

**THE STUDY ON FISHERIES INFRASTRUCTURE SUPPORT
AND
COASTAL COMMUNITIES DEVELOPMENT PLAN
IN
EASTERN INDONESIA
FINAL REPORT
SUMMARY**

JICA LIBRARY



J1170357[6]

OCTOBER 2002

SYSTEM SCIENCE CONSULTANTS INC.
OVERSEAS AGRO-FISHERIES CONSULTANTS CO.,LTD

AFF

JR

02-67

8
7
F
ARY

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)
MINISTRY OF MARINE AFFAIRS AND FISHERIES(MOMAF)
REPUBLIC OF INDONESIA

**THE STUDY ON FISHERIES INFRASTRUCTURE SUPPORT
AND
COASTAL COMMUNITIES DEVELOPMENT PLAN
IN
EASTERN INDONESIA**

**FINAL REPORT
SUMMARY**

OCTOBER 2002

**SYSTEM SCIENCE CONSULTANTS INC.
OVERSEAS AGRO-FISHERIES CONSULTANTS CO.,LTD**



1170357[6]

Preface

In response to the request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Study on Fisheries Infrastructure Support and Coastal Communities Development Plan in Eastern Indonesia, and entrusted the study to Japan International Cooperation Agency (JICA).

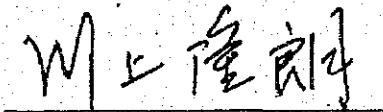
JICA sent to the Republic of Indonesia the study team headed by Dr. Tamotsu TOMIYAMA, System Science Consultants Inc., three (3) times between May 2001 and October 2002.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia, and conducted field survey and investigation in the study area. After the team returned to Japan, further studies were made and this report was prepared.

I do 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.

October 2002

A handwritten signature in black ink, consisting of the Japanese characters '川上隆朗' (Kawakami Takao) written in a cursive style. The signature is positioned above a horizontal line.

Takao KAWAKAMI
President of
Japan International Cooperation Agency

October 2002

Mr. Takao KAWAKAMI
President of
Japan International Cooperation Agency
Tokyo, JAPAN

Letter of Transmittal

Dear Sir,

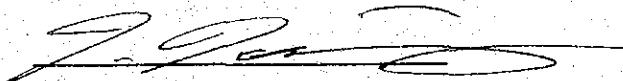
We are pleased to submit to you the report for "the Study on Fisheries Infrastructure Support and Coastal Communities Development Plan in Eastern Indonesia".

This report presents the result of all work performed in both Indonesia and Japan over 18 month period from May 2001 to October 2002. The report includes two volumes consisting of a master plan which covers the present conditions and issues of coastal fishing community of the East and West Nusa Tenggara (NTT and NTB), and a feasibility study of four priority areas.

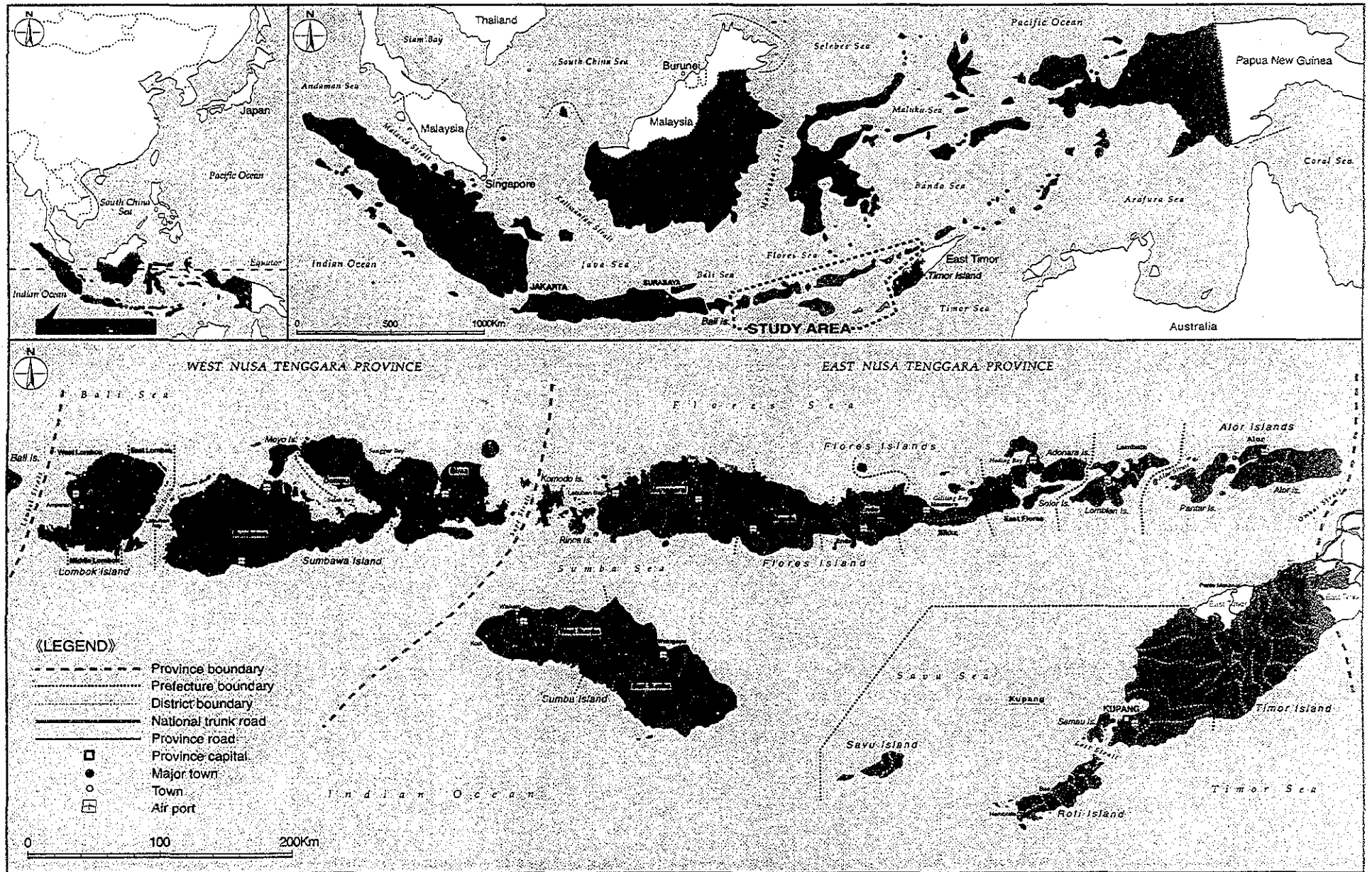
In view of the urgency of improving the socio-economic condition of coastal fishing community and marketing and distribution system in Eastern Indonesia, we recommend that the Government of Indonesia implement this Project as a priority.

We wish to express our sincere appreciation and gratitude to the relevant official of JICA, the Ministry of Foreign Affairs, and the Ministry of Agriculture, Forestry and Fisheries of the Government of Japan for the courtesies and cooperation kindly extended to our team. We also wish to express our deep gratitude to the concerned officials of MOMAF, Provincial and District Department of Fisheries, local governments, and Jakarta Office of JICA, and Embassy of Japan in Indonesia for their close cooperation and assistance extended to the team during the study.

