	0.6 m3
Cramshell bucket	1.0 m3
Bulldozer	70 PS
Barge	400- 600 GRT
Concrete mixer	1.0 m3 drum capacity

44. The construction schedule for each route in relation to the methods are described as follows;

(1) Route 2, Mokmer - Saubeba

a) *Mokmer Site*

45. The construction works should be carried out in the following sequence and using the following methods.

1) The dredging work at Mokmer site will be started first before the piling works of the jetty and trestle structure.

The coral reef dredging works will be carried out by clamshell type dredging equipment (bucket capacity of 1.0 cu.m) and 2-300 cu.m capacity hopper barge for transportation and dumping of dredged materials at the causeway foundation for breakwater and reclamation.

It is estimated that mobilization of dredging equipment to the site will take three months and the dredging works will be completed in three months, meantime the preparatory works of survey and soil investigation are carried out.

2) After the dredging works, the causeway to be extended on both sides to protect the basin for the ferry boats operation will be carried out by the end-on system,i.e. the gravel materials are placed from the land along with the reclamation works.

3) The piling works for the jetty will start after the dredging work, about six months after the commencement of the works.

The piling works and concrete works of the jetty and wharf for the movable bridge installation are to be completed in 6 months. The piling works will be carried out by using a 3.5 ton pile hammer installed on a mobil crane on the a floating barge of 500 ton class. The hammer weight will be adjusted according to the hardness of the coral reef to enable penetration by the 500 mm dia steel pipe piles.

4) It is expected that the reclamation works for the land formation will be completed by this time and the building works, utilities supply and road pavement works will be carried out and completed in 12 months.

5) The fabrication of the movable bridge for the two terminals will be carried out in a steel mill factory located near Jakarta and transported to the sites.

The fabrication will take 9 months from the preparation of shop drawings until delivery to site.

The fabrication schedule will be arranged so that the movable bridge and hydraulic equipment for Mokmer site will be delivered first, after around 18 months of the construction works.

It will take 6 weeks for installation and 4 weeks for testing and trial operation of the bridge.

6) The total period of the works at the Mokmer site will be 24 months.

b) Saubeba Site

46. The 45m long causeway construction to connect the land and jetty sites and the 300m length of breakwater constructed by the end-on method at the Saubeba site will start first.

47. The total period of the works at Saubeba will be 24 months and the sequence of the works will be as follows;

1) After completing the piling and concrete works at Mokmer site, the equipment used will be mobilized to Saubeba site.

2) The piling works and concrete works for the jetty will be carried out from the approach causeway from the land and are estimated to be completed in a 6 months period.

3) Meantime all the causeway construction works and land reclamation works are to be completed in 15 months.

4) The land facilities such as the passenger hall, office building, utilities supply works, road and pavement works will be carried out on the

reclaimed land and will be completed in 12 months after the reclamation.

5) The movable bridge will be delivered to the site around 21 months after the start of the works at the time when the concrete works of the movable bridge foundation is completed.

6) The installation and trial test operation will be completed in 10 weeks.

(2) Route 3, Lewoleba - Terong

a) Terong Site

48. A large amount of preparatory works such as caisson yard preparation for fabrication of concrete caisson and pre-casting of concrete slab and foundation for the trestle are required at the Terong site, where very hard soil is found below the seabed.

49. The total period of the works is estimated to be 24 months. The sequence of the works at this route will be as follows;

1) The works will start at the Terong site with the caisson yard preparation works on the sandy beach near the planned terminal site.

2) The reclamation works are planned on the existing beach area and while the reclamation works and preparatory works for the caisson yard are in progress the rubble mound materials are dumped by barge and leveled on the existing seabed at the planned area of the jetty for the caisson installation.

3) The rubble mound stones will be taken from the mountain near the site and transported by 5 trucks with 5 cu.m loading capacity and dumped in position from the barge. These works will be completed in 10 months.

4) The caisson will be fabricated on the existing sandy beach at the

temporary caisson yard one unit at a time. Each caisson will be transported to its position by floating and placed by filling sand into the cells.

The fabrication and installation of 8 caissons will be completed in 6 months.

5) The installation of bollards and fenders on the caisson will be completed in 4 months.

6) The foundation at the wharf area for installation of the movable bridge will be constructed in 20 months and installation of the bridge and its trial operation will be carried out in 2 months.

7) Building works, road and parking area and utility supply will be carried out after the reclamation works and will be completed within 21 months of the construction works.

b) Lewoleba Site

50. The works sequence and methods at Lewoleba will be as follows;

1) The works at the Lewoleba site will start with the piling works after the preparatory works for the caisson yard at Terong site are completed, which will be within about 6 months of the start of the contract.

2) All the piling works and concrete works for dolphins, trestle and wharf for the movable bridge will be completed in 6 months.

3) The movable bridge structures will be delivered to Lewoleba site within 15 months of the contract and will be placed at the Lewoleba site first.

4) The reclamation works will be carried out on the existing sandy beach area, while the piling and concrete works of the jetty structures are in progress.

5) The buildings, utilities supply and road and pavement works will be subsequently in progress and will be completed within 24 months of the construction works as will be the movable bridge installation.

All the works of Lewoleba terminal are to be completed in a 24 months period.

(3) Route 8, Bajoe - Kolaka

a) Bajoe Site

51. Dredging works are planned in front of the new jetty for the basin and approach channel at Bajoe terminal. The dredging works are to remove the soft muddy clay materials to - 3.5 m.

52. The sequence and work arrangement of the Bajoe site should be as follows;

1) The dredging works will be carried out by suction pump dredger of 1,000 to 1,500 HP capacity and it is planned to dump the dredged material around the mangrove area at the east corner of the existing causeway.

2) The dumping area should be surrounded by a retaining wooden wall so that the dumping area can be used for future land formation and to prevent water pollution which would effect the fishing villages on the neighbouring coast.

3) The land reclamation works are planned near the existing jetty where there are soft clay soil conditions for construction of the passenger hall, truck waiting parking area, etc.

4) It is planned to start the dredging works and reclamation works at the same time.

5) The dredging works will take 5 months for mobilization and preparation and arrangement of equipment at site and one month for

dredging works.

6) The reclamation works at the middle of the existing causeway will take about 9 months by using 10 trucks of 5 cu m loading capacity and making 4 round trips per day, assuming that the reclamation materials can be taken from the mountain behind the city.

7) The new jetty at both terminals for 1,000 GT ships are connected to the existing causeway by pile supported concrete slab trestle structures 105 m long at the Kolaka site and 200 m long at the Bajoe site.

8) The piling works and subsequent concrete works from the trestle are carried out, followed by the jetty structures which will take about 12 months after the mobilization and preparatory works.

9) After around 18 months of the contract the movable bridge structure with its hydraulic equipment is delivered to the site.

10) The bridge installation and its trial operation test is to be completed within 21 months of the contract.

11) The construction of the passenger hall, utilities supply facilities and parking area with pavement will take a 10 months period.

12) The truck scale building for both terminals is to be constructed at the entrance of the newly made reclamation area.
A concrete pile foundation will be used for the weight measure equipment support due to the soft unstable reclamation material.

13) Construction of the truck scales is planned to start around 15 months before the completion of the entire reclamation works so as to complete the whole of the works within 24 months of the contract.

b) Kolaka site

53. The works of Kolaka site will be started by piling works at the same time as the Bajoe site.

The soil condition of the planned site of the jetty and the new approach trestle is very soft and the length of steel piles required, the more time is required for the piling works.

54. The sequence and work arrangement of Kolaka site should be as follows;

1) Reclamation material can be taken from the mountain behind Kolaka city. The reclamation works will be completed in 6 months after the mobilization and preparatory works.

2) Land reclamation is planned at the corner of the north of the existing causeway for construction of the land facilities. The land facilities construction will be completed in 10 months.
The area will be prepared to provide for settlement for a three months period and then made ready for the subsequent works.

3) Construction of the truck scale installation will be started at about 12 months of the contract so as to complete the whole of the works in 24 months.

4) The movable bridge structures will be delivered to the site at around 21 months of the contract so hat the installation and trial operation test will be completed by the time of the completion of the entire works of Kolaka terminal.

(4) Route 9, Palembang - Muntok

a) Palembang Site

55. Reclamation works are to be carried out on the existing swampy area south of the existing terminal area.

56. The sequence of work at the Palembang site should be as follows;

1) It will take about 6 months for the reclamation works by using 5 trucks of 5 cu m loading capacity making 2 round trips per day.

2) The piling works of the Palembang site will be started after about 8 months of the contract after the piling works of the Muntok site breakwater are completed..

3) The land and jetty are connected by pile supported concrete slab trestle over the river bank. Construction of the jetty and trestle will be completed in 10 months while the reclamation works are in progress.

4) The foundation works for the movable bridge will be subsequently in progress and completed in 4 months. Fabrication of the movable bridge will be completed in 18 months. The installation and trial operational test will be completed within 24 months of the start of the works.

5) It is planned that the truck scale will be located on the existing land area. The installation period will be 10 months since no reclamation works or pile supporting works are required.

6) Building works for the passenger waiting hall on the reclamation area will be completed in 12 months

57. During the construction period appropriate attention must be paid to the on-going ferry ship operation and cargo shipping on the river.

b) Muntok Site

58. The land reclamation works are planned on the existing land area. The reclaimed land and jetty are connected by a rock mound type causeway on the existing sandy beach.

The causeway should be constructed by the end-on system from the land. The reclamation and causeway construction will be completed in 9 months

59. The sequence of the works at the Muntok site will be arranged taking into account the local oceanographic seasonal conditions (wind, high waves and fog) during the rainy season. Accordingly work such as piling will be carried out during the dry season from May to October.

1) The works at the Muntok site will start first with the sheet piles (PSP IVL) driving for the break water.

   The 97m long breakwater made with steel sheet pile walls will be constructed on the east side of the new jetty.
   This work will be carried out by using a diesel hammer of 3.5 ton weight installed on a floating barge. The work will be carried out during high tide and will take about 8 months due to the limited working times.

2) After completing the sheet pile wall the piling works for the jetty structures will be commenced and completed in 6 months including the concrete works.

3) The movable bridge structure for both terminals will be delivered to the sites within around 18 months of the contract.

4) The installation works of the movable bridge at the Muntok site should be carried out during the dry season since it would be affected by the local climate conditions of wind, and waves during the rainy season.

5) The building works on the reclaimed land will be completed in 12 months.

60. The engineering and construction scheclule of each route is shown in Table 7-2-1A.

Chapter 8 Environmental Assessment

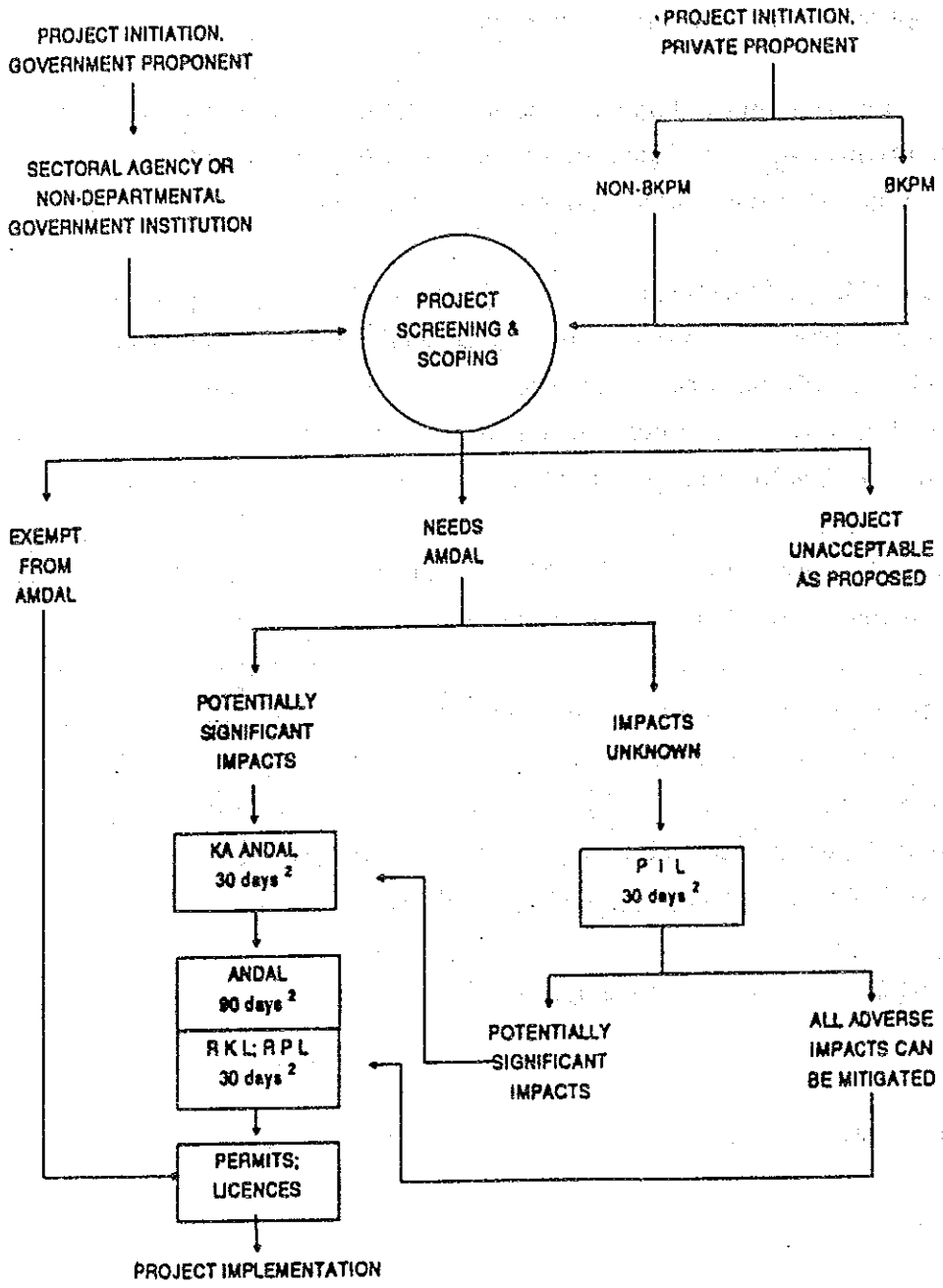
8-1 Environmental Impact Assessment Process in Indonesia

(Source:AMDAL A Guide to Environmental Assessment in Indonesia, Bapedal-Environmental Impact Management Agency July,1991)

1. The AMDAL(Analysis Mengenai Dampak Lingkungan, or Analysis of Environmental Impacts) process is established through Government Regulation No.29,1986, or PP29/1986. PP29/1986 was the first piece of environmental protection legislation promulgated under the key Indonesian environmental law, Act Number 4, 1982, which establishes the principle of sustainable development.

