

## **2 Contents of the Plan**

### **2.1 Objectives**

The objectives are to develop small-scale fisheries and to establish a stable fish supply in the district by introducing coastal fisheries management, developing offshore fishing grounds, developing fisheries infrastructure, reduce post-harvest losses, create a fishermen association that reflects local conditions, and other measures in the three fishing villages of Maumere, Paga, and Ende that have been categorized as independent fishing villages located near consumption sites in the master plan. The lessons that are learned from the development project and the model projects that are implemented in this study will be applied in other regional fisheries development plans in the NTB and NTT provinces for other local fishing communities that will be categorized as independent fishing villages located near consumption sites.

### **2.2 Basic Development Concept**

In both the northern coastal waters on the Flores sea side and southern coastal waters on Savu Sea (Indian Ocean) side, the combination of fish aggregating devices (FADs) with the use of blast fishing by individuals, a practice that has spread uncontrollably, is threatening the appropriate use of resources. To improve this situation, resources must be managed effectively and the unexploited fishery resources in the northern and southern coastal waters developed to raise fishermen's incomes. In other words, the present level of economic losses sustained by the fisheries industry must be reduced (long hours spent landing the fish, lowered fish quality due to shortage of ice, inferior processing technology and the lack of competitive viability of processed fish products). In addition, district laws and regulations to promote coastal fisheries and district government measures to improve the fisheries system are needed. However, due to the lack of fishing knowledge, capital, organizational skills, facilities, institutions, and equipment to support fisheries activities, the fishermen have been forced to survive under the inferior conditions that prevail in production, marketing, and the living environment.

This plan aims to qualitatively improve the fisheries industry in fishing villages located near urban areas and to promote appropriate resources management while ensuring a stable supply of fish to the cities. It will deal with distribution issues by linking Maumere and Ende, as well as production issues in Paga, thereby enabling the region to supply fish to the western areas of Flores Island and to serve as a mid-way point for fish transported from eastern Flores. The following measures will be implemented to comprehensively improve all of the prevailing conditions explained above.

- 1) Due to the nonexistence of fishing rights for the local fishermen and in order to help fishermen achieve an adequate level of resources management, an initial coastal resources management system that is feasible for both the fishermen and the local government will be implemented, in conjunction with measures to improve the knowledge of fishermen about coastal resources management and to improve the local government's fisheries system.
- 2) The plan will develop the facilities for fish landing, shipping, marketing, and processing, and provide tools for shipping fresh fish from Maumere and Ende to western Flores. Technical training will be conducted for fishermen and fishing village women and extension activities will be implemented to improve fishermen's incomes.
- 3) In view of the development level of the fishing village cooperatives, fishing cooperatives, and fishermen groups already organized at each model site, a project

management system will be created around these organizations that will produce benefits for the fishermen. The local government and other local organizations will assist these organizations until they have developed sufficiently to operate independently.

- 4) As in the case of the Bima priority zone, a program to strengthen the self-motivation of the fishermen to improve their living environment and village infrastructure will be developed.
- 5) A training and extension program to disseminate the activities described above to other districts and sub-districts will be developed.

## 2.3 Sector Plan

### 2.3.1 Plan for Coastal Resources Management

The fishing waters in this zone can be divided into two sections, the northern coast on the Flores Sea side of the island where Kalimati/Wuring is located, and the southern coast on the Savu Sea (Indian Ocean) side of the island where Paga and Ende are located. The predominant fishing method in this zone is purse seine fishing, with catches consisting of small pelagic fish and seasonal large pelagic fish like bonito. Skipjack pole and line fishing is used on Pomana Island (Pulau Pomana) off the northern coast and most of the catch is sold to fisheries companies in Maumere. Thus the harvest ratio of large pelagic fish is higher than in other regions. Maumere Bay, however, is developing as a fishing ground for demersal fish, and live fish are shipped by private fish collectors. While the northern coastal waters have fishing grounds for bonito, tuna, and demersal fish for export outside the area, the southern waters do not.

The total allowable catch for these waters is estimated at 21,175 tons in Sikka district waters (area of 10,587km<sup>2</sup>) and 19,299 tons in Ende district waters (area of 7,278km<sup>2</sup>). The table below shows how these figures would be allocated for the waters within four miles of the coast in each district.

Region	Sikka district			Ende district			Total		
	Resource volume	Fish Catch Volume	Development ratio	Resource volume	Fish Catch Volume	Development ratio	Resource volume	Fish Catch Volume	Development ratio
Northern coast	15,298 tons	6,083 tons	40%	9,024 tons	1,957 tons	22%	24,322 tons	8,040 tons	33%
Southern coast	5,877 tons	697 tons	12%	10,275 tons	6,199 tons	60%	16,152 tons	6,896 tons	43%
Total	21,175 tons	6,790 tons	32%	19,299 tons	8,156 tons	42%	40,474 tons	14,936 tons	37%

Source: 1999 Fish Catch Statistics and Annual Report (Sikka district, Ende district)

With the development ratio of fishery resources along both the northern and southern coasts at less than 50 percent, there is room for growth, but development is rather advanced off the northern coast of Sikka district and the southern coast of Ende district. Efforts must be launched to develop a fisheries industry where resources are more effectively managed.

Many individually owned fish aggregating devices (FADs) have also been installed along the northern and southern coasts of Sikka district, and certain fishing boats in the area are monopolizing the waters (about 50 in Maumere Bay and about 30 in Paga).<sup>1</sup> Most purse

<sup>1</sup> According to the Ministry of Agriculture (Directorate of Fisheries, Marine Fisheries law) Law No. 51/1997, fisheries companies are only allowed to install FADs 12 miles or farther away from the coast, but the provincial and state level governments that have authority over the area within 12 miles from the coast have not yet enacted relevant regulations.

seiners in the northern waters rely on FADs, and because those fishing grounds are concentrated in the northwestern waters of Maumere Bay, the situation in the narrow fishing ground is rather confusing. In the southern waters, however, trawling and gill nets are predominantly used. Purse seiners operate only during the daytime and rely on visual observation. They are only called out by the owner when a large cluster of fish has gathered around a FAD. To maintain a healthy fishing environment, the fishing villages and boats that use these areas must coordinate their operations; and regulations regarding the use of certain fishing grounds must be enacted and enforced.

Given these conditions, the following projects have been planned to establish a system for the appropriate use and management of the crowded coastal zone of Maumere Bay and to promote the development of fishery resources in the southern coastal waters where resources are less exploited.

#### **A. Project to Improve the Data Collection System**

This zone straddles the two districts of Sikka and Ende, and neither has established an adequate fish landing data collection system. Fish landing data in Sikka district is obtained from reports submitted by fisheries companies as well as from sampling surveys of the fish catch according to fish species conducted once a month at five major landing sites in the district. Nonetheless, because the landing sites are scattered across different locations and the funds available for these activities are limited, adequate data cannot be collected. In Ende district, however, daily sampling surveys is conducted in Mbongawani (in Ende city), Ende district's largest landing site, but data is not collected from other local landing sites. The annual fish landing volume was calculated by setting the unit catch and number of fishing days for each type of fishing boat. Then sampling methods were used to add to the fish catch ratio of various fish species. However, the data is not accurate due to the seasonal fluctuations in the fishing operations of the fishing boats, the lack of data on daily and monthly fish catch volumes, and the lack of accurate fish landing data for the area. There are also budgetary constraints that impede the efforts of the Provincial Fisheries Office to collect data, and presently it is difficult to increase the frequency or the content of data collection. None of the fishermen maintain a daily record of their fish landing volume or sales transactions, and the groundwork for sound fisheries management practices does not exist.

In view of these circumstances, it is essential to establish and implement an accurate and effective data collection system despite limited human resources and a restricted budget. A specific approach is to have the fishermen keep daily records of their fishing operations. The data will be incorporated as part of the statistics, and the task of daily record keeping will heighten the awareness of management practices among fishermen households. However, in order to promote this activity, preferential treatment in credit activities should be established to heighten the fishermen's incentive to maintain daily records. For example, a trial record keeping task was implemented where 36 fishermen from six locations within this zone were asked to maintain a record of their fishing operations for a one-month period in February to March 2002. Almost all the fishermen, including fishermen of non-motorized boats, successfully completed the task despite the individual differences in the content of the records. Therefore, although there is a slight need to revise the format of the records according to fishing method, it was concluded that the fishermen were fully capable of keeping their own fishing records. Some of the 36 fishermen (or their family members) who participated in this trial, kept a separate record. Fishermen who were unable to write had family members or relatives record the data. Furthermore, as this practice becomes

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established, each fishermen household will begin to be aware of the importance of education, and it is anticipated that this will contribute to a decrease in the dropout rate of primary school children.

A specific plan to improve the data collection system is shown below.

### (1) Scope of the Project

There are many non-motorized boats in this zone, and it would be difficult in terms of the scope of the project to target all of them. Consequently, the project will begin by targeting only those who operate motorized boats at each model site that want to participate in the program. After seeing how the program progresses, it may be possible to occasionally add participants if other fishermen volunteer.

Model site	No. of fishermen households at the site	No. of targeted fishing boats (initial)	Breakdown
Kalimati/Wuring	926	130	Purse seine 54, gill net 24, trawl/angling 47, others 5
Paga (Mauloo)	397	35	Purse seine 21, gill net 9, trawl/angling 2, others 3
Ende/Ende Island	2,963	60	Purse seine 33, lampara net 12, gill net/angling 9, others 6
<b>Total</b>	<b>4,286</b>	<b>225</b>	

Note: Skipjack pole and line fishing boats were not targeted because they are already required to submit data once a month. The "Others" category indicates the number of sample candidate non-motorized boats.

### (2) Content of the Activity

The following activities were implemented in both the Sikka and Ende districts.

	Content of the Activity	Person in Charge	Period
1	Improve the format of the records (based on the findings of this study survey, the format will be revised).	1 fisheries officer Data collectors: 2 (Ende), 3 (Sikka)	5 days
2	Distribute the format of the records and explain the recording method (fishermen will be gathered at each village and a workshop will be held. After an overall explanation has been given, the fishing operation of each individual will be confirmed, and the recording method will be explained accordingly).	1 fisheries officer Data collectors: 2 (Ende), 3 (Sikka)	5 days
3	One-month trial record keeping task (making the rounds of the participating villages, monitor the progress of the record keeping activity, provide individual guidance as needed).	Data collectors: 2 (Ende), 3 (Sikka)	30 days
4	Collect the formatted records and check the content (hold a social gathering at each village, check the records of each fishermen, and answer questions, provide guidance).	1 fisheries officer Data collectors: 2 (Ende), 3 (Sikka)	5 days
5	Evaluate content of the records, analyze data (fisheries officer will supervise the analysis method and procedure to the data collectors).	Same as above	30 days
6	Compile and distribute the logbook (the logbook will be a loose-leaf notebook, in addition to the data sheet, fishing license, training and seminar participation record, record of data submitted, and other additions will be included. Ballpoint pens and calculators will be distributed together with the logbook).	Same as above	To be compiled in 30 days To be disseminated in 5 days
7	Data collection and analysis (fishermen will submit their logbooks to the data collectors once a month which will be confirmed and stamped. The data will be inputted into a PC and sent to the provincial Fisheries Office once a month).	Data collectors: 2 (Ende), 3 (Sikka)	180 days (15 days/month × 12 months)
8	Guidance on improving fishing operations of fishermen households (based on the data that is analyzed, a study group for fishermen will be held once every three months and advice and guidance will be given to help resolve the problems faced by fishermen).	2 fisheries officers	20 days (Sikka) 10 days (Ende) (4 times/year × 2-3 days/site)

## B. Project to Expand Fishing Licensing System

No licensing system for fishing boats exists in this zone. The data on fishing boats is revised every year based on the findings obtained from a fishing boat survey count that is conducted once every five years, but due to the difficulty of visiting the fishing villages that are dispersed throughout the region, an adequate survey cannot be conducted. A system for issuing licenses for small-scale coastal fishing, collecting licensing fees, and issuing licenses for fishing boat construction are still undeveloped. Since the registration number and port of registry are not on the boat, it is difficult to find and check unregistered boats. Although non-motorized boats can be excluded, a plate or other markings on the body of motorized boats are needed. A list of motorized fishing boats was compiled during this study, but it was carried out in conjunction with the field survey at the landing site for one month and data on all the fishing boats could not be collected.

