

FINAL REPORT
THE DEVELOPMENT STUDY ON THE
NATIONWIDE FERRY SERVICE ROUTES
IN THE REPUBLIC OF INDONESIA
SUMMARY

March 1993



JAPAN INTERNATIONAL COOPERATION AGENCY

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FINAL REPORT

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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the development study on the Nationwide Ferry Service Routes and entrusted the study to the Japan International Cooperation Agency(JICA).

JICA sent to Indonesia a study team headed by Mr. Haruo Okada, Executive Director of the Overseas Coastal Area Development Institute of Japan, four times between January 1992 and February 1993.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

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

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

March 1993



Kensuke Yanagia

President

Japan International Cooperation Agency

LETTER OF TRANSMITTAL

March, 1993

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency

Dear Mr. Yanagiya,

It is my great pleasure to submit herewith the Final Report for the Development Study on the Nationwide Ferry Service Routes in the Republic of Indonesia.

The report is the result of studies carried out by the Overseas Coastal Area Development Institute of Japan (OCDI) and Pacific Consultants International as per the contract with the Japan International Cooperation Agency (JICA). The study team conducted four field surveys between January 1992 and February 1993.

Based on the findings of these surveys and on data and information collected and analyzed in Japan, the master plan for appointed nine routes was formulated with a target year of 2010 and the short-term development plan for four routes selected in these nine routes was formulated with a target year of 1998 including a feasibility study.

The study shows that ferry development is important and essential as a socioeconomic infrastructure not only to improve living standards in those areas but also to contribute to the improvement of regional economic disparity and the stability of public welfare in Indonesia. Therefore, I earnestly hope that measures will be taken to implement this project.

It may also be noteworthy that during their stay in Indonesia, the study team carried out a seminar/workshop aiming at the transfer of technology with respect to ferry transport development in Indonesia.

On behalf of the study team, let me express my heartfelt thanks for the generous cooperation, assistance and warm hospitality extended to the study team during their stay in Indonesia of Indonesian Government firstly Directorate General of Land Transport and Inland Waterways of Ministry of Communications and other related organizations.

Our thanks are also due to the Japan International Cooperation Agency, the Ministry of Foreign Affairs, the Ministry of Transport and the Japanese Embassy in Indonesia and the JICA Indonesian Office for their valuable advice and support during the field survey and preparation of this report.

Yours faithfully,



Haruo Okada
Leader
Japanese Study Team for the development Study
on the Nationwide Ferry Service Routes
(Executive Director, The Overseas Coastal
Area development Institute of Japan)



of Study Routes

1

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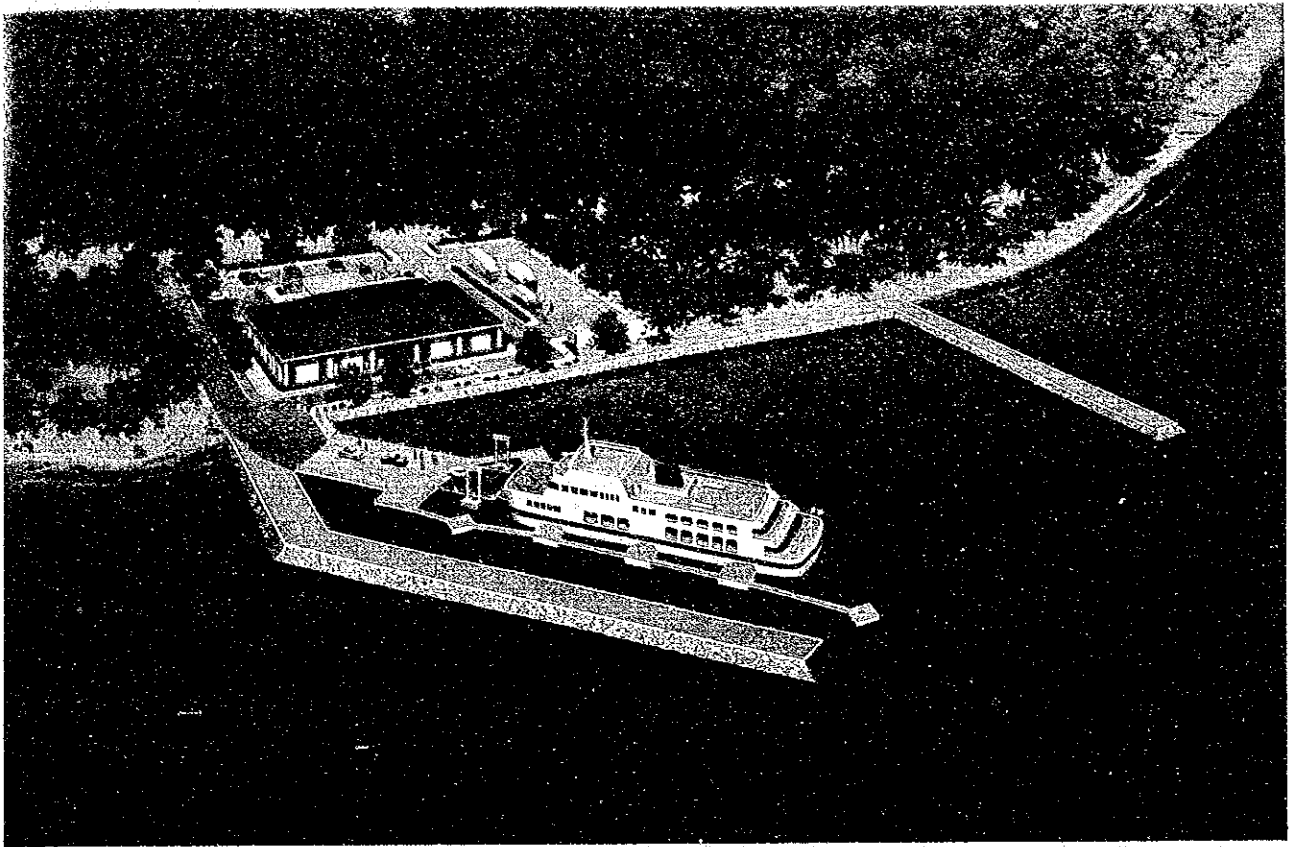
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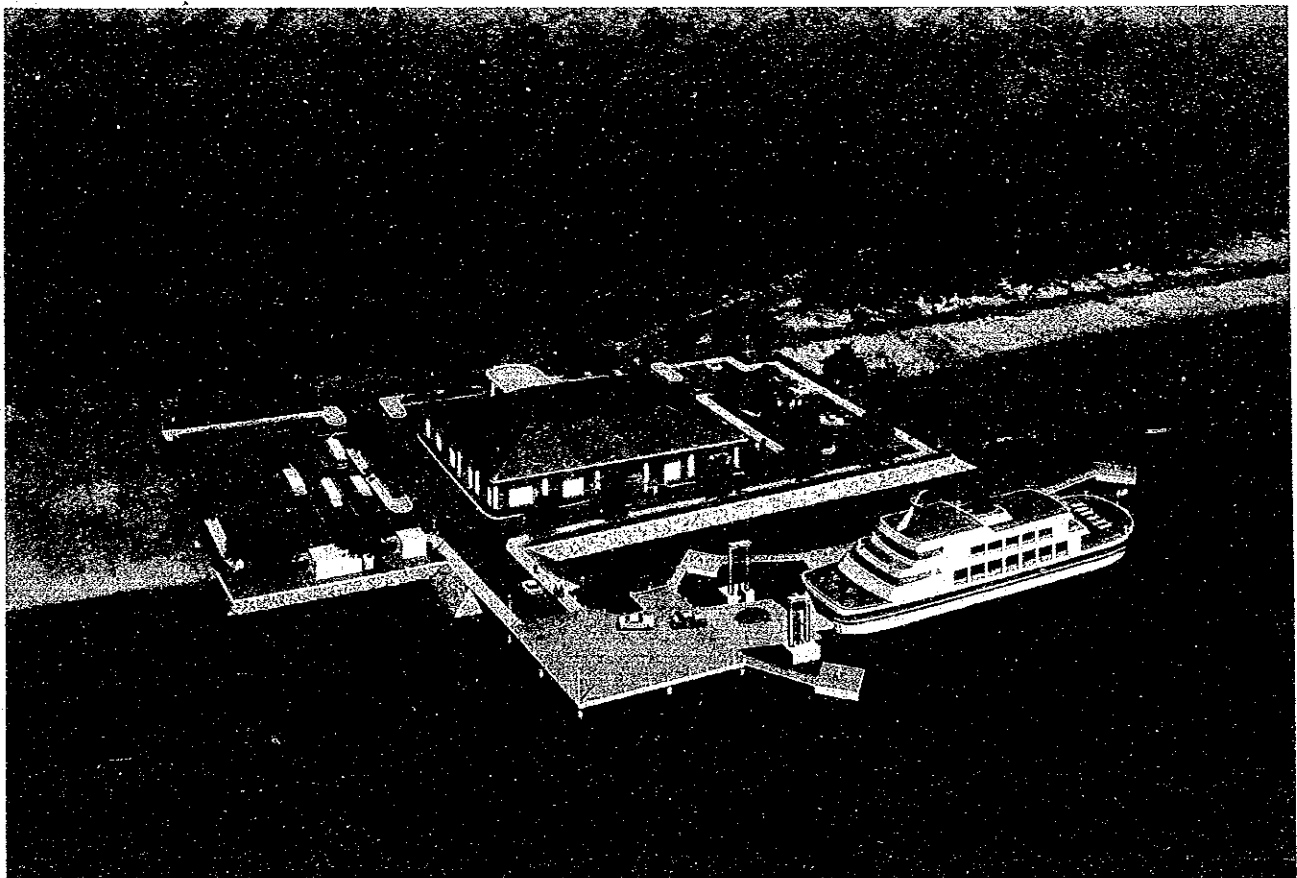
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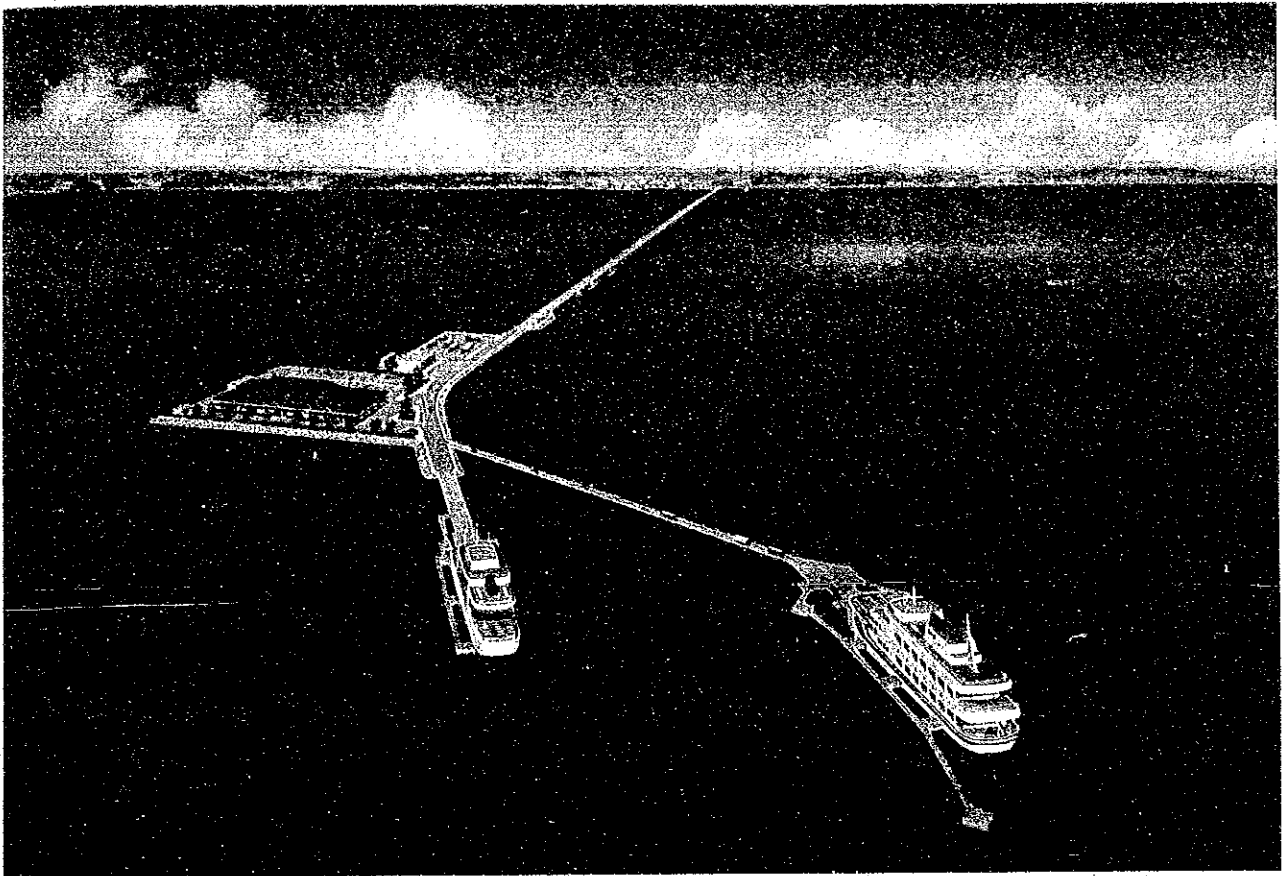
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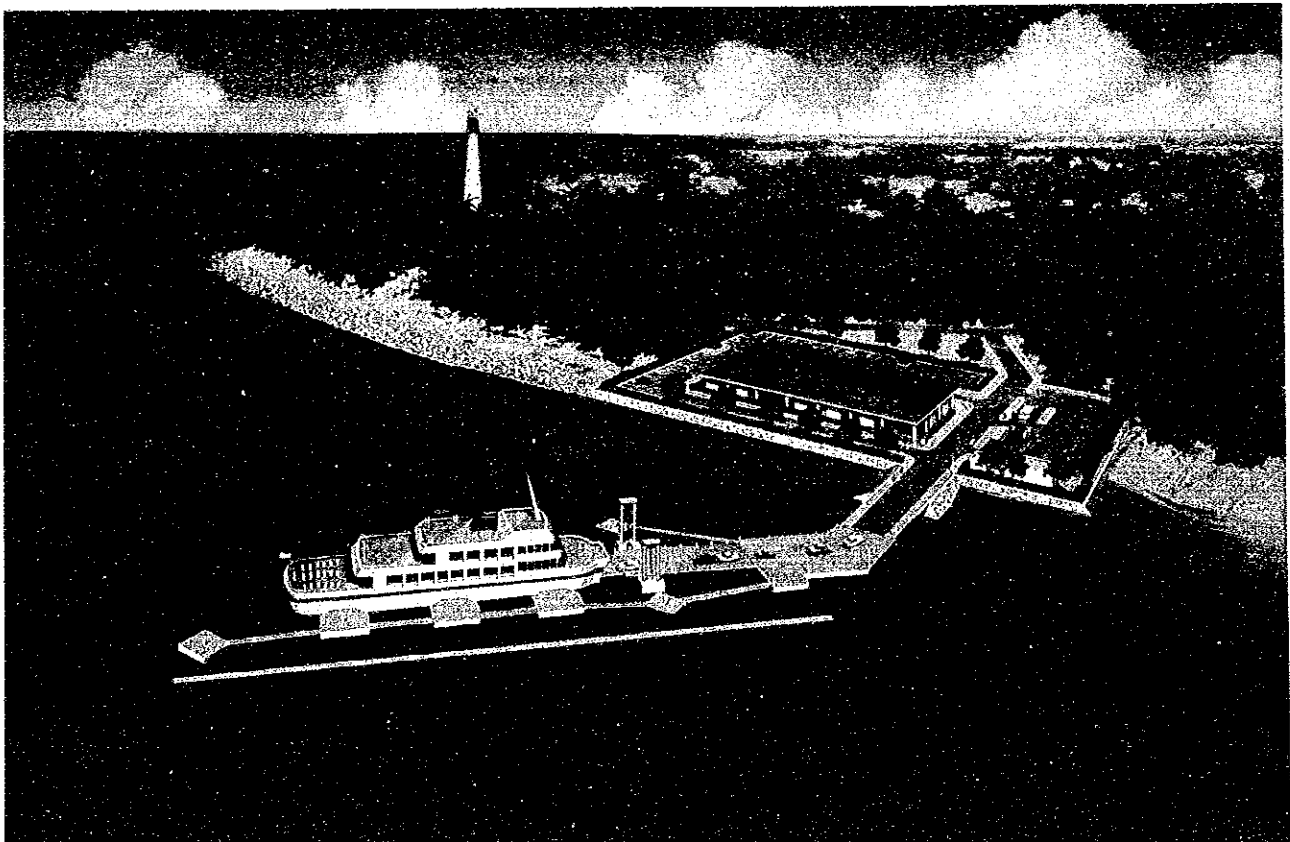
Mokmer Ferry Terminal