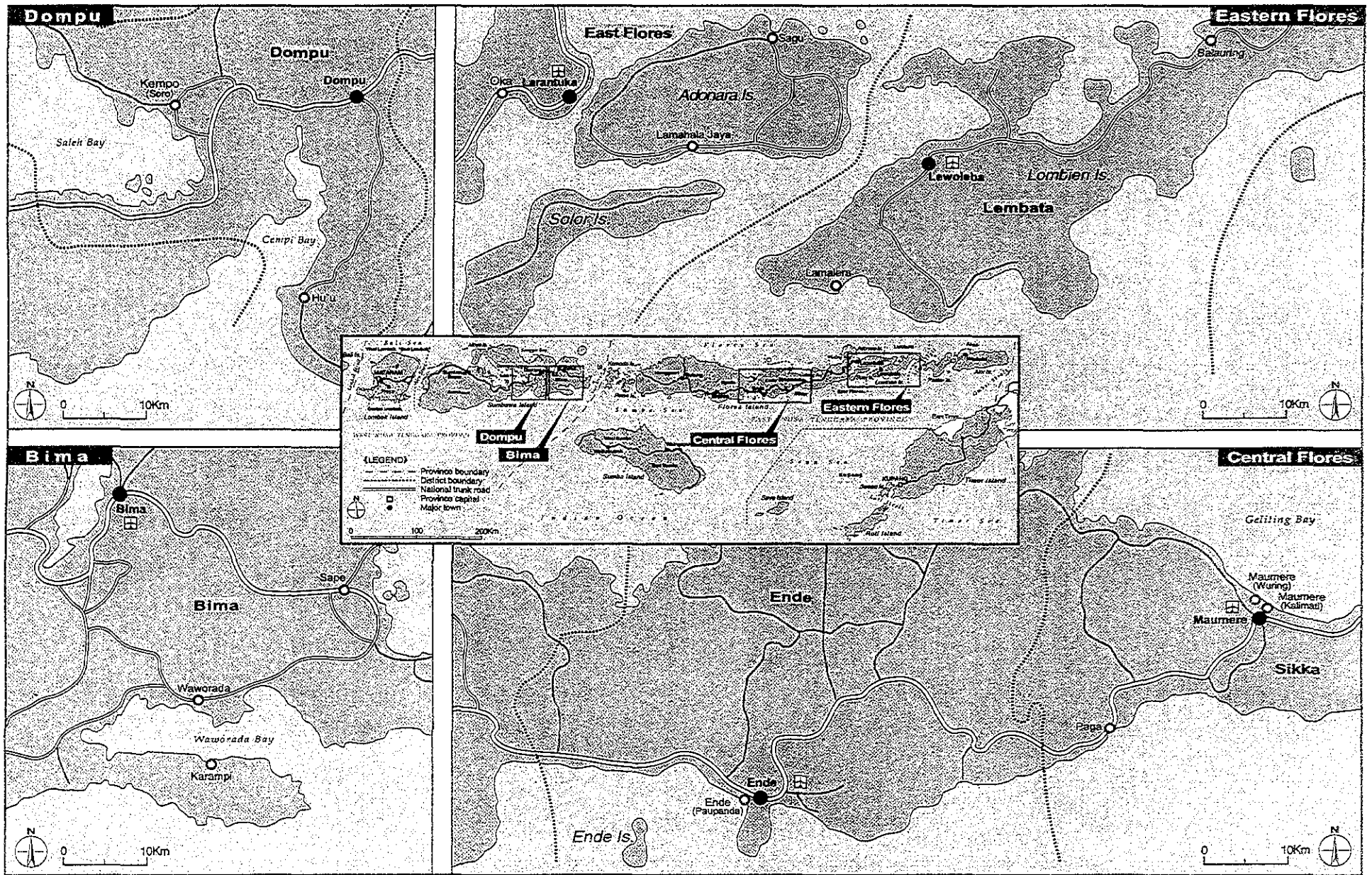
Very truly yours,



Tamotsu TOMIYAMA
Team Leader of the Study on Fisheries Infrastructure Support and Coastal Communities
Development Plan in Eastern Indonesia
System Science Consultants Inc., in consortium with
Overseas Agro-fisheries Consultants co., Ltd.



LOCATION MAP OF THE STUDY AREA



LOCATION MAP OF THE PRIORITY ZONES

Present Conditions in NTB Province



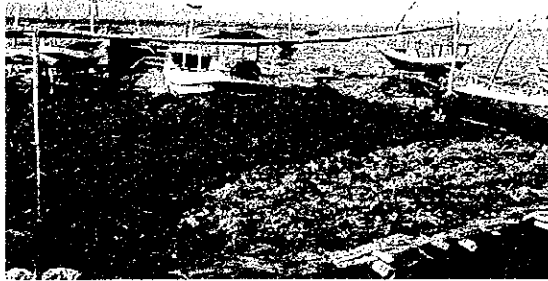
Bagan (Lift net) – A popular fishing method using light during night in NTB
(Alas, Sumbawa District)



Fishing boats kept directly on the beach – High tide allows fishermen to go fishing easily.
(Nanganac, Dompu District)



High rate of motorized fishing boats in NTB than NTB
(Waworada, Bima District)



Seaweed culture in NTB – Dried seaweed are sold to traders
(Tanjung Belu, Bima District)



Fish catch landed directly on the beach in front of fishing village
(Sape, Bima District)



Sales of fish by women on the beach
(Sape, Bima District)

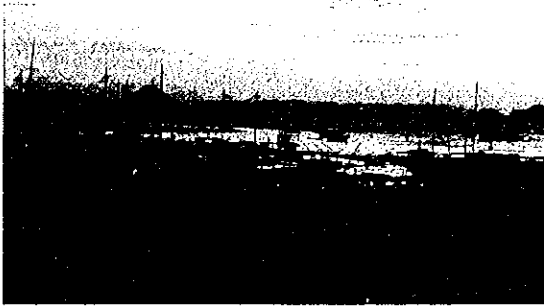


Public fish landing place in Tanjung Luar
(East Lombok District)



Fish retailing by women without use of ice in a market
(Lombok Tengah District)

Present Conditions in NTT Province



A major fishing base (Labuan Bajo-Manggarai District) in Flores Island from where fish products are shipped to Bali and Java Island



High rate of non-motorized fishing boats in NTT than NTB (Sagu-Adonara Island, East Flores District)



Salting/Drying on the beach in front of a fishing village (Nangarelo, Ngada District)



Immediate sales of landed fish catch on the beach (Luten, Manggarai District)



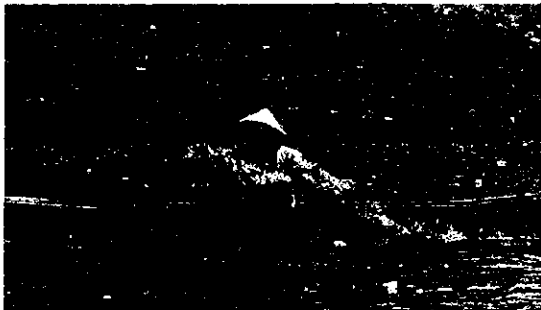
A number of large pelagic fish among fish landed (Mbongawani, Ende District)