2. Overall coordination of the AMDAL process was initially the responsibility of the Ministry of State for Population and Environment (KLH). This responsibility was transferred to the new Environmental Impact Management Agency (Bapedal-Badan Pengendalian Dampak Lingkungan) in June, 1990. Authority for process implementation currently lies with the Central and Provincial levels of government: 1) at the central level with 14 sectorial government departments and non-department institutions, and 2) at the regional level with 27 provincial governments of Indonesia.

AMDAL procedures are shown in Fig.8-1-1.



Meaning in English of the abbreviations used above:

PIL: Preliminary Environmental Information
PEL: Preliminary Environmental Evaluation
KA: Terms-of-Reference
SEL: Environmental Evaluation Study
RKL: Environmental Management Plan
RPL: Environmental Monitoring Plan

Fig. 8-1-1 AMDAL PROCEDURES

8-2 Environmental Assessment for the Feasibility Study Route

3. The development of ferry service routes has a large impact on the economical development of the regions around the ferry terminal sites. And it may have some influence on the daily life of the residents and the various environmental factors. Therefore it is essential to assess the effects of the development plan of the ferry routes of the Feasibility Study on the environment in surrounding areas.

4. The five ferry terminal sites to be newly constructed have been selected considering the following items related to the effects of the development of the project on the environment in surrounding areas.

1) On-land terminal facilities are planned on sites not requiring the change of residences, graves and other public facilities. (However, in Mokmer two houses are required to be moved.) Where breakwaters were required to protect berthing basin, the site was determined so as not to have influence on neighboring coasts.
2) The site and the layout of mooring facilities are planned to have no influence on the activities of neighboring sea port and of fishery around the site.

5. Of the three existing ferry terminals to be extended, new on-land terminal facilities in Bajoe and Kolaka are planned at sea area next to the existing on-land facilities or the existing berth, and in Palembang these are extended in the existing ferry terminal area. This shows that the effect of new development plans on the sea transportation and fishery being conducted around the terminal is negligible.

6. The planned ferry terminal sites are located in the open air of coastal areas, which are far from city residential areas. The pile foundations are generally selected on the ordinary soil conditions and in case of hard soil the caisson foundation are adopted. Atmospheric pollution, noise and vibration by piling works will be small and not affect the resident area during construction works.

7. No mangrove is found in the vicinity of each of the eight ferry terminal sites.

8. Water for passenger terminal and ferry boats is planned to be provided mainly from the extraction of ground waters. The existing ferry terminals using ground waters, including Merak and Bakauheni terminals, the largest ones in Indonesia, have not experienced such problems as declining ground water level or an increase of salinity. Therefore the extraction of ground waters in the Feasibility Study terminals will not cause any problems.

9. No historical or cultural constructions and monuments exist in the vicinity of each of the eight ferry terminal sites.

10. Assessment on the effect of the projects on the surrounding environment is conducted on three categories of environmental impacts as follows.

1) The construction work of ferry terminal(Category 1)
2) The existence of ferry terminal(Category 2)
3) The operation of ferry service(Category 3)

11. Judging from the contents described in Chapters 4 and 5 of Part 3 and the above-mentioned evaluations, environmental factors to be assessed can be listed as follows:

1) Effect on water quality in the sea area by Category 1 and 2 (Item 1)
2) Effect on topography by Category 2(Item 2)
   (accumulation and erosion of sand on coast)
3) Effect on animals/plants by Category 1 and Category 2
   (coral reef)(Item 3)
4) Effect on landscape by Category 2(Item 4)
5) Effect on socio-economics by Category 3(Item 5)
6) Others(Item 6)

8-3 Effects of the construction works of the ferry terminals

12. The environmental effects caused during the construction by the adopted methods of each site such as;

- dredging operation and selection of the dumping areas,
- construction of causeway, breakwater and land reclamation on the existing beach are checked and reviewed for the respective terminals and described as follows;

(1) Mokmer - Saubeba

13. The dredging of the coral reef is planned at Mokmer site. The environmental effects of the water pollution by the dredging works will be minimized by the following arrangement;

The dredged materials are used for the causeway foundation and land reclamation, and the revetment are constructed for the reclamation area to retain the dredged materials.

14. The dredging works will be carried out by using cramshell type baket. The environmental effect of water pollution will be minimized. However the appropriate monitoring system may be required during the dredging and causeway construction and reclamation works.

15. The causeway at the both terminals are constructed by the end-on system by using dredged materials and mountain rock from the land gradually so as not to cause water pollution.

(2) Lewoleba - Terong

16. The enviromental effects of water pollution at the Terong site by the following construction methods for caisson fabrication and yard preparatory works would be minimized.

- The caisson structures are installed independently for each dolphin so as to avoid the disturbance of sea bed materials causing sedimentation of floating materials around the jetty area

- The caisson yard will be prepared on the existing beach near the construction site. The temporary retaining wall will be placed along the faceline of the seaside not to spoil the existing natural beach and shoreline during the fabrication and delivery of caisson to the sea.
- The gravel stones are gradually dropped from the barge to the sea bed for rubble mound for foot protection to install the caisson so as to minimize the water pollution by dumping operation.
- The land reclamation on the existing beach area for construction of land facilities of the terminal willl be constructed by the dredged materials The revetment will be constructed around the reclamation area to retain the materials and minimize the leakage.

(3) Bajoe - Kolaka

17. The dredging works in Bajoe should be carried out by the following arrangement to minimize the environmental effects of water pollution, sedimentation of shorelines and causing shallower water depth of the approach channel to the neighbour port areas.

The dredged materials will be dumped at the north corner of the existing causeway foundation. The dumping area will be protected by the retaining wall of wooden planks not to discharge the overflow materials directly to sea and cause the water pollution to the fishery villages and residents living on the shore beach area.

(4) Palembang - Muntok

18. In Muntok site the sheet pile wall are planned on the east side of the jetty only as the breakwater to protect the basin, the piling works will be carried out during the high tide from sea side by the floating barge and causeway will be constructed by the end-on system from the land. The construction works for this breakwater will not cause water pollution.

8-4 Effect of the existence of ferry terminal

8-4-1 Mokmer(Biak)-Saubeba(Yapen) Route

(1) Mokmer Terminal

19. The mooring basin is protected against waves by a breakwater and a groin; the area of the basin is approximately 55mx100m=5500m^2, the width of the entrance of the port(between the tips of the breakwater and the groin) is 60m, and the tidal range (HWL-LWL) is 1.6m. This shows that the water basin will not be a so-called closed water area and water pollution by the construction of the breakwater and the groin will not occur.(Item 1)

20. Accumulation or erosion of sand seems to have not occurred at the west and east coasts of the terminal site since the reclamation of the site in 1944. Judging from the layout of the breakwater and the groin (Fig. 5-3-1), the construction of these structures will have no influence on the neighboring coasts and the coasts should remain stable. (Item 2)

21. Sea bottom around the breakwater to be constructed consists of sand of 4m thickness, and coral reef is found below it. (Item 3)

There will remain two ponds surrounded with coconut palms and the 5m wide green belts are planned to surround ferry terminal. The passenger terminal and green belts should be designed to match with the surrounding landscape. (Item 4)

22. There are four fishing ponds on the reclaimed land, two of which require reclamation. There are two houses that are obliged to move because of the new terminal construction. The proponent of the project should come to terms regarding the reclamation of the ponds and the movement of houses with the owners. (Item 6)

(2) Saubeba Terminal

23. The effect of the two breakwaters in Saubeba on water quality around the berthing basin is almost negligible considering the width of the entrance of the ferry port. (Item 1)

24. The largest parts of the two breakwaters will be constructed on the coral reef or on the land and the reflected waves by breakwaters which may cause littoral currents seems to be very small. The effect of the construction of the breakwaters on the neighboring coast is negligible. (Item 2)

25. The area of the breakwater constructed on the coral reef is about 700m^2. The coral of about 100m width is developed to the east until the next inlet (the distance to it is about 1.5km) and from the east side of the inlet the coral is developed again. The area of reclaimed coral reef is small compared with the area of existing coral reef. No precious species of coral are found around the breakwaters to be constructed. (Item 3)

26. The terminal site is now covered with trees and no residences are found around the site. Mountains of about 1500m in height are found behind the terminal site. The appearance of the new ferry terminal on the coast with the area of 75mx75m with the mountains for the background will not have a large impact on the current landscape from the sea. With the openings of the road between Serui and Saubeba in Yapen Island and of the ferry route between Biak and Yapen Islands, the new Saubeba terminal site will play an essential role for the movement of commodities and passengers through ferry between the two islands and it should offer a new lively landscape. (Item 4)

8-4-2 Larantuka(Folores)-Terong(Adonara)-Lewoleba(Lomblen) Route

(1) Terong Terminal

27. The neighboring sea port in Terong has not caused any accumulation or erosion of sand on the coast around it. Waves and tidal current which may cause littoral drift on coast seems too small here to cause accumulation or erosion of sand. Therefore the new terminal will not cause any accumulation or erosion of sand on the coast around it. (Item 2)

28. The new ferry terminal with green belts and parks is planned to be constructed to the seaside of the public road leading to Waiwerang, the center of the island. The appearance of the new ferry terminal with the area of 50mx100m with mountains of 1000m in height for the background will have no large impact on the current landscape from the sea. The terminal will be the

center of the community providing business opportunities and a comfortable environment and it should offer a new lively landscape. (Item 4 and 5)

(2) Lewoleba Terminal

29. The effect on topography(Item 2) of the ferry terminal at Lewoleba is almost the same as that at Terong.

30. The new ferry terminal with green belts and parks is planned to be constructed to the seaside of the public unpaved road leading to the center of Lewoleba; about twenty houses exist to the east of the terminal site. The construction of the terminal will not change the current landscape pattern so much. With the opening of the ferry service, the existing unpaved road behind the terminal will be paved, which will facilitate smooth movement of traffic. It should offer a new lively landscape and also provide business opportunities. (Item 4 and 5)

8-4-3 Bajoe-Kolaka Route

(1) Bajoe Terminal

31. Ferry terminal(passenger terminal and parking lot) in Bajoe is planned to be constructed on the shoal 2.7km off the coast and the construction of ferry terminal on the shoal has no effect on the coast(no accumulation/erosion of sand on the coast). (Item 2)

32. Coral in the shoal to be reclamed has been dead(Item 3)

(2) Kolaka Terminal

33. An access way from the tip of the existing jetty to the new mooring facilities is structurally of trestle and permits the sea water to go through under the access way freely offshore or inshore on the ebb or flow. Also the construction of the access way has no effect on the water quality of the sea area between the access way and the newly reclaimed land for the on-land ferry terminal. (Item 1)

34. The sea area in front of the existing ferry passenger terminal(to the north of the causeway leading to the existing berth) is reclaimed for the construction of the on-land ferry terminal. The sea area further north will be reclaimed by local government. No coast are affected by the new ferry terminal facilities after construction. (Item 2)

35. The sea bed to be reclaimed for ferry terminal is of sandy silt clay. The mooring facilities will be constructed 40m from the coral reef. Mangrove exists to the south of the causeway, but none exists in the area to the north to be reclaimed. (Item 3)