Lewoleba Ferry Terminal



Bajos Ferry Terminal



Montok Ferry Terminal

ABBREVIATION LIST

B	BM	Bench Mark
	B/C	Benefit Cost Ratio
C	CD	Chart Datum(Lowest Low Water Level)
	Commod.	Commodity
D	DGLT	Directorate General of Land Transport and Inland Waterways
	DGSC	Directorate General of Sea Communications
	DWT	Dead Weight Tonnage
E	EIRR	Economic Internal Rate of Return
F	FD	Draft in Full Load
	FIRR	Financial Internal Rate of Return
G	GRDP	Gross Regional Domestic Product
	GRT	Gross Registered Tonnage
	GT	Gross Registered Tonnage
H	HWL	High Water Level
	HWS	High Water Spring
I	IBRD	International Bank for Reconstruction and Development
	Is.	Island
	Isl.	Island
K	Kab.	Kabupaten
	Kec.	Kecamatan
	Km	Kilometer
	Kot.	Kotamadya
	Kt	Knot
L	LCM	Land Craft Motor

	LOA	Length Over ALL (of a vessel)
	LWL	Low Water Level
	LWS	Low Water Spring
M	MB	Breadth Molded
	MOC	Ministry of Communications
	MSL	Mean Sea Level
N	NPV	Net Present Value
O	OD	Origin and Destination
P	Passen.	Passenger
	PASDP	Perum Angkutan Sungai Danau dan Penyeberangan
	Perum ASDP	Perum Angkutan Sungai Danau dan Penyeberangan
	Pu.	Pulau
	PC	Prestressed Concrete
	PLN	Persahaan umum Listrik Negara
R	Ro/Ro	Roll on / Roll off
	RC	Reinforced Concrete
	Rp.	Rupiah
	R.T	Round Trip
T	Tg.	Tanjung
	Tk.	Teluk
	Trans.	Transportation
U	UKC	Under Keel Clearance
V	Veh.	Vehicle
	Veh.-4	Four-wheeled Vehicle
	Veh.-2	Two-wheeled Vehicle
	VOC	Vehicle Operating Cost
	Vol.	Volume

EXCHANGE RATE

US\$1.00 = Rp.2,015 = ¥125
(November 1992)

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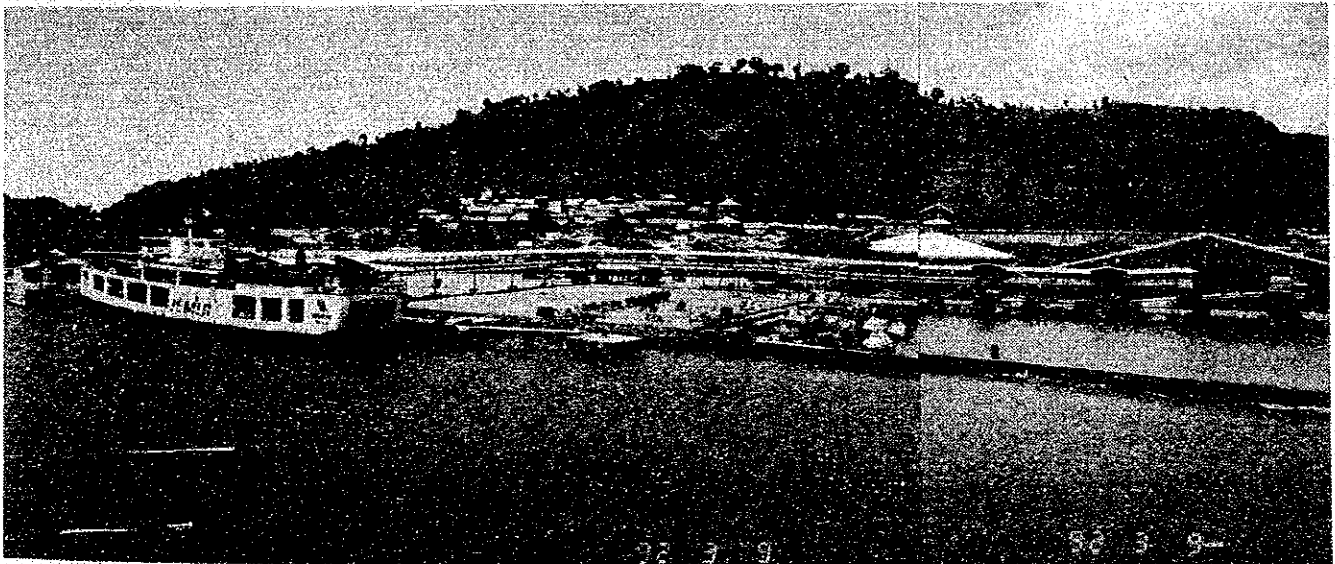
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CONCLUSIONS AND RECOMMENDATIONS



Bakauheni Terminal

Conclusions and Recommendations

I. Conclusions

Master Plan Study

1. At present, the shipping operations in Indonesia are performed by Perum ASDP (public corporation) and 15 private companies. Since private companies have participated in the comparatively profitable routes, the number of passengers transported by private shipping companies already exceeds twice of that transported by the Perum ASDP.

In the case of the existing routes, although a participating private company will have to run business in competition with the Perum ASDP and/or other private companies, it is important for the government to give permission to the private company to introduce private funds to this field as much as possible.

The development of ferry transportation in eastern Indonesia has been playing a role in rectifying the unbalanced living standard between the eastern part and the western part of Indonesia, thus becoming an important government policy. The Perum ASDP, as a public corporation, assumes the task of spearheading the government policy. Granting this role of the Perum ASDP, the government regularly gives ferry boats to the Perum ASDP without charge. It is considered that this kind of government aid will and should continue.

In the eastern regions ferry service should be provided to surrounding small islands connecting with the main islands of Sulawesi, Maluku and Irian Jaya to break the isolation. In terms of providing inter-regional ferry service (connection among main islands), a triangular network formed by connecting Jawa, Kalimantan and Sulawesi should be given priority.

2. The Study Team conducted a field reconnaissance survey to make the development plan of nine ferry routes and select the most suitable terminal sites. The routes 1, 8 and 9 are now operated and a change of terminal site is not required in all of the terminal sites of the three routes except the Kayu Arang terminal of Route 9. At the mouth of the river, in the middle of which the Kayu Arang terminal is located, sedimentation has continued and the shallowing water depth makes ferry sailing through the mouth difficult and delays in arrival or destination changes have increased. The construction of a

ferry terminal at a new site is proposed.

DGLT proposed a ferry route connecting Flores Island and Alor Island with the distance of 130 km. The field reconnaissance survey shows that current social and economic connection between the islands seems to be weak and the ferry transportation demand in planned year seems to be small. On the other hand, a large transportation demand is estimated at two routes, Flores-Adonara/Lomblem route and Alor-Pantar route based on the current sea transportation volume and route distance. The above-mentioned two routes were added to the Master Plan Study.