Salted/dried fish, a valuable source of animal protein in inland market

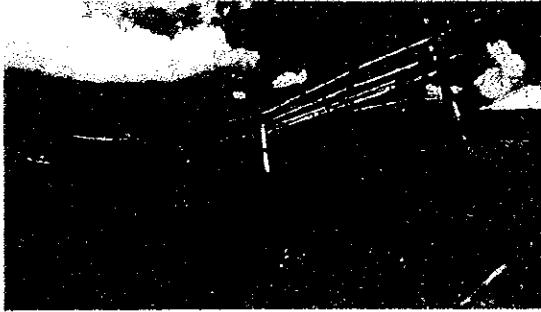


Pilot Study on Grouper Cage Culture (Tapolang, Lembata District)



Seaweed culture in some fishing villages in NTT, though it is not as popular as in NTB (Prawsale, Ende District)

Existing Conditions of the Model Sites in NTB Province



Rompo Project Site --Beach borders the arterial road to Bima Town (the district capital)
(Rompo Site, Bima District)



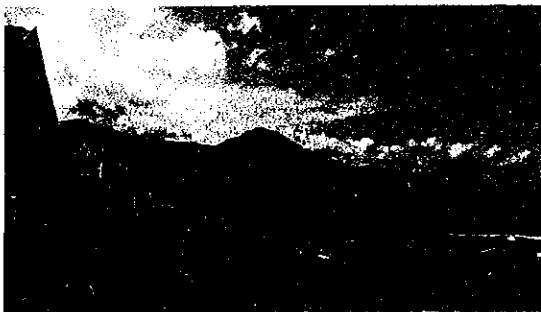
The Rompo Project Site seen from the beach during low tide
(Rompo Site, Bima District)



Relatively large fishing boats are moored in front of the harbour. The boats are unable to leave during the low tide. (Rompo Site, Bima District)



Discussions with fishermen during a workshop held by the study team members
(Rompo Site, Bima District)



Soro fishing village on Saleh Harbour
(Soro Site, Dompu District)



Existing jetty (Soro site) to be extended & auction hall to be constructed at the extension end. Water depth for 24-hour moorage of boats to be secured.



Only land facilities will be constructed at Hu'u. Construction site is a gravel beach ($\phi 5\sim 10\text{cm}$).
(Hu'u Site, Dompu District)



Discussions with women during a workshop held by the study team members
(Hu'u Site, Bima District)

Existing Conditions of the Model Sites in NTT Province



The planned construction site at Oka is a 15-minute drive from the district capital, Larantuka (Oka Site, East Flores District)



Departure of fishing boats on fishing operation at the Larantuka fishing village (Larantuka, East Flores District)



A fresh fish shipment system will be created at this fishing village, Sagu (Adonara Is.) located 2 hours by ferry from Larantuka. (Sagu, East Flores Dist.)



JICA study team explains the content of the project for the model sites. (Larantuka, East Flores District)



The means of transportation to Lamalera fishing villages located on the remote island are limited. (Lamalera, Lembata District)



In addition to small-scale coastal fisheries at Balauring, large sport fishing also exists. (Balauring, Lembata District)



The existing public landing facilities (PPI) are completely unused due to the lack of service functions. (Paupanda, Ende District)



The fishing village Kalimati is located near Maumere, the largest town on Flores Island (Kalimati, Sikka District)

SUMMARY

Table of Contents

Preface	
Letter of Transmittal	
Location Map	
Photographs	
Acronyms and Abbreviations	
Exchange rate	
1. Summary of the Master Plan	1
1.1 Objective of the Master Plan	1
1.2 Survey Study Area	1
2. Present Conditions of the Study Area and Issues Related to Fishing	
Community Development	1
2.1 Existing Conditions of the Fishing Villages	1
2.2 Fishing Community Development Issues	5
2.2.1 Poverty of Fishermen Households	5
2.2.2 Future Deficit of Fish Supply in the Study Area	6
2.2.3 Vulnerable Situation of Fisheries Resources in the Study Area	6
2.2.4 Delays in Organizing Fishermen	6
2.2.5 Inadequate Fisheries Infrastructure	7
2.2.6 Inconvenient Living Conditions of the Fishing Communities	7
3. Outline of the Master Plan	7
3.1 Development Goals	7
3.2 Major Strategic Components	7
3.3 Plan to Improve Fishing Technology and Coastal Resources Management	7
3.4 Plan to Improve Aquaculture Technology	8
3.5 Plan to Improve Fish Handling, Marketing and Processing	8
3.6 Plan to Improve the Fisheries Infrastructure	9
3.7 Plan to Improve the Fishing Village Environment	9
3.8 Plan to Improve Fishermen Organizations and Fisheries Extension	9
3.9 Educational and Training Plan	10
4. Outline of the Project Design by Specific Areas in the Districts	10
4.1 Setting Up of Development Zones, Model Sites and Model Areas	10
4.2 Classification of the Model Site	11
4.3 Selection of Priority Model Areas	12
4.4 Analysis of Linkage between Selected Priority Zone and its Environs	15
5. Feasibility Study	17
5.1 Bima Priority Zone	17
5.1.1 Current Conditions and Issues	17
5.1.2 Development Concept	18
5.1.3 Approach	19
5.1.4 Development Projects	20
5.1.5 Operation and Maintenance Plan	21

5.1.6	Breakdown of Project Costs.....	21
5.1.7	Project Evaluation	21
5.2	Dompu Priority Zone	22
5.2.1	Current Conditions and Issues.....	22
5.2.2	Development Concept.....	24
5.2.3	Approach	25
5.2.4	Development Projects	26
5.2.5	Operation and Maintenance Plan	27
5.2.6	Breakdown of Project Costs.....	28
5.2.7	Project Evaluation	28
5.3	Eastern Flores Priority Zone	29
5.3.1	Current Conditions and Issues.....	29
5.3.2	Development Concept.....	30
5.3.3	Approach	31
5.3.4	Development Projects	32
5.3.5	Operation and Maintenance Plan	34
5.3.6	Breakdown of Project Costs.....	345
5.3.7	Project Evaluation	36
5.4	Central Flores Priority Zone.....	37
5.4.1	Current Conditions and Issues.....	37
5.4.2	Development Concept.....	38
5.4.3	Approach	39
5.4.4	Development Projects	41
5.4.5	Operation and Maintenance Plan	42
5.4.6	Breakdown of Project Costs.....	43
5.4.7	Project Evaluation	43
6.	Project Implementation Plan	45
6.1	Executing Agency	45
6.1.1	Programme Coordination Committee	45
6.1.2	District Project Coordination Committee (DPCC).....	46
6.1.3	Project Implementation Committee	46
6.1.4	Project Management Office	46
6.1.5	Fishermen Organizations That Will Manage the Project (Model Site).....	46
6.2	Implementation Schedule.....	46
6.2.1	Implementation Schedule of the Priority Zones.....	46
6.2.2	Priority Projects in Each Programme	47
6.3	Capital Procurement Plan.....	48
6.3.1	Initial Input Capital	48
6.3.2	Operating Capital	48
6.4	Technical Assistance.....	48
7.	Recommendations	49

1. Summary of the Master Plan

1.1 Objective of the Master Plan

A Master Plan aimed at improving the income of small-scale fishermen and establishing a stable fisheries supply for the coastal fishing communities in East and West Nusa Tenggara provinces (Propinsi Nusa Tenggara Barat and Propinsi Nusa Tenggara Timur), henceforth referred to as NTB and NTT, respectively, was formulated. In addition, a feasibility study to develop fisheries related infrastructure in two priority districts selected from Sumbawa and Flores islands was also implemented.