Because there are no standards or systems for the installation of FADs by individual owners, fishermen with adequate resources are monopolizing certain public waters. An individual, or fishing boat, has to obtain the consent of the local residents before monopolizing a particular area of water, but a formal permit system needs to be established. Incidentally, pearl culturing companies reinvest their profits locally by paying the district government a designated water usage fee, employing local fishermen, and providing tangible and intangible assistance to the fishing villages near their operations.

Based on the conditions described above, the following activities will be implemented on a trial basis in this project at each model site. Based on the results of these activities, a formal fishing licensing system will be developed and extended across all districts.

	Activity	Person-in-Charge	Period
1	Renew the existing list of fishing boats (a survey count and confirmation based on the existing list will be conducted in the field survey. Based on the findings that are obtained, the existing database will be revised.)	Data collectors: 3 (Sikka), 2 (Ende)	30 days
2	Create a fishing licensing system and a licensing system for boat construction (Formulate a fishing licensing system and a licensing system for newly built boats, and implement them experimentally at each model site. Notify the fishing villages of the new system and hold public hearings.)	1 fisheries officer 1 district officer	30 days preparation, 30 days licensing period, 5 days for public hearing
3	Issue licenses and collect licensing fees.	1 fisheries officer	30 days
4	Boat markings (based on the list of renewed licenses, markings for the fishing boats will be prepared and distributed to each registered boat. The markings will indicate the boat's port of registry and fishing method. For fishing boats from other regions that operate in water areas in the district, seasonal licenses will be issued.)	1 fisheries officer Data collectors: 3 (Sikka), 2 (Ende)	30 days
5	Monitor the model sites and revise the system.	1 fisheries officer 1 district officer Data collectors: 3 (Sikka), 2 (Ende)	3 months
6	Develop the formal regulations of the system and disseminate to all districts.	1 fisheries officer Data collectors: 3 (Sikka), 2 (Ende)	12 months

## C. Project to Extend Fishing Grounds

As explained earlier, the development of the northern and southern coastal fishing grounds has lagged, and fisheries activities are concentrated in specific waters in this area. There does not seem to be any stagnation or reduction in the fish catch at this time, but since the fishing ground areas are limited and the number of FADs is increasing annually, it is

important to draft plans to develop and extend the fishing grounds in the future.

### **C-1 Developing Offshore Fishing Grounds**

There are many FADs now installed in the northern and southern coastal waters of Sikka district, but all of them are at shallow depths of 200m or less. FADs are primarily used by purse seiners in the northern coastal waters and by fixed gill net, trawl, and angling fishermen in the southern waters. There are no FADs installed along the Ende coast.

The purposes of offshore FADs in this project are (1) to control crowded operations of purse seiners off the northern coast of Sikka district and appropriately manage the fishing grounds there, and (2) to create large pelagic fishing grounds for small-scale gill net and trawl fishermen in the southern coastal waters. They will also be used at the coastal fishing ground surveillance station that will be explained later. The village or other cooperative will be responsible for the ownership and management of the FADs, and maintenance costs will be covered by the fishing fees that are collected. The location where the FADs will be set, as well as their size and number will follow the standards established in the project to develop a surveillance system for coastal fishing grounds.

### **C-2 Large and Modernized Fishing Boats (providing a fishing boat for the model area)**

Most of the fish catch at all three model sites in this zone are landed by purse seiners. However, existing purse seiners are small vessels that are 8 to 12m long and accommodate a crew of 8 to 10 fishermen. They are not motorized and do not have the space to carry an insulated fish hold. Due to the high offshore waves outside the bay, fishing boats are unable to safely carry out fishing operations continuously for several days outside the bay. Hence, only one-day fishing operations can be conducted, and fishing areas are inevitably limited. The creation of large and modernized fishing boats is deemed essential for developing the unexploited coastal and offshore fishing grounds located far from the fishing bases.

This project will introduce the same kind of model fishing boat at each site for the same purposes as at Waworada Bay (for details see V-1 Bima Priority Zone, Section 2.3.1, C-2 Large and Modernized Fishing Boats).

### **C-3 Motorized Fishing Boats**

The motorization ratio of fishing boats in this zone is low, at only 12 percent in Sikka district and 16 percent in Ende district. While canoes account for 94 percent of the non-motorized boats in Sikka district, they account for no more than 11 percent in Ende district. Because non-motorized boats include small boats (sampan) that are used for landing, and not fishing operations, it is difficult to estimate how many can be potentially motorized, but it is believed that motorization of about 30 percent of the canoes and 50 percent of the keel boats is possible. But, because the Fisheries Office statistics only report the number of fishing boats by district, it is difficult to determine how many non-motorized boats operate at each model site.

Small-scale credit projects for motorizing fishing boats have already been conducted by the government, fishing cooperatives, and NGOs, but they targeted only a small number of boats. It is anticipated that motorization will gradually be promoted by the efficient use of existing credit (revolving fund). But, because the sites and number of boats targeted by existing credit programs are limited, fishing methods that use FADs will be used in the southern coastal waters typically used by trawling and gill net fishermen. If the development of fishing grounds and the motorization of existing fishing boats are not promoted simultaneously at the two model sites with the smallest fishing grounds (Paga and Ende Island), these measures will have little effect.

Thus, this project will provide small diesel engines (8 to 16 horsepower) as well as gill nets and trawling gear to two model site locations along the southern coast (Paga and Ende Island), and will distribute them to fishermen who are using existing credit (either the Directorate of Fisheries LEPPM3 or existing fishing cooperative credit).

The number of boats to be motorized under this project was calculated as follows from the ratio of non-motorized boats to boats that can be motorized, obtained from the results of interviews at the two model sites.

	Paga	Ende Island
Number of non-motorized boats	106 (99 of which are canoes)	285 (33 of which are canoes)
Ratio of boats that can be motorized	Canoes 30%, keel boats 50%	Canoes 30%, keel boats 50%
Number of boats to be motorized	Canoes 30, keel boats 3	Canoes 10, keel boats 126

There are 285 blast fishermen on Ende Island (with 64 fishing boats), all of whom agreed to discontinue blast fishing at the instruction of the government in July 2001. Although the boats that were used for blast fishing (about 10m long) can be used for other types of fishing, the lack of fishing gear, such as purse seines or gill nets, left the fishermen with only the little revenue they could get from angling in their non-motorized boats. Because of this sharp drop in income, several boats returned to blast fishing in 2002. The Ende district government plans to use its FY2002 budget to purchase and install ten *kirinsai* culture rafts and seven shallow-water FADs for the Ende Island fishermen to keep them from engaging in blast fishing. The project to promote motorized fishing boats on Ende Island explained above will play an important role in enhancing these government support policies.

#### D. Project to Improve the Surveillance System of Coastal Fishing Grounds

There are many blast fishermen along both the southern and northern coasts in this zone, especially around Palue Island (P. Palue) in the northern waters and Ende Island (P. Ende) in the southern waters. This illegal form of fishing is propagated by poverty, and is observed along the coasts of Sumba Island as well as Flores Island. Long line tuna boats and lobster boats are often observed operating around Java Island and Bali Island, but the identity of the boats is unknown. If a system of distributing port registry markers with boat identification numbers is implemented, it will be easier to distinguish fishing boats from other districts. This practice will strengthen the system of reporting and controlling boats engaged in illegal fishing.

##### D-1 Develop an Ocean Wireless Communications Network

Although fishermen have observed boats engaged in illegal forms of fishing such as blast fishing, they only report that activity to the Fisheries Office and relevant government bodies much later after they return to port. Therefore, an ocean wireless communications network will be established to enable fishermen to immediately report any illegal fishing boats that are observed during their fishing operations. The wireless network can also be used to report accidents and emergencies.

District	Use	Communications equipment	Qty.	Installation sites
Sikka district	Land office	VHF wireless table unit (25W)	3	Maumere 1, Wuring 1, Paga 1
	Coastal surveillance	VHF wireless portable unit (25W)	4	Wuring 3, Paga 1
		VHF wireless portable unit (5W)	2	Paga 2
Ende district	Land office	VHF wireless table unit (25W)	1	Ende 1
	Coastal surveillance	VHF wireless portable unit (25W)	4	Ende 4

## D-2 Fishing Ground Surveillance Around the FAD Base

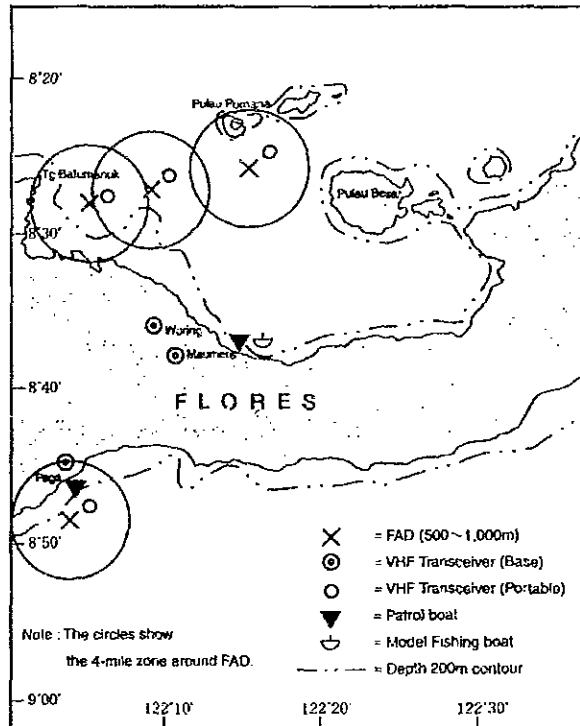
For northern and southern coastal fishing grounds, the center of surveillance activities will be the FAD site that will be part of the effort to diversify the fishing grounds.

The site of the FADs, their size and number will be as follows.

- Installation:
- 1) Will be installed in trawler and purse seine fishing grounds for the use of motorized fishing boats
  - 2) Will be installed within the four-mile water area managed by the district on the outer edge of the island
  - 3) Set up a VHF wireless communications network (extending from the land base to within a radius of 20 miles)
  - 4) Seabed is relatively flat. Areas with constant high waves will be avoided.