The main items of evaluation for the terminal site selection are oceanographic conditions, topographic conditions, accessibility from/to main cities & road condition and land use condition. Appropriate terminal sites in each ferry route have been selected.(See Table 2-1)

3. The future socioeconomic framework(population and GRDP) of each province is prepared based on the growth rates in "REPELITA V 989/90-993/94), referring to the projections by the Demographic Institute, the past growth rate. In deciding hinterlands, the Study Team selects those areas which will be served by the related ferry route on the island or kecamatan level. Small islands and towns generally depend on nearby big cities for their daily necessities.

Forecasted items are passenger, cargo(truck), general car and motorcycle. For demand forecasting the past data is used to predict future traffic with some adjustment by the growth rate estimated from the above-mentioned future socioeconomic framework on existing rates, while for the new routes, two formulas are adopted depending on the distance of ferry route and the future traffic is predicted with the same procedure as the case of the existing routes.(See Table 3-5)

The modified gravity model used for the forecast of the number of passengers on the new routes has a high correlation coefficient.

4. The Study Team has set up five model types of ferryboat in the proposed routes, 150GRT, 300GRT(two types), 500GRT, 1000GRT according to the study of natural conditions in the Indonesian Sea Area and the traffic demand in 2010. The principle dimensions and characteristics such as length over all, breadth molded speed were determined referring to the existing ferry boats and the ferry boats under construction in Indonesia.

In connection with allocation of the optimum type of ferry boat in each

route two fundamental criteria are adopted: the natural conditions and traffic demand of the route. From the above mentioned two factors, it was concluded that a larger type of ferryboat should be allocated as far as it is practical.

5. 25 terminal sites were selected for the nine study routes. Most of the terminals selected seem not to require breakwaters although further detailed survey will be necessary at some terminal sites such as Mokmer, Saubeba, Pulemo and Muntok.

In Indonesia, there exist three types of rolling-on system at mooring facilities, that is, movable bridge type, pontoon type and fixed type. Based on the sea condition (tidal range) at terminal sites, the movable bridge type is adopted for design.

Since the existing rolling-on system in Routes 1 and 8 is a fixed type, new mooring facilities with a movable bridge type are planned. The existing facilities can be utilized to cope with the increase of demand of passengers/cargo further in future with the reinforcements. According to the demand forecast and the ferry operation plan, one berth is sufficient for mooring facilities in each ferry terminal even in 2010.

6. The land for the construction of a new terminal on the standard design is prepared by readjustment of natural beach neighboring to the planned mooring facilities as much as possible to make the construction cost minimum. However if it is impossible, land for terminal is prepared by reclamation.

Parking lots should have sufficient area not only for vehicles ready for loading but also for vehicles (for example mini-bus) waiting for arriving passengers.

A causeway and/or a trestle are constructed from on-land terminal until the water depth needed for accommodation of ferry, at the tip of which mooring facilities with mooring dolphin and breasting dolphin are planned. A concrete top with pile foundation is designed as breasting /mooring dolphins.

The typical layouts of terminals for each route have been prepared. These layouts should be modified in accordance with the actual topographic and hydrographic situation of each terminal site.

7. The project cost of each proposed ferry route consists of the construction cost of the new ferry terminal facilities, the rehabilitation cost of the existing facilities and the procurement cost of new ferry boats to be introduced on the

planned routes.

The basic costs of the works and unit prices of materials and laborers for the construction of ferry terminals are taken from the latest applied contract prices in the relevant provincial government. The procurement cost of new ferry boats is estimated based on the construction cost of the ferry boats under construction in Indonesia.

8. Four ferry routes for Feasibility Study were selected for the Master Plan study routes(although there are nine routes according to the Master Plan, the actual number of routes is thirteen).

The selected evaluation items are 1) ferry transportation demand (passengers/cargoes), 2) project scale, 3) development efficiency(ratio of "development cost per one passenger" /ratio of "development cost per one tonnage of cargo"), 4) necessity of reinforcement/improvement of the existing sea transportation services, 5) others(item to judge regional balance of ferry service network development).

Feasibility Study routes were selected from Alternative A from the viewpoint of the profitability of ferry service and because three of the selected four routes are located in the Eastern Area. The four selected routes are as follows:(See Table 8-1)

Route 2-1(Mokmer-Saubeba)

Route 3-1(Larantura-Terong-Lewoleba)

Route 8 (Bajoe-Kolaka)

Route 9-1(Palembang-Muntok)

Feasibility Study

9. Based on the Master Plan up to the year of 2010, ferry terminal facilities are developed step by step according to the increase of passenger/cargo demand.

Route 3-1 is extended further to the east in the future and the sea condition(waves and tidal current) becomes severe, which requires the introduction of larger ferry boats(500GRT) although 300GRT ferry boats are planned to be introduced in this route in the Short-Term Plan. Therefore, an on-land ferry terminal(passenger terminal, parking lots) is designed for 300GRT ferry boat in Short Term Plan. Mooring facilities are designed for 500GRT considering the construction cost of mooring facilities including long-term plan

and the difficulty of ferry operation using the mooring facilities to be improved during the improvement work.

Any enlargement of facilities in the other three routes is not required up to 2010 because the maximum size of ferry boat to be introduced in 2010 is the same as that in 1998.

10. In order to obtain the present natural condition on Feasibility Study eight ferry terminal, the topographic and hydrographic survey, the tide and current observations and soil investigation were carried out. The subsoil in Terong site consists of very dense sandy gravel and gravelly sand. Pile foundation type mooring facilities are difficult to be installed, thus gravity type foundation is designed.

In Mokmer, Saubeba and Muntok, the construction of breakwaters is required to protect berthing area judging from the topographic and sea conditions. Waves in these sites were hindcasted from wind data. The following design waves have been determined for each terminal sites.

	Wave Height	Wave Period	Wave Direction
Site	(H $\frac{1}{8}$)	(T $\frac{1}{8}$)	
Mokmer	3.0 m	4.8 sec.	WSW
Saubeba	3.0 m	4.2 sec.	W
Muntok	1.0 m	4.0 sec.	SSE

11. Ferry operation plans for the four study route in 1998 were made as follows:

- 1) Route 2-1(Mokmer-Saubeba) one round trip/day with 300GRT ferry

One round trip/day is enough to meet the demand for Short-Term Plan and it is necessary to forecast accurately the daily cargoes/passengers movement between the two islands to decide the departure port in the morning.

- 2) Route 3-1(Larantuka-Terong-Lewoleba) one round trip/day, 300GRT

Although the ferry service on this route has been operated as an extended part of the route from Kupang to Larantuka, in this Study ferry boats are operated between Larantuka-Lewoleba as one route.

- 3) Route 8(Bajoe-Kolaka)

According to the estimated traffic demand in 1998, the required service frequency by 1000GRT ferry boat is three round trips a day. The

present transporting capacity with five ferry boats under service is insufficient to meet the demand in 1998 and a 1000GRT ferry boat should be introduced on this route at a frequency of one round trip a day.

4) Route 9-1(Palembang-Muntok)

Although daily one round trip service will be maintained on this route by the two existing ferry boats, their full transporting capacity is insufficient in 1998 and a 500GRT ferry boat is additionally introduced.

12. Main large-scale construction works of the ferry terminals are as follows:

Construction of breakwater: Mokmer, Saubeba(rubble mound type)
Muntok(curtain wall type)

Reclamation work for passenger terminal and parking lots:

Bajoe(on the shoal 3km far from the coast), about 20,000m²

Kolaka(in front of the existing terminal), about 20,000m²

Dredging work:Mokmer(mooring basin etc.), about 5,000m²

Bajoe(mooring basin, access channel), about 65,000m²

New mooring facilities for 500GRT ferry boat at existing Palembang terminal are planned and a new passenger terminal is constructed in the present terminal area. As the existing parking area is insufficient even for Short-Term Plan, the parking lot is enlarged.

On-land terminals at Mokmer, Saubeba, Terong and Lewoleba are planned between the existing public road and the coast.

(Layout of each ferry terminal is shown in Fig.5.1-5.8)

13. The construction costs of feasibility Study routes are as follows:

Route	x Million Rupiah
Mokmer-Saubeba	10,900
Terong-Lewoleba ¹⁾	14,600
Bajoe-Kolaka	26,700
Palembang-Muntok	19,900

1)The existing terminal facilities in Larantuka can be used at least up to 2010.

The total construction cost of the planned route for the Feasibility Study comprises 1)direct construction cost, 2)consulting cost of the engineering services including soil investigation etc., detailed design and construction supervisory services, 3)physical contingency for the construction works and 4) value added tax for the contract.

The implementation period of the construction of each route is estimated to be three years. 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. The construction works of each route will be started at the same time by one packaged contract after one year of above engineering study and tender procedure, and will be completed in 24 months.

14. Assessment on the effect of the projects on the surrounding environment is conducted on following environmental impacts and environmental factors.

- 1) Effect on water quality in the sea area by Cat. 1 and 2
- 2) Effect on topography by Cat. 2
- 3) Effect on animals/plants by Cat. 1 and 2
- 4) Effect on landscape by Cat. 2
- 5) Effect on socio-economics by Cat. 3
- 6) Others

Cat.1:Effect of the construction works of the ferry terminals

Cat.2:Effect of the existence of ferry terminals

Cat.3:Effect of the operation of ferry service

The assessment was conducted qualitatively and judging from project scale, topographic conditions of the terminal sites and the layout of the terminals, the effect on surrounding environment is estimated to be negligible. However, an appropriate monitoring system may be required during the dredging and reclamation works and the work procedure may be modified.

15. The economic benefits derived from implementation of the development /improvement of ferry terminals and ferry operation plans including the introduction of the proposed ferry boats are analyzed. In this economic analysis, the ferry users' benefits of travel time cost saving(for passengers) and vehicle operating cost are treated as the quantified economic benefits.

The results of the economic analysis are as follows:

Route	EIRR
Route 2-1	12.3%
Route 3-1	2.6%
Route 8	16.0%
Route 9-1	10.9%

These results indicate that implementations of the development of Route 2-1, 8 and 9-1 are economically feasible. The economic analysis result of Route 3-1 in terms of quantified benefits is unfavorable. However, taking the following enormous unquantified effects specifically expected for the related regions into consideration, development of Route 3-1 is also worthy of implementation.

- 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.
- 2) Improvement effect of the unfavorable transportation condition of passengers bringing large volumes of cargo by hand.
- 3) Improvement effect of increase of safety of sea transportation between Terong-Lewoleba which is affected by strong current.
- 4) Incentive effects for tourism sector development of Adonara and Lomblen Islands by shortening of access time.
- 5) Incentive effects for increased medical and educational opportunities for people in Adonara and Lomblen Islands.
- 6) Incentive effects for development of a trunk traffic corridor throughout the whole Flores Islands area.
- 7) Incentive effects for long-term increase of welfare of the people living in the related area.

16. 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.

75% of the construction costs is 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

Repayment: fixed amount repayment of principal

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.

For the estimation of port charge, the tariffs are assumed to increase by two thirds the increase of GDP per capita in Indonesia every five years. Judging from the analysis, the project can be regarded as financially feasible if the port charge is increased by 15% every five years from the current tariff.

II. Recommendations

(1) Nationwide Ferry Network Plan

17. DGLT has formulated the nationwide ferry network plan which was authorized by Directorate General of Land Transport and Inland Waterways in November, 1992. This is really an ambitious plan in that it aims ultimately to cover the whole nation with nearly two hundred ferry routes.

Setting aside relatively short-distance ferry routes serving small islands around major islands and/or connecting small islands with each other, long haul routes connecting major islands for example have a lot of uncertain factors in their viability. Therefore, it is recommended to launch necessary studies without any delay on demand projection, comparison analyses with other transportation means and so on, taking the regional development plan into consideration.