36. The new on-land ferry terminal has been planned to solve the current crowdedness of the existing terminal caused by the absence of a parking lot and the narrow passenger terminal. It should create a comfortable environment for passengers of ferry and residents near the terminal providing enough space/service in passenger terminal and parking lot and comfortable environment with green belts and parks. (Item 4)

8-4-4 Palembang-Muntok Route

(1) Palembang Terminal

37. New on-land ferry terminal facilities are planned to be constructed in existing ferry terminal area and have no new environmental impact (Items 2 and 4)

38. New mooring facilities in Musi River will be constructed close to the existing ones and will have no new environmental impact. (Item 3)

(2) Muntok Terminal

39. The access way in Muntok terminal consists of two structural types; one is rock causeway, 20m long from the revetments of on-land terminal facilities, the other, reinforced concrete trestle, 16m long to mooring facilities. The direction of littoral drift of sea bed materials on the coast between Tanjung Kelian (on the west side of Terminal site) and the Muntok sea port seems to be generally from the west to the east. As shown in Fig.2-2-10A, the coast to the

west of the terminal site is now protected by revetments and its slope is steeper than that to the east of the terminal site; the cape (Tanjung Kelian) exists on the west end of the coast. Considering the above-mentioned facts, sea bed materials do not seem to be provided from the west area to the east one around the terminal site, at least in the coastal zone above 0m of water depth. Water depth at the tip of the causeway mentioned above is +1m above LWS. Therefore the new construction of the causeway will cause no erosion of the coast to the east of the new ferry terminal.(The structure of breakwater is curtain wall type, so-called semi-pearmiable type and should produce no sedimentation in the mooring basin.)(Item 2)

40. Coral reef is not found around the terminal site.(Item 3)

41. An old light house exists at the cape of Tanjung Kelian and six houses exist more than 120m inland. The area of on-land terminal is 80m x 105m and terminal building is one-story. The construction of terminal will not have a large impact on the current landscape from the sea. It should offer a new lively landscape and also provide business opportunities, especially if the tourist resort zone now being planned is realized. (Item 4 and 5)

8-5 Effect of the Operation of Ferry Service

8-5-1 Mokmer(Biak)-Saubeba(Yapen) Route

(1) Mokmer Terminal

42. The Biak sea port exists about 7km to the west of the ferry terminal site of Mokmer and the opening of ferry service has no influence on the activity of sea port (sea transportation service of cargoes or passenger). Several fishing boat moor in the sea area to the east of the reclaimed land; the ferry service in 1998 is one round trip a day and two round trips a day in 2010. The effect of the opening of ferry service on the fishery should be very small. The existence of the breakwater and the groin here will produce a calmer basin in the area where fishing boats moor. (Item 5)

43. Mini-bus transportation service exists on the public road behind the site

leading to the center of Biak city and the road is not crowded. The impact of disembarking vehicles and minibus departing from the terminal is estimated about at 35-40 units on average by the arrival of a 300GRT ferry boat.(Item 5)

(2) Saubeba Terminal

44. The objective of the road under construction is to connect the two cities, Biak, the largest city in Biak Island and Serui, the largest city in Yapen Island to coincide with the opening of ferry service between Biak and Yapen Islands. The road will be extended in future to Yobi, 18km to the east of Saubeba, and will produce new flow of commodities between Yobi and Serui/Biak. Neither a sea port nor a fishing port exits around the terminal.(Item 5)

8-5-2 Larantuka(Flores)-Terong(Adonara)-Lewoleba(Lomblen) Route

(1) Terong Terminal

45. A sea port exists 300m to the east of the ferry terminal site. A ferry boat accesses the mooring facilities from the west. The effect of the opening of the ferry service on the activity of the existing sea port should be very small. No fishing port/facilities exist around the new ferry terminal. (Item 5)

46. A road passes along the back of the terminal site and public transportation service by mini-bus seems poor. The number of vehicles by ferry service which will have an impact on public roads is the same as that in Mokmer. (Item 5)

(2) Lewoleba Terminal

47. A sea port exists 400m to the east of the ferry terminal site. A ferry boat accesses the mooring facilities from the west. The effect of the opening of ferry service on the activity of the existing sea port should be very small. No fishing port/facilities exist around the new ferry terminal. (Item 5)

48. An unpaved road exists behind the ferry terminal site and will be paved with the opening of ferry service. The number of vehicles by ferry service is the same as that in Terong. (Item 5)

8-5-3 Bajoe-Kolaka Route

(1) Bajoe and Kolaka Terminal

49. The maximum size of ferry boat to be introduced in Bajoe-Kolaka Route for the Short Term Plan and for the Master Plan is 1000GRT which is the same as that now in operation. The current impact of vehicles on public road by one maximum size ferry boat has no change for the Feasibility Study. The current ferry service is 2.5 round trips a day and that in the Master plan is 5 round trips. The impact by the increase of ferry service seems not to be large in Bajoe and Kolaka Terminals. (Item 5)

50. No sea port exists around the Bajoe terminal although conventional type cargo vessels are using the jetty for loading/unloading of cargo and it is possible to continue this transportation service after the construction of new terminal facilities including the mooring facilities. (Item 6)

A fishing port exists to the south of the root of the jetty(access way) for ferry service while the fishing zone is far from the jetty. The current ferry operation seems not to have hindered the fishing activity. A fish market providing fish directly from fishing boats is open almost every day on the jetty. (Item 7)

8-5-4 Palembang-Muntok Route

(1) Palembang Terminal

51. The sizes of ferry boat now operated are 150GRT and 200GRT and a 500GRT ferry boat will be introduced in the Short-Term Plan. The capacity of vehicles being loaded on a ferry boat is 13 units (50% of loaded vehicles is 2ton truck and 50%, 4ton truck) in the case of 200GRT, and 30 units in the case of 500GRT. According to the Master Plan, it is enough to provide only two round trips a day by two 500GRT ferry boats to meet the demand volume of passengers/cargoes in 2010. (Item 7)

(2) Muntok Terminal

52. The existing public road at the Ferry terminal site connects the site with

the center of Muntok at a distance of 5km. Public transportation by mini-bus is not provided and the traffic of vehicles is very small here. The enlargement of ferry boat from 150/200GRT to 500GRT and the promised punctuality of arrival of ferry boat will improve the supply of commodities not only from Palembang but also from Jakarta. In addition, the change of ferry terminal from Kayu Arang to Muntok with improved ferry operation will have a large impact on Bangka Island's economic development. (Item 5)

Chapter 9 Economic Analysis

9-1 General

9-1-1 Purpose of Economic Analysis

1. The main purpose of the economic analysis is to show the effect of the implementation of the four Projects, i.e. Route 2-1 (Mokmer - Saubeba), Route 3-1 (Larantuka - Terong - Lewoleba), Route 8 (Bajoe - Kolaka) and Route 9-1 (Palembang - Muntok) selected as the feasibility study routes, and to assess the economic viability of the Projects from the national economic viewpoint.

2. The evaluation of quantified economic costs and benefits follows the conventional discounted cash flow method in determining the economic internal rate of return (EIRR), net present value (NPV) and benefit cost ratio (B/C ratio).

9-1-2 Effects of Project Implementation

(1) Project Implementation

3. The development/improvement of the ferry operation service (the Project) includes implementations of the following:

- Development/improvement of ferry terminal facilities
- Development/improvement of ferry operation plan including the introduction of proposed new ferry boats

(2) Effects of Project Implementation

4. The development/improvement of the ferry operation service will have the effect of contributing to the following:

- Strengthening of communication/transportation capacity for movement of passengers, vehicles and commodities in the region.
  In particular, when the ferry transportation service among a main island and isolated islands will be developed/improved, the communication means of the isolated islands will be greatly strengthened.

- Improvement of punctuality/regularity for transportation mode in the region.
- Improvement of safety and comfortability for transportation mode in the region.

5. Accordingly, the economic benefits derived from implementation of the Project are presented in general as below:

1) Direct Benefit

6. As direct benefits from the Project:

a) Saving of travel time cost
b) Saving of vehicle operating cost
c) Reduction of opportunity loss
d) Increase of punctuality/regularity
e) Increase of safety/comfortability
f) Creation of short-term job opportunities by construction works

2) Indirect Benefit

7. As indirect benefits resulting from the Project other than the above direct benefits:

a) Promotion of development of regional economic/industrial activity
b) Promotion of development of social/cultural communication among regions
c) Promotion of educational opportunities for people in the region
d) Promotion of development of tourism sectors in the region
e) Promotion of creation of long-term job opportunities in the region
f) Promotion of improvement of regional imbalance

(2) Direct Benefit

1) Saving of Travel Time

8. Through the development/improvement of the ferry operation service

including the introduction of proposed new ferry boats with faster speed than before, the total distance of ferry operation routes would be shortened. As a result, the operational travel time will be reduced. This means a saving of travel time cost for ferry users.

2) Saving of Vehicle Operating Cost

9. Due to the limit of traffic capacity in the case of no implementation of the ferry service development/improvement, vehicles which are to be transported essentially by the ferry service would be imposed to utilize a detour route by land. In this case, the incremental operating costs of the vehicles are considered as a benefit of saving in vehicle operating costs.

3) Reduction of Opportunity Loss

10. Through development/improvement of the ferry operation service, the frequency of ferry operations would be increased. The increase of the ferry operations will cause more flexibility/elasticity for timing of utilizing the ferry for users. That is, a decrease of restraints in using the ferry service would be expected. While existing ferry users are suffering from opportunity loss by the limited operations, it is expected that such an opportunity loss for users would be reduced by the improved operation service program.

4) Increase of Punctuality/Regularity

11. Through the development/improvement of the ferry terminal facilities and the ferry operation plan, including the introduction of proposed new ferry boats, the degree of the effect of natural conditions such as waves, tides and winds for the ferry operation would be decreased. Accordingly probable delays in operation would be reduced. Thus an increase of punctuality and regularity of the ferry operation service would be expected.

5) Increase of Safety/Comfortability

12. Through the development/improvement of the ferry terminal facilities and the ferry operation plan including the introduction of proposed new ferry boats, safety in operation would be increased. Moreover, comfortability of the passengers would be improved.

6) Creation of Short-term Job Opportunity by Construction Work

13. The construction works for the development/improvement of the ferry terminals will produce some short-term employment. The creation of short-term job opportunities would be expected.

(3) Indirect Benefit

14. Strengthening of the transportation capacity and securing punctuality/ regularity and safety in ferry operations will have various secondary impacts for related regions. Such by-product effects are defined as indirect benefits and are described below:

1) Promotion of Development of Regional Economic/Industrial Activities

15. The development/improvement of the ferry transportation service will cause a reduction of access time between the producing areas and the market areas for various products. This will accordingly contribute to the incentive to increase production in the related regions. The incentives will be not only to primary products such as agricultural, forestry, fishery and mining products but also to manufacturing products. Also the developed/improved ferry services will contribute to the attraction of factories into the related region.

2) Promotion of Development of Social/Cultural Communications Among Regions

16. As well as the incentive for economic/industrial activities, the following effects on the development of social/cultural communications will be expected:

- Promotion of social communications/visiting among family/relatives living on neighboring islands.
- Promotion of cultural interchange among neighboring islands.
- In addition, a psychological effect of strengthening the consciousness of the unity of an area as "One Province", especially for people enjoying a ferry service connecting isolated islands with a main located within the same province.

3) Promotion of Educational Opportunities

17. Generally, educational facilities are located at specific areas such as a large town or city in the province. Because of the problem of access time to such facilities from the isolated islands, the people living in such isolated islands have a disadvantage regarding educational oppotunity. By improvement of the access time, educational opportunities for such people would be promoted.

4) Promotion of Development of Tourism Sectors in the Region

18. Improvement of the access mode to the region will promote the tourism sector in the related regions. The development of potential tourism resources can be afforded. The developed tourism points will attract more tourists from not only other domestic areas but also from foreign countries. For the already developed tourism points, the extension of staying period in the area will be promoted.

5) Promotion of Creation of Long-term Job Opportunities in the Region

19. As a result of the numerous impacts of items 1) to 4) mentioned above, the creation of long-term job opportunities in the related regions would be promoted.

6) Promotion of Improvement of Regional Imbalance

20. As a result of the various effects described above, improvement of the regional imbalance will be brought about especially for isolated island areas.

(4) Quantified Benefits

21. In this economic analysis, the ferry users benefits of travel time cost saving and vehicle operating cost saving are treated as the quantified economic benefits.

9-1-3 Basic Assumptions for Economic Analysis

22. The following basic assumptions for economic analysis were made:

(1) With Project and Without Project

23. The economic analysis is conducted comparing the project costs and the project benefits between the "With Project" situation and "Without Project" situation.

24. "With Project" means implementation of the investment for the development of the proposed ferry terminals and new ferry boats. Accordingly, in the case of "With Project", the proposed new ferry boats will be introduced in order to meet the projected traffic demands, and the resulting investment, operation and maintenance costs related to the terminal and boats will be considered.