1.2 Survey Study Area

The M/P to develop small-scale fishing communities targeted the eastern coastal fishing communities in NTB and NTT (excluding Timor Island); and the feasibility study that was implemented, based on the M/P, focused on two districts each from Sumbawa and Flores islands.

2. Present Conditions of the Study Area and Issues Related to Fishing Community Development

2.1 Existing Conditions of the Fishing Villages

(1) Economic situation of objective areas

Both NTB and NTT are the least economically developed provinces in Indonesia; and the per capita GDP in 1999 was ranked 25th and 27th, respectively, out of all 27 provinces (the national average of Rp.5.54 million/year/person, in contrast to Rp.2.19 million/year/person for NTB and Rp.1.45 million/year/person for NTT). In addition, the poverty line for both provinces for the same year was Rp.74,677/month for NTB and Rp.66,143/month for NTT. This was equivalent to about one million people in NTB (about 33 percent of the population) and about 1.6 million people (49 percent of the population) in NTT, who were below this poverty line.

In 1999, the number of fishermen households engaged in marine fisheries and brackish water pond culture in both provinces was 20,688 and 28,735 households, respectively. In addition, the GRDP in that same year was Rp.8.2 trillion for NTB and Rp.5.6 trillion for NTT, of which approximately 3 percent was generated by the fisheries sector in both provinces.

(2) Present Conditions in Fisheries

The fish catch volume for NTB and NTT provinces in 1999 was 65,152 tons and 79,598 tons, respectively. Coastal fisheries are predominantly conducted in both provinces. The major fishing methods that are employed are gill net, Bagan (lift-net fishing), and purse seines in NTB and gill net, purse seine, and tuna pole line fishing in NTT province. The fishing boat motorization ratio is about 86 percent in NTB, in contrast to NTT, where the ratio is a low 10 percent. Subsequently, the fish catch volume per fishing boat is higher in NTB province. Since lamp fishing is the major form of night fishing that is conducted in both provinces, the operations are concentrated during the phase of the new moon. In addition, fishing can not be conducted in many fishing grounds in January and February due to the monsoons.

In reviewing the development of fishery resources based on total allowable catch (TAC), approximately 80 percent of the TAC has been achieved in NTB, in contrast to about 30 percent in NTT; and unexploited development potential exists. However, fishing operations conducted in the inland water areas of NTB province are estimated to have exceeded the TAC levels.

Moreover, blast fishing and fishing methods employing the use of poisonous substances have been conducted over a lengthy period of time in each fishing ground in the study area. Although these illegal fishing operations have decreased due to guidance measures taken by the provincial and district governments, they continue to be carried out and is a major factor underlying the destruction of the coastal environment.

The two types of mariculture conducted in NTB and NTT provinces are brackish water pond culture centered on milkfish and prawns and seaweed culture. The production volume of brackish water pond culture in 1999 was 6,954 tons in NTB and 191 tons in NTT province. Seaweed culture has been mainly carried out in NTB province, and the production volume in 1999 was 21,052 tons (there was no statistical data for NTT province). In recent years, the Indonesian government has implemented measures to develop the culture of grouper species. Subsequently, cage culture activities of groupers have been conducted in both provinces, but they have not achieved self-sufficiency.

(3) Fish Marketing and Processing

Fresh fish marketing activities in the study area are mainly centered on the district markets located in the district capitals, and only a segment of the fish is marketed to Bali Island, Jakarta, and other outside neighboring districts. Due to inadequate basic facilities and a transport network for fresh fish marketing activities, the fish catch must be sold to consumers on the day that it is landed. This has become one factor that has impeded the

development of a widespread fresh fish marketing network. Presently, fresh fish is marketed to outside areas through the marketing network of individual fish collectors.

In areas where the fish landing volume is small, the local fishing village women play a central role in fish marketing activities due to the minimal number of fish traders and collectors, whereas in fishing communities near the cities or in areas where the fish landing volume is large, the fish traders and collectors play a focal role in marketing activities.

Fisheries companies and fish collectors provide block ice only for their consigned fishermen. Although the ice supply has improved due to increased ice production in the study area, much of the region utilizes ice sold in plastic bags made by local households. Subsequently, the absolute volume of ice is in shortage. The price of ice is very high (Rp.12- to 150/kg in Java/Bali islands, Rp.150 to 200/kg in Lombok island, Rp.330 to 500/kg in Sumbawa Island, and Rp.660 to 1,000/kg in Flores Island). In addition, the usage ratio of ice for fresh fish decreases eastward in the study area (30 to 60 percent in Sumbawa Island and 10 to 25 percent in Flores Island). Moreover, fish freshness drops quickly since the use of insulated fish boxes is minimal in the inland areas where fish is marketed.

The fish catch is basically marketed fresh in the study area; and fish that can not be sold fresh is processed according to traditional methods (mainly salt-dried). Approximately 40 percent of the annual fish catch volume is sold as processed fish in the study region. The price of dried and salted fish is about one-half to three-fourths the weight of fresh fish. The volume of processed fish increases notably during the peak fishing season; and due to the surplus fish available in the local market, the product is sold at even cheaper prices to large fish traders.

(4) Fish Production Infrastructure

The fishing ports in Indonesia are classified according to Classes A to D, based on the scope of the port facilities, the size and number of fishing boats that use the port, and the fish landing volume (Class D ports have public landing sites, henceforth referred to as PPI). In the study area, there is one Class C fishing port in both NTB and NTT provinces; and 41 of the smallest PPIs are located in NTB and 7 are found in NTT provinces.

The majority of the PPI has depreciated or damaged facilities or is completely unused in fishing activities. This is because the PPI have been designated as fish landing sites and the facilities are mainly comprised of piers and revetments that serve as landing sites with fish handling areas located behind these facilities, but without any functions such as ice production and supply, refueling facilities, fishing gear storage or net drying areas.

(5) Fishing Community Society/Gender

According to the data obtained from a socioeconomic survey of 33 major fishing communities in the study area, the average fishermen household is a nucleus family comprised of a married couple and their single children. The average number of family members per household was 3.18 people in NTB province and 3.34 people in NTT province.

The major source of water was either tap or well water and the overall ratio of fishermen using tap water in both provinces was about 40 percent. In addition, 288 out of 462 households in NTB province and 237 out of 540 households in NTT province did not utilize toilets.