18. It will be helpful to establish suitable criteria for classification of ferry routes in determining development priority and allocation of government investment. In this study, ferry routes were classified by accessibility to provincial capital, demand level or geographical characteristics.

(2) Establishing safe operation system of ferry service

19. Based on experience it is recommendable to take possible certain steps as soon as possible such as the comprehensive operation supervision, the modernization of facilities concerned and the training of a capable task force including crew to ensure the highest degree of safety and create a promising ferry service.

(3) On Detailed Design of the Ferry Terminal Facilities of the Feasibility Study

20. The ferry terminal preliminary design for the Feasibility Study routes was conducted using the results of the natural condition surveys executed in November of 1992. Based on the obtained soil condition under sea bottom in Terong, concrete caisson type is applied for breasting & mooring dolphins.

However at the neighboring sea port, steel pile type was applied for the mooring facilities. This shows that the soil condition under sea bottom around the area might be undulated and complicated. Therefore more detailed surveys on soil condition are recommended for the detailed design of the mooring facilities in Terong terminal.

(4) Appropriate Allocation of Budget for Maintenance of the Facilities

21. Rusted steel structures and cracks of reinforced concrete structures were often seen during site surveys. And it was observed that some navigation aids have been damaged or are missing. In general, present budgets allocated for maintenance seems to be too small. More funds should be allocated for maintaining terminal facilities and navigation aids.

22. Quick and continuous repairs are important for ordinary operations. This is useful for providing passengers with more comfort and minimizing the total terminal operation costs in future and also for maintaining safe ferry operation.

(5) Preservation of Statistical Data on Passengers, Vehicles and Cargoes in Appropriate Form for Future Use

23. Statistical data related to ferry traffic activities should be collected continuously for a long period of time. These present and past data are indispensable for drafting improvement plans and development plans. Data should be prepared in an appropriate form to conduct future demand forecasting, especially for cargoes. Information on vehicles should be divided into two categories, one for transporting cargoes, the other for transporting passengers. Periodical O-D surveys on existing ferry route will provide useful information not only for the improvement plan of the related ferry terminal but also for the development plan of a new ferry terminal under similar conditions.

(6) Appropriate Environmental Monitoring in the Development of Ferry Route

24. The environmental assessment is conducted qualitatively in the Study. In general the impact of the development plan of the four ferry routes on the surrounding environment is estimated to be very small based on the topographic and hydrographic conditions of the ferry terminal sites, the ferry operation plans, the layouts of ferry terminal and construction method of ferry terminals. It will be necessary, however, to introduce appropriate systems to monitor the water quality in the related sea area when executing dredging and reclaiming works and work procedures may be modified, if necessary.

INTRODUCTION



Walpirit Terminal

INTRODUCTION

1. General

1. In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Development Study on the Nationwide Ferry Service Routes in the Republic of Indonesia (hereinafter referred to as "the Study").

2. In accordance with the relevant laws and regulations in force in Japan, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, undertook the Study in close cooperation with the Directorate General of Land Transport and Inland Waterways, Ministry of Communications (hereinafter referred to as DGLT) on behalf of the Government of the Republic of Indonesia.

2. Background

3. The Indonesian archipelago of 14,000 islands stretches over a distance of some 5,100 km, affording the marine sector an important role in the domestic transportation system.

4. The recent national economic growth of the country is notable and on the whole has helped improve the national welfare; however, it has created larger gaps of economic disparity between some advanced regions and other local regions of the country. So, as one of the main policy issues, the Government now seeks to further develop the national transportation system not only to face the growing transportation demand but also to improve regional economic disparity.

5. The Indonesian Government has been developing a nationwide ferry service as a principal transportation infrastructure of the country. At present, there are 35 ferry service routes with 75 ships which handle 70% of the passenger traffic between the islands and 40% of the cargo traffic.

6. However, the present ferry services are not sufficient to meet the demand and there are other problems that remain to be solved. Steadier, safer, more comfortable, and more frequent ferry services need to be provided. The introduction of a new ferry route to serve as the principal means of transportation for the people concerned is also strongly recommended.

3. Objectives

(1) The objectives of the Study

7. 1) To conduct a master plan study on the nationwide ferry service routes
- 2) To conduct a feasibility study on the Short-term Development Plan of selected ferry routes.

(2) Ferry routes for the Master Plan

8. The ferry routes proposed for the formulation of the Master Plan are as follows :

1. Ambon - Seram
2. Biak - Yapen - Irian Jaya
3. Flores - Alor
4. South East Sulawesi - West Kabaena
5. East Kabaena - Muna
6. Kendari - Wawonii
7. Morotai - Halmahera
8. South Sulawesi - South East Sulawesi
9. South Sumatera - Bangka - Belitung

4. Scope of the Study

(1) Analysis of the Existing Data and Information

9. Collection and analysis of all the relevant data and information related to the Study on socioeconomic features, natural conditions, engineering data, present

ferry service system and the public and private sector development plans.

(2) Field Survey

10. Field survey at ferry ports, terminals, access roads and other related facilities.

(3) Establishing Socioeconomic Framework

11. 1) Analysis of the national and regional socioeconomic features
- 2) Establishing the socioeconomic framework for the year 2000

(4) Demand Forecast

12. 1) Analysis of the existing Origin-Destination data
- 2) Forecast of the ferry traffic demand by cargo and passenger up to the year 2010

(5) Formulation of Master Plan

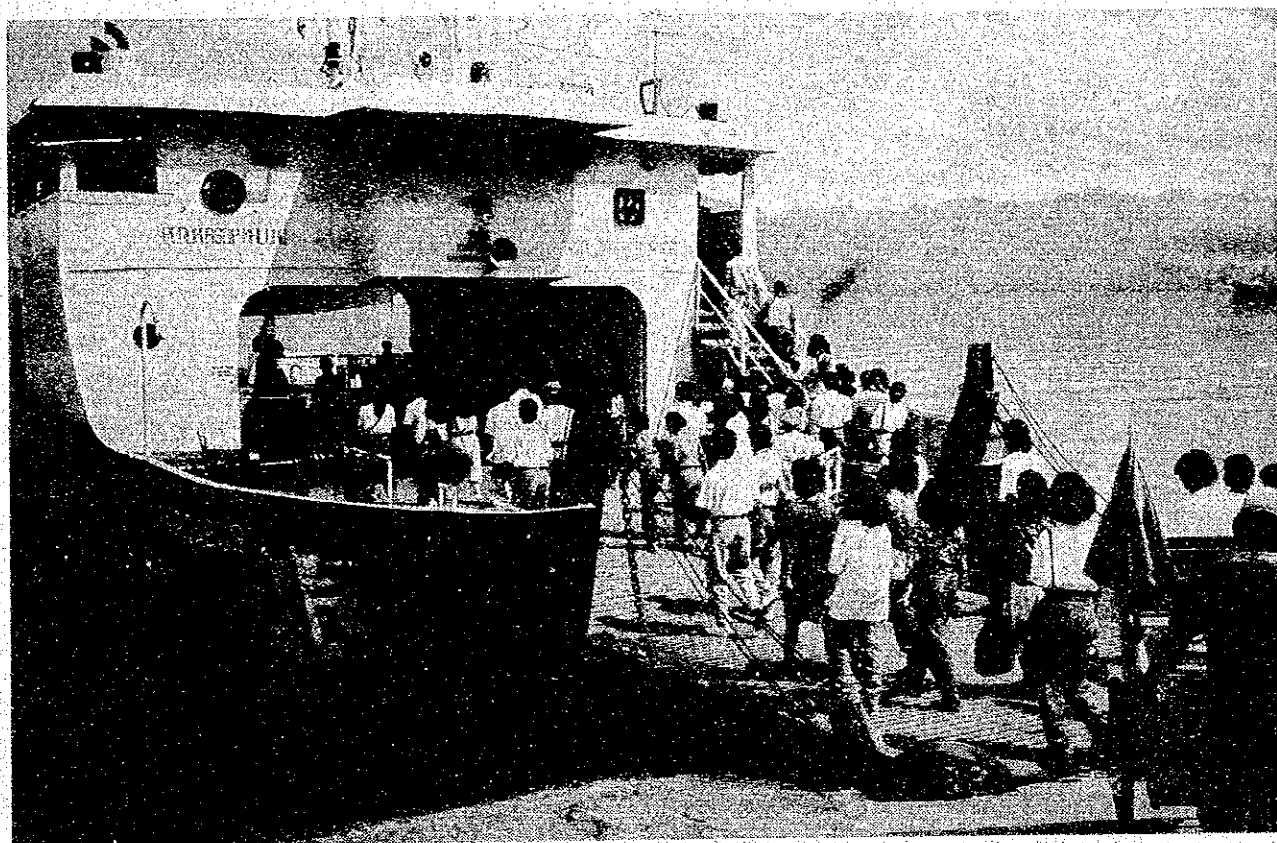
13. 1) Preparation of the basic concept of the ferry network
- 2) Preparation of the basic ferry operation plan
- 3) Preparation of ferry terminal development plans
- 4) Prioritization of the ferry routes for the Short-term Development Plan

(6) Feasibility Study on the Short-term Development Plan

14. 1) Engineering survey on the natural conditions by sounding, boring, current estimation, wave estimation, etc. at each selected terminal area, if necessary
- 2) Preparation of the ferry operation plan on each route
- 3) Layout plan, preliminary design and cost estimation for the ferry terminals and related facilities
- 4) Implementation program at each route
- 5) Economic and financial analysis at each route
- 6) Recommendations on the ferry terminal management system

PART 1

PRESENT SITUATION OF FERRY TRANSPORTATION IN INDONESIA



Scene of Embarkation

Chapter 1 Ferry Transportation System and Activities

1-1 General

1. Ferry transportation plays an important role in archipelagic countries like Indonesia. The Indonesian government defines ferry services as follows.
 - a. A ferry is a floating bridge.
 - b. Ferry activities consist of carrying passengers and cargoes across a river or body of water.
 - c. Ferry activities have fixed routes and regular schedules.
 - d. A ferry vessel is a special form of vessel.

1-2 Organizations Responsible for Administering Ferry Transportation

(1) Ministry of Communications

2. In Indonesia, the transportation of cargoes and passengers is supervised by the Ministry of Communications.
3. The Ministry of Communications has three directorate generals corresponding to the three means of transportation, namely, Directorate General of Land Transport & Inland Waterways(DGLT), Directorate General of Sea Communications(DGSC) and Directorate General of Air Communications(See Fig. 1-1).
4. Major functions of government in ferry port development are as follows:
 - a. Establishing the national ferry port policy
 - b. Review and coordination of ferry port planning
 - c. Financing ferry port development
 - d. Undertaking port construction
 - e. Establishment of technical standards
 - f. Investigation of natural conditions
5. DGLT has the central responsibility for ferry route administration at the national level. In addition, the Ministry of Communications has 27 regional