25. "Without Project" stands for the condition without such investment for the development of the proposed terminals and ferry boats. In this case, in order to meet the projected traffic demand, substitutional traffic means are assumed. That is, a detour route by land or substitutional boats such as the existing type boats or the land craft motor (LCM) type boats are assumed to be utilized. Consequently, in the case of "Without Project" the existing type ferry boats and/or LCM type boats are assumed to be introduced substitutionally, and the resulting investment, operation and maintenance costs related to the terminals and boats will be considered.

(2) Implementation Schedule

26. The period for the Project implementation of the ferry service development works is proposed during 1995 - 1997, and the work completion as a whole is scheduled to be 1998 for each ferry route.

(3) Project Life

27. The project life is assumed to be 30 years after implementation of the development works (1998 - 2027).

(4) Economic Prices of Costs and Benefits

28. All the costs and benefits are estimated in constant 1992 prices. The

economic prices of costs and benefits are estimated by applying the following manner:

- The costs and benefits are classified into the items of 1) trade goods, 2) non-trade goods, 3) skilled labor, 4) unskilled labor and 5) transfer items.

- The estimated conversion factors are applied to the above items and the economic prices of costs and benefits are estimated.

(The details of the estimation are referred to Appendix 9-1-1.)

(5) Residual Values

29. In the economic analysis no residual values are assumed for the assets invested.

(6) Projected Traffic Demand

30. The traffic demands applied for this economic analysis are based on the results of studies for the future traffic demand. For the traffic demand for each years, regression models used for estimating the traffic demands for the planning years 1998 and 2010 were applied for each year.

31. In the "With Project" case, the traffic demands after 2010 were adjusted by the traffic capacity limits related to the number of ferry boats utilized at the proposed ferry terminal facility. Accordingly when the traffic capacity of the ferry terminal will reach its limit, the traffic capacity volume at that time is assumed to be equivalent to the traffic demand volume for the subsequent years.

32. The traffic demands in the "Without Project" case are assumed to be the same as those in the "With Project" case.

9-2 Project Costs

9-2-1 General

33. The cost items for "With Project" and "Without Project" cases are as follows:

(1) Cost Items for "With Project" Case

34. 1) Investment costs for the proposed terminal facilities
2) Operation and maintenance costs for the proposed terminal facilities
3) Procurement costs for the proposed new ferry boats
4) Operation and maintenance costs for the proposed new ferry boats
5) Operation and maintenance costs for the existing ferry boats

(2) Cost Items for "Without Project" Case

35. 1) Operation and maintenance costs for the existing terminal facilities (for Routes 8 and 9-1)
2) Procurement costs for the existing type ferry boats and/or substituted LCM type boats
3) Operation and maintenance costs for the existing type ferry boats
4) Operation and maintenance costs for substituted LCM type boats
5) Maintenance cost for approach channel (for Route 9-1)

9-2-2 Cost Items for "With Project" Case

(1) Investment Costs for the Proposed Terminal Facilities

36. The investment costs for the proposed terminal facilities follow the results of the study in the cost estimates in Chapter 7. Reinvestment costs are distributed to due years considering the life time of the facilities.

(2) Operation and Maintenance Costs for the Proposed Terminal Facilities

37. The operation costs of the proposed terminals were estimated as below:

- The required number of staff and the wage rates were assumed, then the personnel costs were estimated.
- Expenses other than personnel costs were estimated to be 35% of personnel costs based on the survey results of the actual costs in the existing terminals.
- Thus the operation costs of the terminals were estimated.

38. The maintenance costs of the proposed terminals were estimated to be 1% of the terminal construction cost. In this case, the construction cost excluding the cost components of such maintenance-free items as reclamation works, etc. was applied.

(3) Procurement Costs for the Proposed New Ferry Boats

39. The number and the timing (year) of procurement of the new ferry boats were determined through a comparison of the traffic demand and the total traffic capacity of the ferry boats.

40. The type of proposed new ferry boats to be introduced was set up for each route based on results of the study of the ferry operation plan previously described in Chapter 4, as follows:

- Route 2-1 :	(Mokmer - Saubeba)	: C and C' Type
- Route 3-1 :	(Larantuka - Terong - Lewoleba)	: C Type
- Route 8 :	(Bajoe - Kolala)	: A Type
- Route 9-1 :	(Palembang - Mutok)	: B Type

41. The unit procurement cost of a boat is assumed to be Rp. 6.05 million per tonnage of boat. The life time of a boat is assumed to be 30 years.

(4) Operation and Maintenance Costs for the Proposed New Ferry Boats

42. The operation costs of the proposed new ferry boats were estimated as follows:

- The unit boat operation cost was estimated based on the site survey result of the existing route. As a result, the unit boat operation cost

was estimated to be Rp. 12.8 per mile/ton (operating mile/boat tonnage).
- Thus, the total boat operation costs were estimated in accordance with the tonnage of boats operated and the operating distance.

43. The maintenance costs of the proposed new boats were assumed to be 3% of their procurement cost.

(5) Operation and Maintenance Costs for the Existing Ferry Boats

44. The unit operation and maintenance costs for the existing ferry boats are assumed to be the same as those for the proposed new ferry boats.

9-2-3 Cost Items for "Without Project" Case

(1) Operation and Maintenance Costs for the Existing Terminal Facilities

45. For existing Routes 8 and 9-1 the operation and maintenance costs were estimated based on the actual cost data in the existing terminal offices. For Routes 2-1 and 3-1, no operation and maintenance costs for terminal were considered.

(2) Procurement Costs for Existing Type Ferry Boats and Substituted LCM Type Boats

46. The number and the timing (year) of procurement of the existing type ferry boats and/or LCM type boats were determined through comparison of the traffic demand and the total traffic capacity of related boats in the case of "Without Project".

47. Similarly to the proposed new ferry boats, the unit boat procurement cost is assumed to be Rp. 6.05 million per tonnage of boat. The life time of a boat is assumed to be 30 years.

(3) Operation and Maintenance Costs for Existing Type Ferry Boats

48. The unit operation and maintenance costs for the existing type ferry boats are assumed to be the same as those for the proposed ferry boats.

(4) Operation and Maintenance Costs for Substituted LCM Type Boats

49. The unit boat operation cost of substituted LCM type boats was assumed to be twice that for the proposed new ferry boats, i.e. Rp. 25.6 per mile/ton (operating mile/boat tonnage), considering the characteristics of boat operation especially during berthing. Similarly to the proposed new ferry boats, the total operation costs of boats were estimated in accordance with the tonnage of boats operated and the operating distance.

50. The maintenance costs of the boats were also assumed to be 3% of their procurement cost.

(5) Maintenance Cost for Approach Channel (for Route 9-1)

51. Regarding Route 9-1, in order to keep operational in the future the existing route between Palembang and Kayu Arang, maintenance works for the approach channel in Juring river, such as dredging work and installation of navigation aids, would be required. Accordingly, in the case of "Without Project", maintenance costs for the approach channel were considered for Route 9-1.

9-3 Project Benefits

9-3-1 General

52. The quantified project benefit comprises the ferry users benefit and the saving of the investment and operation/maintenance costs in "Without Project" case.

The ferry users benefit comprises the travel time cost saving and the vehicle operating cost (VOC) saving. The benefit of the travel time cost saving is considered as the difference of the travel time cost between "With Project" and "Without Project". The benefit of the vehicle operating cost saving is the difference of vehicle operating cost between "With Project" and "Without Project".

53. The investment and operation/maintenance costs in "Without Project"

treated as negative costs in the cash flow stream in the economic analysis are assumed to be considered as the benefit of the investment and operation/ maintenance costs saving.

9-3-2 Travel Time Cost Saving Benefit

(1) General

54. In this economic analysis, the travel time cost savings for the ferry passengers are considered.

55. However, regarding Route 3-1, due to the difficulties in sea conditions such as strong current and tide, a loss of time for embarking/disembarking of vehicles would be expected when utilizing the LCM type boat in the case of "Without Project". Therefore, the saving of loss of time cost of vehicles embarking/disembarking is assumed to be considered as a benefit especially for Route 3-1.

(2) Unit Passenger Time Cost

56. The estimation of unit passenger time cost was made according to the following process:

- The 1992 average values of per capita GRDP (gross regional domestic product) at current prices excluding oil and gas were estimated for the provinces related to each route.
- The annual working hours were assumed to be 2,040 hours (170 hours per month x 12), from which the per capita GRDP for one hour was estimated.
- The trip purpose composition for ferry passengers was obtained from the results of the 1988 national ferry OD (origin and destination) survey study as shown in Table 9-3-1.

Table 9-3-1 Trip Purpose Composition for Ferry Passengers

Trip Purpose	(%)
Government Official	6.8
State Owned Corporation	2.5
Private Company/Business	11.5
Visiting Family/Friend	49.1
Tour/Recreation	8.0
School/ College	4.7
Shopping	2.5
Trading	5.4
Others	9.5
Total	100.0

Source: Pelaksanaan Pekerjaan, Data Entry, Desain Sistem, Pengolahan Data dan Analisa Data Asal Tujuan Transportasi Nasional 1988

- The coefficient factors for time value in the trip purposes are assumed 100% for "official", "business" and "trading" purposes and 50% for others.
- As a result, the unit time values per passenger for each route were estimated as shown in Table 9-3-2.

Table 9-3-2 Unit Time Value per Passenger for Each Route

Route	Unit Time Value (Rp./hour)
Route 2-1	396
Route 3-1	120
Route 8	225
Route 9-1	371

- The estimation process is shown in Table 9-3-1A.

9-3-3 Vehicle Operating Cost (VOC) Saving Benefit

(1) General

57. The vehicle operating cost saving benefits are considered for truck and sedan. The numbers of truck and sedan are given by the future traffic demand study result.

58. Additionally, it is assumed that when ferry passengers travel by land, such passengers utilize bus transportation. Accordingly, bus is also considered an objective of the estimation of vehicle operating cost. In this case, by deducting the number of passengers related to the sedan from the total passengers, the passengers related to bus use are estimated. For estimating passengers related to the sedan, a load factor of 3.0 persons per sedan is assumed. By applying the assumed load factor of 40 persons per bus, the bus number is estimated.

59. However, it is to be noted that the generation of savings in vehicle operating cost depends on the assumed comparison condition for the traffic situations between "With Project" and "Without Project" (the difference of travel distances by land). Therefore according to the assumed traffic situations of "With Project" and "Without Project", a negative saving for vehicle operating cost would possibly occur due to the difference of travel distance by land.

(2) Unit Vehicle Operating Cost

60. The estimation of unit vehicle operating cost follows the results of the study of vehicle operating cost in the report of "Road User Cost Model, Directorate General of Highways (Bina Marga), Ministry of Public Works, Indonesia, May 1992".

61. As a result, according to the results of the above study, the unit vehicle operating cost by vehicle type and by speed condition are shown in Table 9-3-3.

Table 9-3-3 Unit Vehicle Operating Cost

(Unit: Rp./km)

Vehicle Type	Speed Condition (Km/hour) 35 Km/hour	50 Km/hour
Truck (3 ton)	341	293
Truck (8 ton)	425	378
Sedan	340	291
Bus (Large Bus)	433	383

9-4 Economic Analysis for Each Route

9-4-1 Route 2-1 (Mokmer-Saubeba)

(1) Traffic Situation of "With Project" case and "Without Project" case

62. The traffic situations of "With Project" case and "Without Project" case for Route 2-1 are summarized below:

With	Without
Operation of Proposed New Ferry Boats	Operation of LCM Type Boats

63. For the "With Project" case, the proposed new ferry boats will be introduced in order to meet the future traffic demand.

64. For the "Without Project" case, it is assumed that LCM type boats are introduced. In this economic analysis, the tonnage and basic traffic capacity per one trip of the LCM type boat is assumed to be the same as those of the proposed new ferry boat.

(2) Travel Distance and Travel Time of "With Project" case and "Without Project" case

65. In the case of "Without Project", due to the difficulties of berthing at the north seashore of Yapen island for LCM type boat, the port for LCM in Yapen island is assumed to be at Serui, i.e. the operation route of LCM is assumed to be Mokmer - Serui. Consequently, the base points for measuring travel distances and travel time are also assumed to be Mokmer - Serui.

66. Thus, in the "With Project" case, the travel section by land between Saubeba - Serui is assumed to be added for comparison to the "Without Project" case.

67. As a result, the travel distance and travel time of "With Project" case and "Without Project" case for Route 2-1 are summarized as shown in Table 9-4-1.

Table 9-4-1 Travel Distance and Travel Time for Route 2-1

	With	Without
(A) By Sea	Biak(Mokmer)-Saubeba By Proposed New Ferry Boats(C Type) Distance: 31 miles Travel Time: 3.2 hrs. By Proposed New Ferry Boats(C' Type) Distance: 31 miles Travel Time: 2.5 hrs.	Biak(Mokmer)-Serui By LCM Type Boats Distance: 113 miles Travel Time: 15.0 hrs.
(B) By Land	Saubeba-Serui Distance: 34 km Travel Time: 1.0 hrs.	