### Installation sites/Number of FADs:

- 1) Northern coast of Maumere: 3 (at a depth of 500m to 1,000m)
  - Unjuran lighthouse = E122°09', S8°27'
  - Between Tg. Batumanuk and Unjuran lighthouse = E122°05', S8°28'
  - South side of Gosong Bani lighthouse = E122°15', S8°26' (about 6 miles north of Maumere)
- 2) Paga coastal waters: 1 (at a depth of 500m to 1,000m)
- 3) Ende region: 4 (at a depth of 500m to 1,000m)
  - Between Ende and Ende Island = E121°34' 30", S8°53'
  - West side of Ende Island = E121°28', S8°51'
  - South side of Ende Island = E121°30', S8°55'
  - East side of Ende peninsula (Teluk Ipi) = E121°41' 30", S8°53'



Existing Fishing Grounds and FAD Locations

However, the specifications, number and economic benefits must be reviewed based on a survey of the ocean conditions and topography of the seabed of the proposed installation site, in order to prevent the FAD from being carried away by rough waves and to curtail the



cost of unneeded anchoring rope.

### D-3 Controlling the Dispatch of Fishing Boats in Emergencies

Under this project the Fisheries Office will promptly send out one boat to each site for the same purposes as at Waworada Bay (for details see V-1 Priority Zone Bima, Section 2.3.1, D-2 Controlling the Dispatch of Fishing Boats in Emergencies).

#### 2.3.2 Plan for Fish Landing, Handling, Marketing and Processing

##### (1) Number of Targeted Fishing Boats and Handling Volume

The objective of this project is to provide a stable supply of popularly consumed species of fresh fish to the district market through improved fish landing, handling, and shipping methods and to reduce the economic loss stemming from unsold fresh fish and inferior quality. Therefore, during Stage 1, efforts will be made to improve the quality of the present scope of landed fish. In the future, increased fish landing volume can be anticipated as a secondary benefit generated by the project. But this benefit can only be expected during Stage 2 after problems related to quality have been resolved.

##### 1) Number of fishing boats and fishing landing volume

The fishing boats targeted in this project will be limited to motorized boats that are expected to directly land their catch at the three sites included in the central Flores region. Non-motorized boats that have a small fish landing volume will not be targeted in this project, but if the project is operated efficiently they may also be included. The average number of fishing boats in port per day (peak hours) during the peak fishing season at the sites in this zone, and the fish landing volume have been estimated and are shown in the table below (for details see Table 1-10, Appendix 1).

##### (i) Maumere (Kalimati) (Peak period: October to November)

Type of fishing boats	Fish landing		Average number of vessels in port		Average fish landing volume	
	Time period	Hours	Boats/day	Boats/hour	Tons/day	Ton/hour
Purse seine	05:00-08:00	3	28.9	9.6	8.67	2.89
Gill net	05:00-08:00	3	3.1	1.0	0.08	0.03
Angling	12:00-18:00	6	2.7	0.5	0.01	0.00
Fish collection boat	05:00-08:00	3	8.3	2.8	2.50	0.83
Total	-	6	43.0	7.2	11.26	1.88
Total during peak hours	05:00-08:00	3	40.3	13.4	11.25	3.75

##### (ii) Paga (Peak period: October to November)

Type of fishing boats	Fish landing		Average number of vessels in port		Average fish landing volume	
	Time period	Hours	Boats/day		Time period	Hours
Purse seine	15:00-18:00	3	14.4	4.8	4.32	1.44
Gill net	06:00-09:00	3	3.0	1.0	0.15	0.05
Gill net (FAD)	06:00-09:00	3	6.0	2.0	0.15	0.05
Troll	06:00-09:00	3	2.0	0.7	0.02	0.01
Total	-	6	25.4	4.2	4.64	0.77
Total during peak hours	15:00-18:00	3	14.4	4.8	4.32	1.44

(iii) Ende (Paupanda) (Peak period: May to August)

Type of fishing boats	Fish landing		Average number of vessels in port		Average fish landing volume	
	Time period	Hours	Boats/day		Time period	Hours
Purse seine	15:00-18:00	3	22.6	7.5	6.79	2.26
Lampara net	06:00-09:00	3	8.2	2.7	2.47	0.82
Gill net, angling	06:00-09:00	3	32.3	10.8	1.61	0.54
Total	-	6	63.1	10.5	10.87	1.81
Total during peak hours	15:00-18:00	3	22.6	7.5	6.79	2.26

2) Breakdown of the fish catches according to use

A breakdown of the fish landing volume at each site in this zone according to use, based on the fishing methods given in Appendix 1, is shown in the table below.

		Present Conditions			Targeted Improvements		
		Fresh fish	Fresh fish	Processed fish	Fresh fish (in the zone)	Fresh fish (outside of the zone)	Processed
Maumere	Volume used (tons)	1,824	456	971	2,085	324	842
	Ratio (%)	56%	14%	30%	64%	10%	26%
Paga	Volume used (tons)	558	121	485	654	58	452
	Ratio (%)	48%	10%	42%	56%	5%	39%
Ende	Volume used (tons)	1,778	390	977	1,932	274	938
	Ratio (%)	57%	12%	31%	61%	9%	30%
Central Flores region total		4,160	967	2,433	4,671	656	2,232
		55%	9%	36%	62%	9%	29%

Presently, 64 percent of the fish catch volume is marketed as fresh fish, but about 9 percent, depending on the day, the peak-period fish catch volume (about 14 percent of fresh fish) remains unsold. Because each of the sites in this zone has similar peak periods, there are plans to provide local consumers with a stable fish catch by improving shipping systems based on the fish landing volume at each site through better fresh fish marketing and the development of a city information network. Because this zone is one of the major production sites in the Flores region, it can ship fresh fish quantities that exceed local demand to regions in western Flores where fish is scarce, and can serve as a mid-way point for fresh fish transported from eastern Flores.

(2) Review of the Project Components

A. Fish Landing and Fish Handling Improvement Project

PPIs (public landing facilities) have been established in Maumere at Nangafure, about 15km west of the city center, and in Ende at Paupanda, only 500m from Mbongawani's existing fish landing beach, but the fish catch is not landed at these facilities. They are not used in part because they do not meet the needs of the traders and retailers. Also, the former is located in the outskirts of Maumere, making it necessary to have land transportation to ship the fish catch to the Maumere markets (geographical problem). At the latter facility, the jetty is difficult to approach and unsuitable for landing operations. Exposed reefs make it difficult for fishing boats to enter the port (physical problems).

The Nangafure PPI is currently being managed and used as a military base. Because of its poor location, it is extremely unlikely that it will be used by coastal fishermen in the future. This facility could eventually be effectively used as a development base for a semi-commercial fisheries industry that uses small-scale fishermen by attracting fisheries

companies. The location currently used for fish landings is in the Kalimati area of Maumere city. An outdoor fish market has naturally developed here, turning the area into an important fish landing beach and a center for community life.

The PPI in Paupanda, however, is located near the existing fish landing beach. There is thus a high probability that it can be used by fishermen as well as traders and retailers, if improvements are made to the jetty and anchoring sites, and the landing facilities are expanded.

In spite of the fact that a large number of fishing boats (see the abovementioned number of fishing boats covered by the plan) use both of the current landing facilities at Kalimati and Ende (Mbongawani), fishing boats still anchor offshore and land their fish catch using sampans. Because of this, the beach front is very chaotic, and large losses are suffered due to the time required to land the fish catch.

The Kalimati site was hit by a tidal wave in 1992, but its waves are usually gentle and thus well-suited for the construction of a fish landing facility. Ende, however, gets high waves near the shore during the peak northwestern monsoon season in January and February, making it difficult for boats to approach the shore. But, this will not be problematic in terms of facility use since fishing boats make few fishing trips during this period.

Given these conditions, this project involves (1) improvements to landing facilities at Kalimati, and (2) repairs of the Ende (Paupanda) PPI facility. If the fish landing site and the fish handling shed are in separate locations, there is concern that fish transactions will have to be carried out along the quay wall or on the jetty. Therefore, the handling area for the fish catch will be built closely behind the quay wall where the fish catch is landed. At the Ende (Paupanda) PPI, the existing jetty and handling area are located about 200m from one another, but this does not pose a problem because the fish collectors (about 10) buy the majority of the catch, and the fishermen can carry the catch to the fish handling shed where they wait.

Paga is an area rich in resources, and it is one of the best development potential areas in the Sikka district. However, because the swells from the Savu Sea directly hit this area, a breakwater is an essential component of the development of landing facilities here. Because the number of fishing boats and the fish handling volume are both small compared with other sites, improvements to the landing facilities have been deemed premature in terms of cost-effectiveness. Thus, only a fish handling shed/auction area will be provided here.

#### **A-1 Kalimati Site**

##### **(a) Landing Facility**

As explained above, a quay wall will be constructed to enable fishing boats to directly moor at Kalimati (Maumere) and land their fish catch. After the boats have been moored, the fish catch will be carried to the fish handling shed behind the wharf in plastic containers. After the fish has been sold, the fishermen will wash the plastic containers and store them in a designated storage area. The fishermen will be able to refuel and restock their boats for their fishing operations the next day between the sales transactions after their fish catch has been landed and before they move their boats away from the wharf. The mooring time allocated for one fishing boat is estimated at 30 minutes and the calculations for the landing wharf and size of the plastic containers are as follows.<sup>2</sup>

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<sup>2</sup> In order to facilitate the fish landing process, jointly owned plastic fish boxes (60 liter capacity, mesh) will be provided by the project. Collection boats will use the plastic containers that they presently own (round, 30 liter capacity).

(a-1) Landing wharf

The length of time the landing facility will be used by each boat will be calculated according to the number of fishing boats landing their fish catch during peak hours. A permanent berth will be made for the model fishing boat (15GT) for fish landing, preparation and layover.

Calculations of the necessary length and depth for the fish landing wharf and the berthing facility for the model fishing boat were performed according to the methods given in Appendix 4 and are shown in the table below.

*Length of the Mooring Wharf*

Type of fishing boat	Landing time	Average no. of boats in port (boat/day)	Average mooring time (min)	Average boat length (m)	Berth length (m)	Number of berths	Necessary length (m)	Necessary depth (m)
Purse seines	3	28.9	30	12	13.8	5	70	-2
Gill net	3	3.1	20	6	6.9	1	10	-1.5
Fish collection boat	3	8.3	30	9	10.4	2	20	-2
Model fishing boat	-	1	-	16	18.4	1	20	-3

Note: Necessary berth length for one boat: Average boat length x 1.15m

Number of necessary berths: Number of fishing boats landing their fish per day ÷ (landing time ÷ landing time per boat)

Appendix 4: See 4-1-2. Mooring Facilities

Based on the above, the fish landing and preparation wharf for fishing boats will be a 2m fish landing site (L=100m) and the wharf for the model fishing boat will be a 3m quay wall (L=20m).

(a-2) Plastic containers

During the peak landing times, the average fish landing volume for 30 minutes is 1,875kg ÷ 50kg/boxes = 37 units

(b) Fish Handling Facilities

After the fish have been brought to the fish handling shed and washed, they will be sold by the fish collectors to the retailers and traders through direct negotiations. Following the fish transactions, the fish will be transferred to the containers<sup>3</sup> prepared by the retailers and traders, washed, packed in ice, and sold in the local retail markets. The same units of transaction and weighing methods used in Maumere will also be used here. The fish handling shed and equipment that will be needed is shown below.