The annual per capita income for fishermen in 25 fishing communities (75.7 percent) was lower than the annual per capita income of a farmer with less than 0.5ha of farmland (Rp.1.63 million/year). The per capita monthly income for fishermen in 9 fishing communities (27.2 percent) was lower than the national average poverty line income (Rp.1.89 million/year).

More than 60 percent of the fishing village women were engaged in the sale and processing of fishery products, farming, selling daily commodities, and other economic activities. However, due to the lack of employment opportunities for single women, many go abroad to work. Although women group activities were observed at each site, they were mainly conducted by village women groups (henceforth referred to as PKK) that were organized under the supervision of the district governor's office. The daily activities for both the men and women are comprised of waiting at the beach for the return of the fishing boats between fish retail activities, making round trips to the market, doing household chores, and there is very little collected time available. The men also spend half the day at sea, and subsequently, much of the work done on land is carried out by women.

(6) Fishermen Cooperatives/Fisheries Extension

There are three types of cooperatives in Indonesia—the KUD Mina, Koperasi Nelayan, and Kelompoks or fishermen groups. The activities of the KUD Mina and Koperasi Nelayan are similar, but the KUD has members other than fishermen. Both types of cooperatives provide small-scale loans and conduct purchasing activities, but the scope of the operations is small, and there are very few cooperative operations that are supported by fishermen. In the study area, there were 28 KUD Mina with a total of 4,362 members and 1,151 fishermen kelompoks. However, there are no statistical data on the Koperasi Nelayan.

Fisheries extension activities are conducted by the Agricultural Education, Training, and Extension Agency of the Ministry of Agriculture (BPLLP), which is responsible for planning and implementing extension activities, but extension officers, are under the

jurisdiction of the provincial government. Extension personnel are divided between the PPL (extension officer) and the PPS (experts from the special extensions sector). In NTB province, there are 112 PPL and 18 PPS and there are 64 PPL and 5 PPS in NTT province. The extension activities are dependent on budgets that are procured through existing programmes and projects.

There are three agencies that are involved in agricultural extension activities at the regional level—DIKLAT (educational, training center), BIPP (agricultural information extensions center), and the IPPTP (agricultural technical research center). These three agencies are involved in only inland water fisheries and aquaculture activities and they are not involved in mariculture/culture extension activities.

The fisheries educational, training, and extensions center of the Ministry of Marine Affairs and Fisheries, newly established in 2000, was re-established. The major activity of this center is to develop general manpower in the fisheries and aquaculture sector, and to conduct research and formulate extension measures and plans, and to review educational, training, and extension needs. As of 2002, the center is currently reviewing reforms of the fisheries extension system.

2.2 Fishing Community Development Issues

The main issues in fishing community development in the study area are explained below.

2.2.1 Poverty of Fishermen Households

- The per capita annual income of fishermen households in the study area is generally lower than the national average for small-scale farmers who own less than 0.5 ha of farmland (about Rp 1.6 million). The income level of fishermen in about half of the major fishing villages is on the poverty line (Rp 74,272/month).
- Because of poor fishing equipment such as boats and gears, fishing activities are limited to coastal fishing grounds, and the offshore resources have not been effectively utilized.
- Economic losses sustained during the marketing and processing stages are quite large due to the insufficient supply volume and high price of ice, inappropriate preservation methods of fresh fish, the rancid quality and low unit price of dried and salted fish.
- Available credit system for purchasing fishing gear and fishing operation is limited to KUD credit schemes with very high interest rates ranging from 25 to 100 percent per year. Subsequently, most of fishermen are economically isolated.

2.2.2 Future Deficit of Fish Supply in the Study Area

Based on the estimated demand and supply of fish in 2012, a fish supply shortage is expected in Lombok, Sumba and the western Flores. However, this shortage can be resolved by utilizing surplus fish from Eastern Flores. Thus, the demand and supply of fish in the survey area (excluding Timor Island) will be balanced in 2002.

Area	Unit: 1,000 ton								
	Total Fish Demand			Total Fish Catch			Demand & Supply Balance		
	1999 ¹⁾	2007 ²⁾	2012 ²⁾	1999	2007 ³⁾	2012 ³⁾	1999	2007	2012
Lombok	35.5	49.3	60.3	29.9	31.8	31.8	-5.7	-17.5	-28.5
Sumbawa	56.6	61.6	65.1	48.8	56.7	66.7	-7.8	-5.0	1.6
Sub-total in NTB	92.1	109.9	125.4	78.6	88.5	98.5	-13.5	-21.4	-27.0
Sumba	6.5	10.0	11.2	6.3	7.9	9.4	-0.2	-2.2	-1.7
Western Flores	9.0	18.3	21.6	9.8	9.7	9.6	0.8	-8.6	-12.0
Eastern Flores	19.6	22.8	23.1	26.2	37.5	48.8	6.6	14.7	25.8
Alor	6.4	6.7	6.9	6.8	13.8	19.8	0.3	7.1	12.9
Timor	23.4	55.8	60.5	30.5	41.4	50.8	7.0	-14.3	-9.7
Sub-total in NTT	65.1	113.6	123.2	79.6	110.3	138.4	14.5	-3.3	15.2
Total	157.1	223.5	248.7	158.2	198.7	236.9	1.1	-24.8	-11.8

Note: 1) Estimated fish consumption by area (1999 actual fish production + fish volume inflow – fish volume outflow) – For details refer Table 1.1.3 of Master Plan

2) Details of fish demand for 2007 and 2012 refer Table 1.1.3 of Master Plan.

3) Fish catch estimated based on increase rate for the past 10 years.

However, the surplus fish in Eastern Flores is used to produce inexpensive processed fish or is scrapped due to the inability to transport fish from eastern to western Flores and Lombok Island.

2.2.3 Vulnerable Situation of Fisheries Resources in the Study Area

- A large volume of juvenile fish is harvested by specific fishing activities that are concentrated in coastal waters and the inland bay areas. Thus, fishing pressure on coastal resources is increasing.
- Blast fishing and fishing using poisonous substances that destroys the coastal environment is being conducted.
- A system of recording the daily fish catch in the study area does not exist. Subsequently, it is difficult to precisely assess the trends in coastal resources.

2.2.4 Delays in Organizing Fishermen

- Fishermen establish cooperatives with the objective of receiving government support. As a result, their motivation to conduct self-help efforts is nonexistent.
- Due to district government's insufficient experience in project management, there are only a limited number of district government officers capable of appropriately instructing, monitoring and evaluating projects.

- Fisheries cooperatives are unable to implement activities in sales, insurance and welfare to support members on an adequate scale.

2.2.5 Inadequate Fisheries Infrastructure

- Due to the lack of functional facilities such as ice plants, water tanks, fuel depots, fish handling sheds, and fishing gear repair and dry yard, the utilization rate for most of the existing PPI is low.
- Most of fish landing sites lack the functional facilities and equipment that help to reduce the economic losses of landed fish.

2.2.6 Inconvenient Living Conditions of the Fishing Communities

- Many coastal communities require fundamental improvements in their living environment such as water supply, sanitary condition, etc.
- Women communities in most coastal communities are very busy earning their livelihoods, and do not have enough time to consider measures to improve their living conditions.