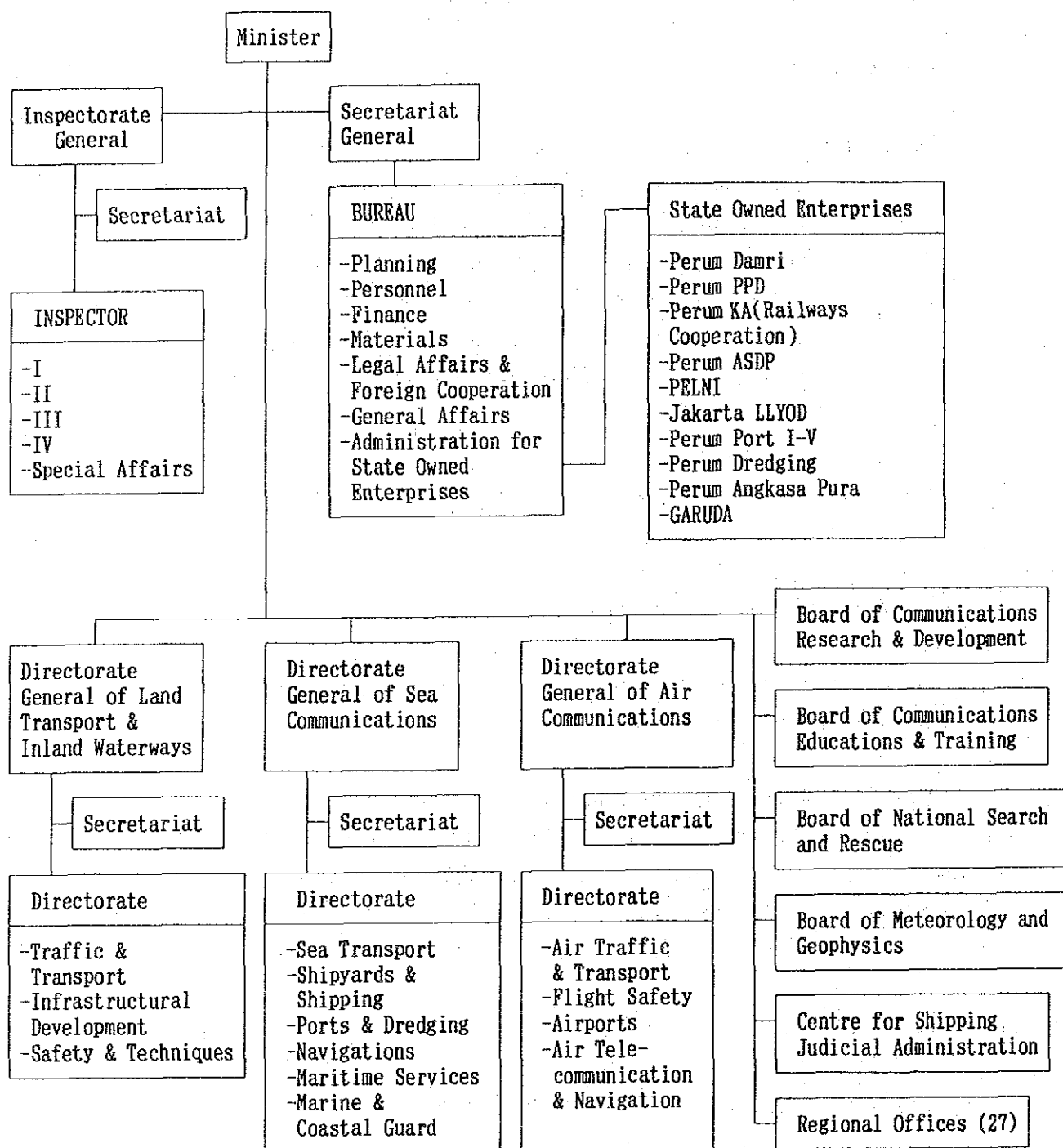


Fig. 1-1 Organization Chart of Ministry of Communications

offices. Regional office Heads are responsible for ferry port development at the regional level.

**(2) Directorate General of Land Transport and Inland Waterways
(DGLT)**

6. DGLT is composed of the Secretary of the Directorate General and three directorates, the Directorate of Traffic and Transportation, Directorate of Infrastructural System Development and Directorate of Safety and Technique.

7. Before DGLT's reorganization in 1989, there was an integrated directorate to supervise ferry transportation. The present organization has been divided into three directorates, each with their respective function.

**1-3 Organizations Responsible for Management/Operation of
Ferry Transportation**

(1) General

8. Concerning the operation of ferry transportation, shipping is managed and operated by the Perum ASDP or private companies; ferry terminals are managed by terminal offices of either MOC or the Perum ASDP.

9. The Perum ASDP operates not only benefit lines but also non-benefit lines. Benefit lines are called commercial lines and non-benefit lines are called pioneer lines.

(2) The Perum ASDP

10. The Perum ASDP is managed by four directors, all of whom are members of the board of directors. These directors are sent from the government.

11. There are 19 shipping branches under the Board of Directors.

12. At present, the Perum ASDP manages and operates 10 terminals in five lines, but the number of terminal branches is seven.

13. The maintenance and rehabilitation of facilities are executed by the Perum ASDP, but new ships and new terminals are prepared by the government.

14. Shipping tariff and terminal tariff are all decided by the government. Shipping tariff is valid for the Perum ASDP and private companies with the same rates, and it can vary according to the route.

15. Operating and working ratios are usually used to indicate the financial efficiency of the management body. Those of the Perum ASDP indicate 89% and 78% respectively in 1991.

(3) Private Companies

16. At present, fifteen private companies are operating ferry services in twelve routes. And, private companies operate in two routes exclusively.

17. The private companies mainly operate on commercial lines. A private company must obtain a business permit and an operation permit from the Minister of Communications.

(4) Terminal Office of Ministry of Communications

18. A terminal office is supervised by a head of regional office of MOC. A head of terminal office is responsible for daily management such as operating and maintenance of terminal facilities.

19. Expenses exceed revenues in all terminal offices. Regarding the Ratios of expenses and revenues, the biggest ratio is 42.5 in Cilacap office, and the smallest one is 1.2 in Panajam office.

20. The Indonesian government allocates a lot of funds to develop and operate ferry services to improve quality of life on isolated islands. The

government maintains the cheaper rates for ferry terminals to achieve its purpose. In other words, the government supports the operations of shipping companies. That is the policy of the Indonesian government.

1-4 Present Situation of Ferry Transportation Activity

21. There were 35 Ferry routes in operation as of 1990, as shown in Fig. 1-2 and Table 1-1. The longest route is Kupang - Kalabahi route, which has a distance of 137 miles.

22. Concerning the cargo volume by commodity transported by ferry, the top-ranked ferry cargo is livestock and raw food material, accounting for 23% of all the cargoes(1988). The second-ranked cargo is general cargo with a share of 17%, and the third is food, drink, and raw material of cigarette with a share of 16%.

23. The seasonal(monthly) variations of the passenger traffic in 1990 are studied on the Merak-Bakauheni route and four study routes. The peaks of traffic are in "Lebaran" month(April), June, July and during Christmas and the New Year season on almost every route. Of the above five routes, the highest peak ratio of 1.98 is seen on Pankalbalam-Tanjung Pandang route.

24. Based on the O-D survey conducted by MOC in 1988, ferry O-D of passengers and cargoes are analyzed in more detail for study routes and some other routes. The purpose of this analysis is to determine the hinterland of the ferry passengers and cargoes.

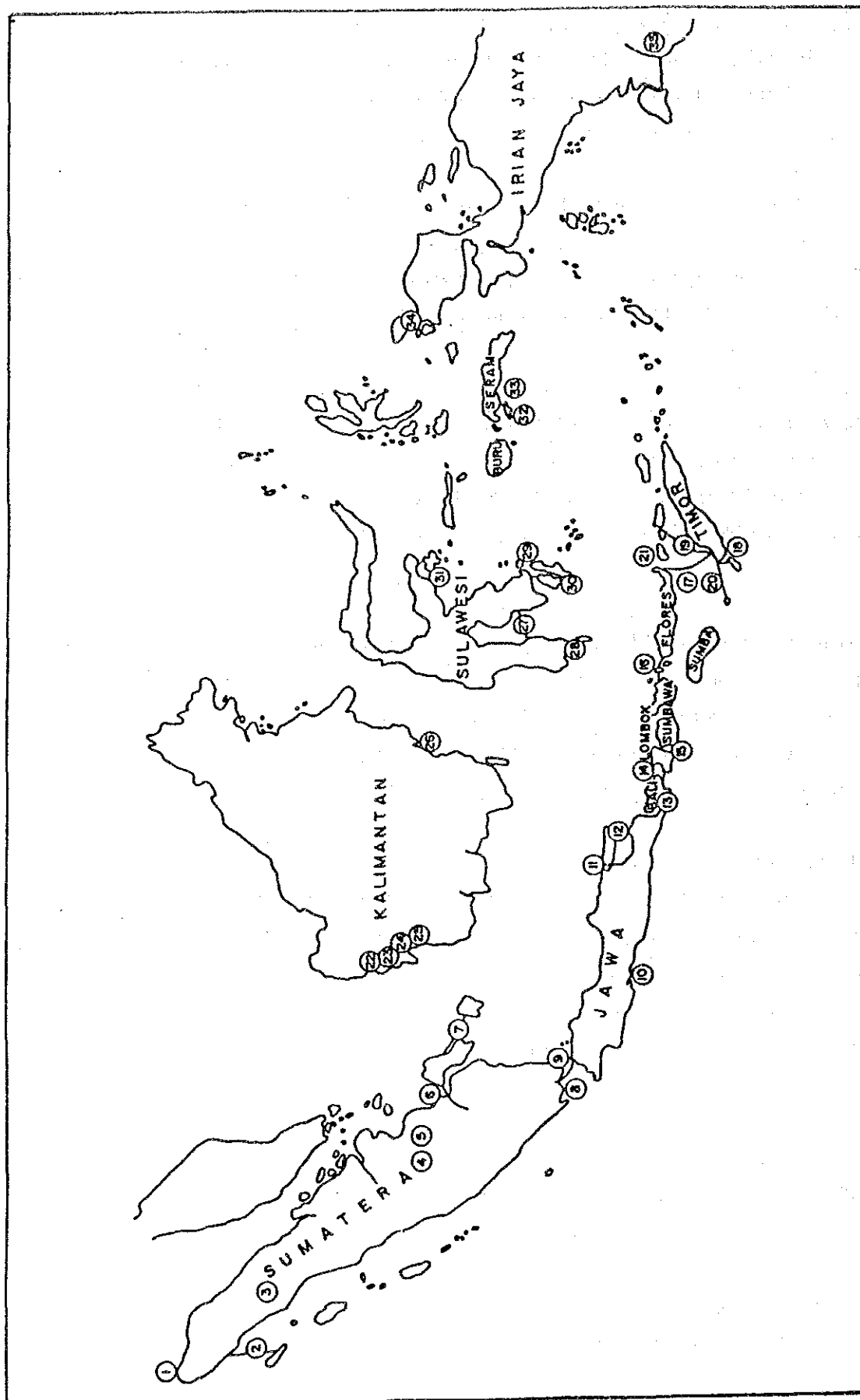


Fig. 1-2 Ferry Route in Indonesia (In Operation 1990)

Table 1-1 Ferry Transportation Volume in 1990

Route	Distance Mile	Trip/Day	Passen. 1,000	Cargo 1,000	Veh. -4 1,000	Veh. -2 1,000
1 Saban-Malahayati	15.0	2.00	85	8	3	5
2 Melaboh-Sinabang	101.0	0.57	22	2	0	0
3 Ajibata-Tomok	3.0	10.00	326	22	29	8
4 Jambi City						
5 Jambi-Kualatungkal			30	14	4	0
6 Palembang-Kayuarang	83.0	2.00	81	2	2	1
7 Banka-Belitung	110.0	0.57	28	1	0	0
8 Merak-Panjang						
9 Merak-Bakauheni	15.0	56.00	8,337	3,183	936	11
10 Cilacap-Kalipucang	35.0	6.00	150	0	0	0
11 Ujung-Kamal	2.5	216.00	13,105	992	1,065	993
12 Jankar-Kalianget	40.0	2.00	56	6	2	3
13 Ketapang-Gilimanuk	4.0	108.00	2,692	1,890	658	67
14 Padangbai-Lember	34.0	6.00	655	97	48	11
15 Lombok-Tano	11.0	4.00	286	15	11	3
16 Sape-Komodo-Labuh	54.0	1.00	24	1	0	0
17 Kupang-Larantuka	120.0	0.57	46	1	1	0
18 Kupang-Rote	40.0	1.14	71	1	3	0
19 Kupang-Kalabahi	137.0	0.57	12	1	0	0
20 Kupang-Sabu	115.0	0.29	9	1	0	0
21 Lar.-Waiw.-Lewol.	30.0	0.57	9	0	0	0
22 Pontianak City			512	0	200	416
23 Kartiasa River Cr.	0.5	30.00	182	3	19	53
24 Semuntai River Cr.	0.5	20.00	232	18	26	10
25 Sekura River Cr.	0.5	20.00	60	1	9	24
26 Penajam-Balikpapan	8.0	10.00	152	15	33	12
27 Bajoe-Kolaka	96.0	4.00	264	36	12	2
28 Bira-Pamatata	17.0	2.00	38	2	3	2
29 Toroburu-Tampo	20.0	2.00	31	2	3	1
30 Baubau-Wara	6.0	3.00	9	0	0	0
31 Luwuk-Sabang-Salakan	46.0	1.00	9	1	0	0
32 Poka-Galala	0.5	100.00	3,788	5	559	311
33 Hunimua-Waipirit	11.0	8.00	274	7	14	8
34 Sorong-Jeffman	15.0	4.00	40	1	0	0
35 Merauke-Bupul			7	0	0	0
Total			31,625	6,330	3,642	1,942

*Source: DGLT

Note:1. Veh.-4: Four-Wheeled Vehicle

2: Veh.-2: Two-Wheeled Vehicle

Chapter 2 Present Situation of Ferry Network Development Areas

2-1 Ambon - Seram Route

2-1-1 Socioeconomic Features

1. This route is in Maluku Province. Maluku Province consists of 4 Kabupatens and kot.Ambon. Proposed sites are located in Ambon island and Seram island of Kabupaten Maluku Tengah.