(b-1) Fish handling shed

The fish handling shed is a facility for seamlessly supporting the series of operations from the landing of the fish catch to its shipment. The space required for each work area, as calculated according to the methods shown in Appendix 4, is as follows (see Table 4-1-3, Fish Handling Facilities, Appendix 4). However, since the only fish catch that will be landed at Maumere (Kalimati) will be marketed as fresh fish, and the fish for processed products will be taken to each fishing village for processing, there is no need to provide a preliminary processing workspace here.

<sup>3</sup> Cool box that will be introduced and diffused through the project to improve fresh fish shipment, will be used for transport of landed fish.

Size and Type of Fish Handling Facilities		
Facility	Work Content	Required area
Fish handling/sorting area	The landed fish are handled and sorted.	210m <sup>2</sup>
Secondary facility	Machine storage room, office, auction room	70m <sup>2</sup>
Temporary storage for insulated boxes	Insulated boxes for shipment, cold storage	20m <sup>2</sup>
Packing area	Packing fish in ice	110m <sup>2</sup>
Storage space for insulated boxes	Overnight storage	20m <sup>3</sup>
Loading/unloading workspace for fish shipment	Loading and unloading fish	120m <sup>2</sup>
Preliminary processing	Sorting, washing, processing of raw fish for processing	0m <sup>2</sup>
<b>Total</b>		<b>550m<sup>2</sup></b>

Source: Appendix 4, Table 4-1-3 Fish Handling Facilities

### (b-2) Hanging scales

The average fish landing volume for every 30 minutes during the peak landing hours is  $1,875\text{kg} \div 50\text{kg/box} \div \text{once}/2 \text{ minutes} = 2 \text{ units}$

## A-2 Paupanda Site

### (a) Landing Facility

As explained above, a quay wall will be constructed to enable fishing boats to moor directly at Ende and land their fish. The fishing boats will moor at the jetty during high tide, but they will anchor in offshore waters as is customary during the low tide and high waves because of the difficulty in approaching the jetty. Their catch will be landed using sampans. There is some distance between the jetty and the fish handling shed, but the fish catch will be carried between the two facilities by hand. For this reason, the mooring time allocated for one fishing boat is estimated at 45 minutes, longer than at Maumere, and the calculations for the landing wharf and size of the plastic containers are as follows.

#### (a-1) Landing wharf

The length of time the landing facility will be used by each boat will be calculated according to the number of fishing boats landing their fish catch during peak hours. A permanent berth will be made for the model fishing boat (15GT) for fish landing, preparation and layover.

Calculations of the necessary length and depth for the fish landing wharf and the berthing facility for the model fishing boat were made according to the methods given in Appendix 4. They are shown in the table below.

Length of the Mooring Wharf								
Type of fishing boat	Landing time	Average no. of boats in port (boat/day)	Average mooring time (min)	Average boat length (m)	Berth length (m)	Number of berths	Necessary length (m)	Necessary depth (m)
Purse seines	3	22.6	45	15	17.3	6	104	-2
Model fishing boat	-	1	-	16	18.4	1	20	-3

Note: Required berth length for one boat: Average boat length x 1.15m

Number of required berths: Number of fishing boats landing their fish per day ÷ (landing time ÷ landing time per boat)

Appendix 4: See 4-1-2. Mooring Facilities

Ende already has a T-shaped jetty with a length of 60m (depth: 3m) at the end portion.

However, although it is not suited for use by boats because of the height of the jetty crown, which rises about 4m higher than the surface of the water during low tide, it can be renovated to serve as a landing facility if the inner side of the existing jetty and the passageway are improved.

The wharf for the model fishing boat will be a 3m quay wall (L=20m) on the inner side of the existing jetty; and the landing wharf for fishing boats will be a 2m landing site (L=50m) in the existing passageway.

(a-2) Plastic containers

During the peak landing times, the average fish landing volume for 45 minutes is  $1,697\text{kg} \div 50\text{kg/boxes} = 34$  units

(b) Fish Handling Facilities

After the fish have been brought to the fish handling shed and washed, they will be sold by the fish collectors to the retailers and traders through direct negotiations. Following the fish transactions, the fish will be transferred to the containers prepared by the retailers and traders, washed, packed in ice, and sold in the local retail markets. The same units of transaction and weighing methods used in Maumere will be used here. The fish handling shed and equipment that will be provided are described below.

(b-1) Fish handling shed

The fish handling shed is a facility for seamlessly supporting the series of operations from the landing of the fish catch to its shipment. The space required for each work area, as calculated according to the methods shown in Appendix 4, is shown below (see Table 4-1-3, Fish Handling Facilities, Appendix 4). However, a fish handling shed (A=275m<sup>2</sup>) and building (A=164m<sup>2</sup>) have already been built at the site. Thus, the facilities will be divided into existing facilities can still be utilized and new facilities that are needed. A new loading/unloading workspace for fish shipment (A=120m<sup>2</sup>) will be built as shown in the table below.

Required Area for Fish Handling Facilities and Facility Status

Facility	Work Content	Required area	Existing facility/New facility
Fish handling/sorting area	The landed fish are handled and sorted.	130m <sup>2</sup>	Use existing fish handling shed
Secondary facility	Machine storage room, office, auction room	40m <sup>2</sup>	Use existing building
Temporary storage for insulated boxes	Insulated boxes for shipment, cold storage	30m <sup>2</sup>	Use existing building
Packing area	Packing fish in ice	70m <sup>2</sup>	Use existing fish handling shed
Storage space for insulated boxes	Overnight storage	40m <sup>3</sup>	Use existing building
Loading/unloading workspace for fish shipment	Loading and unloading fish	120m <sup>2</sup>	New building
Preliminary processing	Sorting, washing, processing of raw fish for processing	50m <sup>2</sup>	Use existing fish handling shed
Total		480m <sup>2</sup>	New building portion: 120m <sup>2</sup>

Source: Appendix 4, Table 4-1-3 Fish Handling Facilities

(b-2) Hanging scales

The average fish landing volume for every 45 minutes during the peak landing hours

is  $1,697\text{kg} \div 50\text{kg/box} \div \text{once}/2 \text{ minutes} = 2 \text{ units}$

### A-3 Paga Site

#### (a) Landing Facility

The fish catch at Paga are landed on the beach by sampan. It is then transported to the fish handling shed in plastic containers, where it is washed, and immediately auctioned at wholesale prices to the waiting traders and retailers. The same units of transaction and weighing methods used in Maumere will be used here. Other operations will also be performed as in Maumere. However, the fish handling space in Paga will also be used in the preliminary preparations of dried and salted fish (scaling, gutting, filleting, and washing). The workspace area and equipment that will be needed is shown below.

#### (a-1) Fish handling shed

The fish handling shed is a facility for seamlessly supporting the series of operations from the landing of the fish catch to its shipment. The space required for each work area, as calculated according to the methods shown in Appendix 4, is as follows (see Table 4-1-3, Fish Handling Facilities, and Appendix 4).

Size and Type of Fish Handling Facilities		
Facility	Work Content	Required area
Fish handling/sorting area	The landed fish are handled and sorted.	80m <sup>2</sup>
Secondary facility	Machine storage room, office, auction room	30m <sup>2</sup>
Temporary storage for insulated boxes	Insulated boxes for shipment, cold storage	10m <sup>2</sup>
Packing area	Packing fish in ice	40m <sup>2</sup>
Storage space for insulated boxes	Overnight storage	20m <sup>3</sup>
Loading/unloading workspace for fish shipment	Loading and unloading fish	60m <sup>2</sup>
Preliminary processing	Sorting, washing, processing of raw fish for processing	40m <sup>2</sup>
Total		280m <sup>2</sup>

Source: Appendix 4, Table 4-1-3 Fish Handling Facilities

#### (a-2) Plastic containers

Plastic containers for landing are used to transport the catch from the beach to the fish handling shed. The scale of facilities and materials needed is calculated based on a mooring time of about 60 minutes per fishing boat (the current level).

During the peak landing times, the average fish landing volume for 60 minutes is  $1,440\text{kg} \div 50\text{kg/boxes} = 29 \text{ units}$

#### (a-3) Hanging scales

The average fish landing volume for every 60 minutes during the peak landing hours is  $1,440\text{kg} \div 50\text{kg/box} \div 15 \text{ times}/30 \text{ minutes} = 1 \text{ unit}$

## B. Project to Improve Fresh Fish Shipment

The ice used at each site in this zone is produced by a small household freezer and placed in plastic bags. These bags are appropriate for small-scale traders and retailers, but there is an overall shortage of ice and the price is quite high.

In Maumere there is one fisheries company that buys and processes frozen bonito and one dried (smoke-dried) bonito processing company. Both of them have ice making

equipment, but they only supply the bonito boats that they buy from, with virtually no other outside sales. A small private ice-making plant (2.5 tons per day, 25kg blocks of ice x 100/day) began operating near Kalimati in Maumere in 2001, but it produces and sells ice to large customers like bonito boats and large-scale traders. None is made available for retail sales.

This project will stabilize the marketed quantity of fresh fish in the region between March and December (about 400 tons/month, about 170 tons for the whole year in Maumere), and will improve and disseminate the fresh fish shipping and transportation system within the region so that extra fresh fish can be shipped to western Flores.

(a) Ice-making and Ice Storage

Based on the fish usage plan according to month for each model site shown in Table 1-11, Appendix 1, the volume of fish used by category and the volume of ice needed for the average daily fish landing volume during the peak period are shown in the following table.

Model site (peak period)	Fish landing volume (tons/day)	Category	Use volume (tons/day)	Ratio of ice	Required volume of ice (tons/day)	
Maumere (Oct.-Nov.)	11.26	Fresh fish	Sale on that day	6.01	25%	1.50
			Overnight storage	0.10	75%	0.07
			For transport outside region	1.41	75%	1.06
		Processing	3.74	10%	0.37	
		Total	9.43		3.01	
Paga (Oct.-Nov.)	4.64	Fresh fish	Sale on that day	0.16	25%	0.04
			Overnight storage	1.76	75%	1.32
			For transport outside region	0.45	75%	0.34
		Processing	2.27	10%	0.23	
		Total	4.64		1.92	
Ende (May-Aug.)	10.87	Fresh fish	Sale on that day	1.30	25%	0.32
			Overnight storage	4.71	75%	3.53
			For transport outside region	1.38	75%	1.04
		Processing	3.49	10%	0.35	
		Total	10.87		5.24	
Regional total					10.17	

1. Since the volume of fresh fish for overnight storage may be transported outside the area, that was estimated to be 1/2 of the fresh fish volume landed in the evening.
2. The volume of fresh fish for transport outside the area was calculated using the ratio of the volume market outside the area to the peak period landing volume (Table 1-11, Appendix 1).
3. Ice ratio according to category was calculated based on fish freshness tests shown in Appendix 3-1.

All of the three model sites above are supplied with 24-hour electricity, and a fresh water supply is available. Hence, ice-making equipment will be installed at each site. Based on the table above, the equipment will have a production capacity of three tons/day at Maumere (Kalimati), two tons/day at Paga, and five tons/day at Ende.

The actual annual number of operating days was estimated as follows from the average ratio of the maximum monthly fish landing volume in this zone.