3. Outline of the Master Plan

3.1 Development Goals

The goals of this development plan are as follows.

- Raise the average income of fishermen in the target region by 1.6 times by 2012 or Rp.2.08 million in the next decade.
- Establish a regular and stable fish supply system in the study area.

3.2 Major Strategic Components

The major strategic components that will be pursued to achieve these goals are as follows.

- Establish a sustainable fisheries resources management system.
- Establish a widespread marketing network of fresh and processed fish products.
- Reduce marketing losses through improved quality control of landed fish.
- Give value-added to fishery products through improved processing methods.
- Cultivate operation and management capabilities and entrepreneurship of fishermen organizations by recruiting their participation in development projects.

3.3 Plan to Improve Fishing Technology and Coastal Resources Management

A segment of the fishery operations that utilize coastal resources will be extended to low usage, unexploited offshore water areas and a resources management system will be

created to promote the sustainable use of coastal resources. The main activities of the plan are as follows.

- Extend fishing activities to unexploited water areas and disperse the fishing pressure on coastal resources.
- Establish a fisheries loan system, which has a larger financing limit than the existing schemes.
- Establish a community based coastal resources management system.

3.4 Plan to Improve Aquaculture Technology

The objective is to raise fishermen income through improved grouper culture techniques and to improve the productivity of brackish water pond culture by using fertilizer to expand milkfish culture.

- Improve the calculation method to determine the area of water bodies suited for aquaculture.
- Establish aquaculture related laws and regulations.
- Establish a technical training system for aquaculture.
- Improve the fish disease prevention system.
- Organizing and strengthen fishermen groups engaged in aquaculture.

3.5 Plan to Improve Fish Handling, Marketing and Processing

This plan is composed of three components, specifically to improve fresh fish marketing, to improve fisheries processing technology, and to improve fish shipments and the information network.

(1) Fresh Fish Marketing Improvement Plan

The objective is to establish a sanitary and stable, high quality fresh fish supply in the region by reducing marketing risks and economic losses through an improved marketing system for fresh fish.

- Promote ice production and establish a supply system.
- Develop a fresh fish storage system.
- Disseminate fresh fish handling technology and improve awareness about fish freshness.
- Improve the fish marketing facilities.

(2) Fresh Fish Marketing Improvement Plan

The objective is to improve and develop fish processing technology, to improve and diversify the quality of processed products, to eliminate economic losses, to effectively use raw fish and improve the income of the fishing villages.

- Improve the quality of existing processed products and disseminate the technology.
- Promote the development and sales of new processed products.

(3) Plan to Improve Fish Shipments and the Information Network

The objectives are to expand the retail market through improvements in fish shipping, transport, and the information system and to correct the balance in the supply and demand of fish in the region.

- Improve the means of fresh fish shipments.
- Provide access to market information.

3.6 Plan to Improve the Fisheries Infrastructure

- Effectively use fish landing facilities and activating fishing villages through development of fisheries infrastructure having appropriate roles and functions.
- To improve facilities of existing PPI
- To create suitable working environment for fishery activities by improving safety and efficiency.

3.7 Plan to Improve the Fishing Village Environment

- Improve the working environment by creating public space along the coastline and improving accessibility between the coastline and the main community road.
- Improve living conditions by improving the existing water supply/drainage and waste treatment condition
- Promote community activities and foster community awareness about self-help measures.

3.8 Plan to Improve Fishermen Organizations and Fisheries Extension

The fishermen and their organizations will play an active role in the proposed programmes. This plan aims to strengthen the existing organizations to become self-reliant and autonomous through the following measures.

- Strengthen and mobilize the cooperatives to provide credit, technical support and services for their members and to conduct economic activities.

- Employ a capable and competent person to serve as a “facilitator and mover” in the organization to oversee day-to-day operations and the management of activities.
- Implement continuous education and training to raise awareness and understanding of activities based on mutual cooperation and to increase skills and knowledge.
- Establish independent and self-reliant operations and management of commonly used facilities and infrastructure.
- Strengthen the financial base by mobilizing the task of collecting membership fees, mutual savings, and generating revenue through economic activities.

3.9 Educational and Training Plan

Education and training in line with national and provincial government development strategies and policies will be implemented in each sector as explained above. Most important component of the educational and training plan is to strengthen the fishermen organizations since they are expected to play an active and dynamic role in developing the fisheries sector.

Education and training activities will be solicited from formal and informal sources. The formal sources are existing education and training institutions and/or research and extension institutions under the provincial or central governments that have on-going programmes in fisheries and aquaculture and extension services. The leaders of fishermen organizations and the extension staff of the district fisheries office will be sent to these institutions and they are expected to disseminate the skills and knowledge that they have learned to their members. Informal education and training will be conducted at the sites on the basis of their needs and requirements, and NGO assistance will be solicited to provide the needed services and support for the community.

4 Outline of the Project Design by Specific Areas in the Districts

4.1 Setting Up of Development Zones, Model Sites and Model Areas

Based on the existing fish marketing and natural conditions, a total of 24 development zones were created in nine districts located in Sumbawa and Flores islands that were designated in the Scope of Works for this study. In each development zone, one model site that best illustrated the characteristics of the zone and was representative as its regional center was selected; and the area surrounding each model site was designated as a model area.

District	No	Development Zone	Model Site (Sub-district)	Model Area	Future Extended Areas
Sumbawa	1	West Coast	Lab.Lalar (Taliwang)	Kec. Taliwang coast	South coast (camp fishing abse)
	2	North Coast	Lab.Sumbawa (Sumbawa)	Kec. Sumbawa coast	North-west coast (Lab.Alas, etc.)
	3	Tl. Saleh	Santong (Plambang)	Kec. Plampang coast	Tl. Saleh mouth (Terata, etc.)
Dompu	4	North Coast	Kilo (Kilo)	(To be extended from Bima north coast area, together with Sanggar area of Bima district)	
	5	Tl. Saleh	Soro (Kempo)	Kec. Kempo coast	Pekat area (Tl. Saleh mouth)
	6	Tl. Cempi	Hu'u (Hu'u)	Inner area of Tl.Saleh	South coast of Sumbawa district (camp fishing base)
Bima	7	Tl. Bima	Bima (Rasanae Barat)	Tl.Bima & North coast	Kilo (Dompu), Sanggar (Bima)
	8	Tl. Sape	Bugis (Sape)	Tl. Sape & its vicinity	
	9	Tl. Waworada	Waworada (Rangle)	Tl.Waworada & its vicinity	
Manggarai	10	Komodo/Rinca	Lab.Bajo (Komodo)	Kec.Komodo coast	Terang area
	11	North Coast	Reo (Reo)	Kec.Reo coast	Pota area
	12	South Coast	Mborong (Mborong)	(To be extended from Aimere area (Ngada district))	
Ngada	13	North Coast	Kotajoko (Aiesa)	Whole north coast (Transfer of fishermen)	
	14	South Coast	Aimere (Aimere)	Kec. Aimere coast	Maumbawa & Nangaroro areas, and south coast of Manggarai
Ende	15	North Coast	Maurelo (Maurelo)	(To be extended from north area of Sikka district)	
	16	South Coast	Paupanda (Ende)	South-west coast	South-east coast (Maubasa area)
Sikka	17	North Coast	Kalimati (Maumere)	Kec.Maumere & Kec. Alo coast	Gelitung area
	18	South Coast	Paga (Paga)	Kec. Pag coast	Leta & Bola areas
Flores Timur	19	Mainland	Oka (Larantuka)	Larantuka & its vicinity	Waiklibang & Waiteba areas
	20	North Coast	Sagu (Adonara T.)	North coast of Adonara	
	21	Sel. Solor	Lamahara (Adonara .)	Sel. Solor area	
Lembata	22	North Coast	Balauring (Omesuri)	North-east coast of Lembata	Tokojaeng area
	23	Tl. Lewoleba	Lewoleba (Nubatukan)	Tl. Lewoleba area	Tl. Hadakew area
	24	South Coast	Lamalera (Nubatukan)	South coast of Lembata	East coast (camp fishing base)