(See Fig. 9-4-1A.)

(3) Number of Boats to be Procured

68. As previously mentioned, procurement of boats is based on comparison of the future traffic demand and the total traffic capacity of the boats. In Route 2-1, the applied boat type for "With Project" case is initially C type and according to the increase of future traffic demand, the type of ferry boat will change to C' type whose speed is faster than C type. With the C' type boat, two round trip per day will be possible. (It is assumed that the procurement cost of C' type boat is 150% that of C type boat. Consequently at the time of changing from C type to C' type, 50% of the procurement cost of C type boat is added for the sake of calculation convenience.)

69. The annual traffic capacity per boat applied to Route 2-1 is shown in Table 9-4-2.

Table 9-4-2 Annual Traffic Capacity per Boat Applied to Route 2-1

Type of Boat	Passengers (person)	Vehicles (3 ton truck unit)
C Type (300 ton)	118,200	8,000
C' Type (300 ton)	236,400	16,000

Note: C Type : Annual traffic capacity per boat at one round trip per day
C' Type : Annual traffic capacity per boat at two round trips per day

70. The basic traffic capacity per one trip of LCM type boat is assumed to be the same as that of the above proposed ferry boat, however the LCM type boat can operate only one trip per day. Accordingly, the annual traffic capacity of LCM type boat in Route 2-1 is shown in Table 9-4-3.

Table 9-4-3 Annual Traffic Capacity of LCM Type Boat in Route 2-1

Type of Boat	Passengers (person)	Vehicles (3 ton truck unit)
LCM Type (300 ton)	59,100	4,000

Note: : Annual traffic capacity per boat at one trip per day

71. The future traffic demand, traffic capacity and number of boats to be introduced for "With Project" case and "Without Project" case are shown in Tables 9-4-1A and 9-4-2A respectively.

(4) Estimation of Costs

72. The estimation process of costs for "With Project" and "Without Project" cases has been previously described in 9-2-2 and 9-2-3. The procurement cost, operation and maintenance costs related to boats for "With Project" case and "Without Project" case are shown in Tables 9-4-3A and 9-4-4A respectively. The costs related to terminal facilities are shown in Table 9-4-7A.

(5) Estimation of Benefit

1) Travel Time Cost Saving Benefit for Passengers

73. The reduction of travel time of passengers when comparing the ferry traffic in "With Project" case and the ferry traffic in "Without Project" case is treated as a time cost saving benefit.

74. In the "Without Project" case the location of the terminal in Yapen island is assumed to be at Serui, while in the "With Project" case the location of the terminal is planned to be set up at Saubeba which is situated 34 km north from Serui in terms of road distance. Consequently, the distance by sea between Biak - Yapen island is shortened.

75. By the effect of shortening the distance by sea and the introducing of proposed new ferry boats, the travel time in the "With Project" case results in a decrease compared to the "Without Project" case.

76. However in the "With Project" case the distance by land between Saubeba - Serui will be added compared to the Biak - Serui route.

77. While the passengers will enjoy a reduction of travel time by sea, they will not have a time saving by land. Nevertheless, the total travel time in "With Project" case is shorter than that in "Without Project" case.

78. The estimation process of passenger time cost saving benefit is as follows:

(Time Cost in "Without Case") - (Time Cost in "With Case")

Time Cost in "Without Case":

Number of ferry passengers
x Travel time (15.0 hrs.)
x Unit time cost.....Wo.(a)

Time Cost in "With Case":

Number of ferry passengers using new ferry boats (C Type)
x Travel time (3.2 hrs. for travel by sea)
x Unit time cost.....W.(a)

+

Number of ferry passengers using new ferry boats (C' Type)
x Travel time (2.5 hrs. for travel by sea)
x Unit time cost.....W.(b)

+

Number of ferry passengers
x Travel time (1.0 hrs. for travel by land)
x Unit time cost.....W.(c)

Time cost saving benefit = Wo.(a) - (W.(a) + W.(b) + W.(c))

79. The result of the estimation of the time cost saving benefit is shown in Table 9-4-5A.

2) Vehicle Operating Costs Saving Benefit for Vehicles

80. As mentioned above, the distance by land in "With Project" case (Saubeba - Serui) is added compared to that in "Without Project" case. Accordingly the incremental operating cost of the vehicles in "With Project" case due to the

added road distance is treated as a negative benefit of vehicle operating cost saving.

81. The number of trucks and sedans are given by the traffic demand study results.

82. It is assumed that the passengers are transported by bus.

83. By deducting the number of passengers related to the sedan from the total passengers, the number of passengers related to bus use is estimated. For estimating passengers related to sedan, a load factor of 3.0 persons per sedan is assumed. By applying the assumed load factor of 40 persons per bus, the number of buses is estimated.

84. The estimation process of vehicle operating cost (VOC) is as follows:

Number of trucks x Travel distance (incremental) x Unit VOC of truck

+

Number of sedans x Travel distance (incremental) x Unit VOC of sedan

+

Number of buses x Travel distance (incremental) x Unit VOC of bus

Here, the incremental travel distance is assumed to be 34 Km.

85. The result of the estimation of the vehicle operating cost saving benefit (negative benefit in Route 2-1) is shown in Table 9-4-6A.

(6) Economic Analysis

1) Economic Analysis

86. The total economic project costs and benefits streams are presented in Table 9-4-7A. Following the conventional discounted cash flow method, the efficiency measures were calculated and the results are shown in Table 9-4-4.

Table 9-4-4 Economic Analysis Results for Route 2-1

EIRR	=	12.3%
NPV at 10% discount rate	=	2,194(Million Rp.)
B/C ratio at 10% discount rate	=	1.2

2) Unquantified Economic Benefits

87. The general indirect effects from implementation of the Project have been previously mentioned in 9-1-2. As well as the quantified economic benefit, the following specific unquantified economic effects are expected for Route 2-1:

- Incentive effects for social-economic development in the north area of Yapen island
- Incentive effects for educational opportunity increased by shortening of access time between Yapen - Biak
- Incentive effects for tourism sector development by shortening of access time between Yapen - Biak

3) Conclusion

88. The results of the economic analysis indicate that the Route 2-1 Project is economically feasible.

9-4-2 Route 3-1 (Larantuka-Terong-Lewoleba)

89. In the economic analysis of Route 3-1, the project costs and benefits are estimated separately for Route 3-1-1 (Larantulka - Terong) and Route 3-1-2, (Terong - Lewoleba) and the evaluation is made in terms of the aggregate of the costs and benefits of both.

(1) Traffic Situation of "With Project" case and "Without Project" case

90. The traffic situations of "With Project" case and "Without Project" case for Route 3-1 are summarized below:

With	Without
Operation of Proposed New Ferry Boats	Operation of LCM Type Boats

91. For the "With Project" case, the proposed new ferry boats will be introduced in order to meet the future traffic demand.

92. For the "Without Project" case, it is assumed that LCM type boats will be introduced. In this economic analysis, the tonnage and basic traffic capacity per one trip of the LCM type boat is assumed to be the same as those of the proposed new ferry boat. The life time of the LCM type boat for Route 3-1 is assumed to be 15 years considering the unfavorable sea conditions of Route 3-1.

(2) Travel Distance and Travel Time of "With Project" case and "Without Project" case

93. For Route 3-1, in the "With Project" case and in the "Without Project" case the operation route is the same. Consequently, the travel distance in "Without Project" case is the same in "With Project" case, and the difference is only the travel time due to the different types of boat.

94. As a result, the travel distance and travel time of "With Project" case and "Without Project" case for Route 3-1 are summarized as shown in Table 9-4-5.

Table 9-4-5 Travel Distance and Travel Time for Route 3-1

		With	Without
(A)	Route 3-1-1	(Larantuka - Terong)	(Larantuka - Terong)
		Proposed New Ferry Boats	LCM Type Boats
		Distance: 14 miles Travel time: 1.2 hrs.	Distance: 14 miles Travel time: 2.3 hrs.
(B)	Route 3-1-2	(Terong - Lewoleba)	(Terong - Lewoleba)
		Proposed New Ferry Boats	LCM Type Boats
		Distance: 17 miles Travel time: 1.5 hrs.	Distance: 17 miles Travel time: 2.7 hrs.

(See Fig. 9-4-2A)

(3) Number of Boats to be Procured

95. As previously mentioned, procurement of boats is based on comparison of the future traffic demand and the total traffic capacity of the boats. In Route 3-1, the applied boat type for "With Project" case is C type with one round trip per day.

96. The annual traffic capacity per boat applied to Route 3-1 is shown in Table 9-4-6.

Table 9-4-6 Annual Traffic Capacity per Boat Applied to Route 3-1

Type of Boat	Passengers (person)	Vehicles (3 ton truck unit)
C Type (300 ton)	118,200	8,000

Note: Annual traffic capacity per boat at one round trip per day

97. The basic traffic capacity per one trip of LCM type boat is assumed to be the same as that of the above proposed ferry boat, and the LCM type boat can operate one round trip per day. Consequently the annual traffic capacity of LCM type boat in Route 3-1 is shown in Table 9-4-7.

Table 9-4-7 Annual Traffic Capacity of LCM Type Boat in Route 3-1

Type of Boat	Passengers (person)	Vehicles (3 ton truck unit)
LCM Type (300 ton)	118,200	8,000

Note: Annual traffic capacity per boat at one round trip per day

98. The future traffic demand, traffic capacity and number of boats to be introduced for "With Project" case and "Without Project" case for Routes 3-1-1 and 3-1-2 are shown in Tables 9-4-8A to 9-4-11A respectively.

(4) Estimation of Costs

99. The estimation process of costs for "With Project" and "Without Project" cases has been was previously described in 9-2-2 and 9-2-3. The procurement cost, operation and maintenance costs related to boats for "With Project" case and "Without Project" case for Routes 3-1-1 and 3-1-2 are shown in Tables 9-4-12A to 9-4-15A respectively. The costs related to terminal facilities are shown in Table 9-4-20A.

(5) Estimation of Benefit

1) Travel Time Cost Saving Benefit for Passengers

100. The reduction of travel time of passengers when comparing the ferry traffic in "With Project" case and the ferry traffic in "Without Project" case is treated as a time cost saving benefit. By the effect of introducing of proposed new ferry boats, the travel time in "With Project" case results in a decrease compared to the "Without Project" case. Thus the passengers will enjoy a reduction of travel time by sea.

101. The estimation process of passenger time cost saving benefit is as follows:

(For Larantuka - Terong)

(Time Cost in "Without Case") - (Time Cost in "With Case")

Time Cost in "Without Case":

Number of ferry passengers
x Travel time (2.3 hrs.)
x Unit time cost.....Wo.(a)

Time Cost in "With Case":

Number of ferry passengers using new ferry boats (C Type)
x Travel time (1.2 hrs.)
x Unit time cost.....W.(a)

Time cost saving benefit = Wo.(a) - W.(a)

(For Terong - Lewoleba)

(Time Cost in "Without Case") - (Time Cost in "With Case")

Time Cost in "Without Case":

Number of ferry passengers
x Travel time (2.7 hrs.)
x Unit time cost.....Wo.(a)

Time Cost in "With Case":

Number of ferry passengers using new ferry boats (C Type)
x Travel time (1.5 hrs.)
x Unit time cost.....W.(a)

Time cost saving benefit = Wo.(a) - W.(a)

102. The results of the estimation of the time cost saving benefit for Routes 3-1-1 and 3-1-2 are shown in Tables 9-4-16A and 9-4-17A respectively.

2) *Loss Time Cost Saving of Vehicle*

103. Due to the difficulties in sea conditions of Route 3-1 such as strong current and tide, a loss time for tide waiting for vehicle embarking/disembarking would be expected when utilizing the LCM type boat in the case of "Without Project". Therefore, the saving of loss time cost of vehicles embarking/disembarking is assumed to be counted as a benefit especially for Route 3-1.

104. The estimation process of vehicle loss time cost saving is as follows:

Number of trucks x Loss time x Unit vehicle time cost

+

Number of sedans x Loss time x Unit vehicle time cost

105. Here, the loss times are assumed as below:

(For Route 3-1-1)

Time difference of boat operation time between "With" and "Without" (1.1 hours) plus the loss time for tide waiting (4.0 hours) = 5.1 hours

(For Route 3-1-2)

Time difference of boat operation time between "With" and "Without" (1.2 hours) plus the loss time for tide waiting (4.0 hours) = 5.2 hours

106. The unit vehicle time costs are assumed to be equivalent to the vehicle hire fees per hour at site, and the hire fees per hour are assumed to be Rp. 4,700 for sedan and Rp. 5,640 for truck.

107. The results of the estimation of the vehicle loss time cost saving benefit for Route 3-1-1 and Route 3-1-2 are shown in Tables 9-4-18A and 9-4-19A respectively.