Maumere: About 300 days (annual average of 271 tons/month ÷ peak fishing season 327 tons/month x 365 days)



Paga: About 240 days (annual average of 97 tons/month ÷ peak fishing season 146 tons/month x 365 days)

Ende: About 270 days (annual average of 202 tons/month ÷ peak fishing season 272 tons/month x 365 days)

In addition, since the maximum daily fluctuations in the fish landing volume were about twice the average value, an ice storage capacity for two days (Maumere: 6 tons, Paga: 4 tons, Ende: 10 tons) was juxtaposed.

Since the primary buyers of ice are small-scale traders and retailers, ice blocks as well as chunked ice in plastic bags will be sold in the same units as are currently sold.

(b) Insulated Boxes and Creating a Storage Area

Fresh fish will be stocked in ice in insulated boxes. In the future, refrigerated trucks will be needed for marketing the catch to more distant locations like western Flores, but because the management costs of such equipment is high, the price of frozen fish is lower than fresh fish, and the dissemination rate of household refrigerators is low, it is first necessary to improve the marketing of ice-packed fresh fish. The scope and number of insulated boxes will be reviewed according to the following three uses.

- Fresh fish transport and sales by traders and retailers (capacity calculated according to number of people, includes export to outside regions)
- Mandatory overnight storage of fresh fish (50 percent of the fresh fish volume landed in the evening)<sup>4</sup>
- Ice storage, fresh fish storage (six villages on Ende Island)<sup>5</sup>

Based on the volume of fresh fish handled per day by traders and retailers during the peak fishing season and the volume of fresh fish stored overnight, the required number of insulated boxes for each site was calculated to be as shown below (see Tables 1-5, Appendix 1).

(i) Kalimati/Wuring

Use	Volume of fresh fish stocked	Number of people	Number of insulated boxes according to size (storage capacity of fresh fish)			
			45L (30kg)	80L (50kg)	150L (100kg)	300L (150kg)
Fresh fish for transport and sale	Under 50kg	31 people	31	-	-	-
	50-100kg	23 people	47	-	-	-
	100-200kg	17 people	-	34	-	-
	More than 200kg	7 people	-	-	13	-
Overnight storage	100kg	Gill net, angling boats	Insulated boxes for transport and sales can be used for small volumes.			

<sup>4</sup> It is surmised that 50 percent of the fresh fish landed in the evening is stored in the insulated boxes of local traders and retailers.

<sup>5</sup> See the section on multipurpose transport boats that comes later.

## (ii) Paga

Use	Volume of fresh fish stocked	Number of people	Number of insulated boxes according to size (storage capacity of fresh fish)			
			45L (30kg)	80L (50kg)	150L (100kg)	300L (150kg)
Fresh fish for transport and sale	Under 50kg	12 people	12	-	-	-
	50-100kg	25 people	49	-	-	-
Overnight storage	880kg	Purse seiners	-	-	-	6

## (iii) Paupanda

Use	Volume of fresh fish stocked	Number of people	Number of insulated boxes according to size (storage capacity of fresh fish)			
			45L (30kg)	80L (50kg)	150L (100kg)	300L (150kg)
Fresh fish for transport and sale	Under 50kg	56 people	56	-	-	-
	50-100kg	38 people	77	-	-	-
	100-200kg	11 people	-	21	-	-
	More than 200kg	3 people	-	-	6	-
Ice storage	1,500kg	Purse seiners	-	-	-	10
Overnight storage	7,200kg	6 villages on Ende Island	-	-	-	30

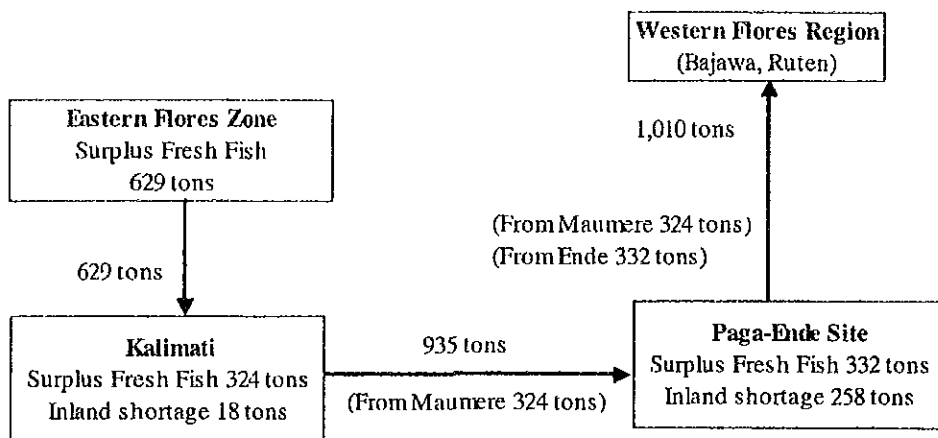
The fresh fish that is landed in the early morning is immediately transported to each city market. Therefore, a storage area for insulated boxes is required. In contrast, for fresh fish that is landed in the evening, each local trader, retailer, or fishermen must stock the fish catch for shipment the next morning. Since there are large-scale fish traders (who handle more than 200kg per day) in Maumere and Ende, a storage space for their insulated boxes will be created at each site as follows.

Model site	Maumere	Paga	Ende
Prepared insulated boxes	150L × 13	300L × 6	150L × 6 300L × 16

## (c) Fish Transport Vehicle

Currently in Maumere there are three groups of traders who ship fresh fish (mostly large pelagic fish like bonito and tuna) to Ende. The annual shipment volume is estimated at 153 tons (Sikka District Fisheries Office 2000 Annual Report). The fresh fish is packed in ice at a 2:1 fish-to-ice ratio in 300L-capacity wooden insulated boxes (with interiors made of ferro cement), and loaded onto a chartered one-ton truck (for Rp.250,000 round trip) that transports it to its destination where it is sold. Any unsold product is salted, taken to Maumere and sold as dried fish or broiled fish. Because of the shortage of ice, the poor performance of the insulated boxes and the inability to obtain more ice at Ende, the catch ultimately yields economic losses.

This project aims to stabilize the supply of fresh fish within this zone and to ship excess supplies far away to western Flores where fish is scarce. A study of the supply and demand for fresh fish in eastern and central Flores (Maumere, Ende) indicates that there is an estimated 1,010 tons of fresh fish per year that can be supplied from both zones to western Flores (see Table 1-11, Appendix 1). Of this surplus, about 65 percent (656 tons) needs to be supplied by this zone (see the figure below).



Currently fresh fish is being shipped from Larantuka and Maumere to Ende, but because the fresh fish marketing system is undeveloped, the supply does not meet the fish demand in Ende. Because ice-making facilities have not been established, it is impossible to ship fresh fish further from Ende to the western regions. Because long distance transport (9 hours from Maumere to Bajawa, 12 hours to Ruteng) is required to supply the 656 surplus tons of fish mentioned above from this zone (Maumere, Ende) to western Flores, more effective refrigerated trucks need to be provided. If the volume of fish for long distance transport at each site is shipped with an ice ratio of 75 percent for 10 months from March to December, the volume per shipment is calculated as follows.

Maumere:  $324 \text{ tons} \div 10 \text{ shipments/month} \div 10 \text{ months} \times 1.75 = \text{about } 5.6 \text{ tons}$  (3.2 tons of fish=2.4 tons of ice)

Ende:  $332 \text{ tons} \div 10 \text{ shipments/month} \div 10 \text{ months} \times 1.75 = \text{about } 5.8 \text{ tons}$  (3.3 tons of fish=2.5 tons of ice)

Given the size of the markets, the transport cost, and a fresh fish volume of 1.5 tons, two 3-ton insulated trucks are needed at both Maumere and Ende. On the return trip from their fish deliveries, the trucks can bring back rice, casaba melons, beef or other inexpensive products from their destinations which can be sold in their local home markets.

(d) Communications Facility

This zone serves not only as a supplier of fish to western Flores, but also as a mid-way point for fresh fish transported from eastern Flores. The two consumption cities of Maumere and Ende are located in this zone, and to provide a stable fish supply, shipments must be coordinated with the existing conditions at the consumption markets. It is thus necessary to build a communications network between each model site. The best option is to develop a wireless system that will allow multiple sites to obtain information from other sites simultaneously. Presently, the District Fisheries Office is not equipped with a wireless unit, making it very difficult to communicate with the villages and as well as hindering various activities.

This project will provide one SSB wireless unit and one VHF wireless unit at each site. This wireless communications network will contribute to the effective implementation of the activities of the coastal resources management plan explained earlier.

(c) Multipurpose Transport Vessel

Ende Island is located seven miles offshore west of Ende city. It has a total of 2,071 households, 75 percent of which are fishermen households. Purse seiners and Lampara net fishing boats operate from Aejeti village along the eastern coast, but most of the fishermen engage in gill net fishing or angling from their sampans close to shore. Most of the fishermen households are unable to fish during the northwestern monsoon season from January to March, and support themselves during that time by cultivating casaba melons. The purse seiners bring in large quantities of fish and land their fish catch directly at Ende, but the large majority of the small-scale fishermen have to salt and dry their catch on the island. Though the catch is small, a lot of demersal fish which sells at high fresh fish prices in Ende is harvested. However, they have no means of transporting the fresh fish, and thus sustain heavy economic losses. The fishermen's standard of living is extremely low. They eke out a living on cash revenue from occasional shipments of salted and dried fish and from textiles (ikat) produced by the women. The islanders' staple food is casaba melons, and they do not have enough money to buy rice. Fresh water is not available on the island, water is obtained from saline wells (with a salinity of about 2 to 3 percent). Under past government projects, water tanks were installed in each village on the island (2 to 3 per village) and water supply vessels came to fill them, but due to profitability issues, fresh water is no longer available.

In light of this situation, this project will provide multipurpose transport boats to establish a system of fresh fish shipments from Ende Island to Ende and to supply drinking water to the island, thereby addressing its most significant problem. On the trip from the island, the transport boats will collect the fish in insulated boxes placed in each village and will deliver them to the Paupanda PPI. On the return trip back to the island, they will deliver fresh water and fuel purchased on Flores. The shipments and maintenance of the multipurpose transport boats will be coordinated by the Ende Island sub-district administrative office (Kantor Camat Kec. Ende), and the shipping fees will be paid by the villages on the island. To ensure the efficient shipment of fish and delivery of fresh water once every three days, the head of each village will select one or two representatives from each sub-village to oversee the loading of fish and the water supply operations on a rotational basis. Shipping fees for the boats will be paid for by collecting a fixed amount from each household.

There are six administrative villages on Ende Island (Pu'u Utara, Aejeti, Ndoriwoy, Baderape, Renderatuma, and Roruranggu). Because demersal fish can be stored in ice for a maximum of three days, each village will be able to ship their fish once every three days. Consequently, it has been determined that two transport boats are needed (6 villages ÷ 3 days). The transport volume per multipurpose transport boat is calculated as shown below.

(e-1) Multipurpose transport boat operations plan

Fresh fish shipment volume: average number of fishermen households per village of  
 $262 \times 1\text{kg/day} \times 2\text{-}3 \text{ days} = 650\text{kg/trip/village}$

Ice supply volume: fresh fish shipment volume per trip  $650\text{kg/day} \times 75\%$  ratio of  
ice/day  $\times 2.5 \text{ days} = 1,200\text{kg}$

Fuel supply volume: As needed

Fresh water supply volume: average number of fishermen households per village:  
 $262 \text{ households} \times \text{fresh water demand of } 4 \text{ liters/day/household} \times 3 \text{ days} = 3\text{KL}$

Crew: 3 crew members, 3-5 shipping representatives from the village. Total: 8 (max.)