4.2 Classification of the Model Site

(1) Fish Production Increase

Type	Criteria
Type A: Diversification of fishing ground	Use of existing unutilized resources outside the bay or coastal waters within the accessible range by existing fishing boats
Type B: Propagation of aquaculture	Fish catch over the potential resources and non-existence of utilizable resources within the accessible range

(2) Fish Landing and Shipment

Type	Criteria	
Type a: Fish landing and marketing center	Main fish landing and consumption area in urban area and social infrastructure is relatively developed	
Type b: Fishing landing and shipment center	b-1: Medium scale	Main fish landing within the rural area as well as collection and shipment centre. Accessible to consumption market is relatively good.
	b-2: Small scale	Condition is same as above, but the scale of fish landing volume is small.
Type c: Fishing Village Center	Main fishing village is among the villages with difficult to access to consumption market and social infrastructure.	

Note: The difference of development policy between b-1 and b-2 is explained on page III-85 of the Master Plan.

(3) Operation/Management Body

Type		Criteria
Type x: Fishermen Organization	x-1: Strengthening of existing cooperatives	Cooperative only composed of fishermen and active
	x-2: Establish new fishermen organization	Non-existence of cooperative only composed of fishermen but can be organized into an association of existing kelompok (groups)
Type y: Operated by village administration and community		Main activity is fishing-cooperative composed of fishermen does not exist and difficult to coordinate the existing kelompok.
Type z: Operated by district government		Model site located in district capital, and the site used by stakeholders from many places and no fishermen cooperatives

Each model site was categorized according to the three criteria shown above and classified as shown in the table below.

Classification of Model Site

District	No	Development Zone	Model Site (District)	Functions		
				Fish Production	Fish Landing & Shipment	O/M organization
Sumbawa	1	West Coast	Lab.Lalar (Taliwang)	A	b-2	y
	2	North Coast	Lab.Sumbawa (Sumbawa)	A	a	z
	3	Teluk Saleh	Santong (Plambang)	B	b-1	x-2
Dompu	4	North Coast	Kilo (Kilo)	A	c	y
	5	Teluk Saleh	Soro (Kempo)	B	b-1	x-1
	6	Teluk Cempi	Hu'u (Hu'u)	A	b-2	y
Bima	7	Teluk Bima	Bima (Rasanae Barat)	B	a	x-2
	8	Teluk Sape	Bugis (Sape)	B	b-1	x-2
	9	Teluk Waworada	Waworada (Rangle)	A	b-1	x-2
Manggara	10	Komodo/Rinca	Lab.Bajo (Komodo)	B	b-1	x-2
	11	North Coast	Reo (Reo)	A	c	y
	12	South Coast	Mborong (Mborong)	A	c	y
Ngada	13	North Coast	Kotajoko (Aiesa)	A	b-2	x-2
	14	South Coast	Aimere (Aimere)	A	c	y
Ende	15	North Coast	Maurelo (Maurelo)	A	b-2	y
	16	South Coast	Paupanda (Ende)	A	b-2	x-1
Sikka	17	North Coast	Kalimati (Maumere)	A	a	z
	18	South Coast	Paga (Paga)	A	b-2	y
Flores	19	Mainland	Oka (Larantuka)	A	a	x-1
Timur	20	North Coast	Sagu (Adonara T.)	A	c	x-1
	21	Sel. Solor	Lamahala (Adonara T.)	A	c	x-1
Lembata	22	North Coast	Balauring (Omesuri)	A	c	y
	23	Teluk Lewoleba	Lewoleba (Nubatukan)	A	b-1	x-1
	24	South Coast	Lamalera (Nubatukan)	A	c	y

4.3 Selection of Priority Model Areas

Priority Model Areas are selected based on the following selection criteria.

(1) Fishing Technology and Resources

(1)-1 Access to Potential Resources

Point 3: Area with potential resources that can be exploited by the local fishermen with minimal input (small boat engines and improved fishing gear)

Point 2: Area with potential resources that can be exploited by the local fishermen at high cost (larger fishing boats and engines)

- Point 1: Area with potential resources that can be exploited by the local fishermen with limited fishing technology (fishermen require training)
- Point 0: Area that is distantly located from potential resources

(1)-2 Resources Management Level

- Point 3: Area where 1) coastal environment and/or resources management projects are under implementation, 2) village regulations related to resources management are executed, and 3) the district government's activities (collection of daily fish landing data, allocation of extension officer on full-time basis) are well conducted.
- Point 2: Area that satisfies either of the two conditions above.
- Point 1: Area that satisfies one condition in the above.
- Point 0: Area that does not satisfy any of the conditions above.

(2) **Fish Marketing**

(2)-1 Expected Benefits Derived from the Use of Ice

- Point 3: Area where the ice supply is limited due to small domestic freezers and high price (Rp.500/kg or more) and where the ratio of ice to fish will improve to more than 50 percent.
- Point 2: Area where ice supply is limited due to small domestic freezers and high price (Rp.500/kg or more).
- Point 1: Area where ice is sold at reasonable prices (less than Rp.500/kg) but limited in quantity or vice-versa.
- Point 0: Area where it is easy to obtain ice at a reasonable price.

(2)-2 Scope of Fish Landing

- Point 3: Areas where the landed catch by boats from the surrounding villages amounts to an annual landing volume of more than 1,500 tons, or areas where the annual fish landing volume by local boats is more than 3,000 tons.
- Point 2: Areas where the landed catch by boats from the surrounding villages amounts to an annual landing volume of 500 - 1,500 tons, or areas where the annual fish landing volume by local boats is 1,500 - 3,000 tons.
- Point 1: Areas where the landed catch by boats from the surrounding villages amounts to an annual landing volume of less than 500 tons, or areas where the annual fish landing volume by local boats is of 500 - 1,500 tons.
- Point 0: Area where only local fishing boats land their fish catch (annual fish landing volume of less than 500 tons).

(3) **Social Factor**

Areas where the project will directly benefit fishermen households.