(6) Economic Analysis

1) Economic Analysis

108. The total economic project costs and benefits streams are presented in Table 9-4-20A. Following the conventional discounted cash flow method, the efficiency measures were calculated and the results are shown in Table 9-4-8.

Table 9-4-8 Economic Analysis Results for Route 3-1

EIRR	=	2.6%
NPV at 10% discount rate	=	-7,771(Million Rp.)
B/C ratio at 10% discount rate	=	0.6

2) Unquantified Economic Benefits

109. The general indirect effects from implementation of the Project have been previously mentioned in 9-1-2. As well as the quantified economic benefit, the following specific unquantified economic effects are expected for Route 3-1:

- Incentive effects for regional development by promotion of inflow of vehicles especially such as construction equipment and agricultural equipment/machines for Adonara and Lomblen islands.

- Improvement effect of the unfavorable transportation condition of passengers bringing large volumes of cargo by hand.

- Improvement effects of increase of safety of sea transportation between Terong - Lewoleba which is effected by strong current.

- Incentive effects for tourism sector development of Adonara and Lomblen islands by shortening of access time. Especially incentive effects for attraction of foreign tourists to these areas.

- Incentive effects for medical and educational opportunity increased for

people in Adonara and Lomblen islands.

- Incentive effects for development of a trunk traffic corridor throughout the whole Flores islands area.

- Incentive effects for long term increase of welfare of the people living in the related area.

- As a result, realization of "basic human need" and "improvement of regional imbalance" will be expected in the long run.

3) Conclusion

110. The results of economic analysis in terms of quantified benefits are unfavorable. However, when the enormous unquantified effects mentioned above are considered, which will be obtained by implementation of the Project, the Route 3-1 Project is conceived worthy of implementation.

9-4-3 Route 8 (Bajoe - Kolaka)

(1) Traffic Situation of "With Project" case and "Without Project" case

111. The traffic situations of "With Project" case and "Without Project" case for Route 8 are summarized below:

	With	Without
(A) For Traffic Volume within Ferry Traffic Capacity	(a) Operation of Existing Ferry Boats and (b) Operation of Proposed New Ferry Boats	Operation of Existing Ferry Boats
(B) For Traffic Volume which Overflows the Capacity		Via Road (Detour)

112. For the "With Project" case, the existing ferry boats will be taken out of service in accordance to their age limit, and in turn, the proposed new ferry boats will be introduced in order to meet the future traffic demand. The age limit of the existing boats used in Route 8 is assumed to be 33 years taking into account the actual ages of the existing boats.

113. For the "Without Project" case, it is assumed that the existing ferry boats will be replaced by boats with the same capacity at the time of their age limit. Accordingly, traffic capacity in the case of "Without Project" will continue at the level equivalent to the total traffic capacity of the existing ferry boats

114. As a result, in the case of "Without Project", a shortage of traffic capacity will be generated. Accordingly traffic demand will be greater than the traffic capacity.

115. In this economic analysis, it is assumed that in the case of "Without Project" the traffic demand overflowed will be diverted to a detour route between Bajoe - Kolaka along Bone Bay with an estimated road length of approximately 550 kilometers. Although information of the road service condition of the section between Bajoe - Kolaka is still uncertain, this road section is assumed in the economic analysis to be served wholly by the year of 1998.

For the "Without Project" case, the traffic demands are divided into the following two categories:

- Traffic demand using the existing ferry boats by sea
- Traffic demand using the detour route by land

(2) Travel Distance and Travel Time of "With Project" case and "Without Project" case

116. In the case of "Without Project", as mentioned above the traffic volume which overflows the ferry traffic capacity is assumed to be diverted to a detour route. In this case, the travel speed of vehicles using the detour is assumed to be 35 km/hour, considering the assumed road conditions and the actual running situation in the sections of Ujung Pandang-Bajoe and Kolaka-Kendari.

117. The travel distance and the travel time of "With Project" case and "Without Project" case for Route 8 are summarized as shown in Table 9-4-9.

Table 9-4-9 Travel Distance and Travel Time for Route 8

	With	Without
(A) For Traffic Volume within Traffic Capacity in "With Case"	(a) Existing Ferry Boats Distance: 80 miles Travel Time: 8 hrs. (b) Proposed New Ferry Boats Distance: 80 miles Travel Time: 5.5 hrs.	Existing Ferry Boats Distance: 80 miles Travel Time: 8 hrs
(B) For Traffic Volume which overflows the Capacity		Via Road (Detour) Distance: 550 km Travel Time: 15 hrs.

(See Fig. 9-4-3A)

(3) Number of Boats to be Procured

118. As previously mentioned, procurement of boats is based on comparison of the future traffic demand and the total traffic capacity of the boats. In Route 8, the applied boat type for "With Project" case is A type boat.

119. The annual traffic capacity per boat applied to Route 8 is shown in Table 9-4-10.

Table 9-4-10 Annual Traffic Capacity per Boat Applied to Route 8

Type of Boat	Passengers (person)	Vehicles (8 ton truck unit)
A Type (1,000 ton)	236,500	10,800

Note: Annual traffic capacity per boat at one round trip per day

120. The annual traffic capacity of the existing boats in Route 8 is as shown in Table 9-4-11.

Table 9-4-11 Annual Traffic Capacity of Existing Boats in Route 8

Name of Existing Boat	Age in 1988	Passengers (person)	Vehicles (8 ton truck unit)
Racmat Buhart	26	56,000	1,600
Banten	32	118,300	5,900
Bone Raya	29	94,600	2,800
Merak	28	88,100	3,500
Edha	31	52,200	3,200

Note: : Annual traffic capacity per boat at one trip per day

121. The future traffic demand, traffic capacity and number of boats to be introduced for "With Project" case and "Without Project" case are shown in Tables 9-4-21A and 9-4-22A respectively.

(4) Estimation of Costs

122. The estimation process of costs for "With Project" and "Without Project" cases has been previously described in 9-2-2 and 9-2-3. The procurement cost, operation and maintenance costs related to boats for "With Project" case and "Without Project" case are shown in Tables 9-4-23A and 9-4-24A respectively. The costs related to terminal facilities are shown in Table 9-4-27A.

(5) Estimation of Benefit

1) Travel Time Cost Saving Benefit for Passengers

123. The reduction of travel time of passengers when comparing the ferry traffic in "With Project" case and the ferry traffic and the vehicle traffic on the detour in "Without Project" case is treated as a time cost saving benefit.

124. The ferry passengers in "With Project" are divided into two groups as below:

- Passengers using the proposed new ferry boats
- Passengers using the existing ferry boats

125. In the case of "With Project", ferry passengers using the existing ferry boats will not receive a benefit of time saving, however ferry passengers using the new ferry boats will enjoy a time saving.

126. The estimation process of passenger time cost saving benefit is as follows:

(Time Cost in "Without Case") - (Time Cost in "With Case")

Time Cost in "Without Case":

Number of ferry passengers within traffic capacity
x Travel time (8.0 hrs. for travel by sea)
x Unit time cost.....Wo.(a)

+

Number of ferry passengers overflow traffic capacity
x Travel time (15.0 hrs. for travel by land)
x Unit time cost.....Wo.(b)

Time Cost in "With Case":

Number of ferry passengers using existing boats
x Travel time (8.0 hrs. for travel by sea)
x Unit time cost.....W.(a)

+

Number of ferry passengers using new ferry boats
x Travel time (5.5 hrs. for travel by sea)
x Unit time cost.....W.(b)

Time cost saving benefit = (Wo.(a) + Wo.(b)) - (W.(a) + W.(b))

127. The result of the estimation of the time cost saving benefit is shown in Table 9-4-25A.

2) Vehicle Operating Costs Saving Benefit for Vehicles

128. The additional operating cost of the vehicles using the detour in "Without Project" case is treated as a vehicle operating cost saving benefit.

129. The number of trucks and sedans which overflow the capacity is estimated by comparing the demand volume and the traffic capacity.

130. Overflow passengers are assumed to be transported using bus via the detour.

131. By deducting the number of passengers related to the sedan from the total overflow passengers, the passengers related to bus use are estimated. For estimating passengers related to sedan, a load factor of 3.0 persons per sedan is assumed. By applying the assumed load factor of 40 persons per bus, the number of buses is estimated.

132. The estimation process of vehicle operating cost (VOC) is as follows:

Number of trucks x Travel distance x Unit VOC of truck

+

Number of sedans x Travel distance x Unit VOC of sedan

+

Number of buses x Travel distance x Unit VOC of bus

Here, the travel distance for the detour is assumed to be 550 km.

133. The result of the estimation of the vehicle operating cost saving benefit is shown in Table 9-4-26A.

(6) Economic Analysis

1) Economic Analysis

134. The total economic project costs and benefits streams are presented in Table 9-4-27A. Following the conventional discounted cash flow method, the efficiency measures were calculated and the results are shown in Table 9-4-12.

Table 9-4-12 Economic Analysis Results for Route 8

EIRR	=	16.0%
NPV at 10% discount rate	=	25,751(Million Rp.)
B/C ratio at 10% discount rate	=	1.4

2) Unquantified Economic Benefits

135. The general indirect effects from implementation of the Project have been previously mentioned in 9-1-2. As well as the quantified economic benefit the following specific unquantified economic effects are expected for Route 8:

- Incentive effects for regional development by promotion of inflow of heavy construction equipment to the province of Southeast Sulawesi by improvement of roll on/roll off system

3) Conclusion

136. The results of the economic analysis indicate that the Route 8 Project is economically feasible.

9-4-4 Route 9-1 (Palembang-Muntok)

(1) Traffic Situation of "With Project" case and "Without Project" case

137. The traffic situations of "With Project" case and "Without Project" case for Route 9-1 are summarized below:

	With	Without
	(a) Operation of Existing Ferry Boats and (b) Operation of Proposed New Ferry Boats	Operation of Existing Ferry Boats (When the terminal capacity is exceeded, LCM type boats will be operated)

138. For the "With Project" case, the existing ferry boats will be taken out of service in accordance to their age limit, and in turn, the proposed new ferry boats will be introduced in order to meet the future traffic demand.

139. For the "Without Project" case, it is assumed that the existing ferry boats will be taken out of service in accordance to their age limit, and ferry boats with the same capacity as the "Bangka Raya" class will be introduced in order to meet the future traffic demand. When the number of ferry boats being operated reaches the limit of the capacity of the existing terminal, boats of the LCM type are assumed to be introduced. In this economic analysis, the tonnage and basic traffic capacity per one trip of the LCM type boat are assumed to be the same as for the existing ferry boat of "Bangka Raya" class. The operation cost of LCM type boat is assumed to be twice that of the existing ferry boat due to the characteristics of boat operation during berthing.

(2) Travel Distance and Travel Time of "With Project" case and "Without Project" case

140. In the "With Project" case, Muntok port is planned to be utilized as the new port. Muntok is located approximately 140 km west from Pangkal Pinang in terms of road distance. On the other hand, the existing ferry port of Kayu Arang is situated approximately 80 km west from Pangkal Pinang in terms of road distance. The distance by sea between Palembang - Muntok is about 74 miles and that between Palembang - Kayu Arang is about 110 miles.

141. Consequently, the base points for measuring travel distances and travel time are assumed to be Palembang - Pangkal Pinang.

142. The travel speed of vehicles by land is assumed to be 50 km/hour considering the actual road conditions and running situation in the roads of Bangka island.

143. The travel distance and the travel time of "With Project" case and "Without Project" case for Route 9-1 are summarized as shown in Table 9-4-13.

Table 9-4-13 Travel Distance and TRavel Time for Route 9-1

	With	Without
(A) By Sea	(Palembang - Muntok)	(Palembang - Kayu Arang)
	(a) Existing Ferry Boats	Existing Ferry Boats
	Distance: 74 miles Travel Time: 8 hrs.	Distance: 110 miles Travel Time: 12 hrs.
	(b) Proposed New Ferry Boats	
	Distance: 74 miles Travel Time: 6.5 hrs.	
(B) By Land	(Muntok - P.Pinang)	(Kayu Arang - P.Pinang)
	Distance: 140 km Travel Time: 2.8 hrs.	Distance: 80 km Travel time: 1.6 hrs.

(See Fig 9-4-4A.)

(3) Number of Boats to be Procured

144. As previously mentioned, procurement of boats is based on comparison of the future traffic demand and the total traffic capacity of the boats. In Route 9-1, the applied boat type for "With Project" case is B type boat.

145. The annual traffic capacity per boat applied to Route 9-1 is shown in Table 9-4-14.

Table 9-4-14 Annual Traffic Capacity per Boat Applied to Route 9-1

Type of Boat	Passengers (person)	Vehicles (3 ton truck unit)
B Type (500 ton)	197,100	10,400

Note: Annual traffic capacity per boat at one round trip per day

146. The annual traffic capacity of the existing boats in Route 9-1 is shown in Table 9-4-15.

Table 9-4-15 Annual Traffic Capacity of Existing Boats in Route 9-1

Name of Existing Boat	Age in 1988	Passengers (person)	Vehicles (3 ton truck unit)
Musi Raya	19	18,500	2,400
Bangka Raya	28	21,300	2,400

Note: Annual traffic capacity per boat at one trip per day

147. The future traffic demand, traffic capacity and number of boats to be introduced for "With Project" case and "Without Project" case are shown in Tables 9-4-28A and 9-4-29A respectively.