(e-2) Scope of the multipurpose transport boat  
 Cargo tonnage: about 5 tons (insulated fish boxes 1.5m<sup>3</sup>, fresh water tank 3KL, 2 drum cans)

Crew;8 members  
 Required number of boats: 2 boats

(e-3) Supplementary equipment  
 Five insulated boxes (300 liters) will be provided to each village for fresh fish storage.

### C. Project to Disseminate Fresh Fish Handling Technology

The regional marketing of fresh fish (shipment outside the area) is largely done by large-scale traders, and ice and insulated boxes are used for shipping. Consequently, it is anticipated that improving the ice supply and insulated boxes will immediately improve and disseminate the marketing of fresh fish. However, many of the fish retailers in the city markets of Ende and Maumere and the retailers who travel to nearby mountain villages are small-scale operators who have not adopted the use of insulated boxes. In the morning markets of Maumere (Kalimati) and Ende (Mbongawani), ice is not generally used for the catch which is landed early in the morning and sold at retail on the spot. However, the use of insulated boxes has become relatively common among some retailers in Ende who sell their fish from insulated boxes full of ice even early in the morning. Except in Paga, insulated boxes can usually be purchased from stores in the cities. Currently ice is made by household freezers and sold in plastic bags. The prices differ by area, at Rp.500/kg in Maumere, Rp.750/kg in Ende and Rp.1,000/kg in Paga, but in all locations bagged ice is more expensive than blocks of ice.<sup>6</sup> If cheaper ice were to come into more stable supply such that some retailers were to start using insulated boxes and people were to begin to notice the difference in quality, the use of those boxes would likely spread more quickly than in the villages. However, most retailers sell their fish early in the morning and only pack their surplus product in ice. Since this surplus supply loses its freshness during the time it takes to sell the rest of the stock, the length of time it can be kept fresh once it is finally packed in ice is shorter than if it had been packed in ice immediately. Whether the fish is packed in ice immediately or not depends on the retailer, but to facilitate the widespread adoption of fresh fish marketing improvements, it is important that government officers provide instruction in fresh fish handling technology.

To promote the use of insulated boxes, workshops for a maximum of 15 people will be held for fresh fish traders and retailers in each area. Workshops will be two days each, and will be held in the order prescribed for the Priority Zone Bima (see V-1 Priority Zone Bima, Section 2.3.1, C. Project to Disseminate Fresh Fish Handling Technology).

Model site	Number of target participants and workshops to be held by site			
	Maumere/Wuring	Paga	Ende	Total
No. of target participants	78	37	108	223
No. of workshops to be held	5	2	7	14

<sup>6</sup> The sales price at a small private ice-making factor in Maumere (Kalimati) is Rp.9,000-9,500/25kg (Rp.360-380/kg). The ice price a fisheries company charges its own fishing boats is Rp.7,500/25kg (Rp.300/kg).

#### D. Project to Improve Fish Processing

Most processed fish in this zone consists of salted and dried fish, while the rest is stored packed in salt. Fish is processed in the yard of each fisherman household. Due to the lack of a cutting table and clean water, the work is carried out in very poor sanitary conditions, where the stench and flies are rampant. During the peak period, the situation is compounded by a shortage of drying space and labor, as well as the wet season in Lewoleba, making it impossible to produce a properly treated processed product of good quality.

The volume of raw fish that is processed in this zone averages about nine tons per day during the peak fishing season (see the table in section B. Project to Improve Fresh Fish Transport, (a) Ice-making and Ice Storage). The aim of the project is to disseminate technology aimed at improving the quality of existing processed fish products, and to develop and disseminate new products of greater economic value. The processing period will be for 10 months from March to December (see Table 1-11, Appendix 1).

Since the project to improve fish processing will be implemented near the landing areas in Paga and Ende where there are a lot of fishermen households, the landing sites themselves will be used for the project site, but since the landing site in Maumere is located in the city and not near the fishermen households, the project will be implemented in the fishing village of Wuring outside of Maumere. The only fish catch landed at Maumere (Kalimati) is marketed as fresh fish. Fish that will be processed is taken to each village for processing. The content of the project to improve fish processing in this zone and at each site will be as prescribed in the Priority Zone Bima (see V-1 Priority Zone Bima, Section 2.3.2, D. Project to Improve Fish Processing).

Tie-ups will be established with existing fisheries companies and demersal fish collectors to promote the sales of new processed products. When those companies ship their own products to destinations like Java, they will promote the sales of new trial products and cultivate new markets. The women interested in marketing the new products will form a group and a representative of that group will accompany the shipments to introduce the products to customers in Surabaya, Jakarta, and other locations and to promote sales. Since there are no related companies in Ende, processors there will cooperate with processors in Maumere to promote sales.

The model processing sites necessary for improving and developing the processed products explained above will be installed in two locations, Maumere (Wuring) and Ende (Paupanda). To disseminate the quality improvements for salted and dried fish explained above to Paga, those functions will be added to the fish handling shed there, workshops will be held periodically in Maumere for local women, and the necessary technology will be disseminated.

##### (a) Volume of Fish to be processed

###### (i) Kalimati/Wuring

	Type of Processing	Fish species	Volume to be Processed
Existing product to be improved	Salt dried/cooked and dried/soaked and dried sardines	Round scads, banded blue-sprat, halfbeaks, flying fish, and others	3.4 tons/day
New product development and promotion	Half-dried bonito	Frigate tuna, bonito, fusiliers	0.1 tons/day
	Fish balls	Frigate tuna	0.1 tons/day
	Overnight drying	Round scads	0.1 tons/day

(ii) Paga

	Type of Processing	Fish species	Volume to be Processed
Existing product to be improved	Salt dried/cooked and dried/soaked and dried sardines	Round scads, sardines, anchovies	2.3 tons/day

(iii) Paupanda

	Type of Processing	Fish species	Volume to be Processed
Existing product to be improved	Salt dried/cooked and dried/soaked and dried sardines	Round scads, sardines, anchovies	3.2 tons/day
New product development and promotion	Half-dried bonito	Frigate tuna, bonito, fusiliers	0.1 tons/day
	Fish balls	Frigate tuna	0.1 tons/day
	Overnight drying	Round scads	0.1 tons/day

(b) Scope of the Model Processing Facilities

(b-1) Cutting, washing, processing facilities (for existing processed product)

The peak landing time is the morning in Maumere and the evening at Paga and Ende. Processing operations are performed immediately after landing. The facility consists of three main components, an iron pot for steaming, an improved drying area, and an indoor processing facility. The cutting and washing are performed in the available space at the fish handling shed. The content and scope of the facilities have been estimated as follows.

(b-1-1) Improved iron pot (3 sites)

Since the daily processing volume at each site will be only 2 to 4 tons, an iron pot for steaming and an iron pot for smoking will be installed, and processing technologies will be improved and disseminated.

(b-1-2) Drying area (improved drying rack)

Drying racks for demonstration purposes, 2 wooden racks (60cm x 400cm, 3 layers), and a wooden frame net panel (24 units, 120cm x 80cm) will be installed in the drying area. This area will also be utilized as an indoor storage area during the rain and at night.

(b-2) Indoor processing facility

This room will be used to carry out trial productions of new processed products such as fish balls and dried bonito for a group of 10 to 15 women. A washing area, handling table, non-motorized meat grinder, manual press, weighing scales, vacuum packager, freezer, and other equipment will be provided.

(c) How the Model Processing Facilities Will be Used

The model processing facilities will be used by processing group. At Maumere (Wuring), the fishermen families are divided into six groups, (1) purse seine, (2) Lampara net and processing, (3) gill net, (4) bottom long line, (5) dried product sales, and (6) fresh fish sales. The fishing village women belong to one of either (1), (2), (5) or (6). The groups that process fish are (2) and (5), and processing technologies will be improved and disseminated among these existing groups. At Mautapaga on the eastern side of the Ende peninsula in Ende, there is one processing group (of five people) that receives financial support from the Fisheries Office to manufacture fish balls and dried products. Other than this, dried products are produced by individual fishermen families. Consequently, in the beginning demonstrations will center around the existing group, and efforts will be made to promote the formation of other processing groups. Since the center for dried product processing is Ende

Island, periodic workshops to disseminate proper processing technologies will be there. Processing groups will be formed in the following two ways.

(c-1) Groups created according to fishing boats

Much of the raw material that is used for processing will be supplied by the purse seiners. Since the fish catch is distributed among the crew, the families of each crew (5 to 10 families) will comprise one processing group, i.e., processing groups will be created for each fishing boat.

(c-2) Groups made up of PKK (village association) units

The processing groups will be made up of PKK units (10 to 20 households per unit), the smallest unit of organization within the village without designating individual fisheries families.

(d) Trial Productions and Workshops to Disseminate Fish Processing Technology

Trial productions of processed products and workshops will be held for the existing women's groups, and the PKK groups and fishing boat groups that will be created as described above. One workshop will be held for three days (50 workshops/year) and the content of these workshops is as follows.

First day: Improvements to existing processed products (dried sardines, overnight drying, Bumbu marinated and dried, others)

Second day: Dried bonito processing

Third day: Fish ball processing, trial production and evaluation

About 50 percent of the revenue generated from the trial products will be distributed to the workshop participants and the remainder will be used to sell the product on a trial basis in the local market by the fishermen association in charge of facility operations. Relatively good quality products will be vacuum packed and stored in a freezer and sold to the fisheries companies or fish collectors in Maumere or on Bali and Java Islands on a consignment basis. The Fisheries Office and the facility operations group will be responsible for improving and disseminating the processing technology and developing marketing routes for the first year. After the second year, the operations of the model processing plant will be turned over to the most interested and active processing group, and the plant's marketing activities will be gradually expanded.

### 2.3.3 Plan for Fisheries Activities Support

A workshop, fuel and water supply facility, fish net repair area, fishing gear store, and other fisheries support facilities will be provided at each site. Consideration will be given to ensure that the operations of these facilities do not compete with the existing activities of private operators at each site. Tenant space will be allocated to the existing operators as much as possible.

(1) Workshop

The fishermen carry out simple boat maintenance and repairs such as filter and oil changes, but the existing repair shop handles the more difficult repair and maintenance work. There are boat mechanics in each village, but in Maumere and Ende (city areas) most of them work primarily on repairing autos and motorbikes. Since they are busy, it can take a long time for repairs to be performed. There are also several mechanics in every fishing village (many are also fishermen), but repairs are not professionally done, and all repair and maintenance work for the community is conducted in the mechanics' yards during their spare time. Moreover, spare parts must be purchased by each fisherman (the mechanics do not keep



their own stock). Thus, individual fishermen from Paga sometimes go as far as Maumere to purchase parts or materials.

A joint working area for boat engine repairs that can be utilized by both fishermen and the local mechanic will be provided by this project at each model site. In addition to engine repairs, the workshop will be used to build drying racks for fish processing and wood frame reinforced insulation boxes for fresh fish marketing activities. Because engine repairs in Maumere (Wuring) are performed by fishermen, a workshop will be set up there rather than at Maumere (Kalimati). Also, a fishing gear store will be established in Paga.