The source for Chapter 2 comes from "Dalam Angka 1990".

(1) Population

2. The Population in Maluku Province was 1,857,970, consisting of 946,868 men and 910,922 women. The rate of population growth during 1980-1990 was 31.68% or an average of 2.88% per year, the growth rate during 1989-1990 was 2.43%.

3. The census taken at the end of 1990 showed that the population in Kabupaten Maluku Tengah was 591,066, consisting of 302,174 men and 288,892 women. Kot.Ambon is the bustling commercial and administrative hub of Maluku with 276,280 inhabitants. The number of people in Ambon island was 367,790 and increased at 112.7% during 1987-1990.

In Seram island, about 315,000 people in Seram population concentrated in the west and almost entirely along the coasts.

(2) Industry

4. Most people in Maluku Province live on fishing and agricultural products such as vegetables, bananas, yams, cassava and sweet potatoes.

In the area of agriculture, Maluku area is known for its production of spices such as clove, nutmeg, and dried-coconut. The development commodity is cacao and coffee.

5. In the sector of Plantation Crops, coconut, clove, nutmeg, coffee and cashew are the main commodities.

In the sector of Forestry, Seram island has the widest area, of 1,985,877.60 ha.

In the sector of Fishery, Kabupaten Maluku Tengah has a potential fishery. This can be seen from the varied fishery business operated in this area which exploit the sea sources in order to gain foreign exchange and to increase the income of the Kabupaten and to improve the income of the fishermen.

(3) Gross Regional Domestic Product (GRDP)

6. The GRDP in Maluku Province in 1989 based on current prices was 1,332,560,946 thousand rupiah.

At constant 1983 prices, the GRDP of 1989 increased to 162.61% compared with that of 1983. The rate of development in previous years in Maluku Province were as follows : 7.33% in 1988 and 17.92% in 1989. The biggest contributor to GRDP is the sector of agriculture. The percentage of the sector of agriculture was as follows: 43.05% in 1987, 41% in 1988, 36.22% in 1989.

7. In Kabupaten Maluku Tengah, GRDP in 1989 based on the current prices was 312,839,274 thousand rupiah.

In 1989, based on the constant 1983 prices which was 194,942,000 thousand rupiah. The rate of development in the previous years in Kabupaten Maluku Tengah was as follows: 5.12% in 1989, 7.33% in 1988 and 13.56% in 1987.

The biggest contributor to GRDP is the sector of agriculture. The percentage of the sector of agriculture was as followed: 46.61% in 1986, 43.05% in 1987, 41% in 1988, 40.50% in 1989.

(4) Road Conditions and Number of Vehicles

8. Maluku Province has three types of roads, state road, provincial road and kabupaten road, their respective lengths are 395.07 km, 1,186.44 km and 2,580.00 km. Concerning the road surface 2,078.41 km or 49.49% is asphalt, 1,100.11 km or 26.44% is gravel, 770.16 km or 18.51% is earth.

9. Road length in Kabupaten Maluku Tengah (1990) is 789.5 km. Compared with 1989 when road length was 715.5 km. Concerning the road surface, asphalt covers 462.5 km or 58.58%, which is an increase of 107.68% over to 1989(429.5 km) and gravel covers 327 km or 41.42%. In Kotamadya Ambon (1990), road length is 232.17 km. In terms of road surface, asphalt covers 182.75 km(78.71%).

10. The number of vehicles in 1990 in this province is 25,984, composed of 3,949 passenger cars, 5,245 trucks, and 16,800 motorcycles. The number of the vehicle in 1990 compared to 1989 decreased by 42.18% or from 44,943 in 1989 to 25,984 in 1990. In Kabupaten Maluku Tengah total number of cars is 1,843, that is 25 passenger cars, 519 trucks and 1,299 motorcycles.

2-1-2 Transportation Activities

(1) Air Transportation

11. Based on Air Transport Statistics(1990), traffic volume handled at Ambon are as follows;

Passenger	Departure	72,024	Cargo	Loaded	588,646 kg
	Arrival	57,547		Unloaded	856,990
	Transit	36,019			

About 60% of departure or 42,745 passengers went to Ujung Pandang and 5,111 passengers went to Biak. Concerning arrival, 14,219 passengers came from Sorong, 13,603 from Ujung Pandang and 6,395 from Ternate.

(2) Sea Transportation

1) Ferry Transportation

12. The ferry service between Ambon Island and Seram Island is operated both by the Perum ASDP with a 142 GRT ferry and a private operator with a 193 GRT ferry.

13. The daily frequency at present is 6 round trips. (It takes about 70 minutes for a trip of 11 miles at a speed of 10 knots.)

14. "Loading-Factors" of passengers and vehicles at present are 53% and 29%. Concerning the passenger volume, the variation ratio of each month, which is the ratio of the monthly volume to the annual average volume is calculated at 0.82 to 1.13.

2) Conventional Transportation

15. On the Tulehu-Amahai route, six small boats are in operation and four small boats are in operation on the Tulehu-Tehoru route. The capacities of the boats are 50-100 passengers. The frequency of service is 6 rounds/day on the former route and 4 rounds/day on the latter.

2-2 Biak - Yapen - Irian Jaya Route

2-2-1 Socioeconomic Features

16. This route is in Irian Jaya Province. Irian Jaya Province consists of 9 Kabupatens and Kot. Jayapura. Proposed sites are located in Biak island of Kabupaten Biak Numfor, in Yapen island of Kabupaten Yapen Waropen and at Nabire in Kabupaten Paniai respectively.

(1) Population

17. The population of Irian Jaya in 1989 was 1,591,830 people consisting of 816,913 men and 774,917 women with an average density rate at 3.84 people per km².

18. The average annual rate of population growth is 1.78% during 1986-1989 and 2.11% during 1988-1989. Compared with the national population growth in the same period - 1.86% /year, the population growth rate of Irian Jaya was quite high.

19. The population in Kabupaten Biak Numfor in 1990 was 90,904 people and the average density was 29.0 people per km². The rate of population growth during 1986-1990 was 10.29% per year and 3.71% during 1989-1990. Biak Kota has the greatest share in population distribution(53.68%). The population in Biak island in 1990 was 75,343 people and the average density was 34.1 people per km². The rate of population growth during 1986-1990 was 12.43% per year and 5.02% during 1989-1990.

20. The population in Kabupaten Yapen Waropen in 1990 was 67,129 people

and average density was 3.5 people per km². The population growth from 1986-1990 was 13.02% per year and 8.84% during 1989-1990. The population in Yapen island in 1990 was 50,766 and the density average was 24.8 people per km². The population growth during 1986-1990 was 14.33% per year and 10.55% during 1989-1990.

21. The population in Kabupaten Paniai in 1990 was 223,337 people and the average density was 4.9 people per km². The population growth during 1986-1990 was 4.5% per year. During 1989-1990, that decreased to 0.84% or 1,891 people. Nabire had the largest population (17%, 38,411 people) in this Kabupaten.

(2) Industry

22. In agriculture, the main commodities of Irian Jaya are cassava, taro, sweet potato. Rice, corn, taro, nut, green bean, and vegetables are also grown. In 1989 production was highest in sweet potato (348,108 tons) which increased by 117.30% compared with 1988.

In the plantation sector, coconut, nutmeg, cacao, coffee, clove and rubber are the main commodities. Coconut is the prominent plant. The volume of coconut harvested was 10,245 tons in 1989, an increase of 257.41% over 1985 (3,980 tons).

(3) Gross Regional Domestic Product (GRDP)

23. The GRDP in Irian Jaya Province in 1989 at current prices was 2,046,693.24 million rupiah.

At constant 1983 prices, the GRDP of 1989 increased to 133.56% compared with that of 1983. The mining sector accounted for the highest share of GRDP, 359,056.33 million rupiah or 31.55% and the second was the sector of agriculture (20.27%).

24. In Kabupaten Biak Numfor GRDP in 1990 at current prices was 106,480.47 million rupiah.

Based on the constant 1983 prices, the productivity of 1990 increased to 61.74% compared with that of 1983. The rate of development in the previous years was as follows: 12.62% in 1990, 27.38% in 1989, 13.57% in 1988 and 6.81% in 1987. The biggest contributor to GRDP was the sector of transportation and

communication. The percentage of the sector of transportation and communication was 26.80% in 1990 and next was the sector of agriculture which was 23.38%.

25. In Kabupaten Yapen Waropen, GRDP in 1990 based on the current prices was 44,249.72 million rupiah. The rate of growth of GRDP in previous years was as follows: 16.83% in 1990, 20.84% in 1989, 19.75% in 1988 and 6.49% in 1987. In 1989 based on the constant 1983 prices, the productivity of 1990 increased to 177.25% compared with that in 1983. The rate of development in the previous years in Kabupaten was as follows: 10.49% in 1990, 17.77% in 1989, 14.39% in 1988 and 6.05% in 1987. The biggest contributor to GRDP is the sector of government. The percentage of this sector was 41.86% and the sector of agriculture was 19.06%.

26. In Kabupaten Paniai GRDP in 1990 based on the current prices was 111,567.80 million rupiah.

In 1989 based on constant 1983 prices, the productivity in 1990 (67,280.75 million rupiah) increased by 138.51% compared with that of 1983. The rate of development in the previous years in Kabupaten was as follows: -0.78% in 1990 and 14.86% in 1989. The biggest contributor to GRDP is the sector of agriculture. The percentage of the sector of agriculture was 40.82%.

(4) Road Conditions and Number of Vehicles

27. The type and length of road in 1989 are as follows: state-road - 545 km, provincial road - 1,635.18 km, and kabupaten road - 2,837.44 km. Of the total road surface, 1,076.42 km or 21.06% is covered by asphalt, 1,773.97 km or 34.71% by gravel and 2,259.88 km or 44.22% by earth. Road length in Kabupaten Biak Numfor (1990) is 479.37 km. In 1990, road length in Kabupaten Paniai is 756.71 km. Concerning surface condition, 96.82 km (12.79 %) is asphalted road, 210.64 km (27.84 %) gravel road, 449.13 km (59.35 %) earth road and there is no data on other roads.

28. There were 44,082 vehicles in this province in 1984, 5,967 passenger cars, 4,036 mini-buses, 4,713 cargo-cars, and 29,366 motorcycles. Compared with 1988(36,946) the number of vehicles has increased at 119.31%.

2-2-2 Transportation Activities

(1) Air Transportation

29. Biak city is on the network of the international air flight service and the international networks are connected not only to the United States(Los Angeles) but also to several major European cities, such as Amsterdam, Frankfurt, London, Paris, etc.