- Point 3: Area where fish marketing activities are carried out predominantly by women.
- Point 2: Area where fish marketing activities are carried out by both local fish traders and village women (mainly for local consumption).

Point 1: Area where the activities of fish collectors for exported fish are notable, in addition to the village women and local fish traders.

Point 0: Area where most of the fish catch is handled by private fish collectors/traders.

(4) Institutional Factor

Areas where fisheries cooperatives are active.

Point 3: Area where the fishermen's cooperatives with more than 100 members that are currently active in credit/deposit, purchase and sales activities

Point 2: Area where there are active fishermen's cooperatives with less than 100 members

Point 1: Area where fishermen's groups (kelompok) exist, but fishermen's cooperatives are inactive or non-existent

Point 0: Area where fishermen's organizations do not exist.

(5) Infrastructure

(5)-1 Availability of Electricity and Water

Point 2: Area where power is available from electricity company and city water can be supplied.

Point 1: Area where power is available from electricity company, but wells or mountain spring water must be developed as the water supply.

Point 0: Area without electricity supply.

(5)-2. Natural Conditions suited to construction of marine civil structure

Point 2: Area where countermeasures are not needed to control the natural conditions.

Point 1: Area where countermeasures are needed, but with minimal cost.

Point 0: Area where costly countermeasures are required to control the natural conditions.

Based on the above selection criteria, the model sites in Sumbawa Island were prioritized. Rompo (Waworada) in Bima district is the first priority, and Soro (Kempo) and Hu'u in Dompu district are the second priority.

Model Site	Points given by criteria								Total	Priority
	(1)-1	(1)-2	(2)-1	(2)-2	(3)	(4)	(5)-1	(5)-2		
Lab.Lalar	3	0	2	1	2	1	1	0	10	5
Lab.Sumbawa	2	0	1	1	1	1	1	0	7	7
Santong	1	1	1	3	1	1	1	2	11	4
Soro	2	1	1	3	1	3	1	1	13	2
H'uu	3	0	1	3	3	1	1	1	13	2
Kel.Tanjung	1	0	1	2	1	1	2	0	8	6
Bugis	2	1	1	3	1	2	2	0	12	3
Rompo	3	1	1	3	1	3	1	1	14	1

Similarly, based on the above selection criteria, the model sites in Flores Island were prioritized. Oka (Larantuka) in East Flores district is the first priority, and Kalimati/Wuring and Paga in Sikka district and Paupanda in Ende district are the second priority.

Model Site	Points given by criteria								Total	Priority
	(1)-1	(1)-2	(2)-1	(2)-2	(3)	(4)	(5)-1	(5)-2		
Lab.Bajo	2	1	1	3	1	1	1	2	12	4
Reo	1	0	2	2	2	1	1	1	10	6
Kotajoko	1	2	3	3	2	1	0	0	12	4
Aimere	1	1	3	0	3	1	1	1	11	5
Paupanda	3	1	2	3	0	1	2	2	14	2
Kalimati/Wuring	2	1	2	3	1	1	2	2	14	2
Paga	3	0	2	0	0	2	1	1	9	7
Sagu	3	0	2	0	2	2	0	2	11	5
Lamahala Jaya	2	0	2	2	2	3	1	1	13	3
Oka	3	0	2	3	1	3	2	2	16	1
Balauring	3	0	2	1	2	1	1	2	12	4
Lewoleba	1	0	2	0	3	2	2	1	11	5
Lamalera	3	1	2	0	3	1	0	0	10	6

4.4 Analysis of Linkage between Selected Priority Zone and it Environs

(1) Sumbawa Island

1) Rompo (Waworada), Bima District (First Priority Zone)

Linkage with other areas

- Landed fish is mainly distributed to Bima and other towns (Renda, Ngali, Tente) on the way.
- Nearly all fish caught in and around Teluk Waworada are collected and/or directly landed at Rompo (Waworada).
- Local fish collectors sell fish to buyers from Bima (once a week) at the site (ice is supplied by buyers free of charge).

Condition of existing facilities

- The existing market in Bima appears to be operating beyond its holding capacity. (Women sell fish along the street outside the market.)
- The fish handling shed at Rompo (Waworada) is depreciated, but there is no surplus land area around the site.

Conclusion

A priority zone consisting of Rompo, located along Waworada Bay, as the core of fishermen village and Bima Fish Market was created.

2) Soro (Kempo) and Hu'u (Hu'u), Dompu District (2nd Priority Zone)

Linkage with other areas

- Both sites are located in the same district (Kab. Dompu) and supply fresh fish to the Dompu market.
- Kempo is a major supplier of small pelagic (catch of Bagan and purse seine), while large pelagic fish are mainly supplied from Hu'u.

Condition of existing facilities

- The existing Dompu market does not have enough space to sell fish and it lacks a suitable area to stock fresh fish.
- There is a depreciated PPI at Soro (Kempo) constructed in 1983 (with jetty, fish handling shed, office space, small fishmeal plant, etc.). Due to its inconvenient design, the fish landing facility at the PPI has not been used.

- There is only a small fish-handling shed (approx. 50 sq. m) in Hu'u. Measures to counter the large swells that are generated in front of Hu'u will be costly (i.e., the cost of constructing a fish landing jetty).

Conclusion

A priority zone consisting of the main fish supply areas, namely Kenpo and Hu'u and the Dompu market, was created.

(2) Flores Island

1) Oka (Laratunka), Flores Timur District (First Priority Zone)

Linkage with other areas

- Larantuka serves as the main gate for fish from the eastern islands (Adonara, Solor and Lembata).
- Large pelagic fish is collected by fishing companies from local fishermen in Sagu, Balauring, etc.
- Fresh and dried fish is usually marketed by local traders (women) in Maumere and Ende, and it is also sold in the local market in Larantuka.

Condition of the existing facilities

- Fisheries infrastructure related facilities do not exist in Flores Timur and Lembata (with the exception of facilities that belong to private fishing companies).

Conclusion

A priority zone consisting of Oka in Larantuka as a fish collection point, Larantuka and central /western Flores, and the remote fishing villages (Lamahala Jaya, Sagu, Lewoleba, Balauring, and Lamalera) was created.

2) Kalimati/Wuring (Maumere), Sikka District and Paupanda (Ende), Ende District (Second Priority Zones)

Linkage with other areas

- More than 1,000 tons of fish are supplied annually from Larantuka and Maumere, and all fish including locally landed fish are consumed within Ende at present. Based on fish demand projections, it is expected that Ende will play a key role as a transition market to distribute fish from the eastern (Larantuka and Maumere) to the western regions of Flores (Bajawa and Ruteng).
- Although it is low in priority as a model area (seventh), Paga, located between Maumere and Ende, will also play an important role to increase fish production not only as an additional supply source to the western region, but also to supply export-oriented fish (tuna) to Maumere.

Condition of the existing facilities

- The existing PPI in Paupanda that was constructed in 1994 has not been utilized due to the lack of an ice plant and fish storage facility. Additionally, the jetty is unsuitable for use by fishing boats.
- In 2001, the district government of Sikka reclaimed the landing facility in Kalimati, which has not been rehabilitated since its destruction by the 1992 tsunami.