## (2) Fuel Depot

Maumere and Ende have a Pertamina fuel storage facility, and fuel can be purchased at standard prices at fuel stations in town. But, even fishermen living in the city will pay slightly higher prices to buy their fuel from (one of several) independent fuel stations that offer greater convenience and are located near their homes or fishing boat docks. The table below shows the refueling volume and methods of obtaining fuel during the peak period at each model site.

### (a) Kalimati/Wuring Site

Type of fishing boat	No. of boats in port/day	Average consumption volume/boat (L/boat/day)			Refueling volume/day		
		Diesel	Gasoline	Kerosene	Diesel	Gasoline	Kerosene
Purse seiner	28.9	20	0	10	578	0	289
Gill net	3.1	10	0	0	31	0	0
Angling	2.7	0	5	0	0	14	0
Fish collection boat	8.3	10	0	0	83	0	0
Total	43.0				692	14	289

This station is located in the center of Maumere city. Since the daily fuel demand is large, fuel is regularly supplied by contract with Pertamina, and can be purchased at standard prices. If fuel supplied by Pertamina is assumed to be one tank lorry (5KL) per fill-up, the station will be refueled once every week ( $5KL \div 692L = 7.2$ ). Thus, one diesel fuel tank lorry (5KL) will be installed. Since the daily demand for kerosene is low, it will be supplied in drum cans. Ten drum cans ( $289L/day \times 7 \text{ days} \div 200L/drum$ ) and one hand pump will be installed. Depending on the fuel consumption, the fuel tanks and equipment may be supplied by Pertamina free of charge. Also, if fuel can be sold at standard prices, the fuel depot may be used by fishing boats and other boats that are not targeted by this plan. The individual stations that sell fuel near Kalimati will form a group, and that group will become the facility tenant.

### (b) Paga Site

Type of fishing boat	No. of boats in port/day	Average consumption volume/boat (L/boat/day)			Refueling volume/day		
		Diesel	Gasoline	Kerosene	Diesel	Gasoline	Kerosene
Purse seiner	14.4	20	0	0	288	0	0
Gill net	9.0	0	5	3	0	45	27
Trawler	2.0	0	5	2	0	10	4
Total	25.4				288	55	31

Because there is no Pertamina fuel supply facility in Paga, private companies purchase fuel at Maumere and transport it to Paga over land. The daily fuel demand for diesel is relatively high, but since there are no landing facilities at Paga, fuel will continue to be supplied to fishing boats as it has in the past. Even if a fuel supply contract is concluded with

Pertamina, the costs of the private companies that ship the fuel in cans will not change much due to the shipping costs involved. For these reasons, six drums (four for diesel, one for gasoline, and one for kerosene) will be installed at fuel stations where there is room for them. The equipment will be managed under a tenant system using existing fuel stations that want to participate. If there are no volunteers, the equipment will be directly managed by the existing fishing cooperation (Koperasi Usaha Baru).

### (c) Paupanda Site

Type of fishing boat	No. of boats in port/day	Average consumption volume/boat (L/boat/day)			Refueling volume/day		
		Diesel	Gasoline	Kerosene	Diesel	Gasoline	Kerosene
Purse seiners	22.6	20	0	0	453	0	0
Lampara net	8.2	20	0	10	165	0	82
Gill net, angling	32.3	10	5	2	323	161	65
Total	63.1				940	161	147

In both Ende and Maumere, fuel is supplied on a direct contract basis with Pertamina. If fuel supplied by Pertamina is assumed to be one tank lorry (5KL) per fill-up, the depot will be refueled once every five days ( $5KL \div 940L = 5.3$ ). Thus, one diesel fuel tank (5KL) will be installed. Since the daily demand for gasoline and kerosene is low, it will be supplied in drum cans. Four drums ( $161L/day \times 5 \text{ days} \div 200L/drum = 4$ ) and one hand pump per drum will be installed. The individual stations that sell fuel near the planned sight will form a group, and that group will lease the facility.

### (3) Water Depot

Household water is needed to ensure the sanitary handling of fish and fish quality. Due to the lack of a water depot, water is not utilized during the entire process of landing, packing, and transporting the fish. Subsequently, the fish catch is handled under very unsanitary conditions and the drop in fish quality and freshness is notable.

For this reason, a water depot will be provided to help improve fish quality and freshness and ensure a minimum standard of sanitation during the fish handling process. The water usage and type of water used are shown in the table below based on the way operations are performed at each site, from landing to shipping and sales.

Usage	Water Usage and Types of Water				Type of water	Type of water use
	Kalimati	Wuring	Paga	Paupanda		
(i) Wash fish	o	-	o	o	Fresh water, sea water	Sea water
(ii) Processing	-	o	o	o	Fresh water, sea water	Sea water Model processing plant, fresh water
(iii) Water supply for boat	-	o	o	o	Fresh water	Fresh water
(iv) Ice-making	o	-	o	o	Fresh water	Fresh water
(v) Washing	o	-	o	o	Fresh water, sea water	Sea water Maumere markets, fresh water
(vi) Water for restrooms	o	o	o	o	Fresh water	Fresh water

Based on the above, the capacity and size of the water tank will be as follows.

Use	Water Supply According to Use				Type of Water
	Kalimati Required volume	Wuring Required volume	Paga Required volume	Paupanda Required volume	
Washing fish	3.4m <sup>3</sup> /day	0.0m <sup>3</sup> /day	1.4m <sup>3</sup> /day	3.3m <sup>3</sup> /day	Sea water
Processing, preparation	-	1.5m <sup>3</sup> /day	0.9m <sup>3</sup> /day	1.4m <sup>3</sup> /day	Sea water
Water supply for boat	-	1.8m <sup>3</sup> /day	1.1m <sup>3</sup> /day	2.6m <sup>3</sup> /day	Fresh water
Ice-making facility	3.6m <sup>3</sup> /day	-	2.4m <sup>3</sup> /day	6.0m <sup>3</sup> /day	Fresh water
Washing (facility, equipment)	4.3m <sup>3</sup> /day	-	1.5m <sup>3</sup> /day	2.6m <sup>3</sup> /day	Sea water
Sanitary use (restrooms)	4.7m <sup>3</sup> /day	1.1m <sup>3</sup> /day	1.2m <sup>3</sup> /day	2.4m <sup>3</sup>	Fresh water
Required volume of fresh water	8.3m <sup>3</sup> /day	4.4m <sup>3</sup> /day	5.5m <sup>3</sup> /day	12.3m <sup>3</sup> /day	-
Water tank capacity	8m <sup>3</sup>	4m <sup>3</sup>	6m <sup>3</sup>	12m <sup>3</sup>	-

Notes: Fresh water will be used for processing and preparation at the model processing site.  
Fresh water will be used for washing (facility, equipment) at the Maumere markets  
See Table 4-1-6 Water Supply and Storage Facility, Appendix 4.

#### (4) Fishing Gear Drying Area and Open Yard

Since landing, handling, and shipping facilities will be installed at Maumere (Kalimati), a fishing gear drying area and open yard are not needed at that site.

Since Maumere (Wuring) is comprised of an elevated over-the-water residential village the whole of which protrudes out into the sea, space for fisheries activities within the village is nonexistent. Hence, the work of repairing and temporarily storing fishing gear (fishing nets) is done on board the fishing boats or is carried out in the cramped floor space of fishermen's homes. Thus, much labor and time are required.

Likewise in Paga and Ende, there is no space available for fisheries activities beyond the sandy beach along the coast. The work of repairing and temporarily storing fishing gear (fishing nets) is done on board the fishing boats or is carried out in the cramped floor space of fishermen's homes. Thus, much labor and time are required.

Therefore, a fishing gear drying area will be created at Maumere (Wuring), Paga, and Ende where the work of washing, drying, and repairing fishing nets and other fishing gear can be carried out. In addition, a multipurpose storage area will be created to raise the efficiency of fisheries activities. This multipurpose storage area will be used for the following.

- As added temporary space where handling and processing can be carried out during fish landing hours
- As a temporary storage area for fishing gear during preparations for the next fishing trip or during work breaks
- As storage space for handling equipment and materials
- As storage space for fishing nets, ropes, fish boxes, and other equipment

The calculations for the outdoor storage areas are given below (for details see Table 4-1-9 Fishing Gear Drying Area and Open Yard, Appendix 4).

Fishing Gear Drying Area and Open Yard					
Type of area	Use	Required area	Kalimati/Wuring	Paga	Paupanda
Fishing gear drying area	Drying area for purse seines	330m <sup>2</sup>	1,650m <sup>2</sup>	1,320m <sup>2</sup>	1,980m <sup>2</sup>
	Drying area for gill nets	75m <sup>2</sup>	230m <sup>2</sup>	80m <sup>2</sup>	750m <sup>2</sup>
	Subtotal	-	1,880m <sup>2</sup>	1,400m <sup>2</sup>	2,730m <sup>2</sup>
Outdoor storage area	Multipurpose area	10m <sup>2</sup>	250m <sup>2</sup>	60m <sup>2</sup>	280m <sup>2</sup>
Total	-	-	2,130m <sup>2</sup>	1,460m <sup>2</sup>	3,010m <sup>2</sup>

Note: The fishing gear drying areas are for purse seines and gill nets.

There are no mooring facilities for loading and unloading gear at Maumere (Wuring). The fishing boats use a site revetment that also serves as mooring space for small boats and a simple wooden corridor that also serves as temporary mooring space for fishing boats. Thus, half of the purse seiners currently perform these operations on board their boats.

The outdoor storage area will be used by each fishermen household on their days off (5 days/month).

See Table 4-1-9 Fishing Gear Drying Area and Open Yard, Appendix 4.

### 2.3.4 Plan for Fishing Village Environment

Based on the Basic Development Concept explained in section 2.2, an infrastructure development project to control the adverse environmental impact on fishery activities at three model sites (excluding Kalimati), and a project to improve the social environment by strengthening the self-motivation of fishermen to improve their communities have been planned.

#### (1) Project to Develop the Infrastructure of Fishing Villages

As explained in section 1.3.3, the village infrastructure at each model site differs slightly, but the use of the landing beaches for toilet use and garbage disposal produces adverse effects for the fisheries activities at each site. This plan proposes that the following facilities be provided to help the current village residents' work to improve this situation themselves.

##### 1) Water Supply and Model Toilet Facilities

(a) Objectives, (b) content and approach of the development plan, (c) maintenance, and (d) benefits are the same as prescribed for Priority Zone Eastern Part of Flores Island (for details see V-3 Priority Zone Eastern Part of Flores Island, Section 2.3.5 Plan for Fishing Village Environment, (1) Project to Develop the Infrastructure of Fishing Villages, A. Water Supply and Model Toilet Facilities).

##### 2) Garbage Disposal System

(a) Objectives, (b) content and approach of the development plan, (c) maintenance, and (d) benefits are the same as prescribed for Priority Zone Eastern Part of Flores Island (for details see V-3 Priority Zone Eastern Part of Flores Island, Section 2.3.5 Plan for Fishing Village Environment, (1) Project to Develop the Infrastructure of Fishing Villages, B. Garbage Disposal System).

The content of improvements in sections A and B are shown below.