30. According to the O-D survey conducted by MOC in 1988, the volume of passenger transported by airplane is as follows:

Kab.Biak Numfor - Kab.Yapen Waropen	5,659 persons/year
Kab.Biak Numfor - Kab.Paniai	2,105 persons/year
Kab.Yapen Waropen - Kab.Paniai	411 persons/year

31. Based on Air Transport Statistics(1990), traffic volume handled at Biak are as follows;

Passenger (Departure)	54,577	Cargo (Loaded)	1,078,748 kg
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About 26% of departure or 13,980 passengers went to Jayapura, 7,787 went to Ujung Pandang and 5,668 passengers went to Serui. At Nabire, 4,544 passengers came from Biak and 28 passengers from Serui.

(2) Sea Transportation

32. In the study area there are five liner ships in operation, of which four ships are designed for cargo transportation, but the 350DWT size ship, which belongs to the government ship operator "PELNI", also transports passengers. The sizes of these ships range from 100DWT to 350DWT, and the frequencies depend on their own service network, varying from one round/week to one round/month.

For passenger use, one 1,400DWT size ship with the capacity of 915 persons is operated by PELNI. The ship starts its journey from Jakarta, goes to Jayapura after visiting Biak, Serui and Nabire, and returns along the same course. It takes 4 weeks for one round trip.

2-3 Flores - Adonara - Lomblem - Pantara - Alor Route

2-3-1 Socioeconomic Features

33. This route is in East Nusa Tenggara Province. East Nusa Tenggara Province consists of 12 Kabupatens and Kot. Kupang. Proposed sites are located in Flores island of Kabupaten Flores Timur and in Alor island of Kabupaten Alor.

(1) Population

34. The population in East Nusa Tenggara according to the Population Census in 1990 was 3,268,644 while the growth of population was 1.79% per year (during the period of 1980 - 1990).

35. The population in Kabupaten Flores Timur was 265,759 consisting of 116,222 men and 149,537 women with an average density rate of 86.3 people per km². The population growth was -0.52% per year during 1986-1990 and -2.73% during 1989-1990.

36. The population in Kabupaten Alor was 144,629 consisting of 70,335 men and 74,294 women with an average density of 50.5 people per km². The population growth was 5.93% per year from 1986-1990 and 4.09% in 1989-1990. The population in Alor island was 110,585 consisting of 54,140 men and 56,445 women with an average density of 52.41 people per km². The population growth was 1.23% per year during 1986-1990 and 3.72% during 1989-1990.

(2) Industry

37. About 33.7% of the area is suitable for agriculture. Only 2.6% of the area is suitable for wet agriculture and the rest can be used for dry agriculture only. The main agricultural export commodities in East Nusa Tenggara such as coconut, coffee, chocolate, cotton and cashew nut contributed 80% to the export value of East Nusa Tenggara in 1990. It was the major source of income in the region and the source of state foreign exchange.

(3) Gross Regional Domestic Product

38. About 85% of the people of East Nusa Tenggara work in the agriculture sector. This sector has a very important role in the forming of the structure of GRDP of the East Nusa Tenggara. The contribution of this sector was 51.47% in 1990. In East Nusa Tenggara Province, GRDP in 1989 based on the current prices was 1,040,253,991 thousand rupiah. Based on the constant 1983 prices, the productivity of 1989 increased by 133.83%. The productivity of the years before compared with that of 1983 was 121.97% in 1987, 126.83% in 1988 and 133.83% in 1989.

39. Kabupaten Flores Timur's GRDP at current prices in 1989 was 70,552,782 thousand rupiah.

In 1989, based on the constant 1983 prices, it was 45,023,849 thousand rupiah. The productivity of 1989 increased by 120.18% compared with that of 1983. The productivity of the years before compared with that of 1983 was as follows: 110.69% in 1987, 115.64% in 1988 and 120.18% in 1989.

The economic activities in Kabupaten are varied but are dominated by the agriculture sector. In recent years, the rate of agriculture sector has been as follows: 1987 = 51.15%, 1988 = 51.18%, 1989 = 50.53%.

40. In Kabupaten, GRDP in 1989 based on the current prices was 52,091,176 thousand rupiah. In 1989, based on the constant prices, it was 34,222,055 thousand rupiah and the productivity of 1989 increased by 117.23% compared with that of 1983. The rate of development in the previous years in Kabupaten was 4.26% in 1989 and 3.91% in 1988. The biggest contributor to GRDP is the agriculture sector. The percentage of the sector of agriculture was as follows: 1987 = 57.44%, 1988 = 57.11%, 1989 = 56.74%.

(4) Road Conditions and Number of Vehicles

41. The type and length of road in 1990 are as follows: state-road - 1,173.78 km, provincial road - 1,889.90 km, and kabupaten road - 11,845.71 km. Concerning the road surface, 4,064.34 km or 27.38% is covered by asphalt, 3,552.01 km or 23.93% by gravel, 6,594.96 km or 44.42% by earth, and for 634.40 km or 4.27% no data exist.

42. Road length in Kabupaten Flores timur (1990) is 1,157.35 km. Compared with 1989 when road length was 978.50 km, it has increased by 18.28 %. In terms of road surface, 250.20 km or 21.62% is asphalted, 286.95 km or 24.79% is gravel and 620.20 km or 53.59% is earth.

43. Road length in Kabupaten Alor timur (1990) is 849.10 km. Compared with 1989 when the road length was 903.30 km, it has decreased by 6.00 %. In terms of road surface, 116.15 km or 13.68% is asphalted, 144.05 km or 16.97% is gravel and 588.90 km or 69.36% is earth.

44. There were 41,579 vehicles in this province in 1990, 1,216 passenger cars, 3,358 mini-buses, 6,560 trucks, 2,629 jeeps and 27,816 motorcycles. Compared with 1989 the number of vehicles has increased by 5.73% or from 39,325 in 1989 to 41,579 in 1990. In Kabupaten Flores Timur there were 984 vehicles. Motorcycles are the predominant type of vehicle (725 or 73.68%) followed by trucks (109 or 11.08%). There were only 17 passenger cars, 1.73% of the total vehicles. In Kabupaten Alor, there were 2,186 vehicles in 1990, 4 passenger cars, 87 mini-buses, 442 trucks, 60 jeeps and 1,593 motorcycles. Compared with 1989(2,276) the number of vehicles in 1990 has increased by 2.73%.

2-3-2 Transportation Activities

(1) Air Transportation

45. According to the O-D survey conducted by MOC in 1988, the volume of passenger transported by airplane is as follows.

Kab.Kupang - Kab.Alor	3,393 persons/year
Kab.Kupang - Kab.Flores	1,420 persons/year
Kab.Alor - Kab.Flores	no direct flight

46. Based on Air Transport Statistics(1990), traffic volume handled at Kalabahi and Larantuka are as follows;

- Kalabahi -

Passenger	Departure	2,645	Cargo	Loaded	6,898 kg
	Arrival	2,625		Unloaded	14,722

All departure passengers went to Kupang.

- Larantuka -

Passenger	Departure	199	Cargo	Loaded	360 kg
	Arrival	341		Unloaded	3,082
	Transit	105			

All departure passengers went to Kupang.

(2) Sea Transportation

1) Ferry Transportation

47. Between Flores Island and Alor Island, there is no complete ferry service network; service is only conducted along a short section between Larantuka, Waiwerang(Adonara Island), and Lewoleba(Lomblen Island). All of the ferry routes in the area concerned have been developed with Kupang serving as the base port.(The ferry service on the route between Larantuka and Lewoleba is operated as an extended part of the route from Kupang to Larantuka). Three boats have been operated for 5 routes. (Two boats are 328 GRT size and the other one is 223 GRT.) The frequency of the service for Kupang- Larantuka and Kupang-Kalabahi routes is 2 rounds/week.

48. As for the Kupang-Larantuka-Waiwerang-Lewoleba route, the average passenger volume in Kupang-Larantuka section is around 200 persons/trip, that in Waiwerang-Lewoleba section is 10 person/trip and is very low compared with the boat capacity.

2) Conventional Sea Transportation

49. There are three cargo-passenger liner boats in operation, of which two boats(500DWT) are operated by PELNI and the required times for one voyage is about 22 days.

50. Besides the liner services mentioned above, there are other transportation services by small boat. Between Kalabahi and Baranusa in Pantar Island, there are some small boats operated by the people. Some of these boats offer 2\$3 round trip service in a week, and transport about 50 passengers for each trip.

51. From Larantuka to Waiwerang in Adonara Island, and to Lewoleba in

Lomblen Island, there are four small boats for daily service. The passenger volume of each trip is about 50\$60 persons.

2-4 South East Sulawesi - West Kabaena Route

2-4-1 Socioeconomic Features

52. This route is in Southeast Sulawesi Province. South East Sulawesi Province consists of 4 Kabupatens and Kot. Kendari. Proposed sites are located in Kabupaten Buton.

(1) Population

53. According to the census in 1990, population in South East Sulawesi was 1,349,619. The population growth rate of South East Sulawesi during 1980-1990 was 3.94% per year, while during 1989-1990 it was 6.97%.

54. The population in Kabupaten Buton was 395,653, consisting of 191,894 men and 203,759 women with an average density rate of 61 people per km². The population growth rate was 7.66% during 1986-1990 and 3.12% during 1989-1990.

(2) Industry

55. Food production in this province consists of rice, rice from dry-plantation, corn, cassava, sweet potato, soybean, peanut and mung bean. The highest production in 1989 was cassava with about 214,376 tons over an area of about 18,801ha.

Plantation products in South East Sulawesi are coconut, coffee, cotton, pepper, nutmeg, clove, cashew fruit, tobacco, cacao, cotton, candlenut and sugar cane. Coconut, coffee, pepper, clove, cashew fruit and cacao have the potential to become export commodities. Coconut has the highest production volume.

56. In 1990 the production of corn, cassavas, sweet potatoes, peanuts and soybeans increased from the year before. On the other hand, the production of rice and mung beans decreased.

The decline in rice production is the result of smaller harvest area.

the fishery, production in 1990 increased to 50,658.2 tons (in 1990) from 31,574 tons (in 1989) or by 60.44%.

The forest area in Kabupaten Buton (1990) is estimated 590,808 ha or 91.41 % of land area in Kabupaten Buton.

(3) Gross Regional Domestic Product (GRDP)

57. From the constant prices in 1983 we know that South East Sulawesi GRDP growth during 1983-1989 averaged 7.44%/year, that is, from 294,274.67 million rupiah in 1983 to 420,778.25 million rupiah in 1989.

The biggest contributor to GRDP was the agriculture sector at 42.55%.

58. In Kabupaten Buton, GRDP in 1989 based on the present prices was 145,125.25 million rupiah which meant that compared to 1983 (84,250.03 million rupiah) it increased by 172.26%.

Based on constant prices in 1983, the order is the same as above. The dominant sector is agriculture (43.47%), government (22.25%), trade (14.66%).

(4) Road Conditions and Number of Vehicles

59. The type and length of road in 1989 are as follows: state-road - 336.55 km, provincial road - 1,208.06 km, and district road - 4,102.64 km.

60. In terms of the road surface, 1,810.45 km or 33.12% is asphalted, 1,485.32 km or 27.17% is gravel, 1,206.89 km or 22.07% is earth, and 964.59 km or 17.64% is no data.

61. Road length in Kabupaten Buton (1990) is 764.90 km. Compared to 1989 when road length was 1,223.39 km, it decreased by 37.38% in 1990 because road length in Kecamatan Poleang and Rumbia weren't included.

62. The number of vehicles in 1989 in this province is 25,780, composed of 4,222 cars, 839 mini-buses, 3,437 cargo-cars, and 17,282 motor-bicycles. The number of machine vehicles in 1989 compared to 1988 increased by 13.04% or from 22,805 in 1988 to 25,780 in 1989.