(4) Estimation of Costs

148. The estimation process of costs for "With Project" and "Without Project" cases has been previously described in 9-2-2 and 9-2-3. The procurement cost, operation and maintenance costs related to boats for "With Project" case and "Without Project" case are shown in Tables 9-4-30A and 9-4-31A respectively. The costs related to terminal facilities are shown in Table 9-4-34A.

149. As mentioned previously in 9-2-3, the maintenance work for Route 9-1 (dredging work for Juring river and installation of navigation aids) will be assumed to be required in the case of "Without Project". The required costs for the maintenance works of the approach channel are assumed as below:

- Cost for initial work : Rp. 3,538 million (in 1997)
- Cost for annual maintenance work : Rp. 386 million (per annum)

150. These costs in the "Without Project" case are treated as benefits of savings in the investment and operation/maintenance costs in the cashflow stream in the economic analysis. (refer to Table 9-4-34A.)

(5) Estimation of Benefit

1) Travel Time Cost Saving Benefit for Passengers

151. The reduction of travel times of passengers when comparing the ferry traffic in "With Project" case and the ferry traffic in "Without Project" case is treated as a time cost saving benefit.

152. In "With Project" case, the location of the terminal in Bangka island is proposed to be changed from Kayu Arang to Muntok. Consequently the distance by sea between Palembang - Bangka island is shortened.

153. By the effect of shortening the distance by sea and the introducing of proposed new ferry boats, the travel time in "With Project" case results in a decrease compared to that in "Without Project" case.

154. However the distance by land between Muntok - Pangkal Pinang is longer than that between Kayu Arang - Pangkal Pinang.

155. While the passengers will enjoy a reduction of travel time by sea, they will not have a time saving by land. Nevertheless the total travel time in "With Project" case is shorter than that in "Without Project" case.

156. In the case of "With Project", the ferry passengers will utilize both the existing boats and the new boats for some years. Accordingly the ferry passengers in "With Project" case are divided into two groups as below:

- Passengers using the proposed new ferry boats
- Passengers using the existing ferry boats

157. Therefore in the case of "With Project", the amount of time cost saving will be different between ferry passengers using the existing ferry boats and ferry passengers using of the new ferry boats due to the difference of travel time between the existing boats and the new boats.

158. The estimation process of passenger time cost saving benefit is as follows:

(Time Cost in "Without Case") - (Time Cost in "With Case")

Time Cost in "Without Case":

Number of ferry passengers
x Travel time (12.0 hrs. for travel by sea)
x Unit time cost.....Wo.(a)

+

Number of ferry passengers
x Travel time (1.6 hrs. for travel by land)
x Unit time cost.....Wo.(b)

Time Cost in "With Case":

Number of ferry passengers using existing boats
x Travel time (8.0 hrs. for travel by sea)
x Unit time cost.....W.(a)
+

Number of ferry passengers using new ferry boats
x Travel time (6.5 hrs. for travel by sea)
x Unit time cost.....W.(b)

+

Number of ferry passengers
x Travel time (2.8 hrs. for travel by land)
x Unit time cost.....Wo.(c)

Time cost saving benefit = (Wo.(a) + Wo.(b)) - (W.(a) + W.(b) + W.(c))

159. The result of the estimation of the time cost saving benefit is shown in Table 9-4-32A.

2) Vehicle Operating Costs Saving Benefit for Vehicles

160. As mentioned before, the distance by land in the "With Project" case (140 km for Muntok - Pangkal Pinang) is longer than that in the "Without Project" case (80 km for Kayu Arang - Pangkal Pinang). Thus the incremental operating cost of the vehicles in "With Project" case due to the increased road distance (140 km - 80 km = 60 km) is treated as a negative benefit of vehicle operating cost saving.

161. The number of trucks and sedans are given by the traffic demand study results.

162. The passengers are assumed to be transported by land using bus.

163. By deducting the number of passengers related to the sedan from the total passengers, the passengers related to bus use are estimated. For estimating passengers related to sedan, a load factor of 3.0 persons per sedan is assumed. By applying the assumed load factor of 40 persons per bus, the number of buses is estimated.

164. The estimation process of vehicle operating cost (VOC) is as follows:

Number of trucks x Travel distance difference x Unit VOC of truck

+

Number of sedans x Travel distance difference x Unit VOC of sedan

+

Number of buses x Travel distance difference x Unit VOC of bus

Here, the difference of travel distance is 60 Km.

165. The result of the estimation of the vehicle operating cost saving benefit (negative benefit in Route 9-1) is shown in Table 9-4-33A.

(6) Economic Analysis

1) Economic Analysis

166. The total economic project costs and benefits streams are presented in Table 9-4-34A. Following the conventional discounted cash flow method, the efficiency measures were calculated and the results are shown in Table 9-4-16.

Table 9-4-16 Economic Analysis Results for Route 9-1

EIRR	=	10.9%
NPV at 10% discount rate	=	935(Million Rp.)
B/C ratio at 10% discount rate	=	1.03

2) Unquantified Economic Benefits

167. The general indirect effects from implementation of the Project have been previously mentioned in 9-1-2. As well as the quantified economic benefit, the following specific unquantified economic effects are expected for Route 9-1:

- Incentive effects for tourism development in the northern part of Bangka island
- Incentive effects for regional development in the vicinity of Muntok (plan for tourism resort development, plan for shipbuilding yard, etc.)

3) Conclusion

168. The results of the economic analysis indicate that the Route 9-1 Project is economically feasible.

9-5 Summary

169. The following is a summary of the economic analysis results (EIRR) for each route.

Table 9-5-1 Summary of Economic Analysis Results (EIRR)

Route	EIRR(%)
Route 2-1(Mokmer-Saubeba)	12.3 %
Route 3-1(Larantuka-Terong-Lewoleba)	2.6 %
Route 8(Bajoe-Kolaka)	16.0 %
Route 9-1(Palembang-Muntok)	10.9 %

170. These results indicate that implementation of the development of Routes 2-1, 8 and 9-1 are economically feasible.

171. The economic analysis result of Route 3-1 in terms of quantified benefits is unfavorable. However, taking the enormous unquantified effects for the related regions into consideration, development of Route 3-1 is worthy of implementation.

9-6 Sensitivity Analysis

172. Assuming that the benefit and cost stream might alter ±10% for each route, the effect of the EIRR was tested and the results are summarized in Table 9-6-1.

Table 9-6-1 EIRR by Altered Benefit and Cost

Route	Base	Benefit-10%	Cost+10%	Benefit-10% Cost +10%
Route 2-1	12.3%	10.7%	10.8%	9.3%
Route 3-1	2.6%	1.4%	1.5%	0.4%
Route 8	16.0%	14.0%	14.2%	12.3%
Route 9-1	10.9%	7.7%	8.0%	4.9%

Chapter 10 Financial Analysis

10-1 Purpose of the Financial Analysis

1. The purpose of the financial analysis is generally to examine the viability of the project and the financial soundness of the port management body during the project life. (The project means the short-term development plan in this chapter.)

2. The financial analysis has a premise that the management body is financially independent. When the management body is in the above situation, the financial analysis can be regard as significant.

3. The contents of the financial analysis are mainly the considerations of profitability and the financing plan. For fundamental facilities in which public element is high, the financial analysis places more importance on the financing plan rather than the profitability of the project.

10-2 Methodology of the Financial Analysis

10-2-1 Viability of the Project

4. 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:

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

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
Costs: investments (initial investments and reinvestments) maintenance, repair and fuel costs personnel and administration expenses

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.

10-2-2 Financial Soundness of the Port Management Body

5. The financial soundness of the port management body 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:

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

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:

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

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.

(3) Operational Efficiency

Operating Ratio:

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

Working Ratio:

$$\frac{\text{Operating Expenses - Depreciation Expenses}}{\text{Operating Revenues}} \times 100\ (\%)$$

The operating ratio shows the operational efficiency of the organization as an enterprise, and the working ratio shows the efficiency of the routine operations of the port.

When the calculated operating ratios are less than 70-75%, and the working ratios are less than 50-60%, the operations of port are generally efficient.

10-3 General Presuppositions of the Financial Analysis

10-3-1 Scope of the Financial Analysis

6. The viability of the project can be analyzed, based on the revenues and costs related to the project. In this study, there are four routes and eight terminals. In this chapter, the project will be analyzed independently by route for the ease of judging the financial viability of each route.

7. As mentioned in the above paragraph, "the project" in this chapter means the short-term development plan as the object of loan requirement. Therefore, scope of the project varies according to the object of loan. We envisage two concrete cases for loan requirement as shown in Fig. 10-3-1A.

8. One is the case where the Perum ASDP manages and operates the ferry service and the procurement of ships is executed with soft foreign loans. In this case, the procurement of the ships is generally performed by the government, which in turn gives the ships to the Perum ASDP. In Indonesia, all the ferry terminal facilities are constructed by the government. This is Case-1 in Fig. 10-3-1A. As the costs of the project, construction costs of port facilities, procurement costs of ships, operation costs, personnel and administration expenses, maintenance and repair costs and reinvestment costs are considered. Revenues from port and shipping operations are calculated based on the respective tariffs.

9. The other is the case where the procurement of the ships is executed without soft loans. The private company obviously can not utilize soft loans. In case the Perum ASDP can not use soft loan, this case is also applied. Costs and revenues from port facilities and port operations only are considered. This is Case-2 in Fig. 10-3-1A.

10. It is very difficult for the Perum ASDP to use soft loans to procure ships because of the local regulation to build ships in Indonesia for ships below 5,000 DWT. This does not match international tender with soft loans. As a result of discussions with DGLT, we reached a conclusion to perform the financial analysis for Case-2 in Fig. 10-3-1A.

11. The finances of MOC as the port management body will be mainly analyzed to examine the financing plan. Because the financing plans require the analysis of the cash flow statement, the scopes of the port management bodies are assumed to be the same as the projects in this feasibility study. The finance in the port is assumed to be balanced independently on each ferry service route. Therefore, financial evaluations will be made of the four routes separately.

10-3-2 Project Life

12. 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 will be determined as 33 years from the beginning of the project including three years of detailed design and construction of the port facilities and 30 years of operation.

10-3-3 Base Year

13. For the estimate, all costs, expenditures and revenues analyzed quantitatively here are indicated in prices as of 1992, when the price survey was conducted. Neither price inflation nor increases in nominal wages are considered during the project life.

10-3-4 Number of Passengers, Vehicles and Cargo Volume

14. Based on the forecast of the number of passengers/vehicles, cargo volume and the estimated capacity of port facilities, the annual handling volume in each port will be determined as shown in Table 10-3-1A to Table 10-3-5A.

15. The most maximum of round trips is assumed based on the ferryboat operation plan. Though it may vary depending on, for example, whether there are lighting facilities for night trip or not, it will be assumed that there are five round trips a day in Bajoe - Kolaka route or Palembang - Muntok route.

10-3-5 Port Charges and Revenues

16. The existing port tariff rates are shown in Table 10-3-6. At present, this tariff is at a comparatively low level according to the government policy, and expenditures exceed revenues from port charges in all terminals.

17. For the estimation of port charges, the tariff rates are assumed to increase by two thirds the increase of GDP per capita in Indonesia every five years as follows:

Year	Tariff Rates
1998	15% increase
2003	15% increase
2008	15% increase
2013	15% increase
2018	15% increase
2023	15% increase

10-3-6 Fund Raising

18. We assume that the funds necessary for the implementation of the project will be raised as follows:

(1) Soft Loans

19. 75% of the construction costs will be raised by soft foreign loans in this financial analysis. A soft loan for this project is assumed to be as follows:

Loan period:	30 years, including a grace period of 10 years
Interest rate:	2.6% per annum (loans from foreign government)
Repayment:	fixed amount repayment of principal

(2) Government Funds

20. 25% of the construction costs for the project is assumed to be raised by government funds. The government funds are assumed to be free of repayment and interest.

21. In addition to the above funds necessary for the initial construction, the government continuously needs funds for reinvestment, repayment of soft loans, interest on soft loans and a part of operating expenses during project life. This situation is the same as that of other port operation offices at present.

10-3-7 Expenditures

(1) Investments

22. The initial construction costs of the project are estimated in Chapter 7 of Part 3. Based on the above chapter, investments are calculated by Table 10-3-7A to Table 10-3-15A for the financial analysis.

23. The depreciable facilities and equipment will be renewed based on their service lives shown in Table 10-3-16A.

24. The funds for reinvestment need to be financed by the government.

(2) Maintenance and Repair Costs

25. Annual maintenance and repair costs are calculated as 1% of initial depreciable assets excluding the maintenance free assets.