Village Infrastructure Development Project	Maumere (Wuring) (All 397 households are fishermen households)	Paga (Of the total 1,465 households, 27%, or 397 households are fishermen households)	Ende (Paupanda) (Of the total 5,199 households, 26.7%, or 1,390 households are fishermen households)
Water supply and model toilet facilities	A small-scale multipurpose facility was built under a separate project, and since the model facility planned under this project would be the same kind of facility, there are no new plans for this site.	Since the landing beaches for the two sub-villages are located separate from one another, a model facility will be built at the landing beach of each sub-village.	Since improvements were made to the existing PPI facility under a different project, and the model facility planned under this project would be the same kind of facility, there are no new plans for this site.
Garbage disposal system	40 garbage receptacles and 4 carts will be provided. This is an independent fishing village, but since it falls under the influence of the Maumere city government, the receptacles will be incorporated under the city's garbage collection system.	This site has a low percentage of fishermen. Since it is hoped that garbage collection will be handled by Paga sub-district, there are no new plans for this site.	Since this site falls under the influence of the Ende city government, it is hoped that garbage collection will be handled by the city, so there are no new plans for this site.

**(2) Project to Develop Community Awareness to Improve the Social Environment of the Sub-villages**

For the project content, see V-1 Priority Zone Bima, Section 2.3.4 Plan for Fishing Village Environment, (2) Project to Develop Community Awareness to Improve the Social Environment of the Sub-villages.

**2.3.5 Plan for Fishermen Organization and Fisheries Extension**

The objective of the plan is to organize and strengthen the fishing communities in three model sites in the Central Flores priority zone with the aim to promote and lead them to a self-reliance organization by engaging in the planned programmes.

**(1) Plan for Fishermen Organization**

**1) Background and rationale**

The development activities planned for the three model sites are fisheries resource management, diversification of fishing activities to offshore waters, fish landing and transport, fresh fish handling, marketing and processing, and a mini workshop for boat and engine repairs and maintenance.

There are no cooperatives in Kalimati/Wuring but there are 16 fishing groups and seven women groups, and there is one cooperative in Paga that is no longer in operation. In Ende (Paupanda) there is one cooperative, but its activities are small and it is not well-organized. The management and operations of this project can not be directly entrusted to them. In view of these circumstances, a new fishermen cooperative must be created to manage and operate the projects at the model sites.

2) *Proposed fishermen organization for project management*

The major fisheries facility will be constructed in Maumere (Kalimati) since the fish landing site at Maumere (Kalimati) is located about 5km from the fishing village of Wuring. Therefore, Maumere city and the District Fisheries Office will directly manage the facilities that are planned in the project. But the joint management and operations body of the facilities will be comprised of representatives from Maumere city and district, Wuring village, and the users of the fish landing facilities (traders, processors, and others). Although the Wuring facilities will be directly managed by the fishing village, the District Fisheries Office will coordinate the viewpoints of the several fishermen kelompok that exist in the village.

Similarly, the joint management and operations body of the facilities in Ende will also be comprised of the representatives of the existing cooperative, village communities and users (traders, processors). The District Fisheries Office will coordinate the viewpoints of the different groups. A detail on the functions of the management body is explained in section "2.5.1 Organization for Operation and Management".

The management system will be implemented in two stages—the first five-year stage and second five-year stage. The first stage will necessitate appropriate extension/training, OJT, guidance and supervision by DFO and village administration, in order to strengthen and gradually build up its viability and self-reliance.

It is expected that the fishermen organization will evolve into a strong, viable, and active organization with board members with leadership and administrative skills and a sound financial base on operation of the programmes and the extension/training that was imparted in the initial stage. This will enable the organization to become an independent and self-reliant organization that can undertake confidently the management and operation of the planned programmes. Education/training programmes should be held periodically as needed by the DOF and the fishermen association (see section 2.3.6 Plan for Education and Training).

In the second five-year period, the management and operations body of each model site should be completely entrusted to the fishermen association or cooperative, and assistance from the government should be minimal due to the independent and self-reliant management conducted by these organizations.

**(2) Fisheries Credit**

With regard to the needs for fisheries credit, please refer to Part V-1 of Section 2.3.6 in Bima Priority Zone.

In this zone, about 12 percent of the boats in Sikka district and 16 percent of the boats in Ende districts are motorized. Some 33 boats in Paga and 136 boats in Ende Island are anticipated or expected to be motorized (refer C-3 of section 2.3.1 for details). Hence, there is a need for a credit source to finance the fishermen wishing to motorize their boats. The recommended credit sources, based on the existing institutional credits that provide credit to the fisheries sector as explained in Section 2.93 of Part II, are PEMP credit fund and JICA credit. The conditions of these two sources are quite favorable in terms of the borrowing amount per group of Rp 15-50 million for PEMP credit with 8 percent annual interest, and Rp 10-20 million for JICA credit with 9 percent annual interest.

The credit system proposed here is based on the prevailing system of credit funds that are organized in PEMP fund and JICA fund. The conditions are as follows:

- Fishermen should form a kelompok to receive the credit
- Initial borrowers in the kelompok will be decided by themselves

- Accumulated repayment and interest will be revolved
- Kelompok as whole must guarantee timely repayment and interest as it is used as revolving fund

In order to meet the motorization plan, it would require Rp 165 million for boats in Paga and Rp 680 million for boats in Ende Island as shown in the table below. Since the required number of boats for motorization in Paga is about 33 which is relatively small in comparison to Ende Island which has 136 boats for motorization, a sum of Rp 50 million as initial revolving fund with conditions of two-year repayment and 8 percent annual interest, can motorize all the boats in 5 years. As shown in the table below, 15 boats can be motorized in the first year and followed by 5 boats every year with the incremental (accumulated) fund of repayment of principal and accrued interest.

In case of Ende Island, the motorization of 136 boats will require at least Rp 100 million as an initial fund to motorize in 10 years. As shown in table below, 30 boats can be motorized in the first year and about 10 boats every year thereafter using the accumulated interests and repayments. It is expected that the district fisheries office will make arrangement and support to these funding sources in the motorization of fishing boats.

	Boat for Motorization	Motorization Cost (Rp Million)	Annual motorization boats with Initial Revolving Fund of Rp 50 million (Paga) & Rp 100 million (Ende Island)					Number of years to motorize all boats
			1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	
Paga	33	165	15	5	5	5	3	5 years
Ende Is.	136	680	30	10	10	10	10	10 years

Remarks: 1) Cost of a 10-horse power engine is Rp 5.0 million  
 2) Assuming initial available revolving credit fund is Rp 50.0 million for Paga boats and Rp 100 million for boats in Ende Island.  
 3) Conditions for the credit are 2-year repayment period and interest rate is 8 percent per year.

### (3) Fisheries Extension

Refer to Part V-1 of Section 2.3.6 (3) in Bima Priority Zone

### (4) Activity Plan

Refer to Part V-1 of Section 2.3.6 (4) in Bima Priority Zone for the plan, and the cost is detailed in Section 2.5.2 (5).

### 2.3.6 Plan for Education and Training

The plan is basically similar to that described in Part V-1 of Section 2.3.6 (4) in Bima Priority Zone and the cost of operation is detailed in Section 2.5.2 (5).

### 2.3.7 Summary of Projects in Sector Plans

The summary of projects by sector (2.3.1-2.3.6) is shown in the following pages.

### 2.3.7 Project Summary of Sector Plan

Sector Plan	Name of Project	Project Contents	Project Site			
			Maumere (Kalimati)	Maumere (Wuring)	Paga	Ende
Plan of Coastal Resources Management	A. Project of Data Collection System Improvement	Technical Assistance for Fishery Management (Improvement of log book format, recording of fishing operation by fishermen, data collection / analysis, etc.)	o	o	o	o
	B. Project of Fishery Licensing System Expansion	Technical assistance for renewal of fishing boat list, issuance of fishing license, license fee collection, formulation of boat construction permit system, marking of fishing boat, etc.	o	o	o	o
	C. Project of Fishing Ground Expansion Promotion C-1. Provision of Offshore Fishing Ground C-2. Modernization / Up Sizing of Fishing Vessel C-3. Motorization of Small scale Fishing Boat	Installation of FAD and technical assistance of artificial reef Provision of model fishing boat, and training of fishermen Extension support on application of existing credit system for motorization of existing boats (small engine, gill net and trolling)	-	o	o	o
	D. Project of Monitoring System of Coastal Fishing Ground D-1. Provision of Marine Communication Network D-2. Set Up of Monitoring of FAD Base System against Illegal Fishing D-3. Set Up of Enforcement System against Illegal Fishing	Provision of VHF radio  Technical assistance of monitoring activities of illegal fishing by using FAD base Provision of speed boat	o	o	o	o
Plan of Landing, Handling, Shipment and Processing Plan of Fishery Activities Support	A. Project of Fish Landing / Handling Improvement	Provision of fish landing facilities (Landing wharf, plastic containers)  Provision of fish handling facilities (Fish handling space, scales)	o	-	o	o
	B. Project of Fish Shipment Improvement B-1 Ice making and storage B-2 Insulated box and storage area creation B-3 Fish transport vehicle B-4 Communication facility B-5 Fish collection and supply of water	Provision of Ice Plant / Storage Provision of Cool Box and Storage Space Provision of Insulated Fish Transport Vehicle Provision of SSB radio and VHF radio Provision of multi purpose transport vessel	o	-	o	o
	C. Project of fresh fish handling extension	Extension of utilization of cool box by users (demonstration, test use and rental of cool box, training of making hand made cool box, )	-	o	o	o
	D. Project of Fish Processing Improvement D-1. Model Processing Facilities for Local Women D-2. Pilot Test / training for Extension of Fish Processing Technology	Provision of fish processing facilities (space for cutting, and washing, improved kern and dry stall, processing room, etc. Technical assistance of technology improvement and extension activities	-	o	-	o
			-	o	o	o
			-	o	o	o



Sector Plan	Name of Project	Project Contents	Model Sites			
			Maumere (Kalimati)	Maumere (Wuring)	Paga	Ende
Plan of Fishery Activities Support	Workshop multipurpose building	Workshop	-	o	o	o
		Fuel supply facilities	o	-	o	o
		Water supply facilities	o	o	o	o
		Space for repair and stock yard	-	o	o	o
		Small multipurpose building for local fishermen	-	o	-	-
Plan of Community Environmental Improvement	A. Project of Community Infrastructure Improvement A-1. Model water Supply / Toilet A-2. Garbage Collection System	Provision of model kamar-mandi with water supply / drainage	-	-	o	-
		Provision of garbage bin and extension of collection system	-	o	-	-
	B. Project of Upgrading Motivation of Community People on Social Environment Improvement B-1. Provision of Audio Visual Education Material for Extension of Social Environmental B-2. Provision of Equipment for Community Improvement Education Support	Technical assistance for making education materials and its guidance, and provision of necessary equipment (Umbrella under Provincial Dinas Perikanan)	o	o	o	o
		Provision of vehicle and audio visual equipment for extension of community improvement (Umbrella under Provincial Dinas Perikanan)	o	o	o	o
Plan of Fishermen Organization / Fishery Extension Improvement		Mobilization of fishermen organization for O/M of planned program, training of participatory monitoring and evaluation of OM.	o	o	o	o
Plan of Fishermen Education /Training		Education/training for strengthening of capability of fishermen leaders and fishery extension staff, and for supplementary technical knowledge	o	o	o	o