Of the total number of vehicles, in Kabupaten Buton, cars or mini bus account for 104, commodity cars account for 105 and motorcycles account for 3,624.

2-4-2 Transportation Activities

(1) Air Transportation

63. According to the O-D survey conducted by MOC in 1988, the volume of passenger transported by airplane is as follows.

Kot.Ujung Pandang - Kab.Kendari	15,560 persons/year
kot.Ujung Pandang - Kab.Muna	403 persons/year

64. Based on Air Transport Statistics(1990), traffic volume handled at Ujung Pandang are as follows;

Passenger	Departure	279,146	Cargo	Loaded	10,111,399 kg
	Arrival	306,070		Unloaded	10,368,143
	Transit	266,807			

About 6% of Departure or 15,556 Passengers went to Kendari. 83,812 passengers went to Jakarta and 61,331 went to Surabaya.

(2) Sea Transportation

65. The sea transportation of Kabaena with the main island is mainly through Sikeli port(western coast). Sikeli Port has many sea transportation connections with the main island and Buton Island. From Ujung Pandang, Bone, Bupinang, Banbaea, Kasipute and Bau Bau, 20 - 50 ton class vessels come to Sikeli Port 2 or 3 times a week.

2-5 East Kabaena - Muna

2-5-1 Socioeconomic Features

66. This route is in Southeast Sulawesi Province. South East Sulawesi Province consists of 4 Kabupatens and Kot. Kendari. Proposed sites are located in Kabaena island and Muna island of Kabupaten Buton.

(1) Population

67. The population in Kabaena island was 26,451 in 1990 with the average density rate was 28.20 people/km².

The rate of population growth during 1987-1990 was 5.32% or 1.33% per year and 1.79% during 1989-1990. Muna island is divided into two Kabupaten. Mawasangka, proposed site in this study, is located in the south part of this island or in Kabupaten Buton. The population of Muna island, which belongs to Kabupaten Buton, was 57,858 in 1990 and it decreased by 1.23% compared to 1989(57,154).

2-5-2 Transportation Activities

(1) Air Transportation

68. Air Transportation in Southeast Sulawesi Province has already been described in 2-4-2.

(2) Sea Transportation

69. The sea transportation of East Kabaena is mainly with Mawasangka, Bau Bau and Kasipute, the frequency of call is about twice a week from each place.

2-6 Kendari - Wawonii Route

2-6-1 Socioeconomic Features

70. This route is in Southeast Sulawesi Province. South East Sulawesi Province consists of 4 Kabupatens and Kot. Kendari. Proposed sites are located in Kabupaten Kendari.

(1) Population

1) Kabupaten Kendari

71. The population in Kabupaten Kendari in 1990 was 488,392 population density rate of 30 people per km². Compared to total population(423,442) in 1986, it increased by 15.34 % or 3.07 % per year. It shows that Kabupaten Kendari has a higher population growth rate than South East Sulawesi(1.34 % per year).

72. The population in Wawonii island was 21,051 with a density rate of 27.2 people/km². The population growth during 1986-1990 was 2.62% per year and 5.90% during 1989-1990.

(2) Industry

73. In Food crops production, rice production in 1989 is 68,389 tons. There is a variety of plantation commodities in this area, coconut, coffee, cloves, cacao, cashews, kapok, cotton, candlenut tree, pepper, nutmeg, ginger etc.

(3) Gross Regional Domestic Product (GRDP)

74. The growing number of GRDP based on current prices during 1983-1989 increased by mean 18.36% per year. That number is higher than that of South East Sulawesi (16.46%). At the same time, based on constant prices, it reaches 11.34% per year and is higher than South East Sulawesi (7.96%).

Concerning each economic sectors role based on constant 1983 prices, the agriculture sector makes the biggest contribution to GRDP. Agriculture sector's share in 1986 was 34.78%, 35.45% in 1987, 36.74% in 1988 and 35.53% in 1989 respectively.

(4) Road Conditions and Number of Vehicles

75. In 1989, road length in Kabupaten Kendari was 1,091.4 km. Concerning its surface, 218.4 km (20.01%) is asphalted road, 376.6 km (34.51%) is gravel road, 199.4 km (18.27%) is earth road and 297.0 km (27.21%) is not specified.

76. There were 25,780 vehicles in this province in 1989: 4,222 cars, 839 mini-buses, 3,437 cargo-cars, and 17,282 motorcycles. Compared to 1988(22,805), the number of vehicles has increased by 13.04%(25,780).

2-6-2 Transportation Activities

(1) Air Transportation

77. Based on Air Transport Statistics(1990), traffic volume handled at Kendari are as follows;

Passenger	Departure	26,702	Cargo Loaded	118,603 kg
	Arrival	24,896	Unloaded	535,204
	Transit	634		

Most of departure passenger went to Ujung Pandang. About 60% of arrival or 15,556 passengers came from Ujung Pandang.

(2) Sea transportation

78. In Kendari port, ferry service has not yet begun operations. Two ferry routes connect Muna Island and Buton Island with the main island of Southeast Sulawesi Province(capital of which is Kendari).

79. Four passenger ships are being operated between Kendari and Muna Island/Buton Island. Passengers and cargoes between Kendari city and Wowonii Island are transported by five boats(approximately 20 GRT).

2-7 Morotai - Halmahera Route

2-7-1 Socioeconomic Features

80. This route is in Maluku Province. Maluku Province consists of 4 Kabupatens and Kot. Ambon. Proposed sites are located in Morotai island and Halmahera island in Kabupaten Maluku Utara.

(1) Population

81. The population in Kabupaten Maluku Utara was 561,354, consisting of 287,809 men and 293,545 women. The population growth during 1986 - 1990 was 12.96 % or an average of 2.59 %/year and the growth rate during 1989-1990 was 6.51 %.

82. The population in Morotai island was 44,328 people consisting of 22,919 men and 21,409 women and the density rate average was 17.9 people/Km². The population in Daruba which is the main town in Morotai island was 26,639 in 1990 and 25,719 people in 1987, which represents an increase of 0.89%/year.

(2) Industry

83. The rice harvest area at Maluku Utara in 1990 is 36,079.9 ha and yields a production of about 80,164.96 tons.

The area of plantations has been increasing steadily for years. In 1990 the coconut plantation area occupied 74.99% (23,863 ha) of the total area of the plantation plant and the production of coconut in 1990 was 87,703 tons (91.78%).

(3) Gross Regional Domestic Product (GRDP)

84. In 1989, the GRDP of the Kabupaten Maluku Utara based on the current prices was 353,815,694 thousand rupiah. Compared with 1983(130,341,025 thousand rupiah), it increased by 171.45 %.

In 1989, GRDP of the Kabupaten Maluku Utara based on the constant 1983 prices reached 210,977,515 thousand rupiah.

The rate of growth of GRDP in the previous years was as follows :9.02% in 1984, 2.06% in 1985, 13.61% in 1986, 19.84% in 1987, 1.24% in 1988 and 5.54%

in 1989.

The biggest contribution to GRDP is made by agriculture sector which accounted for 44.07% in 1989, 45.23% in 1988, 47.20% in 1987 and 49.05% in 1986.

(4) Road Conditions and Number of Vehicles

85. In 1989 the length of the road at the Kabupaten Maluku Utara is 507.80 km. Concerning the road surface, 237.93km or 46.885% is asphalt-road, 207.07km or 40.80% is gravel road, 62.50 km or 12.32% is unspecified.

2-7-2 Transportation Activities

(1) Air Transportation

86. According to the O-D survey conducted by MOC in 1988, the volume of passenger transported by airplane in area of Kab.Maluku Utara is 8,451 persons/year.

87. Based on Air Transport Statistics(1990), traffic volume handled at Ternate are as follows;

Passenger	Departure	25,718	Cargo Loaded	81,131 kg
	Arrival	24,027	Unloaded	272,347
	Transit	2,952		

Half of departure passengers went to Manado, 6,395 passengers went to Ambon and 1,984 went to Galela. About 60% of arrival passengers came from Manado.

(2) Sea Transportation

88. Ternate is the center of the sea transportation service in the study area. Between Morotai Island and Halmahera Island there is a liner passenger service, of which Ternate is the base terminal. The boat(the capacity of passengers is 500) offers 2 rounds service in a week.

2-8 South Sulawesi - Southeast Sulawesi

2-8-1 Socioeconomic Features

89. This route is in South Sulawesi and South East Sulawesi Province. South Sulawesi consists of 21 Kabupatens and Kot. Ujung Pandang. Proposed sites are located at Bajoe in Kabupaten Bone of South Sulawesi Province and at Kolaka in Kabupaten Kolaka of South East Sulawesi Province.

(1) Population

90. The population in South Sulawesi Province was 6,980,589, consisting of 3,409,989 men and 3,570,600 women with an average density rate of 111.72 people/km². The population growth rate during 1986-1990 was 1.34 %/year.

91. The population in Kabupaten Bone in 1989 was 649,065, consisting of 305,234 men and 343,831 women with an average density rate of 142.37 people/km². The rate of population growth during 1986-1989 was 0.36% per year and during 1988-1989 was 0.06%. But it decreased by 5.97% to 610,315 in 1990.

92. From 1986 to 1990, there was an increase in population in Kabupaten Kolaka. In 1986, total population was 197,084. It increased to 239,682 in 1990, consisting of 123,997 men and 115,681 women. The population growth rate from 1986-1990 averaged 21.61% or 4.32% per year and 9.08% per year in 1989-1990.

(2) Industry

93. In the food plants sector, rice is the main commodity and second is maize.

The volume of rice harvested in South Sulawesi Province was 3,132,378 tons over 735,831 ha or 42.57 tons/ha.

In the plantation, production volume are as follows: coconut 269,966 tons, coffee 101,908 tons, cocoa 89,966 tons and candlenut 56,837 tons. All production increased compared to the previous year.

Production by fishery sector is 318,269 tons in 1990 and Kabupaten Bone is ranked first(40,093 tons or 12.60 %).

(3) Gross Regional Domestic Product (GRDP)

94. In South Sulawesi Province GRDP in 1989 based on the current prices was 3,735,668.12 million rupiah which meant that compared to 1983(1,751,729.24 million rupiah) it increased by 213.26%.

The growth rate of GRDP in previous years was as follows: 113.77% in 1989 and 114.94% in 1988.

At the constant prices, GRDP in 1989 which was 2,502,520.39 million rupiah increased by 142.86% compared to that of 1983. The productivity of the years before compared to that of 1983 was as follows : 123.70% in 1987, 134.91% in 1988 and 142.86% in 1989.

The biggest contributor to GRDP is the agriculture sector. The share of the agriculture sector was 43.81%.

95. Based on the constant 1983 prices, the regional income per capita of Kabupaten Bone in 1986 was 193,898 million Rp., 197,771 million Rp. in 1987 and 210,183 million Rp. in 1988. The rate of growth compared to previous years was 6.28% in 1988 and 2.00% in 1987.

96. Based on the constant 1983 prices, the regional income per capita of Kabupaten Kolaka in 1986 was 369,045.01 million Rp., 349,448.32 million Rp. in 1987, 422,474.80 and in 1988 and 492,500.27 million Rp. in 1989. The rate of growth compared to previous years was 16.57% in 1989, 20.90% in 1988 and in 1987 -5.31%.

(4) Road Conditions and number of Vehicles

97. Land transportation in this province is very important as it is used to transport people, agriculture products, plantation products, forestry products etc. South Sulawesi province has three types of road, state-road - 921 km, provincial road - 1,690 km, and district road - 19,913 km. Concerning road surface, 6,982 km or 31.00% is asphalted especially 96.78% is asphalted in state and provincial roads, 5,862 km or 26.03% is gravel.

98. Road length in Kabupaten Bone (1990) is 2,199 km. In terms of its surface, 371 km (16.871%) is asphalted road, 626 km (28.47%) is gravels, 1,202 km (54.66%) is earth.