(3) Personnel and Administration Costs

26. Annual personnel costs are estimated based on the required number of workers proposed in Chapter 6 of Part 3.

27. Annual administration costs are calculated as 35% of the annual personnel costs based on the actual situation of ferry port finances.

(4) Depreciation Expenses

28. Annual depreciation expenses of port facilities and equipment are calculated by the straight line method based on their service lives.

29. For the calculation of FIRR, fixed assets are assumed to be sold at their residual values at the end of the project life.

10-4 Evaluation

30. At the present stage, the Indonesian government does not consider ferry port facilities managed by MOC to be profitable. Therefore, the method of evaluation is intended to show the subsidy amounts for this project.

31. The subsidy amounts are determined by balancing the cash-inflow with cash-outflow in the projected financial statements for each route. The results of these calculations are shown in Table 10-4-1A to Table 10-4-4A. The government subsidy parts necessary for these calculations are reinvestment, repayment of long-term loans, interest on long-term loan and short parts of ordinary operations. Concerning the ordinary operations, if these parts gain profits, these are assumed to be used for other necessary government subsidy parts. A summary of the government funds are shown in Table 10-4-1 to Table 10-4-4.

Table 10-4-1 Subsidy in Mokmer-Saubeba Route

(Unit: Million Rp.)

Year	Invest Reinvest	Repayment	Interest	Operation	Total
1995	101	0	0	0	101
1996	938	0	8	0	945
1997	1,679	0	81	0	1,759
1998	0	0	212	107	319
1999	0	0	212	106	318
2000	0	0	212	105	317
2001	0	0	212	104	316
2002	0	0	212	103	314
2003	0	0	212	96	308
2004	0	0	212	95	307
2005	0	15	212	93	320
2006	0	156	211	115	482
2007	1,231	407	207	113	1,959
2008	0	407	197	105	709
2009	0	407	186	103	696
2010	0	407	176	100	683
2011	0	407	165	98	670
2012	0	407	154	96	657
2013	0	407	144	83	634
2014	0	407	133	79	620
2015	0	407	123	76	606
2016	0	407	112	71	591
2017	1,231	407	102	75	1,815
2018	0	407	91	56	554
2019	0	407	80	50	538
2020	0	407	70	44	521
2021	0	407	59	37	504
2022	1,140	407	49	30	1,626
2023	0	407	38	-2	443
2024	0	407	27	-11	424
2025	0	392	17	-21	388
2026	0	252	7	-32	227
2027	0	0	0	-43	-43
Total	6,318	8,150	4,132	2,027	20,627

Table 10-4-2 Subsidy Larantuka-Terong-Lewoleba Route

(Unit: Million Rp.)

Year	Invest Reinvest	Repayment	Interest	Operation	Total
1995	135	0	0	0	135
1996	2,082	0	11	0	2,092
1997	1,443	0	173	0	1,616
1998	0	0	285	126	411
1999	0	0	285	109	394
2000	0	0	285	108	394
2001	0	0	285	107	393
2002	0	0	285	106	392
2003	0	0	285	98	384
2004	0	0	285	97	382
2005	0	20	285	96	401
2006	0	332	285	94	712
2007	1,013	549	278	93	1,931
2008	0	549	262	94	905
2009	0	549	248	92	889
2010	0	549	233	90	873
2011	0	549	219	88	856
2012	0	549	205	86	839
2013	0	549	191	71	810
2014	0	549	176	67	793
2015	0	549	162	64	775
2016	0	549	148	60	757
2017	1,013	549	134	56	1,752
2018	0	549	119	35	703
2019	0	549	105	31	684
2020	0	549	91	30	670
2021	0	549	76	30	655
2022	1,462	549	62	30	2,103
2023	0	549	48	10	607
2024	0	549	34	10	592
2025	0	529	19	10	558
2026	0	216	6	10	232
2027	0	0	0	10	10
Total	7,148	10,977	5,585	2,009	25,699

Table 10-4-3 Subsidy in Bajoe-Kolaka-Route

(Unit: Million Rp.)

Year	Invest Reinvest	Repayment	Interest	Operation	Total
1995	247	0	0	0	247
1996	3,304	0	19	0	3,323
1997	3,121	0	277	0	3,398
1998	0	0	520	212	733
1999	0	0	520	205	725
2000	0	0	520	196	717
2001	0	0	520	188	708
2002	0	0	520	179	699
2003	0	0	520	151	672
2004	0	0	520	139	660
2005	0	37	520	127	684
2006	0	533	519	114	1,166
2007	2,160	1,001	506	101	3,767
2008	0	1,001	480	51	1,532
2009	0	1,001	454	34	1,488
2010	0	1,001	427	15	1,443
2011	0	1,001	401	-5	1,397
2012	0	1,001	375	-11	1,366
2013	0	1,001	349	-72	1,278
2014	0	1,001	323	-72	1,252
2015	0	1,001	297	-72	1,226
2016	0	1,001	271	-72	1,200
2017	2,160	1,001	245	-72	3,335
2018	0	1,001	219	-142	1,078
2019	0	1,001	193	-142	1,052
2020	0	1,001	167	-142	1,026
2021	0	1,001	141	-142	1,000
2022	4,030	1,001	115	-142	5,004
2023	0	1,001	89	-223	867
2024	0	1,001	63	-223	841
2025	0	964	37	-223	778
2026	0	468	12	-223	257
2027	0	0	0	-223	-223
Total	15,023	20,014	10,147	-488	44,695

Table 10-4-4 Subsidy in Palembang-Muntok Route

(Unit: Million Rp.)

Year	Invest Reinvest	Repayment	Interest	Operation	Total
1995	186	0	0	0	186
1996	2,697	0	15	0	2,711
1997	2,095	0	225	0	2,319
1998	0	0	388	145	533
1999	0	0	388	143	531
2000	0	0	388	141	529
2001	0	0	388	139	527
2002	0	0	388	137	525
2003	0	0	388	123	511
2004	0	0	388	120	508
2005	0	28	388	118	534
2006	0	432	388	130	950
2007	1,076	747	376	127	2,326
2008	0	747	357	108	1,211
2009	0	747	337	104	1,188
2010	0	747	318	101	1,165
2011	0	747	299	97	1,142
2012	0	747	279	93	1,119
2013	0	747	260	67	1,074
2014	0	747	240	74	1,061
2015	0	747	221	69	1,036
2016	0	747	202	63	1,012
2017	1,076	747	182	58	2,062
2018	0	747	163	21	930
2019	0	747	143	29	919
2020	0	747	124	22	892
2021	0	747	104	14	865
2022	2,886	747	85	6	3,724
2023	0	747	66	-42	770
2024	0	747	46	-49	744
2025	0	719	27	-56	689
2026	0	314	8	-63	259
2027	0	0	0	-71	-71
Total	10,016	14,932	7,570	1,965	34,483

32. Concerning the above table, the item of "invest, reinvest" means domestic portion of initial construction costs and investment for renewal of initial investment. "Repayment" means the repayment of long-term loans. "Interest" means the interest on long-term loans. "Operation" means the shortage of operating expenses excluding depreciation expenses.

33. When the figure of "operation" turns to a negative number, the port management body gains the revenues sufficient for ordinary operating expenses.

34. FIRR calculation with these government subsidies are shown in Table 10-4-5A to Table 10-4-8A by each route.

35. The weighted average interest rate, which is the floor limit, is 1.95% in this study. The calculated FIRR in each route exceeds the weighted average interest rate(1.95%).

10-5 Sensitivity Analysis

36. Sensitivity analysis is conducted to examine the impact of unexpected future changes. The following three cases are envisaged.

Case 1: The revenue decreases by 10%
Case 2: The construction cost increases by 10%
Case 3: The revenue decreases by 10% and the construction cost increase by 10%

37. The necessary total government subsidies are calculated as shown in Table 10-5-1.

Table 10-5-1(1) Total Subsidy on Sensitivity Analysis

(Unit: Million Rp.)

	Mokaar-Saubeba Route				Larantuka-Terong-Lewoleba Route			
	Base	Case 1	Case 2	Case 3	Base	Case 1	Case 2	Case 3
1995	101	101	111	111	135	135	148	148
1996	945	945	1,040	1,040	2,092	2,092	2,301	2,301
1997	1,759	1,759	1,935	1,935	1,616	1,616	1,777	1,777
1998	319	321	345	348	411	414	446	448
1999	318	321	344	347	394	399	429	433
2000	317	320	343	346	394	398	428	433
2001	316	319	342	346	393	397	427	432
2002	314	318	341	345	392	396	426	431
2003	308	312	335	339	384	389	418	424
2004	307	311	334	338	382	388	417	423
2005	320	324	349	353	401	407	444	444
2006	482	486	524	528	712	717	785	785
2007	1,959	1,963	2,149	2,153	1,931	1,937	2,127	2,127
2008	709	714	775	780	905	912	999	999
2009	696	701	761	766	889	896	982	982
2010	683	689	747	753	873	880	964	964
2011	670	676	733	739	856	864	947	947
2012	657	663	719	725	839	847	929	929
2013	634	641	695	702	810	820	900	900
2014	620	628	680	687	793	802	881	881
2015	606	614	664	672	775	785	862	862
2016	591	599	649	657	757	768	843	843
2017	1,815	1,824	1,995	2,004	1,752	1,763	1,939	1,939
2018	554	565	609	621	703	716	789	789
2019	538	549	592	604	684	698	769	769
2020	521	533	574	587	670	683	753	753
2021	504	517	556	569	655	669	738	738
2022	1,626	1,639	1,791	1,805	2,103	2,117	2,330	2,330
2023	443	462	494	512	607	622	688	688
2024	424	443	473	492	592	608	672	672
2025	388	409	435	455	558	573	634	634
2026	227	248	258	280	232	247	276	276
2027	-43	-20	-37	-15	10	25	32	32
Total	20,627	20,694	22,657	22,924	25,699	25,981	28,503	28,534

Table 10-5-1(2) Total Subsidy on Sensitivity Analysis

(Unit: Million Rp.)

	Bajoe-Kolaka Route				Palembang-Muntok Route			
	Base	Case 1	Case 2	Case 3	Base	Case 1	Case 2	Case 3
1995	247	247	271	271	186	186	205	205
1996	3,323	3,323	3,655	3,655	2,711	2,711	2,982	2,982
1997	3,398	3,398	3,738	3,738	2,319	2,319	2,551	2,551
1998	733	747	801	816	533	540	582	589
1999	725	741	793	809	531	538	580	588
2000	717	733	785	801	529	537	578	586
2001	708	726	777	794	527	535	576	584
2002	699	718	768	786	525	533	574	582
2003	672	694	740	763	511	520	560	569
2004	660	684	728	752	508	518	558	567
2005	684	710	756	782	534	543	586	595
2006	1,166	1,193	1,288	1,314	950	960	1,042	1,052
2007	3,767	3,795	4,150	4,178	2,326	2,336	2,556	2,567
2008	1,532	1,566	1,696	1,731	1,211	1,224	1,332	1,345
2009	1,488	1,524	1,650	1,686	1,188	1,201	1,307	1,320
2010	1,443	1,481	1,602	1,640	1,165	1,178	1,282	1,295
2011	1,397	1,437	1,554	1,594	1,142	1,156	1,257	1,271
2012	1,366	1,406	1,520	1,560	1,119	1,133	1,232	1,246
2013	1,278	1,325	1,430	1,477	1,074	1,090	1,185	1,201
2014	1,252	1,299	1,401	1,448	1,061	1,078	1,170	1,187
2015	1,226	1,273	1,372	1,419	1,036	1,054	1,144	1,161
2016	1,200	1,247	1,344	1,391	1,012	1,030	1,117	1,135
2017	3,335	3,382	3,692	3,739	2,062	2,081	2,273	2,292
2018	1,078	1,132	1,216	1,270	930	952	1,031	1,054
2019	1,052	1,106	1,188	1,242	919	943	1,019	1,042
2020	1,026	1,080	1,159	1,213	892	916	990	1,014
2021	1,000	1,054	1,130	1,184	865	890	961	985
2022	5,004	5,058	5,535	5,589	3,724	3,749	4,106	4,131
2023	867	929	992	1,054	770	800	862	892
2024	841	903	963	1,026	744	775	833	865
2025	778	840	894	956	689	721	774	806
2026	257	319	321	384	259	291	302	334
2027	-223	-161	-207	-145	-71	-38	-60	-27
Total	44,695	45,909	49,702	50,916	34,483	35,002	38,049	38,567

10-6 Conclusions

38. Judging from the above analysis, the project can be regarded as financially feasible if the government funds are raised in the above manner and if the port charges are increased by 15% every five years from the existing tariff.

39. Judging from the increase of GDP per capita and the financial independence at the first stage, the increase in the port tariff is considered reasonable. But, the Indonesian government can check the increase in port tariff by raising more funds.

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